Universitat de Girona

GREEN CITIES AND GREEN URBAN ECONOMY; CONTRIBUTIONS FROM CASE STUDIES FOR A NECESARY LOW-CARBON FUTURE

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PhD THESIS

Green Cities and Green Urban Economy;

Contributions from case studies for a necessary low-carbon future

Sergi Nuss Girona

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Green Cities and Green Urban Economy; Contributions from Case Studies for a Necessary Low-Carbon Future

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Tables, figures and abbreviations:

List of Tables:

List of figures:

Acronyms and abbreviations:

AL: Almada
AR: Arendal
ANG: Nature Association of Girona
ASPO: Association for the Study of Peak Oil
BMGF: Bill and Melinda Gates Foundation
BO: Bologna
BRICS: Brazil, Russian Federation, India, China and South Africa
CAP: Climate Adaption Plan
CCP: Cities for Climate Protection
CCS: Carbon Capture and Storage
CHP: Combined Heat and Power
CN: Climate Neutral
CO: Corporations and Utilities
CoM: Covenant of Mayors
CoR: Committee of the Regions
CP: Climate Plan
CPN: Climate Partners Network
DESA: UN - Department of Economic and Social Affairs
EC: European Commission
EE: Energy Efficiency
EEA: European Environment Agency
EROEI: Energy Return on Energy Investment
EOD: Earth Overshoot Day
ESCO: Energy Service Companies
EU: European Union
GDP: Gross Domestic Product
GEO: Global Environment Outlook
GI: Girona
IEA: International Energy Agency
IPCC: International Panel on Climate Change
JE: Jerusalem
LAKS: Local Accountability for Kyoto Goals (EU-Life+ Project)
LAP: Local Action Plan
LG: Local Government
LGEM: Local Government Environmental Manager
LGTE: Local Government Technical Expert
LSC: Local Sustainability Council
LSE Cities: Green Cities Program-London School of Economics
MBCC: Municipal Board for Climate Change
MoP: Mobility Plan
MP: Master Plan (spatial planning instrument)
NEF: New Economics Foundation
OECD: Organization for Economic Cooperat. and Development
PB: Public Sector
pc: per capita
PO: Peak Oil
PPP: Public Privat Partnership
PV: Photovoltaic energy
RE: Researcher RES: Renewable Energy Sources
SO: Civil Society and NGOs
SDI: Sustainable Development Indicator
SEAP: Sustainable Energy Action Plan
SRREN: Special Report on Renewable Energy Sources and Climate Change Mitigation (UNEP)
TU: Turku
UNCCC: UN Commission on Climate Change
UNDP: UN Development Program
UNEP: UN Environment Program
WEO: World Energy Outlook
WMO: World Meteorological Organization
WI: Wuppertal Institute
WWI: Worldwatch Institute
ZEA: Zero Emissions Administration

Green Cities and Green Urban Economy;

Contributions from case studies for a necessary low-carbon future

Contents

SUMMARIES IN ENGLISH, CATALAN AND SPANISH

ENGLISH

Between October 2011 and April 2012 the author conducted research with ICLEI-Europe on the Green Economy approach of 6 cities active in local climate change and energy. These are: Almada (Portugal), Arendal (Norway), Bologna (Italy), Girona (Spain), Jerusalem (Israel) and Turku (Finland). These cities were selected not only as they cover a wide geographical area, but also a broad cultural, economical and political spectrum.

Three questions were addressed through the research: 1) How green 'Green Cities' are?, 2) Who takes part in the green urban economy and what this green economy is like, according to the EU 2020 Strategy? and 3) How are the global economic, environmental and energy crisis -the 'Threefold E Crisis'- and the responses to it perceived? The research approach consisted of 3 key activities: 1) conducting workshops with municipal technical experts; 2) organizing a set of interviews with representatives of the public authorities, private companies, the civil society and the research/education sectors (on average 16 encounters per city); and 3) collecting data about relevant topics such as environmental policies, sustainability indicators and climate change planning / monitoring tools.

Research has shown that in all six cities at least 50% of 39 economic sectors related to energy and climate change are present, although in different developmental stages. Some traditional sectors in municipal responsibilities, such as sustainable management of waste, water and green spaces, show maturity and a positive perception by expert stakeholders. In contrast, other areas such as energy efficiency in housing and commerce, and most innovative sectors as for instance car sharing, clean production techniques, cradle-to-cradle production and corporate social responsibility are still limited. At the policy level, climate change mitigation plans are common to all cities, with new instruments deserving specific attention and multiplication. Meanwhile, climate change adaptation strategies are the new topic on their agendas.

This dissertation will show how the cities engage different social and economic agents to promote and implement the green urban economy approach. Further, it will also stress the relationship between the objectives of the EU 2020 Strategy -European adaption of the green economy paradigm- and the consequences of the current economic crisis in each of the visited cities. Finally, the focus will reflect on the role of leaders and political commitments in achieving successful green urban economies.

CATALÀ

Entre octubre de 2011 i abril de 2012 l'autor en col·laboració amb ICLEI-Europe ha desenvolupat una recerca sobre l'aproximació a l'Economia Verda en 6 ciutats actives en canvi climàtic i energia. Aquestes són: Almada (Portugal), Arendal (Noruega), Bolonya (Itàlia), Girona (Espanya), Jerusalem (Israel) i Turku (Finlàndia). Aquestes ciutats van ser seleccionades no només per cobreixen un gran àmbit geogràfic, sinó també perquè representen un espectre cultural, econòmic i polític molt ampli.

Mitjançant la recerca s'han abordat tres preguntes: 1) Com de verdes són les 'Ciutats Verdes'?, 2) Qui participa a l'economia verda urbana i com és aquesta economia verda d'acord a l'Estratègia Europea 2020, i 3) Com són percebudes tan la crisi econòmica, ecològica i energitca global -la 'Crisi de la Tripe E'-, com la respostes a la mateixa? L'enfocament de recerca va consistir en 3 activitats clau: 1) realització de tallers amb tècnics municipals; 2) organitzacion d'una sèrie d'entrevistes amb representants d'autoritats públiques, empreses privades, la societat civil i el sector acadèmic i de la recerca (de mitjana

16 entrevistes per ciutat); i 3) recol·lecció de dades sobre temes rellevants com polítiques ambientals, indicadors de sostenibilitat i instruments de planificació / monitorització del canvi climàtic.

La recerca mostra que a totes sis ciutats estan presents almenys el 50% de 39 sectors econòmics relacionats amb l'energia i el canvi climàtic, si bé en diferents estadis de desenvolupament. Alguns sectors tradicionals de competència municipal, com la gestió sostenible dels residus, de l'aigua i dels espais verds, presenten maduresa i una percepció positiva per part d'agents socials experts. En contrast, altres àrees com l'eficiència energètica a les llars i els comerços, i els sectors més innovadors com per exemple el *car sharing*, les tècniques de producció neta, la producció *cradle-to-cradle*, i la responsabilitat social corporativa encara són limitades. A nivell de polítiques, els plans de mitigació del canvi climàtic són comuns a totes les ciutats, amb nous instruments mereixedors d'atenció específica i multiplicació. Mentretant, les estratègies d'adaptació al canvi climàtic són el nou tema de les agendes locals.

Aquesta dissertació mostrarà com les ciutats involucrem diferents agents socials i econòmics per promoure i implementar l'economia verda urbana. A més, es farà èmfasi en la relació entre els objectius de la l'Estratègia Europea 2020 -l'adaptació europea del paradigma de l'economia verda- i les conseqüències de l'actual crisi econòmica en cadascuna de les ciutats visitades. Finalment, també es reflexionarà sobre el rol dels líders municipals i dels compromisos polítics en l'assoliment exitós d'economies verdes urbanes.

CASTELLANO

Entre Octubre de 2011 y Abril de 2012 el autor en colaboración con ICLEI-Europe ha desarrollado una investigación sobre la aproximación a la Economía Verde en 6 ciudades activas en cambio climático y energía. Estas son: Almada (Portugal), Arendal (Noruega), Bolonia (Italia), Girona (España), Jerusalén (Israel) y Turku (Finlandia). Estas ciudades fueron seleccionadas no solo porque cubren un gran ámbito geográfico, sino también porque representan un espectro cultural, económico y político muy amplio.

Mediante la investigación se han abordado tres preguntas: 1) ¿Cómo de verdes son las 'Ciudades Verdes'?, 2) Quién participa en la economía verde urbana y cómo es esta economía verde de acuerdo a la Estrategia Europea 2020, y 3) ¿Cómo son percibidas, tanto la crisis económica, ecológica y energética global -la 'Crisis de la Triple E'-, cómo las respuestas a la misma? El enfoque de investigación consistió en 3 actividades clave: 1) realización de talleres con técnicos municipales; 2) organización de una serie de entrevistas con autoridades públicas, empresas privadas, la sociedad civil y el sector académico y de la investigación (de media 16 entrevistas por ciudad); y 3) recolección de datos sobre temas relevantes como políticas ambientales, indicadores de sostenibilidad y de instrumentos de planificación / monitorización del cambio climático.

La investigación muestra que en las seis ciudades están presentes al menos el 50% de 39 sectores económicos relacionados con la energía y el cambio climático, si bien en diferentes estadios de desarrollo. Algunos sectores tradicionales de competencia municipal, como la gestión sostenible de los residuos, del agua y de los espacios verdes, presentan madurez y una percepción positiva por parte de agentes sociales expertos. En contraste, otras áreas como la eficiencia energética en las viviendas y los comercios, y los sectores más innovadores como por ejemplo el *car sharing*, las técnicas de producción limpia, la producción *cradle-to-cradle*, y la responsabilidad social corporativa aún son limitadas. A nivel de políticas, los planes de mitigación son comunes en todas las ciudades, con nuevos instrumentos merecedores de atención específica y multiplicación. Mientras tanto, las estrategias de adaptación al cambio climático son el nuevo tema de las agendas locales.

Esta disertación mostrará como las ciudades involucran diferentes agentes sociales y económicos para promover e implementar la economía verde urbana. Además, se hará émfasis en la relación entre los objetivos de la Estrategia Europea 2020 -la adaptación europea del paradigma de la economía verde- y las consecuencias de la actual crsis económica en cada una de las ciudades visitadas. Finalmente, también se reflexionará sobre el papel de los líderes municipales y de los compromisos políticos en la consecución exitosa de economías verdes urbanas.

Chapter 0 - INTRODUCTION.

The global environmental crisis has been a personal concern to me since I was 15. It all started in highschool by "buzzing in the ears" of my female classmates about hair sprays and the ozone layer. Not surprisingly, once in college I enrolled in the first promotion of the Bachelor Degree in Environmental Sciences in the University of Girona (only the second year these studies existed across Catalonia and Spain). At the same time, I became an activist of a local environmentalist NGO, Associació Naturalistes de Girona (ANG). ANG was a source of personal and professional training, parallel to my official university studies. In the ANG, as either a volunteer or staff member, I took part in multiple campaigns in a broad variety of environmental and professional fields, such as urban ecology, spatial planning and urbanism, biodiversity and ecosystems conservation, climate change, environmental law, environmental education, public relations and spokesman, human resources management, etc. The ANG is a part of my life now. I've never been able to quit the unique experience of sharing and building with other people a altruistic project. Even so, a more conventional professional career was also initiated after college, which took me to work -particularly- in waste management, environmental consultancy, local and regional sustainable development and research.

Among the latter, one project stands out and paved the way for what ended up being my PhD research; the Sustainability Observatory for the Region of Girona (OSCG). The OSCG is a not-for-profit initiative born from a conglomerate of environmentalist organizations, including the ANG, with the mission of collecting, registering, analyzing and assessing progress in the region of Girona according to the principles of sustainable development. In cooperation with the Province Authority of Girona, between 2007 and 2010 through this platform we developed a series of yearly assessment reports about sustainability at provincial, county and municipal levels, for a territory encompassing 221 municipalities, 8 counties overall and with approximately 750,000 inhabitants in 5,900 Km2. Two are the essential outcomes of OSCG. First, a website giving access to all the reports and to a battery of maps representing sustainable development indicators at municipal and county level. Secondly, a book issuing an assessment of progress in sustainable development at local level after 10 years of Local Agenda 21 in the region.

Thanks to that prior experience, the Geography Department and the Institute of the Environment of UdG kindly took me in (2010), in order to proceed with research in the field of local sustainable development through a PhD project. The main curiosity I wanted to satisfy, was to confront impressions and findings from the work at OSCG and ANG with what was going on at the international level, reason why we established contact with ICLEI-Europe, as this organization works on a daily basis with local governments (from all over Europe plus another area of influence) which are dealing with sustainability programs on many issues (climate and energy, water, sustainable governance, procurement, etc.).

Concurrent to the OSCG and PhD processes, the international financial recession and debt crisis began, with the resulting severe impact on several OECD economies, such as Spain, Portugal, Italy, etc. However, at least within the sustainability world (NEF, UNEP...), a longer lasting crisis was understood to be emerging behind this apparently momentary turmoil; one much more structural and critical, the economic, environmental and energy crisis, also called "Threefold E Crisis". Consecutively, at both the European and global scales, with the EU 2020 Strategy, EU Low Carbon Pathway 2050, and Rio+20 Declaration the notions of Low-Carbon and/or Green Economy were heralded as the new destination of development.

It was, therefore, from merging the interest on local sustainability, the collaboration with ICLEI-Europe and the discourse on low-carbon development, that the present research project was generated. A project aiming at studying the adoption of low-carbon pathways by outstanding local governments, in order to showcase success stories, yet revealing as well the

uncertainties, contradictions and constraints. We wanted to see when comparing cities from countries as different as Norway and Israel (although in all cases cities form countries belonging to the OECD), just how similar or how different their green urban economy realities, strategies and instruments really were. We wanted to know how green 'Green Cities' are, who takes part in the green urban economy; what this green economy is like, according to the EU 2020 Strategy; and how are the 'Threefold E Crisis' and the responses to it perceived?

Finally, six cities were surveyed, through visits and online communication. An ad hoc quantitative and qualitative field data collection methodology was developed by combinging interviews, questionnaires, onsite tours about specific experiences, and workshops. On average 16 meetings took place in each city, with an overwhelming amount of results and information. As a consequence, not all the analyses possible have been effectively developed, leaving work to do for the "postdoc" period. On the other hand, given the extent of the results it was a challenge to deliver a readable dissertation. For this reason, the Results chapter is organized into 3 sections with the associated discussion included. Additionally, a General Discussion and Conclusions chapter follow the Results chapter. Full length results are located in the Annex sections, particularly, a city-by-city profile in Annex I, with details of every interview and activity conducted, in order to enable a full contrast of statements in the Results chapter.

By the time this research is ready for discussion, the IPCC is about to release the full version of its 5th assessment report (AR5). Sectoral documents from AR5 published between the end of 2013 and mid 2014 basically increase the degree of the emergency, as the gap to unsafe levels of global warming is rapidly shrinking. Events in the field of the global environmental crisis are accelerating at a speed faster than what this PhD has been able to report. Realizing the latter does nothing but reaffirm why at the end of this experience I can only express my admiration to all the committed technical experts, elected officials, entrepreneurs and activists I met. The challenge of fighting for an effective bottom-up transition towards sustainable development is enormous, because the inertia is magnificent, but also pressures to detour or stop the process are unremitting, from above and below. The cultural inception of individualism, consumerism, reluctance to change and climate/environmental skepticism is so strong, it seems to be almost instinctive; something natural. Hence, any progress made is a huge leap forward, and this is thanks to the tenacity of few.

Chapter 1 - THEORETICAL FRAMEWORK

1.1 - The Global Titanic and the Environmental Iceberg

Is sustainability still possible? This suggestive and critical interrogation is the title of the 2013 edition of Worldwatch Institute's [WWI] *State of the World*. Nowadays, human origin of global environmental change is no longer a debate; 50 years of evidence of anthropically caused ecological distress (Carson, 1962) has turned into an issue of planetary scale (Bardi, 2011; *Global Environment Outlook-5* [GEO-5] by UNEP, 2012; Meadows et al., 1972; *Millenium Ecosystem Assesment* [MEA], 2005; Wackernagel and Rees, 1998). Actually, the magnitude of anthropogenic impact on the biosphere is so vast that it has been defined as a new geological age, the Anthropocene (Crutzen, 2002, Steffen et al., 2011). In response to all this, currently, a whole new epistemological space in Earth Sciences is opening up, with major key topics including: the definition and description of the mechanisms potentially leading to large-scale ecological disruption; where are we in the mission of preventing this?; and, what probable consequences will humanity need to cope with in the not so distant future? A growing volume of research is being published regarding the drivers of change (local and global), the present status of the environment, and the future scenarios (Barnosky et al., 2012; International Pannel on Climate Change [IPCC] 2007, 2013, 2014a, 2014b; Motesharrei et al., 2014; Rockström et al., 2009; Stern, 2006, 2008 -in press-).

Barnosky et al. (2012) underline the 4 main global-scale forcing mechanisms which are exceeding, *"in both rate and magnitude, the forcings evident at the most recent global-scale state shift, the last glacial–interglacial transition"*: 1) population growth with increasing resource consumption, 2) habitat transformation and fragmentation, 3) energy production and consumption, and 4) climate change.

Regarding the impacts of the previous forcing mechanisms, an ongoing integrative approach is allowing to produce global reports from a large myriad of sectoral studies - at all scales- in a very wide range of topics, such as: the access to water (Mee and Adeel, 2012); the loss of biodiversity (Barnosky et al., 2011; Cardinale et. al 2012; Hooper et al., 2012); the state and depletion of fisheries (Anderson et al., 2012; Davies and Baum, 2012; Jackson et al., 2001); land use change and human appropriation of net primary production (Barnosky et al., 2012; Haberl et al., 2007; Vitousek, Mooney, Lubchenco, and Melillo, 1997,); global warming and the impacts of climate change (IPCC, 2007, 2013, 2014a, 2014b; Stern, 2006, 2008[1] -in press-; Lenton, 2011); etc.

In most cases the news is unpleasant, but adding them together is even worse. There is a great concern on how sectoral changes in the biosphere are building into a dangeorus critical mass, which could trigger a global tipping point. Indeed, planetary-scale environmental transitions over a time span of several hundreds or thousands of years have already been registered (Scheffer et al., 2009; Steffen et al., 2011).

As part of the latter process, recent scientific breakthroughs (Barnosky et al., 2012; IPCC, 2007; Rockström et al., 2009) have started to explain, analyze and estimate from a holistic perspective, the fundamental processes and constraints of the Planet's holocenic interglacial relative stasis[2]. The new scientific quest is to understand and learn how to manage these interacting processes of different scale and nature. What Rockström et al. (2009) describe as the *"planetary boundaries within which we expect that humanity can operate safely"*.

Table 1.
Planetary boundaries of sustainability and current situation.

Source	Thresholds	Current State
Rockström et al. (2009)	1. Climate Change: CO_2 < 350 (to 550) ppm / +1- +1.5 W/m^2	1. Transgressed
	2. Ocean Acidification: ≥80-≥70% pre-industrial Aragonite saturation state of mean surface ocean	2.
	3. Ozone Depletion: <5% (to 10%) reduction of 290 DU	3.
	4. Atmospheric aerosol loading: to be determined	4.
	5. Biogeochemical flows: P: < 10× (to 100×); N: industrial and agricultural fixation of N_2 < 35 Mt N yr^{-1} (25-35% of total)	5. Transgressed
	6. Freshwater Use: <4000 (to 6000) km^3 yr^{-1})	6.
	7. Land System Change: <15% (to 20%) icefree land to crops	7.
	8. Biodiversity loss: 10 (to 100) extinctions / 10^6 species yr-1	8. Transgressed
	9. Chemical pollution: to be determined	9.
Barnosky et al. (2012)	• Planetary land use change <50% (to 90%) --> by 2025 we could reach 50% in correlation to population growth.	• 43% land has urban or agriculture use
IPCC (2007)	• 445-490 ppm CO_{2e}: 75-50% probability of temp. rise <+2º C over pre-industrial levels; boundary of acceptable impacts	• 2011: 391.6 ppm CO_2[3], 2005: 455 ppm CO_{2e}
(2013)	• Global carbon budget 2000-2049: total atmospheric release <1,000 gigatons (1 Tt) to stay under the 2°C threshold	• 531 gigatons CO_2 as of 2011

Source: Nuss, S.

Despite the uncertainty underlying this new science, a closing gap towards the fuzzy limits of planetary stability has been proven. And we now know that global tipping point(s) exist and once surpassed rapid[4] ecological collapse may happen. Barnosky et al. (2012) argue that *"biological systems on many scales can shift rapidly from an existing state to a radically different state"*, to which Rockström et al. add *"transgressing one or more planetary boundaries may be deleterious or even catastrophic due to the risk of crossing thresholds that will trigger non-linear, abrupt environmental change within continental- to planetary-scale systems"*.

[1] http://www.theguardian.com/education/2008/mar/25/academicexperts.highereducationprofile

[2] The Holocene covers the last 11,000 years in which global mean temperature remained practically constant. It is the age where humans created agriculture and evolved until present day development (life expectancy, population, technologies, knowledge...).

[3] Source: www.co2now.org

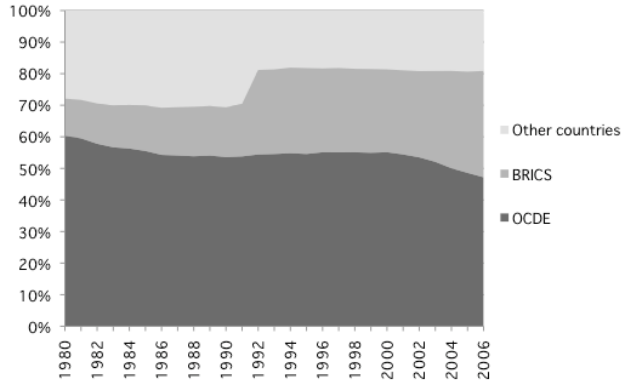
[4] Abrupt warming of deglaciation was followed by an even more abrupt cooling between 12,800 and 11,500 years ago, namelly the Younger Dryas event. This paleoclimatologic event had a start (and an end) transition from 7 to 50 years with a temperature drop approx. 11ºC, believed to be associated with a disruption of the Thermohaline circulation (Berger, 1990).

Two main social and economic factors determine the drying out of ecosystem functions and induce the remaining global forcings aformentioned, namely: a) demography and b) high (energy and materials) consumption patterns. The ongoing population explosion which started in the industrial revolution and has grown from 1 billion to 7 billion[5] inhabitants in 250 years, and with prospects of reaching 9 billion in 2050 (United Nations Department of Economic and Social Affairs [UNDESA], 2009), is undoubtedly a major driving force in the unfolding resource crisis. Even so, as figure 1 shows, the lifestyle of the industrialized countries stands out as the major generator of environmental degradation. Using CO_2 emissions as a proxy of resource consumption patterns, we see that OECD countries, where barely 18% of the World's population live (World Bank[6], 2012), account for close to half of the greenhouse gas emissions ([GHG] IEA, 2008a). In fact, when emissions embedded in international trade of goods and services are considered, a higher load should be assigned to the latter (Jakob and Marschinski, 2012), as it is estimated that 78% of emissions produced in developing economies are consumed in developed countries[7] (Carbon Trust Analysis, 2004).

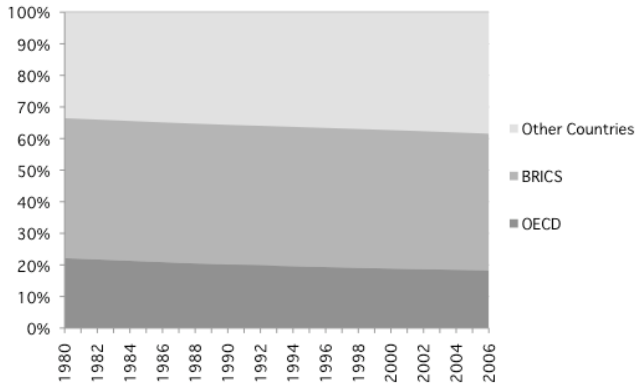
So far, scientists hope that it is still in hands of humanity to be able to stabilize global environmental change to below critical levels. But for this to happen it is more than urgent to stop degradation of the ecosystem services and resume them instead. Constanza et al. (1997) calculated an average annual value of US$ 33 trillion for 17 ecosystem services on a worldwide scale, almost doubling the global GDP. Yet, this is a decreasing natural budget between *"sometime in the 1970s"* (Global Footprint Network [GFN], 2012) and 1987 (New Economics Foundation [NEF] in Dutta and Shahani, 2014), when humanity's yearly rate of materials and energy extraction exceeded the annual productivity of the Earth for the first time. Currently, according to GFN (2012) the human ecological footprint is 50% larger the Planet's annual biocapacity. Thus, despite the inexactness of Constanza's et al. estimation[8], we are in a downward trend of the 'natural monetary flow'. To better visualize the process, NEF[9] coined the concept of the Earth Overshoot Day (EOD), which corresponds to the day in the year when society has consumed the biosphere's absolute annual yield of ecological resources and services. Hence, each day after is dependant on exploiting "passive" or "stock" resources, therefore depleting the total potential output for the following years. In 1987 the EOD was scheduled to be December 19, whereas in 2012 this date has moved forward to August 22. Thus, already for more than 4 months of the year, humankind lives of subsistence sources from future generations.

Figure 1.
Percentage of World Carbon Dioxide Emissions and Population.

a) CO_2 from consumption & flaring of fossil fuels.



b) Percentage of World Population. Data source: World Bank [WB], 2012



Notes: OECD: OECD member states; BRICS: Brazil, Russian Federation, India, China and South Africa; Other countries: 207 sovereign States.
Source: Nuss, S., based on data from (a) International Energy Agency (2008); and (b) World Bank (2012).

Eight years after *The Stern Review* (Stern, 2006) the question on the feasibility of achieving sustainable development is more and more common. Actually, prior to the Rio+20 Summit *Nature Magazine* published a special issue (vol. 486) assessing the global environmental crisis and the effective implementation of sustainable development in the last 20 years, through the Rio92 agreements and treaties. Its conclusions could not be more preocupying: *"few could have guessed how much worse the situation would get... Our assessment shows how little progress nations have made towards honouring the commitments they made in 1992... In sharp contrast to the political stalemate over the past two decades, scientists have developed a more sophisticated understanding of the roots and effects of the current environmental crisis... shrinking biodiversity is affecting ecosystems... the voracious consumption patterns of the developed world are to blame... Earth and its inhabitants have a second chance in Rio. They may not get many more."* (Nature, 2012).

Looking ahead, climate change will aggravate already existing problems, such as poverty, diseases, violence and migrations (IPCC, 2014a). Furthermore, *"if currents continue unchanged we are on track to require the resources of two planets well before mid-century"* (GFN, 2012). Applying this forecasts to sectoral issues we find, for instance, that by 2050 7 out of the 10 largest water basins in the world -which

[5] Billion: 10^9
[6] source: http://data.worldbank.org/
[7] According to the same model only 9% of emissions travel in the opposite direction.
[8] and the fact that nowadays new methods, such as those used for *The Economics of Ecosystems and Biodiversity* (2008) report, are able to vary the number of environmental functions considered and therefore the total value.
[9] In cooperation with GFN and Best Foot Forward

currently feed 25% and 10% of the World's population and GDP, respectively- *"will suffer great water bankrupcy"* (Mee and Adeel, 2012; commissioned by UNEP). Williams, Jackson and Kutzbach (2007) have announced that *"climates found at present on 10–48% of the planet are projected to disappear within a century, and climates that contemporary organisms have never experienced are likely to cover 12–39% of the Earth"*. In 2006 Stern advised that early intervention against climate change would be less costly economically (but also socially and environmentally) than the opposite approach. Following this monetary approach, a recent release by Hanewinkel, Cullmann, Schelhaas, Nabuurs and Zimmermann (2012) suggests that *"by 2100, between 21% and 60% (mean: 34%) of European forest lands will be suitable only for a Mediterranean oak forest type with low economic returns* [14-50% less than today]*"*.

An exhaustive list of future environmental scenarios is impossible to reproduce here. Yet, we expect the aforementioned examples to make clear that, even shifting away from business as usual (BAU) development, putting the available pieces of the puzzle together -despite it being incomplete- the 21st century projects an image of a mounting probability of a global metamorphose. The tremendous amount of exergy (Ayres, Ayres and Martinàs, 1996) the biosphere must reset in equilibrium due to human activities of the last 250 years, together with an expanding demand of resources -derived from both an increasing total population and a growing share of intensive consumers-, in a context of shrinking stock and yearly yield, must be addressed as a crucial moment for all of humanity.

Unfortunately, it seems that we lack the intellectual, institutional and technological capacities to confront this unprecedented challenge. In fact, as the next chapter explores, we still expect to rely on the concepts of development of the previous 100 years to tackle the threats of a potential global environmental crisis.

1.2 - Neoliberal economy in a Silent Spring: brief history of a double and opposite development agenda of humanity.

The 1960s and 1970s saw the birth and growth of environmentalism. In part thanks to very important new findings made by Earth Sciences. The first environmental "hit" was fifty years ago (1962) when Rachel Carson in *Silent Spring* exposed the relationship between pesticide inputs and biodiversity loss, human diseases and the pollution of vital resources (water and soil).

In 1972 Meadows, Meadows, Randers and Behrnes published *The Limits to Growth* for the Club of Rome. The book became the environmentalist "bible" of its day. In fact, the conclusions of its systems dynamics computer simulations are still discussed and contrasted today (Turner, 2008; Bardi, 2011). The key message of the book was that BAU development of five interlinked global economic subsystems (population, food production, industrial production, pollution and consumption of non-renewable natural resources) would create challenging scenarios for global sustainability sometime in the 21st Century. In practice, prospects of *The Limits to Growth* are consistent with current evidence, as specifically shown in *The Limits to Growth Revisited* (Bardi, 2011) and chapters 1.1 and 1.3 within this dissertation.

Another key discovery in the start-up period of environmentalism was James Lovelock's *Gaia Theory* (1979). Also through computer science, this British chemist showed that the biosphere has a regulatory effect on the Earth's environment that acts to sustain life; biodiversity fosters environmental stability, which in turn enhances conditions for biological complexity and ecological balance. As we very well know now, air pollution and GHGs are threatening the atmosphere's chemical equilibrium created by this natural homeostatic mechanism.

In that period and in response to Carson and Meadows et al. breakthroughs, treadmill development advocates coined the still circulating slogan that environmentalists are *"against progress"* (Turner, 2008) and worse *"anti technology, probably communist nuts..."* (Briggs in Marco, Hollingworth and Durham, 1987). However, the environmentalist "awakening" process of science and society of the 1960s and 70s, was strong and disquieting enough to instigate States and Governments to acknowledge and regulate environmental issues. At least 17 countries included the environment in their Constitutions between 1967 and 1979 (Aguilera et al., 2010). And, at the 1972 UN Man and Biosphere Conference (MAB) in Stockholm, the first national and international environmental reports were presented. This conference led directly to the creation of government environmental agencies and the United Nations Environment Program (UNEP). Also at the MAB the former European Community announced its intention to adopt a continental environmental policy (Aguilera et al., 2010). That same year, the USA passed new legislation such as, the Clean Water Act, the Clean Air Act, the Endangered Species Act, and the National Environmental Policy Act.

In reality, the outburst of environmental awareness took place together with a much wider cultural transformation period in history. Converging quests for peace, labor, democracy, race, religion, gender, sexuality, etc. arose. The so-called "hippy" or "flower power" movement was a product of these times of cultural shock as well. Many demonstrations around the Globe peaked with various civil demands: the end of the Vietnam War (1969), stronger social rights (1965 Los Angeles, 1968 Paris), a halt to nuclear power and weapons[10], the protest against Martin Luther King's death (1968), etc. At the same time some of the most prestigious environmental organizations in the World were founded, such as World Wildlife Fund for Nature (WWF, 1961), Friends of the Earth (1969) and Greenpeace (1971).

Parallel to this process, neoliberal capitalism born in the 1930s was retrieved and re-empowered. Rüstow coined the term neoliberalism in 1938, understanding the economy as "*the priority of price mechanism, free enterprise, the system of competition and a strong and impartial state*" (cited in Mirowski and Plehwe, 2009). Currently, those who are included in the updated neoliberal economics (i.e. IMF, WTO, WB, ECB, Wall Street...) defend government non-intervention, fiscal austerity, and enhancing the role of the private sector by market deregulation, as regulation is seen as inefficient. Founders of neoliberal economic theory include University of Chicago philosopher-economist Friedrich von Hayek and his students, like Milton Friedman at its nucleus (George, 1999). The creation of an integrated framework and the institutions for international trade had been in deployment since the end of WWII (Wolf, in George and Wolf, 2003). For von Hayek (1967, 1976) and Friedman (1962), Lyndon B. Johnson's *Great Society* from the 1960s generated a social welfare model that was too rigid against the emerging international markets, and it was *"indispensable to shrink the State and its administrations in order to flexibilize the markets and enhance private economy"* (Friedman, 1962). Amidst this economic debate the first Oil Crisis (1973-1980) leapt onto the scene. Scarcity and high prices of crude oil boosted a general increase in fuel efficiency (Davidson, 2000); in manufacturing, vehicles, power plants, etc., but it also paved the way for neoliberal economics. Recession associated to the Oil Crisis drove the USA to deregulatory structural reforms in the public administration, work, welfare, tax and finance systems; in an update of the *laissez faire* principles, in order to facilitate capital flows and business for the recovery of growth.

The decade of the 1980s neoliberal capitalism consolidated internationally. Former US and British heads of state Ronald Reagan and Margaret Thatcher fuelled the aforementioned welfare dismantling principles through the *Washington Agreements* (George, in George and Wolf, 2003). Under the ideal of delivering an integrated global market, they opened the agenda for trade liberalization (reduced import-export taxes, facilities to invest abroad, flexible stock markets, etc.), together with a very strict adoption of cost-benefit efficiency in the public administration. This last

[10] although anti-nuclear movements started much earlier, it was the Three Mile Island accident of 1979 that put the issue of atomic power in the spotlight leading to many mass demonstrations. The largest was in New York City in September 1979 and involved 200,000 people (Wikipedia, 2014).

measure was the formal authorization to privatize public services[11] (Xercavins, 2004) under the argument that *"there is no alternative"*, expression later on coined as Thatcher's *TINA* (George, in George and Wolf, 2003). The expected results of these new economic policies proposed that economic growth would occur when marginal tax rates were low enough to spur investment, and consequently the economy would gain stronger stability and jobs would be created, which in turn would mean more purchasing power for the middle class and thus, a better quality of life. Indeed, in Reagan's term in office, GDP grew an average of 3.85% per year and 16 million jobs were generated (Bureau of Economic Analysis, 2007); yet other stats from that period are debatable, as it will be exposed further ahead.

The Reagan-Thatcher process started what we now call globalization of the economy. Global trade as a share of GDP went from 40% to 63% between 1980 and 2011 (KPMG, 2014). Foreign aid and the expansion of international trade and industry across the Planet led to significant urban development, as workforce was attracted to cities. Parallel advances in education, health and technology took place, reaching and spreading in countries and communities before underserved. Thanks to this, extreme poverty rates have been cut in half in the past 25 years and child mortality has remarkably reduced (Bill and Melinda Gates Foundation [BMGF], 2014). Even in some traditionally deprived regions there's been outstanding progress; 7 of the 10 fastest-growing economies of the past half-decade are in Africa, and in sub-Saharan Africa income per person has climbed by two thirds since 1998, to nearly USD $2,200 from just over $1,300 (BMGF, 2014). Growth in trade is projected to continue at a 5% rate through to 2030, and by 2022 more people will be middle class than poor (KPMG, 2014). Prospects also indicate that by 2035 there will be almost no poor countries left in the world, from the current 35 classified by the World Bank (BMGF, 2014). While extreme poverty has declined and the majority of humanity is currently nearby the USD $10/day (BMGF, 2014), on the other hand inequality continues to broaden almost everywhere. Today, 71% of world population live in nations where income inequality is increasing (KPMG, 2014). As Keating (2011) exposes (citing Milanovic, 2011), the amplification of economic disparities has been a global trend since 1820. Using the Gini Index, an analysis between countries manifests a 300% jump of inequality in the 1820-2002 period, and a no lesser important 25% rise throughout 1929-2002 (Milanovic, 2011). In the USA inequality followed a slightly reductive pattern between 1947 and 1968 (US Census Bureau, 2011), but the rich-poor gap has grown ever since. Not surprisingly, the tipping point in this downward-upward shape of inequality separates the Lyndon B. Johnson's *Great Society* from the Oil crisis and the liberalization agenda. Currently (2007) the index is 0.467, whereas in 1968 it was 0.386; thus, North Americans have 15% more inequality now than in 1968 (US Census Bureau, 2011). Compared to Germany, current inequality in the USA is about 55% higher. At European level, since the debt crisis started in 2007 some countries are seeing significant changes in their Gini Index. For instance, in 2012 distance between wealthy and poor was about 9.6% and 14.6% higher than in 2007, in Spain and France respectively (Eurostat, 2014a).

Table 2.
Facts about economic disparities worlwide.

- The amount of money that the richest 1% of the world's people makes each year equals what the poorest 57% makes.
- The world's 358 billionaires have assets exceeding the combined annual incomes of countries with 45% of the world's people.
- The richest 5 percent of the world's people have incomes 114 times that of the poorest 5 percent.
- The combined wealth of the world's 200 richest people hit $1 trillion in 1999; the combined income of 582 million people living in the 43 least developed countries is $146 billion.
- GDP of the poorest 48 nations (i.e. 1/4 of the world's countries) is less than the wealth of the three richest people combined.
- A few hundred millionaires own as much wealth as the world's poorest 2.5 billion people.

Source: Adapted from UNDP, 2000.

In terms of income, Milanovic (2011) highlights a global change in GDP per capita from USD $689 in 1820 to $7,099 in 2002, including an exponential growth of 155% since 1960 ($2,778). But the pyramid of disparities continues to show a disturbing image. The *Global Wealth Report 2013* by Credit Suisse estimates that more than 2/3 of adults in the world -3.2 billion individuals- have below USD $10,000 in 2013, representing an overall wealth of $40 trillion. In contrast, 32 million people representing 0.7% of total population accumulate USD $98.7 trillion, which is around 41% of global wealth. About 95% of these concentrate in North America, Europe and Asia Pacific countries. Within the millionaires group, some 98,700 ultra high net worth individuals have over USD $50 million. Global data from 2000 by UNDP offered a very similar outcome (Table 2). In the USA, whereas GDP per capita increased 86% since 1970 (WRI, 2011[12]), median household income has only become 25% higher between 1965 and 2010 (US Census Bureau, 2011). This means that economic progress took place mainly through concentration of capital, not by distribution; as we likewise saw for nations. The unfairness of the current economic system has reached a point where even the mega milionaire Warren Buffet (2011 in press) has publicly expressed to *"stop coddling the super-rich"* and the need for more taxation amid the upper class people. Also in France and Germany wealthy citizens called for a review of neoliberal deregulations which beneffit them (Stiglitz, 2011).

Returning to the historical process behind the expansion of neoliberal economics, the meltdown of the Communist bloc in the 1980s played a significant role. An accumulating effect began with their loss of income potential after the oil price depression of 1985 and 1986, followed by the fall of the Berlin Wall in 1989, together with the *Velvet Revolution* in former Czechoslovakia and the constitution of the Third Polish Republic, all of which literally broke the Soviet regime. The process culminated in 1991, when the Soviet Union was

[11] Later on regulated and subscribed to by the World Trade Organization (WTO) members in the GATS, GATT and TRIPS treaties.

[12] Note: the source of this data is no longer available according to: http://www.wri.org/our-work/project/earthtrends-environmental-information. Cited data retrieved from before closure of WRI Earthtrends website: http://earthtrends.wri.org/text/ economics-business/variable-638.html. Please check

dissolved and in the former Yugoslavia the Balkan Wars began. Even though the latter description is very superficial, essentially, the sinking of the antagonist put neoliberalism at the rudder of humanity's development course. Francis Fukuyama (1992) phrased this shift as *"the end of history"*, considering that universal capitalism had become the ultimate level of human development. China's sky rocketing growth had not kicked off at the time, leaving the European Union and its powers -France, Germany, and Italy- as the only possible counterforce to the USA's worldwide political, economic and ideological hegemony, supported as usual by the UK. Western European welfare capitalism represented a model of success in terms of social cohesion, economic development and international cooperation, which attracted 12 countries at the EU's foundation in 1993, a number currently increased to 28.

In parallel to all these geopolitical and economic transformations, the 1980's were years of important environmental upheavals too. For instance, the nuclear accident of Chernobyl (1986) that took place in a fading USSR; the Chemical explosion in Bhopal, India (1984); the Colza Oil poisoning in Spain (1981); and the Exxon-Valdez Oil spill in Alaskan waters (1989). Moreover, scientific evidence on global warming and climate change was rapidly growing, leading to the creation of the Intergovernmental Panel on Climate Change (1988) by the World Meteorological Organization (WMO) and UNEP. Whether these events had an effect on consciousness or not, the fact is that the 80's gave continuity to the environmentalist ideas set in motion two decades earlier. The most important breakthrough was the concept of "sustainable development" (1987, Bruntdland Commission in *Our common future*), which emerged with the hope of becoming a consensus yardstick for the redefinition of human progress, and subsequently of economic rules. In 1992 this new standard was elevated to a global objective in the UN Earth Summit (Rio de Janeiro; Rio'92). Three years later the signatory nations of the General Agreement on Tariffs and Trade (GATT) created the World Trade Organization, the international institution in charge of the markets' liberalization agenda. The 90s were years of building and developing a very strong environmental narrative after the Rio'92 agreements (Agenda 21, Forests, Biodiversity etc), together with the burial of trade protectionism.

Simultaneous advent of Rio'92 and WTO shows very well the "*double and contrary agenda of humanity*" that is being addressed here. On one hand, a new planetary scale vision of development and governance was put in place together with the emergence of climate change, which became, through the Kyoto Protocol (1997), the first crosscutting[13] international environmental regime undertaken. Meanwhile, on the other hand, the politics and instruments for liberalized economic globalization gained strength and momentum. Delocalization of production to developing countries, in particular towards the "sleeping giant" China, but also to Central America, South East Asia, India, Eastern Europe and North Africa, became the trend of industrial activity. Every prosperous company wanted to have its production centers abroad to reduce manufacturing costs and sustain the growth of corporate benefits in an extremely competitive and speculative stock market (Joseph Stiglitz, 2011). A critical mass of deregulation supported by governments (the Millennium Round of Doha and its subsequent meetings), economists and the media, was silently growing (Xercavins, 2004). Not surprisingly, the practice of SD moved at a much slower pace than neoliberal economics and public political pronouncements. An example being the delayed commitment to the Kyoto Protocol by some of the biggest GHG emitters, such as Russia and China, and which held up its coming into force until 2005[14]. The same can be seen in most of the international environmental and development policies, by observing the current trends of many other key sustainability issues (population, biodiversity, land use, fisheries, water etc.) (GEO-5, 2012).

At the turn of the century a new multilateral mandate for the salvation of the Earth and the eradication of social injustice was reached with the 2015 Millennium Development Goals (UN, 2002). However, once again the international interests focused away from global social and ecological justice, following -in a very simplified approach- 4 particular and interwoven events. First, fossil fuel scarcity and *Peak Oil* started to be conspicuous in the geopolitical scenario (see section 1.3). Second, and in response to the prior, the USA followed by many countries launched the invasions of Afghanistan (2001) and Iraq (2003), supported on the terrible September 11 terrorist attacks. The wars literally allowed the western economies to gain stronger control over gas and oil assets, yet, likewise, the North American economy went into an unprecedented debt escalation. Third, China's accelerated economic growth -from 6th place in 2000 to 2nd in 2010 on the World Bank's GDP ranking- allowed the new power to concentrate and control at least 11 raw and semi-finished materials, affecting localization of production, stocks, prices and market speculation (RAND Corporation, 2013). Last but not least, in 2007 the global financial crisis began, due to the world's vastly extended bubble of deregulated credit, and spurred by the burst of US toxic housing bonds. In a domino effect this contemporary upheaval is still knocking over first world economies today, due to the ensuing public debt collapse. No relevant multilateral environmental policy has been established after Kyoto, and none is expected until 2020. In effect, because neoliberalism and the globalized free market steer planetary development, the space for sustainability in political agendas has been steadily shrinking as more chrematistic priorities continue to appear. According to many authors (Campbell and Laherrère 1998, Turiel 2012, Coderch, 2012) the abrupt intensification of oil decline is the reason behind the increasing social and economic tension. In the words of Dave Cohen from ASPO (2007), it will be *"the perfect storm"*. Section 1.3 is an attempt to describe this potential event.

[13] The prejudicial gases (CO2, CH4, CO, NOx) are very strongly involved in most human activities, in constrast to Ozone depletion for example, which mainly concerns certain chemicals such as, CFCs related only to specfic needs like cooling.

[14] In 2012, the year the Treaty ended, the USA had yet to sign.

1.3 - The upcoming global scarcity

"Hurricane Sandy is a disturbing sign of things to come: dirty energy makes dirty weather" (Al Gore, in press 2012)

Classic development theory defends the concept that social progress and the satisfaction of the needs of a growing population requires steady economic growth (Solow, 1956 and 1957; Rostow, 1960). Hence, the IEA in its World Energy Outlook (2008a) depicts an annual worldwide GDP increase of 1% in response to the projected demographic trends until 2030. For this to be possible, the report calculates a 1.6% yearly rise in energy demand. Indeed, energy use as a proxy for growth is well documented (IEA, 2008b). According to Ayres and Warr (2009) economic catch-up for 24 countries closing the gap towards the USA's GDP (since the 1960s) is highly correlated (r^2:0.99) to an increasing supply of electricity and oil. However, for the upcoming decades several intertwined problems emerge for the IEA's formula to continue working. The main problem is that, so far, growth has relied on the access to large amounts of cheap and inefficiently used energy, mostly fossil fuels and uranium. And neither of these options is possible on the mid- to long-term. Since *Peak Oil* was reached in 2006 (IEA, 2010a) cheap energy appears to be a question of the past (Murray and King, 2012), because there are no substitutive energy sources available in the necessary amount (De Castro, Mediavilla, Miguel and Frechoso 2011). And energy efficiency still remains very low -e.g. approximately 13% in the USA and 20% in Japan-, in spite of having been considerably improved in industrialized economies during the last century (Ayres and Warr 2009). Furthermore, GHG emissions from fossil fuels must be urgently cut down, as they represent the major driving force of climate change; 56.6% of global warming emissions in 2004 (IPCC, 2011).

As Turner (2008) states, *"The release of the LtG* [The Limits to Growth] *in 1972 had immediate and ongoing impacts... the LtG recommendations on fundamental changes of policy for sustainability have not been taken up... This is perhaps partly a result of sustained false statements that discredit the LtG... many criticisms* [which] *falsely claim that the LtG predicted that resources would be depleted and the world system would have collapsed by the end of the 20th Century... [while] its modeling was that continued growth in the global economy would lead to planetary limits being exceeded sometime in the 21st Century". "Debtonation Day"* -9, August, 2007- (The Green New Deal Group and NEF, 2008) might be considered when the tipping point predicted by the LtG came true. By then *Peak Oil* was no longer a myth, and since 2005 worldwide crude production had turned inelastic (Murray and King, 2012). That day, the '*Threefold E Crisis*' ('3E Crisis' from hereon) -Environmental, Energetic and Economic- formally began. The following paragraphs will attempt to display how currently more and more evidence is mounting to confirm this notion.

In 1956 geophysicist M.K. Hubbert established the mathematical function for oil production throughout time. This corresponds to a parabolic or bell shaped curve, and *Peak Oil* is the point when maximum yield is reached under conditions of efficiency. After that, extraction slows down and proceeds to decrease because the total available resource is lower -even when adding new found reserves- and technical requirements for its extraction become more complex. Several data and recent media statements in Turiel (2011) indicate that we have already crossed *Peak Oil* (PO). World oil production has been on a plateau since 2005 and crude oil peaked in 2006 (IEA, 2010a); decline for OECD states began after 2005 (Staninford, 2009); in 2009 the President of *Petrobras* announced PO for 2010; *Total*'s CEO (de Margerie) in 2010 projected PO before 2013; in September 2011 Peter Voser *Shell*'s CEO admitted a 5% annual fall of crude production (all forms) which would require 4 Saudi Arabias in the next 10 years for compensation[15].

The direct consequence of *Peak Oil* is that energy prices start to rise because there is fewer resource and thus increasing competition to obtain it. This opens up the option of exploiting lower quality reserves, which means higher costs, and, because of less expertise, higher risks, such as in the case of fracking (e.g. links to seismic activity; in press, 2014[16]) and deepwater offshore oil drilling (e.g. the 2010 explosion of a BP rig and oil spill in the Gulf of Mexico). Through these sources, and an increase in natural gas and the use of unconventional oil (gas-to-liquids, coal-to-liquids, tar or bituminous sands, extra-heavy oil, biofuels, deep water and Arctic reserves, etc.), the IEO (2010) hopes to keep up production and cope with growing demand prospects. However, all these new forms of obtaining oil suffer from very low *Energy Return on Energy Investment*[17] [EROEI] (Heinberg, 2009, Murphy et al. 2011). Thus, to obtain the same amount of energy as before, a greater portion must be invested in less efficient resources that produce more waste and pollution, in both their production and use. So, on top of decreasing margins of oil and its derivatives, the post PO energy framework generates a negative feedback loop on the environment in the form of more GHG emissions. Moreover, Murphy et al. (2011) shows that intensive use of "unconventionals" will imply acceleration in available energy descent as a greater share of high EROEI sources is applied to obtain low EROEI substances. Actualluy, despite the international economic crisis and the GDP crunch of recent years, 2011 was the year with the highest CO_{2e} sent out to the atmosphere in history (in press[18]).

As previously depicted the strong link between oil and the economy has been thoroughly studied. Indeed, crude oil is highly related to growth (Hirsch, 2008), so much that PO may be considered the unspoken cause of the 2007 economic collapse and its prolonged readjustment. Hamilton (2009) discovered that whenever the oil bill of the US is above 5% of its GDP, the country goes into recession. At current economic

[15] Deficit between production and demand is being covered by stocks of the industry itself, according to Turiel (2011).

[16] http://www.nbcnews.com/science/environment/ohio-geologists-link-seismic-activity-fracking-n78231

[17] Amount of energy obtained per amount of energy invested in the production process. In the early 1900s ERT for oil was >100. Currently, it is ~20 (Heinberg 2009) -and falling- and for the unconventional sources it is even lower.

[18] source: http://www.nytimes.com/2011/12/05/science/earth/record-jump-in-emissions-in-2010-study-finds.html?_r=1&hp - NY Times | "Carbon emissions show biggest jump ever recorded" - December 2011

levels this event takes place when the barrel costs $80-85 USD. After a period of volatility (high rise and fast decrease) between the beginning of the crisis (2007) and December 2008, average prices have followed a steady overall growth pattern. In October 2010 the USD $80 per barrel threshold was crossed, and has subsequently remained beyond this threshold. In actual facts, only once after January 2011 did the unit of crude drop below the $100 mark (EU DG Energy, 2014). This means that the oil market has become inelastic, a process which started in 2005 according to Murray and King (2012), as prices can no longer fluctuate despite declining demand, demonstrating that scarcity is the root factor. Already in 1998, based on data from the US Energy Information Administration, which estimated that demand for oil will have increased about 60% by 2020, Campbell and Laherrère wrote that *"the switch from growth to decline in oil production will thus almost certainly create economic and political tension"*. Oil accounts for only 34% of the World's primary energy[19] (IPCC; 2011), but as the ongoing crisis shows, we have already reached this moment. If other large scale, minimally efficient and cheap sources of energy were available, oil substitution would be able to take place. According to anthropological research, subsistence of human societies requires EROEI levels of at least 10 (Lee, 1968; Harris, 1997), or perhaps 5 if very well organized (Hall, 2009). Average EROEI of oil is estimated to fall near 10 by 2020 (Turiel, 2012) because for some of its unconventional forms EROEI is far below that: tar sands 5 and oil shale 4 (Murphy, 2011), biofuels 1 (Heinberg, 2009). Nevertheless, none of these may be produced at high rates for a long time (see paragraph below). According to the US Department of Energy expert Glen Sweetnam (2009) by 2030 approximately 60% of the oil demand will require unidentified projects.

From the perspective of the end uses, the absence of surrogates for oil is even more complex; for transport in particular, which is the key factor for a globalized and exports based economy, because oil provides 95% of the fuel. For certain functions of energy, such as industrial production, electricity or heating, other resources like natural gas, coal and uranium can be and already are a substitutive. Yet, the zenith of such energetic substances is also close: uranium 2015 (Dittmar, 2011), gas 2020 (Bentley, 2002), coal between 2011-2030 (Heinberg and Fridley, 2010). Hence, as IEA projects (2010), current increase and diversification in use of the latter sources to cope with oil depletion will accelerate phase out of them too.

Returning to the LtG's hypothesis and the initial question of this dissertation (*Is sustainability still possible?*) it must be noted that the IEA's strategy adopts the IPCC's B1 scenario (2007a), but it takes it to the limit. According to the IPCC, *"atmospheric GHG concentrations would need to be stabilized in the range of 445 to 490 ppm CO_{2e} in the atmosphere. This in turn implies that global emissions of CO_2 will need to decrease by 50 to 85% below 2000 levels by 2050 and begin to decrease (instead of continuing their current increase) no later than 2015"* (IPCC, 2007). In contrast, the IEA's Energy Outlook (2010) reference scenario would lead to a rise in energy related GHG emissions of 45% by 2030 and 60% for 2050, eventually reaching 73% of all CO_{2e} carriers. Such a path would result in a 1000 ppm CO_{2e} atmosphere in the 22nd century, and an average planetary temperature increase of 4-6ºC, far beyond the "safety" levels of +2ºC established by the IPCC (2007a). Given the obvious contradiction between both approaches, the IEA (2010) agrees to the +2ºC boundary, simplified to 450 ppm CO_{2e} reference atmsphere, as common ground for action. However, when developing its energy planning framework, the IEA assigns a total CO_2 budget of 1.4 Tt between 2000-2049, which is 0.4 Tt over the IPCC's desirable threshold, and moves the emissions peak and curving year from 2015 to 2020: *"OECD+ countries are assumed to take on national emissions-reduction commitments for 2020. All other countries are assumed to adopt domestic policies and measures, and to generate and sell emissions credits. After 2020, commitments are extended to Other Major economies, including China, Russia and the Middle East"* (IEA, 2010a). As a result, the IPCC's 75% likelihood of containing temperature rise below 2ºC falls down to a 50% chance of success with the IEA's focus.

In regards to the energy roadmap to follow, several technological alternatives must conquer the pursued cut backs in GHG emissions according to the IEA's *Energy Technology Perspectives* (2010b). Clean and renewable energy sources (RES) will see a significat expansion, but cannot deliver neither the expected increase in demand, nor tackle the necessary abatement in GHG releases. In its optimistic vision the agency allocates a 17% contribution to the task from RES, concurring with the idea assessed by several authors of a low potential for growth of RES at global scale. Hydropower could reach about 6.6% of worldwide energy demand, yet suffering a progressive decrease due to colmatation of reservoirs; total output from aeolian sources is estimated at around 1% including offshore winds (De Castro, Mediavilla, Miguel and Frechoso 2011). In turn, the production peak for photovoltaic would be nearby 1% of total demand (with EROEI of 2.7; Prieto and Hall in press 2012). Revolving on IEA's scenario, higher hope is deposited on Carbon Capture and Storage [CCS], which is assigned to mitigate 18% of GHG emissions. The lack of clean alternatives in many industrial sectors (including energy generation) requires to stress efforts on end-of-pipe technologies like CCS, with the mission of injecting into natural (for example empty oil sites) or artificial sinks discrete sources of GHG releases. For Coderch (2011) it is to wonder if this is *"challenge or wishful thinking?"*, after he calculates than to effectively reach the 9.4 Gt of CO_{2e} to capture and store by 2050, 6 times the current oil extraction and transport industry would be necessary. Last, but not least, the IEA allocates 58% of emissions reduction is expected to come from energy efficiency and fuel switching, in both the power sector and the end-uses of energy. Efficiency is undoubtedly a pathway to follow as much as possible, but it has its own pitfalls, as discussed later on. And large scale fuel switching may be as unfeasible as CCS. For instance, the *Electric and Plug-in Hybrid Vehicles Roadmap* target of 100 million sales in 2050 would need an installed capacity of electricity +50% larger than that of today

[19] Year: 2008; Source: IPCC, 2011; Fossile fuels together (oil, gas and coal) add up to 85,1% of the World's primary energy.

(Coderch, 2011). In the IEA's scenario it is not clear what technologies would provide this new power.

In contrast to the IEA's prospect, the IPCC (2011) recently launched a much more optimistic vision of the future energy system based on renewables; a vision clashing as well with the boundaries for the growth of RES previously reported. The report *Renewable Energy Sources and Climate Change Mitigation* [SRREN] analyzes 164 renewable energy deployment models and includes assessments of available RES resources and technologies, costs and co-benefits, barriers to up-scaling and integration requirements, future scenarios and policy options. The first important breakthrough in this report is that *"studies have consistently found that the total global technical potential for RE is substantially higher than global energy demand"* (IPCC, 2011). Even so, no explicit reference to costs, barriers or policies, or to the possible effects of climate change on RES is made in this specific assessment. For direct solar energy alone, the growth potential ranges from 2.2 to 69.5 times current energy demand (2008). For all the RES together (solar, biomass, geothermal, hydropower, ocean and wind energy), minimum and maximum potential values are 2.6 and 73.5 times larger, respectively. A second important finding is that for 42 of the 164 scenarios (25.6%) atmospheric CO_2 concentrations are stabilized at a level of less than 440 ppm. More precisely, the IPCC (2011) estimates that *"the median RE deployment level in 2050 is 248 EJ/yr (139 EJ/yr in 2030), with the highest levels reaching 428 EJ/yr by 2050 (252 EJ/yr in 2030)"*; i.e. from 4 to 7 times the levels of today and 2 to 4 times in 2030. Thus, a very important push in the RES sectors may be triggered if the IPCC climate targets are respected. In effect, more than half of the models include in the SRREN predict *"a contribution from RE in excess of a 17% share of primary energy supply in 2030 and rising to more than 27% in 2050. The scenarios with the highest RE shares reach approximately 43% in 2030 and 77% in 2050"*. It appears that political will and agreements should be found easily, as there is a wide scope of paths (42) to stay within the 440 ppm limit, and the overall growth in RES should not be qualified as unreachable in a 40 year period (average share in RES by 2050 about 50%, whereas at present times it is 13% approximately). In this regard, SRREN has analyzed in detail, although only in the power generation sector, four illustrative scenarios to estimate global cumulative investments in RES. For a scenario that seeks to stabilize atmospheric CO_2 (only) concentration at 450 ppm, required investments are (in 2005) USD $5,100 billion for the decade 2011 to 2020, and $ 7,180 billion for the decade 2021 to 2030. The annual breakdown of these investments would represent 0.81% and 1.14% of the world's 2010 GDP, approximately a five-fold increase of the funds currently allocated to RES sectors, which at first glance is an apparently affordable amount. As a final point, the IPCC's scenario is also a decarbonization opportunity from the point of view of Lifecycle assessment (LCA). *"LCA for electricity generation indicate that GHG emissions from RES technologies are, in general, significantly lower than those associated with fossil fuel options and, in a range of conditions, less than fossil fuels employing CCS. The median values for all RES range from 4 to 46 g CO_{2e}/kWh, while those for fossil fuels range from 469 to 1,001 g CO_{2e}/kWh (excluding land use change emissions)"* (IPCC; 2012). Hence, despite EROEI results often being low for RES, as previously shown, the type of energy produced is so much cleaner than it makes the investment worthwhile.

Given that currently all renewable sources (wind, solar, geothermal, biomass and biofuels) supply less than 2% of final world energy consumption, 100% RES based futures - with or without demand increase- must takle two main feasibility challenges, namely: material scarcity, and energy source potential. On the issue of scarcity, the notion of *Peak Everything* (Turiel, 2012) has arised in regards to the evidences of depleting raw non-renewable materials (iron, copper, aluminum, etc.). *Peak Everything* speaks about is progressive bottleneck process, for which Jeremy Grantham, Chief Investment Officer of GMO Capital (with over $106 billion in assets under management), published in 2011 a quarterly letter with a very clear title: *Time to Wake Up: Days of Abundant Resources and Falling Prices Are Over Forever*. Grantham (2011) states that *"accelerated demand from developing countries, especially China, has caused an unprecedented shift in the price structure of resources: after 100 hundred years or more of price declines, they are now rising, and in the last 8 years have undone, remarkably, the effects of the last 100-year decline!"*, in order to confirm that *"we now live in a different, more constrained, world in which prices of raw materials will rise and shortages will be common"*, and advise *"to develop thoughtful energy policy and give up our carefree and careless ways with resources"*. In relation to the RES potential, according to de Castro, Mediavilla, Miguel and Frechoso (2013), many reports make *"generous estimations of effective global surface that could be occupied by the renewable infrastructure and/or ignore the mineral reserve limits"*. For instance, for photovoltaics (PV) present and foreseeable future density of solar power infrastructures are 4–10 times lower than most published studies. Hence, per watt land necessities are much larger than expected. And, furthermore, *"mineral reserves of some scarce materials* [such as silver and germanium] *being used will also put pressure on this industry, because there is also a trade-off between solar park efficiencies and mineral limits"* (de Castro, et al., 2013). Then, in conclusion, perhaps solar energy input is limitless (in human terms), but the land and materials needed for large scale implementation may be hardly compatible with the rest of anthropic activities. Using another kind of methodological discrepancy, potential expansion of wind energy may also become much smaller speculated; *"... the reported regional and global technological* [wind] *potential are flawed because they do not conserve the energetic balance on Earth, violating the first principle of energy conservation"* (de Castro, et a., 2011). Adding up both analyses, potential capacities throughout the 21st century for solar and wind energy are estimated to reach of 1 TW (de Castro et al, 2011) and 2-4TW (de Castro, 2013) respectively. The addition of both power potentials would be lower than 50% of the theoretical necessities of 2035; 9 TW approx. (IEA, 2011).

The bottom line of this whole discussion is that energy scenarios in the mid- to long-term only consider a growing

consumption, hence an increasing generation, even if its factibility suffers from material and source inconsistencies. This occurs because, so far, only visions of economic growth are taken into account to project the possible means to satisfying the needs of future generations, and using the track record of the last century as a benchmark, this will only happen through a larger use of energy. In this framework, even the mission behind a boost in energy efficiency (EE) is to increase production of cheap goods and services on sale and make them available to a wider population; something which could easily lead to expanding loops of positive feedbacks in energy needs, reproducing, in the end, the *Jevons Paradox* formulated in 1865 for the case of coal and steam power engines. Essentially, energy and economy may somewhat decouple, with energy intensity of GDP curbing, yet, at last, total energy requirements may continue to grow, in response to production enlarging at a stronger pace than efficiency. And likewise for materials efficiency. If it is indeed time to forecast, then alternative routes and models should start to be considered. For instance, a bottom-up approach feeding into a final top-down strategy would be interesting. Such as that proposed by Vaclav Smil (2010) and the Swiss Institute of Technology (2002) who suggest that a *"sustainable-energy society pitches the rational average level at 2000 Watts per capita"*. A demand comparable to that of Chinese and Latin American societies, but approximately 30 and 15 times lower than that of the US plus Canada and the rest of industrialized countries respectively. Of course, this would put the economy and the paradigm of maximized expansion of unlimited individual access to products and services on a second footing. The uses of energy would be much more selective and vital (electricity, some heating, some collective transports) than many current activities, which are only possible in a context of cheap and abundant power: e.g. low-cost flights; international truck transportation of lettuces; European pigs fed with soy beans from Latin America, etc. But perhaps it is worth it. Because the environment should not be risked for the sake of the economy, by an irrational overuse of dirtier and more inefficient energy resources (the "unconventionals") than *black gold*. It appears, though, that for the powers that be (represented here by the IEA) it is still not acceptable that human development and economic progress may have to come from a low energy consumption and non economic-growth model. Neither is it conceivable that humankind's ingenuity may not be able to develop the crucial clean, abundant and cheap energy sources to substitute oil, gas and coal, in order to mitigate global warming as soon as possible. Nor, that with *Peak Oil* and *Peak Everything* the end of growth is also a possibility, because the continuity of massive delocalized production and large scale trade may be at stake. In any case, the gap is narrowing down for all, turning the 2010-2020 decade into the key period to change and shift energy and raw-material policies. The IEA's scenario and all international agreements on climate and energy (Rio+20; the post-Kyoto framework; the EU 20-20-20;) have pinned 2020 as the year when the different sectors (governments, industries, etc.) must have the necessary political instruments, economic resources and innovative technologies to curb GHG emissions and to seriously stimulate energy efficiency and renewables. 2020 is only 6 years ahead. With decisions postponed compared to what science demands (represented by the IPCC), one must wonder if the official calendar is talking about real commitment, or if it is actually saying *"we do not have a clue about how to do this, let's discuss it later on"*?

We know that throughout history at least 26 civilizations have collapsed (Diamond, 2005) after overstepping their resource constraints. Yet, never before has the magnitude of this threat had global dimensions. In this age of knowledge, we should be able to avoid this destiny. Above all, we should avoid going down this road simply because we weren't modest enough to open the debate, because we remained faithful to business as usual and short sighted denials (Motesharri et al., 2014). Instead, we should learn to better ascertain the natural and technological limits of our living system and adapt to them. Given that by 2030 60% of the World's population is expected to be middle class and 80% of this in developing regions (KPMG, 2014), it seems inevitable that the challenge of socioecological sustainability must comprise a component of downscaling living standards, particularly in resource and energy use; a component of degrowth (Latouche, 2009).

1.4 - From Unlimited Growth to Green Economy

The social (Kuznets, 1962; Rowe and Anielski, 1999; UNDP, 2000), ecological (see chapter 1.1), institutional (Fanfani, 1935 in Anielski, 2007; George 2003; van Griethuysen, 2009; Xercavins, 2004) and even economic (Anielski, 2007) inconsistencies of sustained economic growth have been largely discussed and furthermore, proven by reality. However, it is the underlying philosophy of liberal capitalism, of the individual ahead of the collective, of unlimited property and wealth, in the realm of ontology and beliefs, that feeds the current human and industrial development model.

As early as 1935 capitalism was already discussed from the perspective of dogma, by Amintore Fanfani, economic historian and former Primer Minister of Italy and President of the United Nations General Assembly. Fanfani argued that capitalism is *"unbounded by morals, ethics, virtues or the laws of nature"* (cited by Anielski, 2007). Instead, he defined it as *"a system of methods, means, institutions and economic forms for the production, circulation and distribution of wealth without considering its ends"*. He concluded that *"the capitalist worships money and material wealth accumulation as an end in itself rather than as a means to happiness"* (Farfani, cited in Anielski, 2007).

Kuznets (cited in EC, 2007a), in turn, who contributed to the national income accounting of the USA, warned Congress in 1934 that *"the welfare of a nation can only scarcely be inferred from a measurement of national income"*. And with regards to economic growth, in 1962 he wrote, *"Goals for more growth should specify more growth of what and for what"*, appealing to the distinctions to keep in mind between the quantity and the quality of growth.

For Anielski (2007), with a liberal economy and sustained economic growth, we are *"making money,* [but] *growing poorer"*. Crossing several data from USA's economy between 1950 and 2005, Anielski shows that today's debt triples the real economy of the country. In the studied period, GDP grew 4,143% to reach USD $ 12.5 trillion whereas aggregated debt (public, household, business and foreign) climbed 7,935% to a level of $ 38.3 trillion. Thus, as Anielski points out, growth is essentially fed by debt; debt has turned into the fuel of the economy (instead of investment, work and resources). In consequence, the productive economy is no longer the focus for the creation of wealth, but debt itself. In practice, debt is growing so much faster than the economy -exponentially, *ad infinitum*- that it is turning into an unreachable load. In consequence, at present times the primary mission of the economy is to repay debt. In fact, several countries, such as Spain, Greece and Portugal have modified their Constitutions in order to establish the nation's mandate to repay debt as an *"absolute priority"* (section 3 of Article 135 of the Spanish Constitution, since 2011). Recent forecasts indicate that *"global levels of net public debt are set to reach 98% of GDP by 2035"* (KPMG, 2014). The Wall Street *Crash* of 1929 happened because most of the economy had been sucked in by finance and debt (Krugman, 2008); it is to wonder if the debt crisis unfolding since 2007 is actually caught up in a self-destructive uneconomic loop of the same kind. Experts suggest that interwoven threats over capital markets and the global economy, could trigger a global crash sometime between 2015 and 2020 (Leggett, in press, 2014).

Table 3.
The seven major fallacies of GDP.

- GDP regards every expenditure as an addition to well-being, regardless what the expenditure is for and its effects.
- GDP ingores the crucial economic functions that lie outside the realm of monetary exchange, such as: unpaig housework, child care, volunteer work, leisure...
- GDP does not account for natural resources that are require to sustain current and future economic development - implying that the future has no value; implications of current activities for the next generations do not enter in the calculation.
- GDP ignores totally the distribution of income, the social costs of inequality and poverty.
- GDP contains expenditures that do not cotribute to economic welfare, such as weapons, personal costs of commuting, crime, environmental impacts and ecological disasters, and automobile accidents.
- GDP minimizes the value of expenditures on education, health care, social services and environmental protection because it does not reflect the outcomes or returns on investment from such activities.
- GDP does not directly measure investment in social capital (health and wellness of communities, social institutions and democratic processes)

Source: Adapted from Anielski, 2007.

From a totally different perspective, another problem related to the current economic model is that growth of the GDP is providing neither a higher distributed income, nor a substantially happier society (Cobb, 1995; Row and Anielski, 1999; NEF, 2006). Indeed, important dysfunctions of GDP itself as a measure of development and/or wealth have been described (Mallarach, 2003). Fritz Schumacher (1911-1977), Economist, Chief Advisor to the UK's National Board for Coal for 2 decades and writer of *Small is Beautiful*, once said, *"call a thing immoral or ugly, soul-destroying or a degradation to man, a peril to the peace of the world or to the well-being of future generations: as long as you have not shown it to be "uneconomic" you have not really questioned its right to exist, grow, and prosper".* Schumacher was retrieving the core message of Küznets (1934) in the sense that GDP does not calculate nor represent the degree of welfare and its progress in a society. With this in mind seven major fallacies regarding GDP have been formulated (table 3).

In order to reverse the GDP's lack of precision in explaining the reality of the social and economic development of societies, different theoretical frameworks and alternative indexes have appeared over the past 40 years, the majority of which could be aggregated under a common general phylosophy of sustainable development (Bruntland, 1987). Describing each and everyone of these approaches and tools is not the purpose of this text. Table 4 reveals some relevant cases of the latter, in order to highlight the abundance and richness of the intellectual production related to sustainable development[20].

[20] For an expanded read on Sustainable Development please refer to *Sustainable Development: Definitions, Principles, Policies* (Daly, 2002)

The contribution of the latter sources cannot be overemphasized, however. For instance, Cobb's Genuine Progress Indicator (GPI) modulates GDP by adding or subtracting economically assessed values for a wide set of well-being aspects, i.e. income inequality (the gap between rich and poor); unpaid housework, parenting and voluntary work; lost leisure time; family breakdown; commuting time; crime; long-term environmental degradation; air pollution; net foreign borrowing; etc. Rowe and Anielski (1999) applied GPI to the US economy for the time span 1950-2005, and found that the indicator has been steadily declining since about 1975, despite that per capita GDP has more than doubled. The same tendency is shown by the Index of Social Health (ISH), the Ecological Footprint (EF; rising in this case) and the Living Planet Index (LPI).

Table 4.
Flash about Sustainable Development frameworks and methods.

THEORETICAL / METHODOLOGICAL FRAMEWORKS[21]
• Ecological Economics (Polanyi, 1944, Kaap, 1950, Georgescu-Roegen, 1971)
• Environmental Economics (inspired on welfare economics of Pigou, 1920)
• Permaculture (Mollison and Holmgren, 1978)
• Sustainability Planning and Design (FLACAM, 1989, in Pesci, 1995)
• Industrial Symbiosis / Ecology (Renner, 1947, Frosch and Gallopoulos, 1989)
• Human Scale Development (Max-Neef, 1987): matrix of
• Sustainable Development (Bruntland Comission, 1988)
• Local Agenda 21 (UN, 1992) + Aalborg Charter in Europe (ECSCT, 1994)
• Degrowth (Georgescu-Roegen and Club of Rome, 1970s, Latouche, 2003)
• Resilience: Energy (Lovins & Lovins, 1982), Urban-Climate (Godschalk, 2003)
• Boundaries of Planetary Sustainability (Rosckström et al. 2009)
• Green Economy (UNEP, 2011): including Factor 4 (Lovins, Lovins and von Weizsäcker, 1998); Green New Deal (Wuppertal Institute / The Greens - European Free Alliance, 2009); Covenant of Mayors ([CoM]; EC, 2009)
• Economy of Well-Being (Felber, 2010)
ALTERNATIVE INDEXES
• Human Development Index -HDI- (ul Haq, 1990 for UNDP)
• Genuine Progress Indicator -GPI- (Cobb, 1995)
• Index for Social Health -ISH- (Miringoff, 1987)
• Genuine Wealth Assessment -GWA- (Anielski, 2004)
• Ecological Footprint -EF- (Rees and Wackernagel 1994):
• Happy Life Years Index -HLY- (NEF, derived from Veenhoven, 1996)
• Life Satisfaction Index -LSI- (Kahneman and Krueger, 2006)
• Living Planet Index -LPI- (WWF and UNEP-WCMC, 1997)
• Happy Planet Index -HPI- (NEF 2006)

Notes: refered authors are referential, not necessary foundational
Source: Nuss, S.

Contradictions of growth theory have been issued by the economic science itself; particularly, from the *"happiness or Easterlin paradox"*, which Kallis (2012) raises as the *Achilles' heel* of the whole body of growth economics. Almost 40 years ago (1974), economist Richard Easterlin found that in international comparisons, the average reported level of happiness does not vary much with national income per person, at least for countries with incomes sufficient to meet basic needs. Follow-up research with similar results was conducted by the 2002 Novel Prizes in economics Alan Krueger and Daniel Kahneman. In 2006 NEF and Friends of the Earth published *The (un)Happy Planet Index* (HPI), showing that happiness versus income depicts an asymptotic curve. Until approximately USD $ 7,500 (inhab.yr) happiness rapidly reaches a level of 6 (over 10). But after that, the slope of HPI slows down very fast and only 2 nations cross the 8 point barrier (Denmark and Switzerland). Actually, all Top 10 countries show incomes below USD $32,000, including Bhutan and Brunei with $1,969 and $19,210 (inhab.yr), respectively. Also, between 7 and 8 in happiness, where most industrialized economies are, one may find 15 other States with incomes ≤$10,000. Finally, even some rich societies suffer from intermediate HPI degrees; Japan for instance, with HPI barely >6. In essence, high levels of happiness do not necessarily depend on wealth. In response, *"mainstream economists have rushed to generate studies that attempt to refute this finding: if growth does not deliver happiness then the whole rationale for pursuing it, and studying it, is in shambles"* (Kallis, 2012). Yet a new study, the most extensive ever on this issue, by Easterlin, Angelescu McVey, Switek, Sawangfa and Zweig (2010) including not only Western, but also African, Asian, Latin American and ex-socialist countries, confirmed the paradox. Whereas happiness falls with recessions and increases with expansions, in the long-term it tends to stay the same. On the other hand, the distribution, rather than the total level of income, does make a difference on well-being. If happiness is a purpose of development, sustained growth seems not to be the optimal solution.

The ruling authorities have echoed the described falacies of unlimited growth economics and the fenomenal challenges derived from the '3E Crisis'. Despite adherence to the theory of growth continues unchanged, there is a new narrative stating that capitalism should be reoriented for a more environmental and social performance. The following sections discuss this process leading to the emergence of the paradigm of the Green Economy (GE).

One relevant report to address the latter issue was Nicholas Stern's *Review on the Economics of Climate Change* (*The Stern Review,* 2006), after a request of former UK Prime Minster Gordon Brown, to understand more thoroughly the economic repercussions of climate change. His conclusions clearly pointed to a shift towards a low-carbon economy. Economic estimations indicated that the benefits of strong, early action on climate change would outweigh the costs. In order to stabilize atmospheric CO_{2e} under 550 ppm investments around 1% of the global GDP per year were urgently needed[22]. For the authors the transition to a low-carbon economy will bring challenges for competitiveness, but also opportunities for growth. In constrast, BAU economy in the long-run may suffer GDP losses within a 5-20% range, depending on the severity of climate impacts. Among criticisms made about *The Stern Review*, the cost-benefit advantage of action was debated, for instance in a UN report leak which says that necessary investment to mitigate climate change is in reality about 5% of the world's GDP (cited in Nelson, in press 2006[23]). Even so, Stern's rhetoric was refueled after the IPCC's 2007 IV Assessment Report, as it exposed how sympthoms of global change had accelerated; how progress towards a future scenario of high impacts had increased much faster than expected; and how much vulnerable were the poorer nations in the World against

[21] Social movements originators of / derived from the listed frameworks (Environmentalism, Deep Ecology, or Alter-Globalism) have been omitted on purpose, in order to focus on the academic / opeartional approach. Theories such as Ecological Economics or Environmental Economics have led to / are fed by an extensive range of more specific approaches and methods.

[22] Remaining under 450ppm CO2e - <2ºC, as recommended by IPCC, was stated as "already very difficult". Stern's 550ppm CO_{2e} implies a global temperature increase of at least 3ºC, well beyond safety levels.

[23] Source: Nelson, F. (2 November 2006). "Leaked UN report shows Stern is wrong on climate". The Business.

these risks. Responding to this report, in 2008 Stern stated *"We underestimated the risks [...] we underestimated the damage associated with temperature increases [...] and we underestimated the probabilities of temperature increases"*, indicating that economic impacts of climate change may probably be much higher than they initially calculated. In spite of detractors, *The Stern Review* has become a worldwide reference, by launching with monetary assessment that climate change is a danger to the BAU economy, whereas climate investments can lead to new business while stopping unwanted social and economic damage from global warming.

Following *The Stern Review* (2006) and the IPCC 's 2007 4th Assessment Report, also in 2007 the EU leaders took a stand and committed Europe to become a highly energy efficient and low-carbon economy. This agreement was ratified through the climate and energy package of 2009, establishing a strategic body of policy comprising three headline targets set for 2020, known as the '20-20-20' targets:

1) A 20% reduction in EU greenhouse gas emissions from 1990 levels; (

2) Raising the share of EU energy consumption produced from renewable resources to 20%;

3) A 20% improvement in the EU's energy efficiency.

Table 5.
EU Climate and Energy Package (2009).

- Revision of the EU Emissions Trading Scheme: Revision of DIR 2003/87/EC, in order to include by 2013 a single EU-wide cap on emission allowances in place of the existing system of national caps. The cap will be cut each year so that by 2020 emissions will be 21% below the 2005 level. Also, as of 2012 emissions from commercial airlines were integrated in the ETS system.
- National targets for non-EU ETS emissions: Under the so-called Effort Sharing Decision, Member States took on binding annual targets for reducing their greenhouse gas emissions from the sectors not covered by the EU ETS, such as housing, agriculture, waste and transport. Around 60% of the EU's total emissions come from sectors outside the EU ETS.

  The national targets, covering the period 2013-2020, are differentiated according to Member States' relative wealth. They range from a 20% emissions reduction (compared to 2005) by the richest Member States to a 20% increase by the least wealthy (though this will still requires a limitation effort by all countries). Member States must report on their emissions annually under the EU monitoring mechanism.
- National renewable energy targets: Under the Renewable Energy Directive (2009/28/EC) Member States took on binding national targets for raising the share of renewable energy in their energy consumption by 2020. These targets, which reflect Member States' different starting points and potential for increasing RES production, range from 10% in Malta to 49% in Sweden.

  The national targets will enable the EU as a whole to reach its 20% renewable energy target for 2020 as well as a 10% share of renewable energy in the transport sector. The targets will also help to cut greenhouse gas emissions and reduce the EU's dependence on imported energy.
- Carbon capture and storage regulation: Approval of a directive creating a legal framework for the environmentally safe use of carbon capture and storage technologies. Carbon capture and storage involves capturing the carbon dioxide emitted by industrial processes and storing it in underground geological formations where it does not contribute to global warming. The directive covers all CO2 storage in geological formations in the EU and lays down requirements which apply to the entire lifetime of storage sites.
- Energy efficiency targets: The climate and energy package of 2009 addresses the energy efficiency targets through the 2011 Energy Efficiency Plan and the Energy Efficiency Directive (2012/27/EU).

Source: adapted from the EC's website, 2014.

The EU estimated that meeting the 20% RES target could create around 417,000 net additional jobs, plus 400,000 more while getting on track to achieve the 20% EE improvement. As a result, a series of regulatory reforms and new instruments were undertaken (Table 5). The track record derived from the Kyoto Protocol and parallel efforts in the continent is an encouraging reference in regards to the '20-20-20' committments. Currently, the EU's 27 Member States generate around 12% of annual global anthropogenic direct GHG emissions. By 2011 emissions had already fallen 18.4% below 1990 levels (EEA, 2012). All sectors show decreases in a range between 14.7% and 65.5%, except for those linked to transports (ground, maritime and aviation) which grew between 18.9% and 95.1% (EEA, 2012). At country level, in the same 1990-2011 period 20 countries had achieved descents from -3.2% in Litchtenstein all the way to -56.3% in Lituania. The 7 Member States where GHG releases kept increasing are, from higher to lower change, Iceland (31%), Spain, Portugal, Norway, Greece, Austria and Ireland (3.4%) (EEA, 2012). In spite of the record of the latter countries, the path to a low-carbon EU is clearly in motion. Even so, risk of "carbon leakage" from the EU's climate and energy policies led the European Commission assess this issue. Looking ahead, the more recent 2050 Energy Roadmap fully aligns with the IPCC, as it pinpoints to explore decarbonization alternatives for a -80% GHG goal.

Parallel to all of the prior, in 2008 the Green New Deal Group (GND) and the New Economics Foundation (NEF) released *A Green New Deal. Joined-up policies to solve the triple crunch of the credit crisis, climate change and high oil prices*. The document was the product of a collective effort from the Green New Deal Group (*The Group* hereon) formed by a panel of experts from a variety of organizations; e.g. the Green Party, The Guardian, NEF, and former executives of Greenpeace and Friends of The Earth. The introduction of the document states:

"The triple crunch of financial meltdown, climate change and 'peak oil' has its origins firmly rooted in the current model of globalisation. Financial deregulation has facilitated the creation of almost limitless credit. With this credit boom have come irresponsible and often fraudulent patterns of lending, creating inflated bubbles in assets such as property, and powering environmentally unsustainable consumption. This approach hit the buffers of insolvency and unrepayable debts on what we think of as 'debtonation day', 9 August 2007, when the banks suddenly fully understood the scale of debts on the balance sheets of other banks, and stopped lending to each other. In the same year, natural disasters struck body blows to entire national economies, and rising prices began to alert the world to the potential scarcity of oil. At both ends of the climatic spectrum, Australia saw a prolonged drought decimate its domestic grain production, and Mexico saw floods wipe out the agricultural production of an entire large state. In the oil markets, growing numbers of whistleblowers pointed to the probability of an early peak in production, and a possible subsequent collapse of production. The International Energy Agency (IEA) said an oil crunch is likely in 2012". (GND/NEF, 2008)

To fight this triple collapse, *The Group* proposed a Green New Deal program, inspired on Franklin D. Roosvelt's economic recovery plan after the *Crash* of 1929. The program outlines, on one hand, re-regulation of national and international financial and taxation systems. On the other, sustained investments on energy conservation and RES, coupled with demand management. The document focuses in some detail on the case of the UK and with more general options for the global community (Table 6).

Table 6.
Highlights of the Green New Deal program.

- Investments (£50 bilion+/year in UK) for making "every building a power station" through renewables and efficiency measures.
- Creating and training a 'carbon army' of workers to provide the human resources for a vast environmental reconstruction programme.
- More realistic fossil fuel prices that include the cost to the environment, and are high enough to tackle climate change effectively. An Oil Legacy Fund, paid for by a windfall tax on the profits of oil and gas companies would provide funding for the Green New Deal.
- New instruments for smart investments that not only finance the development of new, efficient energy infrastructure but also help reduce demand for energy, particularly among low-income groups, for example by improving home insulation.
- Re-regulating the domestic financial system to ensure that the creation of money at low rates of interest is consistent with democratic aims, financial stability, social justice and environmental sustainability.
- Breaking up the financial institutions that have needed so much public money to prop them up in the credit crunch. Retail banking should be split from both corporate finance (merchant banking) and from securities dealing.
- Re-regulating and restricting the international finance sector to transform the national and global economy.
- Subjecting all derivative products and other exotic instruments to official inspection.
- Minimising corporate tax evasion by clamping down on tax havens and corporate financial reporting
- Allowing all nations far greater autonomy over domestic monetary policy (interest rates and money supply) and fiscal policy (government spending and taxation).
- Setting a formal international target for atmospheric GHG concentrations that keeps future temperature rises as far below 2ºC as possible.
- Delivering a fair and equitable international climate agreement to succeed the Kyoto Protocol in 2012.
- Giving poorer countries the opportunity to escape poverty without fuelling global warming by helping to finance massive investment in climate-change adaptation and renewable energy.
- Supporting the free and unconstrained transfer of new energy technologies to developing countries.

Source: adapted from GND/NEF, 2008

The economic instruments behind the Green New Deal are based on the Keynessian precedents in the 1930s. Keynes argued that the employment degree was critically dependant on low interest rates. He considered that low rates allowed private sectors to expand and progress as credit was affordable. He also enhanced the regulatory role of public authorities and public financial institutions in order provide control and stability to the markets. After the Wall Street *Crash* his monetary reforms were implemented in the USA, UK, Germany, France... helping all of these countries recover from the first international credit crunch. As *The Group* claims, the present crisis requires Keynessian concepts once again, but not for an eventual time frame, but as a new governance of the economy. For environmental purposes *The Group* adds: *"Ecologically sustainable finance could also be cheap finance. Because if the cost of finance is halved, then a great deal more investment projects become viable, including renewable energy projects, public transport, and the like"* (GND/NEF, 2008).

Contemporary to the Green New Deal report, Renner, Sean Sweeney, Kubitas, et. al. (2008) from the Worldwatch Institute and Cornell University issued *Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World* (comissioned by UNEP). The study analyzes at global scale labor in 36 sectors matching their idea of green employment: *"*[positions] *towards decent work in a sustainable, low-carbon world ...* [and] *that contribute substantially to preserving or restoring environmental quality. Specifically, but not exclusively, this includes jobs that help to protect and restore ecosystems and biodiversity; reduce energy, materials, and water consumption through high-efficiency and avoidance strategies; decarbonize the economy; and minimize or altogether avoid generation of all forms of waste and pollution. But green jobs ... also need to be good jobs that meet longstanding demands and goals of the labor movement, i.e., adequate wages, safe working conditions, and worker rights, including the right to organize labor unions"* (Renner et al., 2008). Renner et al.'s (2008) idea of the green economy (and green jobs) trespasses the boundaries of environmental issues, to integrate social values related to labor. From this inspirational report, **UNEP coined in 2011 what today is the official definition of Green Economy**[24]: ***"A green economy is one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. In its simplest expression, a green economy can be thought of as one which is low-carbon, resource efficient and socially inclusive"***.

Regarding the figures, Renner et al. (2008) report: *"the global market volume for environmental products and services currently runs to about* [USD] *$1,370 billion (€1,000 billion), according to German-based Roland Berger Strategy Consultants, with a projected $2,740 billion (€2,200 billion) by 2020"*. So far, we are talking about 2.2% of the World GDP (in 2008 USD $61trillion; World Bank, 2011). Thus, it is not a negligible sector any more. Nor it is the amount of people already working in green economic activities. Only accounting for those in low-carbon (includes energy saving and efficiency) related goods and services, the calculated labor force is a rough number of 21.5 million (Renner et al., 2008; Table 7). Once data about sustainable practice within the 1.3 billion agricultors and 1-1.7 billion forest dependent population is available, green jobs impact will grow substantially. And, likewise, if the scope of the study had included environmental awareness and education, water quality and treatment, environmental workforce of the public administration, etc., such as done in parallel reports at regional and national level (Ervet, 2010 and 2012; Forum Ambiental, 2000, 2002, 2004, 2006, 2008, 2010; OSE, 2010). Furthermore, as the authors reflect, *"given the rapidly rising interest in energy alternatives, future years may well see*

[24] Pearce was already talking about Green Economy in 1989, in B*lueprint for a Green Economy* (also known as the *Pearce Report*). Pearce advocated on valuing environmental effects, and making use of market incentives to attain environmental sustainability (taxing under the "polluter pays" principle, emission rights trading, etc.). However, the notion of Green Economy did not become widespread until the late 2000s.

worldwide [green] employment soar -possibly as high as 2.1 million in wind energy and 6.3 million in solar photovoltaics by 2030, and on the order of 12 million jobs in biofuels-related agriculture and industry-" (Renner et al. 2008).

Table 7.
Green Jobs Worldwide - Discrete sectors, 2008.

•	Renewables (combined) ~2,330,000
•	Green Buildings and Efficiency in Housing: ~1,880,000
•	Car Industry ~235,000
•	Railway transport ~4,340,000
•	Recycling ~12,670,000

Source: Renner et al., 2008.

The spring of 2008 another capital document was produced, The Economics of Ecosystems and Biodiversity (2009, [TEEB]), led by Mr Pavan Sukhdev, a senior banker at Deutsche Bank. This work had been endorsed by the G8 and the five major newly industrialising countries. A first remark of the authors is the need to reform environmentally harmful subsidies. It is estimated that one third of global subsidies (USD $1trillion/yr) support the production and consumption of fossil fuels. Hence, *"reforming subsidies that are inefficient, outdated or harmful makes double sense during a time of economic and ecological crisis"* (TEEB, 2008). In return, a new green phylosophy should be introduced in economics, based on: 1) addressing losses through regulation and pricing; 2) Adding value through protected areas; and 3) Investing in ecological infrastructure. The bottomline idea of TEEB is to establish an economic value to natural resources, drawn from the ecosystem services delivered to humanity and the biosphere. This way, it will be possible to create and feed a yearly flow of money -from economic activities exploiting, transforming or even damaging the natural capital- to protected areas and the ecological infrastructure, in order to compensate and resume natural assets and their functions for the environment and society. Despite it is calculated that ecosystem services contribute to around 50% of the Global GDP[25], in reality *"from the economic perspective, the most important gaps to be filled relate to the measurement of ecosystem services and of the ecological condition of the ecosystems that provide them"* (TEEB, 2008). Indeed, many services are incommensurable; thus, prices -if given- would be so high that economic profitability would never be possible. On the other hand, some ecosystem services are of such vital nature that use should not be allowed even under a TEEB scheme. Likewise, certain natural resources have important issues linked to property rights of native communities, which practically neglects an economic dimension to their use. As reported in The People's Summit in Rio de Janeiro (2012) this new economics of ecosystems may be raised to a flaw, because it enters in conflict with all of the above. Actually, it is argued that the TEEB approach *"will extend corporate control into new areas from forestry to water ...* [and] *... will spur even greater convergence of corporate power and unleash the most massive resource grab in more than 500 years"* (ETC Group, 2011), putting at stake ethical and environmental principles beyond economy.

In 2007 HSBC launched yet another framework for the definition and measurement of green economic activity; the Global Climate Change Index [GCCI]. This is a stock market index including 377 companies (in 2009) with more than 10% of their revenue derived from one or more of 18 climate change themes (table 8). In contrast to Renner et al. (2008), the GCCI does not consider employment aspects, only economic indicators. As a result of this cluster 4% of the global listed market capitalisation may be aggregated under goods and services linked to climate change. Moreover, progress between 2004 and 2009 shows a tremendous increase (about 150%) in the number of companies under the GCCI framework. For HSCB (2009) this is evidence that *"companies across the globe ... have recognised the link between climate change and their own long-term success"*.

Table 8.
Global Climate Change Index - Climate Change Sectors.

LOW-CARBON PRODUCTION	**ENERGY EFFICIENCY & ENERGY MANAGEMENT**
• Bio- Energy	• Buildings Efficiency
• Diversified Renewable	• Energy Storage
• Gas	• Fuelcells
• Hydro / Geothermal / Marine	• Industrial Solutions
• Integrated Power	• Transport Efficiency
• Nuclear	
• Solar	
• Wind	
WATER, WASTE AND POLLUTION CONTROL	**FINANCIALS**
• Carbon Trading	• Water
• Investment Companies	• Waste
	• Pollution Control

Source: adapted from HSBC, 2009 in WI, 2009

Bernard et al. (2009) supplied a different perspective by measuring green packages in the crisis recovery programs. Results fluctuated from 1.3% in Italy to 80.5% in South Korea. Besides the latter country, only the EU authorities exceeded 50% in the studied sample. Among the rest just France and China surpassed the 20% level (21.2% and 37.8% respectively), whereas Canada, Germany, Japan, Spain, UK, USA remained below 15%. Against this, Bowen et al. (2009) suggested a 20% green share of total stimulus packages, leading to some €300 billion of public spending annually. According to the Wuppertal Institute (WI, 2009) *"this is in line with McKinsey & Company (2009), who estimated that €320 billion a year until 2015 will be needed to put the global economy on a low-carbon trajectory"*. In a subsequent report, WI (2009) recalls a variety of environmental shortcomings and rebound effects from some of the considered green packages, such as: *"the US package, for instance, includes spending €21 bn on new roads, which will result in increased car emissions (Harvey, 2009) ... For example, Canada has declared support for the nuclear industry as 'green' (HSBC, 2009)"* (WI, 2009). Germany's so called 'environmental bonus' for the renewal of cars suffers from parallel flaws. Owners of cars more than 9 years old get a financial bonus for scrapping their vehicles, when buying a new car that meets the Euro 4 emissions standards, at least. *"The risk that the new car could consume more fuel (if people switch from small to bigger cars) and/or that additional emissions and material flows could result from the production of the new car, are often not considered"* (WI, 2009). An evaluation by Ecofys & Germanwatch (2009) of this issue of positive vs. negative stimuli in the green packages, exposed that counter-productive measures in Italy outweighted the positive ones.

[25] Source: the author, by dividing the annual average yield of USD $33trillion from ecosystem services (Constanza, 1997) against the global GDP of 2008 ($61 trillion)

Also in 2009, the Greens/European Free Aliance campaigned (in the European Parliament elections) for a global Green New Deal, in order to stress the need for recovery programs focusing on green industries. In order to land their proposals, prior to the UNCCC COP meeting in Copenhagen (December 2009), the Green European Foundation comissioned a study to the WI analysing public and private investment in certain economic sectors and their development: ecoindustries[26], transport, and renewable energies, as well as the worldwide transfer of these technologies. The approach of the study took even into account possible harmful effects of green growth, for instance its mere contribution to an already unsustainably high level of natural resource consumption. In summary, from a strategic perspective of a Green New Deal, according to the WI (2009), EU policies and programs should meet 3 main objectives: 1) Break up unsustainable structures; 2) Build up sustainable structures 3) Give the right mid- to long-term orientation[27]. Through several stimuli the green parts of the Lisbon Strategy combined with the Sustainable Development Strategy, could be integrated in a Green New Deal to *"support efficiency frontrunners and technological leapfrogging in regions with low resource productivity[28]... This would enable the EU to harvest a double-dividend of decreased pressure on the environment (including CO2 emissions) and increased competitiveness due to the reduction in production costs"* (WI, 2009). Finally, the authors suggested 3 priority areas -sustainable mobility, energy and material efficiency- for this regional green transformation of industries, and for which they developed factors to stimulate change (Table 9).

Support or "pull" measures should be triggered in parallel to other "push" factors in order narrow down the path to deliver greener mobility, energy and industries (WI, 2009). Thus, side by side to grants, investments and purchases there must be limiting regulations, eco-taxes and disincentives to unefficient technologies. Last but not least, the mid-term action policy mix to consolidate this Green New Deal should strengthen and bring to convergence different EU programs affecting eco-innovation and regional development, creating the financial basis -at the European and regional level- for a 'triple-helix' of cooperation among entreprises, the public sector and academia (research and training) (WI, 2009). For WI (2009) the long-term goal should be a *"self-sustaining market for improving resource efficiency in the European Union"*.

Feeding on the expanding debate about green economy, **in 2010 the EU approved the 2020 Strategy** (EU2020 hereon), **aiming at the *Smart, Sustainable and Inclusive Growth* of the Union**, through 5 headline targets: 1) To achieve an investing of 3% of GDP in R&D; 2) To fullfill the 20-20-20 policy above; 3) To raise the employment rate of the population aged 20–64 from the current 69% to at least 75%; 4) To reduce the share of early school leavers to 10% from the current 15% and increase the share of the population aged 30–34 having completed tertiary from 31% to at least 40%, and 5) To reduce population below national poverty lines by 25%, lifting 20 million people out of poverty. This strategy may be considered the first comprehensive Green Economy policy as it simultaneously addresses the threefold -low-carbon, environmental and social- dimensions of green economic development.

Table 9.
Green New Deal factors to stimulate green industrial development in the EU.

SUSTAINABLE MOBILITY
• Investments in new public transport vehicles – buses, trams and regional trains
• Ivestments in infrastructure for bicycles anD pedestrians which are realisable in the shor term
• Investments in infrastructure improvements for public transport
• Investments in services to make public transport more user-friendly
• Incentives for retro-fitting cars and public transport vehicles
• Fiscal measures to subsidise high-efficiency vehicles
• Research on energy-efficiency technologies
• Marketing of more sustainable modes of transport
• Education about eco-driving
ENERGY
• Grants for building retro-fitting including renewable energies and high energy efficiency standards
• Pilot projects for passive or zero-emission houses on existing building stock
• Intelligent combinations of high energy performance standards and renewable energies
• Support cities and regions to develop zero-GHG zones or zero-GHG cities
• For new buildings, pilot 'energy-plus' houses to provide examples of building standards in general
• External financial support (e.g. BREEAM, CASBEE, Effinergie, DGNB and LEED) in new buildings for integrated low emission strategies with resource efficiency
• Grants and incentives for energy consumption reduction of heating and air-conditioning systems
• Support programmes for the most energyefficient white appliances
• support programmes for office, communication, and entertainment appliances without a stand-by facility and with low on-mode consumption
• Free or subsidised energy audits for industries
• Promote regional and/or sectoral networks and sectoral energy schemes and ESCOs
• Targeted financial support programmes to promote end-use
• Create awareness among consumers about energy consumption, energy costs and GHG emissions
• Motivate consumers to monitor energy consumption and to take action
• Decrease the running costs of metering and billing
• Create the technical basis for managing peak demand and integrating renewable energy sources
• Adapt the structure of the European grid to integrate large decentralised renewable supply systems, large-scale offshore wind and concentrated solar power plants; Smart-Grids
• Additional funding should focus on EU-wide distribution and transmission infrastructure
RESOURCE EFFICIENCY
• Combined creation of a European Resource Efficiency Agency and national Resource Efficiency Funds
• Raise awareness of the cost reduction potential among decision-makers in industry through the EU. Resource Efficiency Agency, to increase demand for specific resource-efficiency technologies
• Finance resource efficiency, especially in SMEs through Resource Eff. Funds
• Resource-efficient public procurement

Source: Adapted from WI 2009

When in 2011 UNEP issued its definition of green economy, it had already become a trending topic among the international community (World Bank, EU, OECD, G-20, etc.).

[26] Based on the Eurostat/OECD definition of ecoindustries, WI (2009) defines a Green New Deal as *"targeted state investment in activities which produce goods and services to measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as problems related to waste, noise and ecosystems. This includes innovation in cleaner technologies to reduce environmental risk and minimise pollution and resource use"*.

[27] The study admitts that *"Long-term fiscal reforms, or fundamental shifts to a steady-state economy and other more profound changes will be needed eventually to allow for sustainable development in the European Union, but they are not the subject of this study... A Green New Deal will therefore not be a complete strategy for ecological modernisation but it could help Europe to emerge stronger and more sustainable than it was before the current crisis"* (WI, 2009)

[28] Up to 8 times difference in resource productivity between top and bottom performing countries.

The climax of this process was the 2012 Rio+20 Summit, in which the green economy was included as one of the two thematic debates. Outcomes of the conference are contradictory, yet the expected. The *Report of the United Nations Conference on Sustainable Development* (also refered to as *The Rio+20 Declaration*; UN, 2012) covers the resolutions adopted by the participating States. The adopted vision *The future we want* renews the international commitment to sustainable development, for present and future generations. Particularly, *"eradicating poverty is the greatest global challenge facing the world today"* (UNCSD, 2012) and countries are committed to fight it *"as a matter of urgency"*. Protection of the natural resource base of economic and social development, and mainstreaming sustainable patterns of consumption and production are also highlighted. Even so, conceptual shortcomings rise when, for all of the above, nations *"reaffirm the need to achieve sustainable development by promoting sustained, inclusive and equitable economic growth"* (UNCSD, 2012). In Rio'92 the economic model to pursue was more vague, and subsidiary to sustainable development. There seemed to be room for debate and confrontation of alternative economic visions, in order to achieve optimal levels of well-being and environmental balance. In Rio+20, economic growth was elevated to the one and only path towards the desired goals of progress, as well as the EU did with the 2020 Strategy. The UN considers that growth economics is the best option for *"creating greater opportunities for all, reducing inequalities, raising basic standards of living, fostering equitable social development and inclusion, and promoting integrated and sustainable management of natural resources and ecosystems that supports, inter alia, economic, social and human development while facilitating ecosystem conservation, regeneration and restoration and resilience in the face of new and emerging challenges"*.

After displaying the growth bound nature of the '3E Crisis' -the closing gap to the safety limits of environmental stability, evidences of scarcity of non-renewable factors of production (raw materials and energy sources), the growing global debt bubble, increasing social disparities, etc.-, international hegemonic support to growth economics seems to be an ideological obsession, rather than a pragmatic and science based solution. In effect, billions of people all across the planet aspire to the living standards of westeners, or at least the access to basic amenities such as clean and running water, electricity, education, health, etc. This will all require tremendous investments, thus, there is a rationale for green growth (LSE Cities, 2013). Oportunities for low-carbon growth open up if money is properly allocated into productivity supplied by resource efficiency and renewables (Hepburn and Bowel, 2012; Murray and King, 2012). Indeed, HSBC forecasts that the global low-carbon energy market will triple to USD $2.2 trillion/yr by 2020 (HSBC, 2010 in press). Then, admitting that economic growth will continue to play a critical role in eradicating poverty is necessary (Collier, 2007). However, so far, the reaction of nations to Peak Oil, with important economic derivatives since 2007, has been to sustain growth and expand the provision of living standards through less efficient and more polluting fossil fuels (coal and *unconventionals*). Therefore, besides green growth, it is also the time for arithmetics and to assume that continuing the current trend is impossible and unfair; e.g. in 2009 the first official climate change refugees evacuated their island homes for good (Merchant, in press 2009). A low-carbon future also demands to practice lifestyles with much lower ecological footprints. Hence, it is also the moment to cope with a cultural transition for which certain degree of downshifting will be necessary, especially in the high-income countries. In conclusion, it should not be underestimated that then end-line of today's 'sustainable or green growth' is either 'degrowth' (Latouche, 2003; Kallis, 2011) or 'a-growth' (van den Bergh, 2011). All trajectories will co-exist for a certain period, but if no clear policy choices are made, in order to prioritize what must grow and why, what should degrow, and the potential of development in an a-growth approach, the result may well be a collapse driven compulsory degrowth, rather than a smooth transition (Friedrichs, 2010). Given the individualism, industrialism and mass consumerism of the modern societies, denial of the prior challenge is a risk multiplier against resilience (Rose, 2011). In absence of international agreements, bottom-up transitions will become more and more vital for staying within the boundaries of the desired resilience. The next section will address this issue from the perspective of local governments, arising as a global bottom-up sustainability movement.

1.5 - Cities and Sustainable Development

Year 2010 saw how planetary urban population crossed the 50% threshold (UN-Habitat, 2013). This means that 3,5 billion human beings are currently concentrating in less than two per cent of the earth's surface (LSE Cities Cities/ICLEI, 2012). According to the World Bank (2010) 90% of urban growth happens in the so called developing world, where each year around 70 million new residents reach the urban areas. This movement of people from rural to urban environments appears to be unstoppable. By 2050 70% of humanity's 9 billion will reside in cities (UN-Habitat, 2013). In the coming decades about one-third of the increase in the urban population will be in China and India (United Nations, 2009). Still, South Asian and Sub-Saharan countries are expected to double urban dwellers over the next 20 years (LSE Cities, 2013) and cities across the rich world (Europe, North America, Australia, etc) are growing in population as well (LSE Cities, 2013).

For Indovina (cited in Nel·lo, 2012), the city is so relevant to humanking that it should be understood as the *"ecological niche of the spcecies"*. True or not, indeed many people continue to flee towards the cities seeking a better life and economic opportunities, yet urbanization can also be a national strategy to drive economic development (Li-Yin Shen et al, 2011). And as a matter of fact, the importance of cities in powering economic growth, development and prosperity worldwide continues to increase (LSE Cities, 2013). Today 70% of the World's GDP is generated by the cities and their neighboring regions (LSE Cities/ICLEI, 2012), and 150 of the world's largest metropolitan economies produce 46% of global GDP with only 12% of the global population (Brookings Institution, LSE Cities Cities et al. 2010). Furthermore, the emerging global service economy will continue to expand the cities' role in economic development (K. McCormick et al., 2013). In return, cities are progressively falling under the spotlight of global environmental and sustainability challenges. As centers of energy demand and industrial production, urban areas are responsible for up to 80% of anthropogenic GHGs (UN-Habitat, 2007; Clinton Climate Initiative (in Satterthwaite, 2008); LSE Cities, 2013) and play a dominant role in global consumption and production of resources (Sukhdev, 2009). On the other hand, cities and towns already experience many environmental strains at the local level (GEO-5, 2012). The growing demand for services and the expansion of slums derived from the global rural exodus (Romer P., 2009), and the necessity to develop adapted and resilient settlements due to climate change (Otto-Zimmermann et al., 2011; ICLEI, 2013) must be addressed. Moreover, poor resource efficiency and low environmental quality in cities create negative impacts on long-term economic growth, as productivity decreases from social externalities, such as health issues (LSE Cities, 2013). In summary, cities have a growing responsibility as bearers of socioecological sustainability for the present and future generations.

Engagement of cities and towns in sustainable development is no longer a new topic. In 1992's UNCSD in Rio de Janeiro, chapter 28 of Agenda 21 was dedicated to the cities' role in the ambitious goal of a global shift towards sustainability. By acknowledging both the local level's responsibility and capacity of transforming reality, cities and towns were invited to join through Local Agenda 21 (LA21) processes. A part from a few cases of cities and towns having started more than 40 years back (LSE Cities/ICLEI, 2012), for the majority of Local Governments (LG) LA21 was their kickoff in SD. Since LA21 was announced Different strategic frameworks at either the continental or the international scales have evolved, trying to ease the way for LGs willing to take part in the sustainability 'movement', such as: the Aalborg Charter (1994) and Aalborg+10 (2004), the Thematic Strategy for Urban Environment (2006), the Leipzig Charter (2007), ICLEI-USA's 10 principles and 81 goals for sustainability (2010), ICLEI's 8 agendas for a sustainable city (2012a), the Covenant of Mayors (CoM) and the 2020 energy and climate challenges (EC, 2008), the Integrated Sustainable Urban Development Cohesion Policy Framework 2014-2020 (EC, 2014), the Reference Framework for Sustainable Cities (ICLEI, 2012b) or the Economics of Green Cities (LSE Cities, 2013).

Parallel to the prior evolution, relevance of LGs has steadily grown within the international sustainability negotiations and institutions. In fact, whereas for the international and national levels limited agreement to act has followed major global events, such as the Climate Change Conference of Copenhagen (2009) and the Rio+20 Earth Summit (2012), on the contrary, Local Governments have been able to create, establish and expand their own sustainability and low-carbon agendas and networks (van Staden and Musco, 2010; Nature, 2012; McCormick et al., 2013). One outstanding initative merging both action and self-organization of LGs is Carbon*n*, the cities climate action global registry. A consortium of sponsors and promoters including the World Mayors Council on Climate Change, ICLEI, The Mexico City Pact and United Cities and Local Governments launched this network in 2010. By 2013, 414 cities representing half a billion people have contributed, feeding the registry with 4208 mitigation and adaptation actions, 836 climate and energy commitments and 770 greenhouse gas inventories. More than half of the cities have pledged to cut their emissions more than 1% every year, exceeding the targets of even the most ambitious nation-states under the Kyoto Protocol (ICLEI, 2013).

After years of lobbying through an array of international LG bodies and campaigns, nowadays there is a shared notion that only urban settlements can efficiently implement effective and integrated solutions (UN-Habitat, 2011; ICLEI, 2010a; Wheeler and Beatley, 2010; Roseland, 1997). As highlighted by UNEP/ICLEI (2012) *"The planet and its people are accelerating towards a sobering and largely unsustainable future, ...* [while] *the world is rich in local policies, initiatives and projects. In the absence of strong international action, local responses represent beacons of hope"*. Such firm statement is a logical consequence of UNEP's (2012) GEO-5 assessment report. As the latter release issues significant progress has only been verified for 4 of the 90 key sustainability goals set by the international community

throughout the past decades; for 24 other goals no progress at all has been made (UNEP, 2012).

Overall, the message of necessary multi-level governance of sustainable development is finally getting to the nation-states and the international institutions, and room is being made for the LGs to intervene as official parties of the global roundtables on sustainable development. Since COP-16 (Cancun, 2010) LGs are recognized as 'governmental stakeholders' allowing their UNFCC constituency (the Local Government and Municipal Authorities: LGMA) greater access to high-level talks with negotiators (ICLEI, 2010b). Nevertheless, LG delegates still need to register through an observer organization to attend, and are not allowed to participate in decision-making (ICLEI, 2010b). Progress is ongoing however, with, for instance, the celebration of the first ever "Cities Day" as part of the official program of the UN Warsaw Climate Conference (COP19/CMP9). A date, November 21 2013 - considered by ICLEI (2013) a "monumental day" for cities and regions- in their aim to raise through local action the level of ambition on the fight against climate change. Likewise, low-carbon experiences in mitigation and adaptation will also be showcased in June 2014 at the UNFCCC Cities Forum in Bonn and in Lima at a Mayors-Ministerial Dialogue at UNFCCC COP20 in December (ICLEI, 2013). Top-down integration of LGs is also taking place; upon request of national governments UNFCC has begun to work closely with LGs in projects draining from the international climate funding mechanisms (ICLEI, 2010a). At the EU level, the EC (in CoR, 2012) realizes that reaching the EU2020 targets will largely depend on the decisions adopted at local and regional level. In consequence, for a more effective transition, the Committee of the Regions is following several multi-level pilot experiences in order to facilitate replicability (CoR, 2012). Even follow up by the OECD is taking place, for recommendations and policy implications; in this case, for the EU2020 harmonized development Program of Sweden's Skånse region (CoR, 2012). LGs' next target is their role be reflected in post-2015 [millennium] development goals. Indeed, a voice defined as 'critical' by Sering Falu, UN Millennium Campaign, in 2012 United Cities and Local Governments (UCLG) World Council (IISD, 2012).

LGs' entrepreneurship in coping with environmental and sustainability challenges has produced the concept of 'green' or 'sustainable' city with a twofold notion. On one hand, the 'green'/'sustainable' city is a theoretical framework for bundling a variety of principles, policies, instruments and practices for sustainable urban transformation (ICLEI, 2012; EIU, 2012; LSE Cities, 2013). On the other, it is a branding factor, associated to innovation, quality of life and thriving economies (LSE Cities, 2013). The tag 'Green City' aims to differentiate cities from their national and international competitors based on strengths and competitive advantage, in order to draw people and investments to urban centers (Gulsrud et al, 2013). in a logical sequence, a key open question to answer is *How 'green' are 'green cities'?*; *how to assess that cities self- / being labeled as 'green' really do "walk the talk"?*

Kumar, Murty, Gupta, and Dikshit (2009) report that there is vast literature on urban sustainability assessment methodologies and sustainable development indicators (SDI), and in accordance a lack of consensus (Legrand et al., 2007; Planque and Lazzeri, 2006). In words of ICLEI (2010d) *"for too long, community sustainability has been a nebulous concept ... there has never been a national* [nor international] *standard by which to measure sustainability performance"*. Nevertheless, as the interest of the cities in benchmarking their 'green' profile grows, some frameworks and methods are becoming more popular, and this will be the focus of the following paragraphs through 6 referential cases.

European Ministers in charge of urban development from the EU's 27 Member States signed in 2007 the Leipzig Charter on Sustainable European Cities (EC, 2007b). This charter outlined an ideal model for the European Sustainable City and laid for the first time the foundations for an integrated urban policy. By 2008 in Marseille (France) the Ministers decided to have a tool created that would translate into practice the common sustainability goals and the Leipzig Charter objectives (ICLEI, 2012a). Parallel to the prior, ICLEI approved in 2012(b) **the 8 Urban Agendas of Action for Sustainable Cities** in their 2012-2015 Strategic Plan (Table 10). A variety of more than 100 projects offer ICLEI's more than 1200 LGs in 70 countries the opportunity to join the implementation of the 8 Agendas.

Table 10.
ICLEI's 8 Agendas of Action for Sustainable Cities

Green urban economy. A viable local economy will be based on cradle-to-cradle material cycles and an appreciation of human labor over energy-intensive technology. Sustainable procurement by all Member local governments will drive the market green, create green jobs, and support future-oriented industries.
Sustainable city. Preparing a city for the future means taking a holistic, long-term perspective and devising an integrated sustainability policy. ICLEI Member local governments should lead by example.
Resource-efficient city. Eco-efficient cities will gain a competitive advantage in an era of shrinking global resources and growing global and urban populations.
Biodiverse city. The benefits of ecosystem-based local planning and management are multiple. Cities and local governments have a key role to play.
Low-carbon city. Low-carbon, or even climate-neutral cities, will be the signposts to sustainability. Ultimately, all Member local governments should establish climate action plans and integrate the reduction of greenhouse gas emissions into their planning and investment structures.
Resilient community and city. Low-risk cities show low vulnerability to climate change, natural and industrial disasters and economic shocks. Climate change adaptation and disaster risk reduction planning by all Member local governments will be key to facilitating sustainable communities.
Smart urban infrastructure. The eco-efficient, resilient and low-carbon development of a city requires green urban infrastructure. Smart infrastructure requires smart systems design, not only single efficient technologies. Green infrastructure development means looking at the variety of urban infrastructures, identifying possible efficiency gains through linkages between different infrastructures, new operational and business models, as well as financing models.
Healthy & happy community. The ultimate goal is for local communities to enjoy health and happiness. Whether on a modest or more affluent economic footing, local governments must promote community vitality, health, education, culture, and good governance.

Source: ICLEI, 2012b.

Whereas the 8 Agendas generate guiding principles for the 'Green City', **the Reference Framework for Sustainable Cities [RFSC]**, also presented by ICLEI in 2012, supplies the Leipzig Charter with the above requested development tool,

through an online software that integrates environmental, economic, social and governance pillars of sustainability (ICLEI, 2012b). The operative approach of the RFSC is based on a simple 3-step process: 1) Checklist tool about the sustainable city; 2) Qualitative evaluation tool to assess the integrated approach; 3) Quantitative tool with a library of indicators. Experiences of 200 European cities and the definition of 25 urban sustainability goals covering European objectives and principles provide robustness to the system. Since its launch in January 2013 the RFSC community has grown to include 73 cities (RFSC, 2014 website). It is sill too early to assess the effectiveness or practical success of the RFSC, even so, the sole existence of a platform validated by the EU for the development and monitoring of 'Green City' strategies is already enormous. Unfortunately, so far the tool is only available for cities and towns from EU adherent States, and from EFTA and accession countries. Given that both initiatives are steered by ICLEI, hopefully, in the future the RFSC will be the implementation method to export the 8 Agendas for Sustainable Cities anywhere in the world.

Ambientalia's 2007 ***Urban Ecosystem Europe*** - *Report* (UEE hereon) assessed the sustainability of 32 of the *"main and bigger"* European cities. 25 sustainable development indicators were measured, according to the 10 Aalborg Commitments, the EU Thematic Strategy on Urban Environment, the Leipzig Charter, and a series of local indicator systems and related research projects (as Urban Audit, ECI, TISSUE, STATUS...) (Ambientalia, 2007). EU City Networks such ICLEI, Union of Baltic Cities, MEDCities or Climate Alliance, among others, endorsed the project. Indicators were grouped in 6 major themes to offer an overall integrated assessment.

Concern and progress were both issued through the results of UEE. Air pollution was among the relevant problems found, as -despite legally binding regulations- 45% of the cities suffered excess of PM_{10} in at least one monitoring station and 90% were very far from coping with the 2010 NO_2 threshold. In urban transport the challenge of stopping the expansion of cars was exposed together with encouraging messages about sustainable mobility measures. *"Car users are invading cities, but local policies could succeed"* (Ambientalia, 2007); for instance, by enhancing home-to-work use of public transport (58% in Prague) and bicycle (20% in Aalborg and Arhus; 29% in Kobenhavn). Waste production was growing almost in every city of the sample - only Dresden (334 kg/inhab/year) had curved the trend and the rest remained between 400-700 kg/inhab/year. Not differentiated waste was below 250 Kg/inhabitants/year in Munchen and Antwerp thanks to separate collection, a practice reaching up to 62% in Aalborg and 50% in Helsinki. Reduction in electricity consumption was outstanding in Oslo (-26% in 5 years). Water consumption was under 100 L/inhab/day in Dresden and Heidelberg; 100% of inhabitants served by water treatment was ongoing in most cities. In conclusion, Ambientalia (2007) suggests that a combination of the success stories collected in their sample of 32 cities -dealing also with noise, district heating, gender equality, participation in local elections, etc.-, could represent the notion of a 'Sustainable City'.

Table 11.
Sustainability Indicators of *Urban Ecosystem Europe - Report.*

Local Action for Health and Natural common goods	1. Air quality: PM10 concentrations 2. Air quality: NO2 concentrations 3. Noise map and noise reduction plan 4. Domestic water consumption 5. Inhabitants served by water treatment plants
Responsible consumption and lifestyle choices	6. Electric consumption variation 7. Amount of municipal waste produced 8. Municipal waste processed according to differentiated refuse collection schemes 9. Green public procurement procedures and purch.
Planning, design and Better mobility, less traffic	10. Passengers travelling on public transport within the urban area 11. Underground and tram lines in the urban area 12. Number of registered cars 13. Cycle paths and lanes availability 14. Public green areas availability
Local to global: Energy and Climate change	15. Setting of an Energy Balance and a CO2 reduction target 16. Solar power generation in public buildings 17. Inhabitants connected to DHS 18. Climate and Energy saving policies
Vibrant, Sustainable Local Economy and Social equity, justice and cohesion	19. Demographic and old age dependency 20. Female employment 21. Population qualified at highest level of education
Local Management towards sustainability and Governance	22. EMAS and ISO 14001 certification of public authorities 23. Level of implementation of LA21 processes 24. Electorate voting in city elections 25. City representatives who are women

Source: Adapted from Ambientalia (2007)

The Green City Index (GCI) created by the Economist Intelligence Unit and sponsored by Siemens is a ranking of cities according to an integrated assessment of urban environmental sustainability. The series began in 2009 and covers more than 120 cities in different planetary regions: Europe, Latin America, Asia, North America and Africa. Seven cities in Australia and New Zealand were included in 2012. GCI allows for a yearly comparison of the cities' race towards urban sustainability, based on evaluating planning and management of 8 topics, namely: CO_2 emissions, energy, buildings, transport, waste & land use, water, air quality and environmental governance. The European methodology uses 16 quantitative and 14 qualitative indicators and it was adapted for the other regional indexes. The ill-represented social and economic pillars of sustainability trigger a merely environmental and technological vision of the 'Green City'. However, the index and the annual renovation of the benchmarking produced are very powerful tools for lifting and comparing efforts from cities at global scale. Nonetheless, 'Apples to apples', the challenge of collecting comparable data worldwide (EIU, 2012) throws, to a certain extent, questionable results. Results for Europe and North America are represented in a numeric 0-100 scale. For the remainder regions outcomes are presented in qualitative terms. Six European cities, such as Copenhagen or Stockholm, break the 80 points mark. Highlights include: *"Oslo uses the highest share of renewable energy at 65%. The Index average is 7%"; "Copenhagen's and Berlin's residential buildings consume almost 40% less energy than the Index average"*. In North America only San Francisco and Vancouver fall in this +80 point group, because in general resource intensity is much higher. For instance, CO_2 emissions from US Index cities (~16 tCO_{2e}/inhab/yr) triple the level of emissions from Europe (5.2 t.); US and Canadian Index cities more than double water use (590 L/inhab./day)

than the other cities worldwide. In this context and without further detail on the stats, it is difficult to understand why Rome and Houston are at the same level in points (62.6). As reported, *"greenhouse gas emissions are high by any standard and urban sprawl remains a challenge"* in USA and Canadian cities (EIU, 2012). But, GCI outcomes are compensated by *"water infrastructure, recycling levels and environmental governance mechanisms comparable to the best cities in other GCI regions"* (EIU, 2012). After all, the branding effect of GCI is a potential attractor for cities in both developing and developed economies around the topic of green cities. The environmentally concerned public, research institutions and private corporations will find in the GCI ranking an assistant in their search for like-minded metropolis where to settle and/or to do business. Probably, somehow, over-scored cities will also suffer some type of penalty in form of ignorance or negative press.

The Economics of Green Cities Program (EGC from hereon), chaired by Lord Stern at the London School of Economics, defines 'green economy leaders' as those cities displaying *"high productivity and economic competitive advantage in the short term, high and growing levels of environmental performance, and long-term sustainable growth"* (LSE Cities, 2013). EGC is a collaborative research program with the *"aim of examining the risk-adjusted costs and benefits of green policy frameworks on the sustainable economic growth of cities in different parts of the world"* (LSE Cities, 2013). The purpose of EGC is to deliver recommendations for the development of green urban economies, based on consistent evidence from ongoing experiences. EGC focuses on two key areas: 1) the economic rationale of early-action green policies in developed and developing countries; 2) the policy program, institutions and tools that are most promising for policy makers to implement, measure and monitor green city policies. Economic literature explains that setting public sector challenges boosts innovation and that investment flows to pioneers (Mazzucato 2011 and Pérez 2002 in LSE Cities, 2013). Moreover, as reported in LSE Cities (2013) prosperity is correlated to higher levels of green policies and environmental performance. Therefore, entrepreneurial and innovative cities have a positive feedback for economic and 'green' success, which leads the EGC program to conclude that over the coming century, due to climate change and [conventional] energy scarcity, additional comparative advantages will appear for sustainability forerunners.

Departing from the prior framework the EGC conducted in 2013 an in depth research of the case of Stockholm, a very successful case of simultaneous long-term economic prosperity and 'off the roof-top' socioecological sustainability performance. Stockholm is an early-starter, as it began to examine alternative energy sources and energy management in the 1970s (LSE Cities, 203). The impact on prices of the 1970s global oil crisis and the city's almost full dependency on imported oil triggered a shift towards an energy system based on local and renewable sources. Tackling the energy means for district heating was critical, as it allowed to reduce oil, coal and gas to 10-20% for this service. In combination with national low-carbon electricity production (particularly hydro and nuclear) GHG emissions in Stockhom have declined from 5.4 tCO_{2e}/inhab. in 1990 to 3.5 tCO_{2e}/inhab. in 2010; half the OECD European average of 7 tonnes (LSE Cities, 2013). Parallel to this carbon track, Stockholm County's GDP grew 4.1% per year on average between 1993 and 2009. The analysis of the case has raised 8 green economy drivers, displayed abbreviated in Table 12. Five modalities of environmental policies -for which Stockholm's specifics are described- support EGC's transition of cities to 'green economy leaders', namely: pricing; planning and regulation; public finance; public procurement; and information. The great value of EGC is that it explores relevant cases of success, in order to build the local policy theory bridging economic development and environmental excellence. Given the level of priority that the economy has for LGs, while departments of finance, economic development and technology are rarely involved in developing their municipality's green strategy (LSE Cities/ICLEI, 2012), EGC unfolds the common ground for cooperation.

Table 12.
Green Economy Drivers of Stockholm

Driver 1: Urban form. Compact urban form, with development concentrated along main public transport corridors. Strategic planning since the 1950s.
Driver 2: Innovation. Innovation-led economy with 1st class universities, research institutions, and public private technology centers. At the national level, Sweden ranks first on the EU's Innovation Union Scoreboard.
Driver 3: Investment. High levels of inward foreign direct investment (FDI). Over the past two decades inward FDI has averaged 4.7% of GDP, well above the European average of 2.8% and higher than that for the United States, Japan and Brazil. Foreign-owned businesses in the County increased by 520% from 1998 to 2010 and the number of employees went from 75,000 to 208,000.
Driver 4: Skills and employment. High employment rates (an average of 77% over the last decade). Highly skilled workforce provides talent for productive knowledge-economy sectors.
Driver 5: Enterprise. Business environment that provides start-ups and SMEs with opportunities to enter and compete fairly in markets and access to substantial venture capital. Over 24,000 companies were newly registered in 2011 - 29% higher than in 2005, despite the global economic downturn.
Driver 6: Energy and resource effectiveness. Strong energy and water security. Energy consumption per capita is lower than the national average due to lower industrial activity. Even so, enhancing energy and resource efficiency should be a greater priority (water use remains substantially higher than the European average, while incineration for DHS keeps demand for waste high).
Driver 7: Low-carbon. Low levels of greenhouse gas emissions. in Europe. In 2011, Stockholm's emissions were 3.5 tonnes per person, compared to an average of 7 tonnes in OECD Europe. By 2050 the target is to be fossil fuel free, requiring major strategic decisions on pathways to eliminate carbon entirely from domestic heating and transport.
Driver 8: Environmental quality. Substantially improved air and water quality. Over the last 50 years, policies have successfully reduced SOx and NOx in the air, as well as phosphorus and nitrogen in the surrounding lakes. However, PM_{10} levels remain above WHO international standards.

Source: Adapted from the EGC (LSE Cities, 2013).

Last but not least, the European Commission created in 2008 **the European Green Capital Award**, after a memorandum initiative of 15 cities in 2006. This prize rewards cities' efforts in sustainable development, through a consistent record of high environmental standards and ongoing ambitious goals and commitments. Receiving the award symbolizes a unique prestigious distinction for winners, as they become the role model to follow all across Europe. In fact, a communication campaign is associated to the each Green Capital, in order to disseminate best practices and inspire other cities to take further ahead their 'green city' plans and programs. Only cities over 100,000

inhabitants are eligible by showcasing their progress in twelve environmental indicator areas. An international expert panel shortlist candidate cities and a jury formed by several EU bodies and environmental organizations (such as DG Environment, CoR, EEA or ICLEI) is responsible for selecting the winner (Table 4). So far the awarded cities are Stockholm (2010), Hamburg (2011), Vitoria-Gasteiz (2012), Nantes (2013), Copenhagen (2014) and Bristol (2015).

Table 13.
Indicator Areas of the European Green Capital Award.

1. Climate change: mitigation and adaptation
2. Local transport
3. Green urban areas incorporating sustainable land use
4. Nature and biodiversity
5. Ambient air quality
6. Quality of the acoustic environment
7. Waste production and management
8. Water management
9. Waste water treatment
10. Eco innovation and sustainable employment
11. Energy performance
12. Integrated environmental management

Source: Adapted from the European Green Capital website, 2014.

Six different 'green' / 'sustainable' city approaches have been presented. Some use guiding principles and tailored assistance, some evaluate sustainability indicators and environmental policies, others require external assessment, others use a combination of the prior. However, it appears that environmental performance, detailed in a variety of sectors, is both a critical factor to assess effective progress and the driver for local eco-innovation and economic shift to low-carbon activities. Local Governments linking to either of the 'green city' concepts shown assume a leading role by setting the targets, planning the urbanscape, shaping the policies and allocating the investments necessary for the city's progressive 'green' "mutation". Social aspects appear to be less represented or measured, yet employment, enterprise, aging and education indicators serve as proxy for social wellbeing, together with an urban environment with high quality standards (green spaces, low pollution and noise, etc.). Given that measuring public participation and satisfaction is difficult, citizenship attachment to the city's project through the local elections completes the governance pillar of the 'green city'.

Building upon the described references of 'sustainable cities', this research examines the cases of 6 cities engaged in the development of 'Green City' approaches. Policies, instruments and measures, as well as environmental sustainability indicators are analyzed and assessed, in relation to the low-carbon performance of 10 climate and energy sectors, according to scores and opinions by local green economy stakeholders and experts.

Chapter 2 - OBJECTIVES

Relevance of the local scale in tackling the increasingly worrisome sustainability challenges of humankind has been widely exposed. In this process, Local Governments and the local communities and stakeholders must lead the economy to shift from brown to green; driving to one which is low-carbon, resource efficient and socially inclusive, as expressed by UNEP (2011) and in the EU 2020 Strategy. Drawing from this basic framework, this research project is shaped into the following research questions and objectives:

1) Research question: ***How green 'Green Cities' are?***

Objectives: To explore the transition to sustainability of cities from different countries adopting low-carbon pathways, in order to showcase success stories, yet unfolding as well uncertainties, contradictions and constraints. To assess the degree of sustainability of the case studies from an integrated discussion of methods and data, together with own *ad hoc* methodology.

2) Research question: ***Who takes part in the green urban economy and how is this evolving according to the EU 2020 Strategy?***

Objectives: To assess what sectors of the green economy are currently developing in low-carbon cities, by whom, what barriers must these confront, and how do these activities relate to the EU 2020 Strategy targets.

3) Research question: ***How are the 'Threefold E Crisis' ('3E Crisis) and the responses to it perceived?***

Objectives: To discuss the triple environmental, energy and economic crisis with different green stakholders from a variety countries. To discuss the social and economic pathways for tackling this crisis; the role of the EU; the position of the respondees' cities and countries; potential evolution of the crisis...

In order to conduct this research with the widest potential scope, the number and variety of study cases will try to represent different economic, social and environmental realities. Still, as deployment of the research will be done in collaboration with ICLEI-Europe, all cases will belong to its area of influence. As a result, all case studies are from OECD member states; hence, countries in the high-income class according to the World Bank (2014).

This research does not rely on a prior hypothesis. Assumptions about the importance of the city's context (local, regional, national or international) may be forecasted. Nevertheless, for the researcher the interest is on discussing to what level and how this context is significant. And what other factors must be taken into account when dealing with the topic of 'Green Cities', including those that will allow to set common ground with independence of the context. Ultimately, this project aims at delivering reflection and insight on low-carbon, sustainable and resilient development of communities, hoping that it will prove useful to scholars, professionals and decision-makers engaged in this arena.

Chapter 3 - METHODOLOGY AND STUDY CASES

3.1 - Description

Between October 2011 and April 2012 the author conducted a research with ICLEI-Europe on the green urban economy approach of 6 cities active in climate change and sustainable development, namely: Almada (Portugal), Arendal (Norway), Bologna (Italy), Girona (Spain), Jerusalem (Israel) and Turku (Finland). These cities not only cover a wide geographical area, but also a broad cultural, economical and political spectrum. ICLEI was selected as partner, as it is one of the most experienced and well connected international organizations working with LGs. It has a track record of more than 2 decades working in local sustainability, thanks to which over 1,200 LGs have affiliated to this NGO, representing altogether more than 550 million people (van Staden, 2012).

After the Climate and Air Team of ICLEI-Europe kindly accepted the researcher's request to collaborate, the selection of the case study cities was initiatied. As van Staden (2012) reflects *"with more than 100,000 local governments in Europe, this is a group that has tremendous potential for action and for shaping change at the local community level"*. Given the connection between the 'Green City' concept and low-carbon development, only cities active in climate change mitigation and adaptation policies were identified, and in the area of influence of ICLEI-Europe. Even so, by the time the research was ready for defining a sample, the potential sample already included more than 2,700 European cities engaged in the CoM. In consequence, a process of invitations to participate was completed, based on the experience of ICLEI's Climate and Air Team in cooperating with LGs. This allowed to pre-select a group of 11 particularly active cities for the invitation process (Table 14).

Table 14.
Invited cities and participating cities.

City	Country	Population (2009-11)	€ GDPpc (State'09)	Covenant of Mayors	Other CC Projects
Almada	Portugal	164,844	15,748	Yes / 2009	CCP
Arendal	Norway	41,655	56,865	No	Clim.Neut.
Birmingham	UK	1,028,701	25,284	Yes / 2009	CCP
Bologna	Italy	380,604	25,225	Yes / 2008	CCP
Bydgoszcz	Poland	358,029	8,105	Yes / --	LAKS
Copenhaguen	Denmark	528,208	40,258	Yes / 2009	CCP
Girona	Spain	96,236	22,846	Yes / 2008	LAKS
Jerusalem	Israel	780,517	18,159	(Adapted)	CCP
Padova	Italy	213,151	25,225	Yes / 2010	LAKS
Reggio Emilia	Italy	167,678	25,225	Yes / 2009	LAKS
Turku	Finland	174,906	32,054	Yes / 2010	CCP

Source: Own, data from Wikipedia, World Bank, CoM and ICLEI.

Finally, 6 cities took part in the research, representing a variety of realities in terms of environmental background, population size, political and cultural traditions, and socio-economic status. All 6 cities belong to OECD countries and classify under high-income economies (Wolrd Bank, 2014). The 6 cities fall within the European-Mediterranean region, with four of them from EU Member States. Exclusion of cities responded to different factors, from unresponsiveness and declinations to participate, to insufficient time and resources to conduct the fieldwork. Clear commitment to climate action was represented by the cities' enrollment on the Covenant of Mayors, their involvement in the Cities for Climate Protection (CCP) campaign promoted by ICLEI since 1993 - recognized by the Covenant of Mayors as a "Benchmark of Excellence" (ICLEI, 2010c)-, and/or their engagement in other outstanding carbon emission mitigation initiatives (e.g. Climate Neutral City; EU-Life Project LAKS). Invitations were done through emails by both the researcher and ICLEI-Europe to LG representatives, and additionally by direct interaction with the latter in pre-arranged brief meetings during international events (e.g. 6th European Conference on Sustainable Cities and Towns in Dunkerque - France, 2011; Resilient Cities Congress in Bonn - Germany, 2011).

The core activity of the research was a 5 days study visit in each city, in order to conduct a series of on-site tasks, including a program of interviews to local actors working in different sectors of the green economy, based on Renner et al., 2008. Each LG established a permanent contact person, whom facilitated the whole research process, prior, during and after the study visit. Furthermore, every LG built an agenda of meetings for the study visit, according to prior considerations made by the researcher on the number of interviews per day (maximum 5), their length (60-90 min) and the nature and fields of target organizations / persons to interview (Table 15). With the agenda ready prior to the fieldwork trip, the researcher was able to contact each of the future interviewees and send beforehand the questionnaires for the meeting. Interviews were recorded (voice) upon authorization of respondee. The LG contact was also responsible for facilitating the attendance of municipal technical experts to an initial presentation session including a 1h workshop.

Table 15.
Target organizations and/or persons to interview (typology)

Public Adm.	Corporations	Educ. & Research	Civil Society
- Senior Local Decision Maker - Local Environmental Manager - LG Technical Experts - Environmental Manager of Regional Authorities	- Private Companies - Public-Private Utilities - Economic Sector Associations & Federations	- Research Institutions - University Researchers - Science-Education Institutions	- Environmental NGOs - Social Welfare Organizations - Non-Profit corporations - Private Foundations

Source: Own data.

An *ad hoc* methodological approach was developed, by combining qualitative and quantatitve data collection methods. Data retriveal consisted of 3 key activities: 1) conducting workshops with municipal technical experts; 2) developing individual face-to-face interviews with representatives of: public authorities (either elected officials or staff), private companies, the civil society and the research/education sector (on average 16.2 encounters per city); and 3) collection of data about relevant topics, such as environmental policies, sustainability indicators and climate tools (Table 16). In total 10 questionnaires were generated. Respondees were requested to answer one or more of these questionnaires according to the targeted information.

Questionnaires often combined scoring (e.g. *Your city is engaged in climate change mitigation and adaptation. Please qualify the city's performance on the sectors below [from 0 to 10]*); open questions (e.g. *Explain Why?*); and/or detailed data requests (e.g. values of environmental sustainability indicators). For full detail on the questionnaires please see Annex 2. In addition, revision of literature and online documents (reports, new, websites, etc.) was conducted in order to complete necessary context and/or missing information. Last but not least, on occasions the LG offered extensive presentations of their green strategies and/or policies.

Table 16.
Targeted element and data collection method used.

Target Information/ Element	Research Method
- Selection of Study Cases - The Cities	- Expert Response by ICLEI-Europe
- Selection of Study Agents for face-to-face interviews	- Expert Response by LGEM / LGTE (and by the researcher for Girona)
- Interview "General Framework of SD in the city"	- Expert Response by SLDM, LGEM, and/or RE
- Interview "The city and the EU 2020 Strategy"	- Expert Response by SLDM, LGEM, and/or RE
- Conflicts and Potentials regarding Development and Climate Change in the city (C/P workshop)	- Workshop with LGEM and LGTE (except in Almada; results extracted from documents and interviews)
- Policy and Instruments	- Expert Response by LGEM
- SD Indicators and Greenhouse Gas Emission Invetory	- Expert Response by LGEM, LGTE
- Green Economy Activity	- Expert Response by LGEM, LGTE, CO, SO and/or RE
- Green Economy Annex	- Expert Response by LGEM, LGTE, CO, SO and/or RE
- Performance in Climate and Energy Sectors	- Expert ANONYMOUS Response by SLDM, LGEM, CO, SO and/or RE
- Links to the EU 2020 Strategy Targets	- Expert Response by SLDM, LGEM, CO, SO and/or RE
- Discussion of Green Growth and the 3 E Crisis	- Expert Response by SLDM, LGEM, CO, SO, and/or RE

Abbreviations: SLDM: Senior Local Decision Maker; LGEM: Local Government Environmental Manager; LGTE: Local Government technical experts; RE Scholar / Researcher / Scientist; CO: Green economic corportation managers; SO: Representatives of NGOs and the civil society.
Source: Own data.

All interviewing materials were facilitated beforehand electronically. The majority of responses were obtained through presential meetings. Eventual interviews and some specific data ('Policy and Instruments'; 'SD Indicators'). were received by email (e.g. Regional Government of Emilia Romagna) or gathered in an online phone / videoconference (e.g. County Aust-Agder in Norway; LAB Program Officer of Jerusalem; GE Researcher from University of Bologna). Only one section of the interviews is anonymous; 'Performance in Climate and Energy Sectors'. This decision wad made in order to increase freedom of opinion about the city and its activities. However, record of each response was kept in digital format (audio and in the project's data base). For full detail on the questionnaires please see Annex 2.

Certain methodologies and sources fed the design of the questionnaires and activities. Data about environmental sustainability indicators was determined by combining several sustainability indicators frameworks, namely: Ambientalia's Urban Ecosystem Europe (2007), the Green City Index (EIU, 2009), EUROSTAT's Sustainable Development and EU2020 indicators, and prior research at local scale (Nuss in OSCG, 2010, Nuss S., 2011). In total, data about four environmental areas -energy and climate, mobility and transports, waste and water, land use and food security- was requested, in form of 36 indicators. Nevertheless, results are presented for only 20 for which the collection process was considered more successful. Few data about land use indicators was received, leading to discard the whole section after all. Examples from Ambientalia (2007) and OSCG (2010) contributed in shaping the list of local policies and instruments on sustainable development and climate action. Climate action planning was assessed through CCP's 5 milestones methodology. GHG emissions inventory data was designed using the system created for the EU-Life+ Project *LAKS: Local Action for Kyoto Goals* in which 2 participant cities -Bologna and Girona- took part (LAKS, 2010). This project was also the base for the selection of 10 urban sectors linked to climate change and energy sustainability, which were used to evaluate low-carbon performance of the city. In comparison to LAKS, only 'Natural Hazards' was added *a posteriori* in order to capture the respondees' perception about potential risks over urban resilience induced by climate change, and the adaptive measures in plance or under planning. Some sector names also differed compared to those in LAKS. This was done in order to abbreviate or to facilitate a wider interpretation of the sector topic. For instance 'Agriculture' turned into 'Food Production', helping this way to discuss low-carbon performance of the local food market as a whole, not only the local production. On the other hand, 'Buildings' was used to qualify all kinds of buildings (residential, public facilities, office buildings, etc.). These simplifications also helped reduce the number of sectors to 10 and aggregate government and community sectors in one same list. Last but not least, the workshop was conducted by displaying the 'Conflicts and Potentials' participative diagnose methodology of the Latin American Forum of Environmental Sciences (FLACAM, 1989) for which the author had received training in 2006.

Two additional exercises were partly ran. First, one questionnaire about 'Cooperation between stakholders on the topic of Climate Change'. In this case, results were dismissed because only one person per city responded (SLDM or LGEM) and it was considered better to pospone this analysis for future research with larger samples of answers. Second, a mapping exercise as part of the C/P workshop, in order to determine current and future infrastructures for climate adaption and mitigation. This activity was too complex. Thorough comprehensive results would have required a lot of time and effort by participants, and it was abandoned after trial in 2 cities.

Final validation of the questionnaires and the overall research approach was based on expert assessment by ICLEI's Climate and Air Team. Right before the field trips were initiated, a short internship period (2 weeks) at ICLEI-Europe's headquarters in Freiburg provided the time and space to precise and conclude the research data and forms, and for performing last contacts with the cities. Meetings and email discussions took place before the final versions of the questionnaires were sent out to respondees, in order to ensure the convenience of the scope and data requested in

each interview, as well as the written language, given the variety of information and forms generated.

For each questionnaire an Excel data sheet was generated. Responses were directly introduced into this sheet during the meetings. Sound recordings (uner authorization of the interviewee) were done in parallel, for post fieldwork additional review and analysis of the information in the spreadsheets. All data was finally introduced in one unique Excel file for each city. Furhter data set files were generated for comparative analysis of specific data ('Performance in climate and energy sectors'; section 'Barriers to the Green Economy' within questionnaire 'Green Economy Activity'; 'Links to the EU 2020 Strategy' and 'Perception about the '3E Crisis''). Basic statistics were used for the analysis of quantiative data (average values and standard deviation), then represented in Tables or charts (columns or radials) depending on the type and quantity of information (please see section 4 -Results- for more detail). Anaylisis of qualitative data from section 'Perception About the '3 E Crisis'' was done through *ad hoc* method inspired on Discourse Analysis (Coulthard and Montgomery, 1981; Stubbs, 1983). A simplified analysis of text fragments with message tags was practiced, yet without the necessary rigourosity and iterations of the original methodology, given the researcher's inexperience in this precise method.

3.2.- Discussion

The first thing to discuss regarding the methodology is the magnitude of the information collection tasks. In order to obtain the most accurate picture about the city's green profile and the green economic activities operating, as well as perceptions about progress and obstacles, reciprocal opinions and reflections on 3 E Crisis and the paradigm of green economy, a very large set of surveys and interviews was developed and executed. This model has advantages and disadvantages, as shown in table 17.

Table 17.
Advantages and disadvantages of the methodology used.

Benefits	Disadvantages
- Comparability between the cities	- Excess of information difficults processing + analysis
- Contrast between quantitative and qualitative data	- Workload limits scope to a small sample + research
- Contrast between self-referential & 3rd party opinions	- Language and terminology barriers
- Value of expert response with/without information	- Effect of expert intermediation by 3rd parties
- Effect of expert intermediation by 3rd parties	- Risk of overloading the interviewees
- Cultural and socioeconomic aspects of SD	- Questionable capacity to reach in depth reflections

Source: Own data.

3.2.1.- Advantages of the research approach:

- Comparability between the cities:

The fact that the information system created includes quantitative data from measurable parameters (SD indicators), checklists (presence/absence of certain policies and instruments), and marks on a 0-10 scale (e.g. for the cities' performance in climate and energy sectors) provides a framework for basic statistical comparability of results between both cities and respondees.

- Contrast between quantitative and qualitative data:

It has been possible to contrast opinions with quantitative data, and the latter with effective action. A simple example of this is confrontation of the enthusiasm expressed by some elected officials, against actual results of environmental sustainability indicators. And consecutively, raise the question and reflect (the researcher) about why the latter parameters often do not show the magnitude and relevance of sustainable policies and instruments in execution. The diversified methodology used has shown a gap between these three fundamental elements of green urban development. In the same sense, marks for the cities' performance in climate and energy sectors were complemented with *Whys*, providing a interpretation to the numerical value, and a better way to compare between cities. In future explorations of the data, spoken responses could also be broken down for statistical and/or qualitative study, helping this way to cluster factors and opinions.

- Constrast between self-referential and 3rd party opinions:

An interesting exercise was to confront each city's self-opinion about performance in climate and energy sectors -expressed by a SLDM or LGEM-, against that one of 3rd parties, such as technical staff of the City Government itself, or alien organizations (private companies, researchers and civil society). Besides analyzing the specific results of the exercise, this was also a chance to face all the knowledge collected by the reseacher about ongoing LG activities and policies, with what expert workers and stakeholders consider/know.

- Value of expert response with/without information:

Expert response provided two kinds of contributions. For topics with important amounts of information available (such as climate change, the depletion of natural resources, the financial crisis) almost all the experts interviewed had a notion and an opinion. However, when talking about city performance the answer "Do not know/No Response" was also relevant (8.3%; section 4.1.1.c). The fact that specialized agents, who deal with green economy issues in their daily activities, are not aware of actions and measures for sustainable development in their cities, is an interesting indicator of how hard it is to reach out to the society in these topics. There is an undesirable gap of information and understanding of sustainable development policies, unless for visible, tangible and co-involving measures (e.g. bike sharing, light rail, recycling...).

- Effect of intermediation by third parties:

The intermediation by third parties is positive and negative at once. This intermediation took place in two ways. First, by the support of ICLEI-Europe in selecting and contacting the cities which would become the study cases. Aftewords, with the help from the Local Government in setting the visits agenda; hence, selecting and pre-contacting the local agents whom to interview. Both inputs were very beneficial in order to optimize research efforts, because invitation to participate in the project was based on prior cooperation between the intermediators (ICLEI-Europe and the LGs) and the targeted agents (LGs and green activity organizations). Thanks to this, it was more likely to reach the objective of contacting people with a certain willingness to contribute. Nonetheless, the interest in studying the best possible cases of green urban economies -thus, the better performing cities- was not necessarily a success. There is plenty of evidence to consider all 6 cases adequate for the research. Even so, it must be assumed that many other cities could have been included, such as some of those with strong international branding as 'Green Cities'; e.g. Freiburg, Copenhagen, Växjo or Stockholm. However, the positive counterforce of the decision taken, was the fact of putting under the spotlight cities that are also active in climate and energy and with a lot to share, in spite of not in the 'top ten' worlwide examples. In the same sense, another ideal aim of the study was to obtain a complete representation of the universe of the green stakeholders in each city. A thorough image of "who is who", in order to determine the survey subjects according to a well diversified sample. In practice, a selection facilitated by the LG was used. This, on one hand, introduces uncertainty in the exploration, as potentially suitable organizations may have been left out. Moreover, it may generate a bias towards those agents with closer ties to

the LG, or with "better feeling". It is not possible to define which criteria used each LG to create the list of stakholders whom to interview. Yet, the exercise of letting the LG specify the agenda was conducive to an idea of their picture of the city's green urban economy. An idea of what the LG knows and sees as green urban economy, and therefore a sort of diagnose about information connections and exchanges between local activities and actors in the green field. The different cases were used as a tool for contrast, shedding light on those cities with wider reach range and others with a more narrow one. This whole point is relevant in the sense that some of the numerical data collected -jobs and turnover- become purely testiomial and in no case indicative of the magnitude of the green urban economy in any of the cities studied (besides where there is literature on the subject; Emilia Romagna and Catalonia).

- Cultural and socioeconomic aspects of Sustainable Development:

Even if this research used only 6 cases, cultural and socioeconomic aspects of sustainable development were confirmed. The qualitative approach taken, in form of interviews and on-site visits to each city and their most noticeable experiences, brought to surface factors such as the strong value of committment -in regards to SD or any other matter- for northern countries with a protestant background, compared to a more flexible and circumstantial vision of life in the catholic western Mediterranean places explored. In Jerusalem, the intercultural mix led by anglosaxon Jews was expressed by and in-between understanding of compromise and pragmatism relating to green issues. Chapters 4-6 will provide a deeper analysis of this finding while comparing and discussing specific results. These same chapters will also go into interesting emerging associations between economic wealth and vision / value of sustainable development.

3.2.2.- Disadvantages:

- Excess of information hampers processing and analysis:

The research has generated more information than what is feasible to scrutinye in detail within the time frame of the PhD. In consequence, the mission of the author is to focus on the essential and most relevant results and outcomes. The same fact of having an excessive load of information hampers the task of producing a meaningful data system, selecting the top ranking documentation to analyze and which analytical tools to use. A simplified version of the methodology is recommendable for future replications.

- Workload restrains research scope to a small sample:

Complementarily to the prior point, the large workload associated to the extensive methodology used may restrain the scope of this kind of exploration to a small number of cases (each time it is deployed). In similar terms, this type of surveying may be feasible only as an academic/scientific activity, as time and effort flexibility are lower in other institutions (firms, Local Authorities, NGOs...) with potentital interest in replicating the methodology somewhere else. Nonethless, it would be possible for a city to enquire about their green urban economy thru an adapted version of the surveys and interviews used here.

- Language and terminology barriers:

Language and terminology are undoubtedly a limitation of this research method. Visiting 6 countries with different native languages may cause misinterpretations and expression barriers by both the researcher and the interviewees. To better facilitate communication by the targeted organizations surveys were done in the home language in Italy, Portugal and Spain whenever necessary. In Finland, Israel and Norway meetings were always held in English. In addition, there may have not been a complete common understanding of the terminology used in the questionnaires. Searching to prevent this the researcher received terminological assessment by technical experts at ICLEI-Europe. However, unforeseen event with terminology occurred anyways. For instance, the concept of 'degrowth' with wide academic literature and social expansion in the western Mediterranean countries, was basically unknown in the Scandinavian region and Israel. In the same sense, terms such as 'sustainable development', 'green economy', 'green growth', 'low-carbon performance', 'carbon neutrality', etc., are in practice so intertwined that users from non-scientist circles phrase them almost indistinctly. In order to avoid a terminological discussion, the whole research and this dissertation will follow this criterion of exchangeability by proximity.

- Effect of expert intermediation by 3rd parties

As this point has benefits and disadvantages at once, both have been fully described in the section about advantages.

- Risk of overloading the interviewees:

Interviews may not be considered excessive in terms of time length; they usually lasted from 60 to 90 minutes maximum (sometimes even less than 60 min.). However, the range of topics was so generous that sometimes it wasn't possible to complete the whole survey. In occasions interviewees ended with a certain overload after going through 5 sections of questions. In particular, the section dedicated to "Links to the EU 2020 Strategy targets" was often too detailed as for many organizations this strategy was basically unknown and links just limited to the climate and energy issues.

- Questionable capacity to reach in depth reflections:

The fact of not having followed the in-depth interview method (Boyce and Neale, 2006) may have reduced the research's capacity to obtain in depth reflections about several of the factors explored (e.g. barriers for the green economic activities; possible evolution of the crisis and the role of green economy in it). On the other hand, it was believed that reflective outcomes would be of notable quality as the interviews were addressed to expert agents is the wider field of sustainable development; hence, people and organizations with sufficient knowledge as to provide useful

contributions to the debate around green economy and the 3 E crisis. The actual results demonstrate the validity of the approach used, yet the dimension of thinking "out of the box" versus "in" may have not been as strong as desired. This was detected after including interviews to green economy specialists from academic institutions.

3.2.3.- Was the methodology successful?

The impression of the researcher is that the methodology deployed was successful from the mere perspective of achieving the objectives of the research.

It was very interesting to confront quantitative and qualitative data for the reflection on *How green 'Green Cities' are?* Relevance of the context became evident, in parallel to the genuine efforts by LGs for their cities' shift to low-carbon development; because, in practice, such efforts clashed with a reality of strong economic and cultural inertias, which drive to a slower than desirable progress. The importance of the local leaders (elected officials or technical experts) also arose, for getting the city to take the extra mile and hence compensate the distress of unwilling forces. The impact of diverse political visions was seen as well. And a new method to approach the maturity of different Green City cases has been tested, with apparent good results, which ought to be re-confirmed through more research.

Discussions about barriers to the green economy and the 3E Crisis contributed to a more analytical perspective of these topics, for which a North-South / wealthy-not wealthy divide has clearly emerged.

Future replication of this research approach should search to increase statistical significance of the data sets, particularly regarding the number of interviews per city, both in total amount and per each responding agent.

Much less workload could be introduced in replications. First, by enhancing the qualitative methodology with face-to-face deliberative interviews. Also, by discarding a variety of data that was finally not used, due to excess of information. Nevertheless, the on site field work approach continues to seem fully operational, as the quality of direct interaction with each reality and its experiences and actors is something that off site research would fail to capture.

Last but not least, opportunities arise for replication at single case level. For any local authority interested in understanding the status, scope and issues of its city's green economy, and in obtaining a detailed image of the Local Government's successes and challenges in low-carbon development

3.3.- The Study Cases

Before diving into the cities' green strategies, instruments and features, it is worth providing a brief presentation in historic and socio-economic terms[29], in order to expose the variety of realities gathered in this research. Cases are ordered according to the calendar of visits.

3.3.1.- TURKU - FINLAND - "The Market Place"

Turku, founded in the 13th century, is the oldest city and the first capital of Finland. The region where it is nested is named Finland Proper after this historic bond. The first university in the country was created in Turku as well. Today, after 200 years of Helsinki as the capital, Turku is the 5th largest Finnish city with ~180,000 residents. It lies on a very complex section of the Baltic coast, surrounded by thousands of islands and some 60 km until the open sea, at the mouth of the Aura River in the southwestern corner of the State. Unemployment in 2010 affected 13% of workforce, despite the city's large maritime sector suffered a period of crisis. The University with 35,000 students and the Municipality with 14,000 workers (7.8% of the inhabitants) drive much of the economic life in Turku. Thanks to the unique Finnish decentralization policies, Turku Municipality is responsible for all the education system (from kindergarten to Universities), Health Care (hospitals included) and even income tax collection, managing an total budget of 1,300 M€. The huge public structure is, however, a management challenge. And urban sprawl towards the coast and islands clashes with sustainability plans.

3.3.2.- ARENDAL - NORWAY - "The Valley of Eagles"

Arendal is a small city (pop. ~42,000) in the so-called "Bible Belt" running along the SW coast of Norway. The region where Arendal is nested is famous for receiving more annual hours of sun than elsewhere in the country. This aspect, together with outstanding nature and good access to surrounding islands helped Arendal become a popular touristic destination and a second residence resort. With very low unemployment, living standards in this city exceed the average of Norway. Nonetheless, Arendal is completing its reconversion towards a service and tourism economy, after the heavy industries linked to oil drilling that it hosted were removed and relocated to developing countries. In this transition, the town is doing important efforts to foster a green renaissance of the local industrial activities. A remarkable cluster of institutions and programs are bridging green research, development and innovation practices to the traditional economic activities of Arendal, as well as to those newly born.

3.3.3.- JERUSALEM - ISRAEL - "The Holy City"

Jerusalem, the Capital of Israel, holds a population of 780,517 (2010). The city's importance goes far beyond the national borders as it concentrates holy land for the three major monotheistic religions in the World (Jewish, Christian and Muslim), an aspect clearly visible by the four ethnic-religious divisions of the walled city center. The Israeli-Palestinian conflict over the territories of eastern Jerusalem, at both sides of the West Bank barrier, is a crucial constraint to the progress of life quality. Despite it is the Capital, Jerusalem is the poorest city in the country; 55% of its workforce is unemployed for religious / cultural reasons (Jewish orthodox men and Muslim women in a 50-50 proportion approximately). Economy is largely service based, mainly around pilgrim tourism and public administration; industry only ranges 2.2% of the zoned land. An urban sprawl trend of political and social nature has expanded the city much beyond the urban area. Sustainable development policies must challenge these realities, as well as a strongly centralized system.

3.3.4.- BOLOGNA - ITALY - "The City of Porticoes"

At least 3,000 years of history lay under the grounds of current Bologna, with relevant milestones such as the oldest university in the world, created in 1088. The historic district is also very famous for the 38 Km of porticoes. This UNESCO World Heritage Centre allows pedestrians to move around protected from uncomfortable weather: heat, rain, snow, etc. A climate adaptation strategy started in the XI century.

Bologna is also the capital and largest city of the Italian region Emilia Romagna. This region, at the crossroads of Italy hosts its major roads and trains hubs. A large industrial economy has developed around it, embedding innovation and strong clusters in food, automotive, packaging and electronics. Overall, high added value contributing to Emilia Romagna's 3rd highest GDP in Italy, and one of the wealthiest regions in Europe according to the European Regional Economic Growth Index. Likewise, Bologna usually ranks in the top ten for quality of life in Italy (1st in 2011). Center-left coalitions are traditionally in power in both the region and the city, a heritage from anti-fascist resistance from World War II.

3.3.5.- GIRONA - SPAIN - "Three times immortal"

The Romans founded Girona almost 21 centuries back, yet remains go back to the Iberians. It is popularly named "Three times immortal" after repelling attacks from Napoleon's troops. The city's medieval quarter is outstanding and the Jewish remains are famous internationally within this tradition. The colored houses by the river are one unavoidable scene as well. The mid-size city of Girona is also the capital of the Province of Girona, on the northeast of the Iberian Peninsula. Bordering with France, the region holds the main international infrastructure corridor from/to Europe. The province is also home to the Costa Brava, a major touristic destination for Europeans and Barcelona residents (just 100 Km south). All these location and landscape features have made of Girona -province and city- a wealthy Spanish region with high quality of life. Tourism, the University, commerce and the administrative capital role feed the economy. Still, recession since 2008 is striking hard, as prior activity was highly dependent on real estate and its related services.

Figure 2.

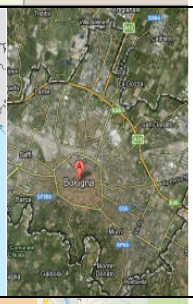
[29] Source: data from Wikipedia; Googlemaps, WB and research questionnaires

General data about the 6 study Cases.


TURKU - FINLAND
Study Visit: 1-5/11/2011
Coordinates: 60º27'N - 22º16'E
Pop. 2012: 179,529 inhab.
Surface: 273 km² (metro: 2,331 km²)
Mayor: Aleksi Randell - Liberal-Cons.
Vote turnout 2008: 58.6%
Municipal Budget 2010: 1272 M€
Per capita income 2010: 34,100 €pc
Unempl. 2010: 13 %
Government Structure: Decentralized
GDP 2009-12: Unsteady -0.8% yr Av.

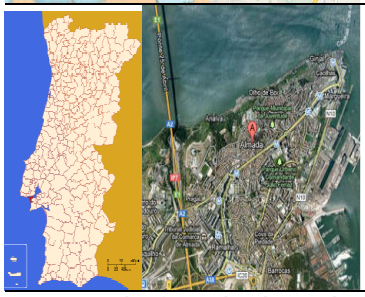

ARENDAL - NORWAY
Study Visit: 21-25/11/2011
Coordinates: 58º28'56''N - 8º46'57''E
Pop. 2011: 42 229 inhab.
Surface: 270 km²
Mayor: Einar Halvorsen - Conserv. P.
Vote turnout 2011: 61.6 %
Municipal Budget 2011: 1 300 M€
Per capita income 2009: 56 865 €pc
Unempl. 2011: 3.5 %
Government Structure: Decentralized
GDP 2009-12: Sheltered+0.78%yrAv.

JERUSALEM - ISRAEL
Study Visit: 2-6/01/2012
Coordinates: 31º47'N - 35º13'E
Pop. 2010: 780,517 inhab.
Surface: 125 km² (metro: 652 km2)
Mayor: Nir Barkat - Liberal-Indep.
Vote turnout 2008: 42.7%
Municipal Budget 2008: 651 M€
Per capita income 2009: 19 155 €pc
Unempl. 2011: 55 %
Government Structure: Centralized
GDP 2009-12: Fast Gr. 3.73% yr Av.

BOLOGNA - ITALY
Study Visit: 30/01 - 5/02 /2012
Coordinates: 44º30'27"N - 11º21'5"E
Pop. 2011: 382 460
Surface: 140.7 km²
Mayor: Virginio Merola -Democratic P.
Vote turnout 2011: nd
Municipal Budget 2010: 541 M€
Per capita income 2010: 21 122 €pc
Unempl. 2010: 5%
Government Structure: Decentralized
GDP 2009-12: In crisis -1.45% yr Av.

GIRONA - SPAIN
Study Visit: 23/04 - 5/05 / 2012
Coordinates: 41º58'59''N-2º49'30''E
Population (2012): 97 198
Surface: 39 km²
Mayor: Carles Puigdemont -Conserv.
Vote turnout 2011: 48.3%
Municipal Budget 2012: 97 M€
Per capita income 2009: 20 300 €pc
Unemployment 2011: 13.8%
Government Structure: Decentralized
GDP 2009-12: In crisis -1.38% yr Av.



ALMADA - PORTUGAL
Study Visit: 16-20/04/12
Coordinates: 38º40'50''N - 9º9'30''W
Pop. 2011: 174 030 Inhab.
Surface: 70 km²
Mayor: M.E.N. da Sousa -Commun. P.
Vote turnout 2009: 48.3%
Municipal Budget 2012: 83 M€
Per capita income 2009: 19 055 €pc
Unempl. 2009: 5.5%
Government Structure: Centralized
GDP 2009-12: In crisis -1.38% yr Av.

Source: Own, data from Wikipedia; Googlemaps, WB and research questionnaires

3.3.6.- ALMADA - PORTUGAL - "Cradle of Republic and Democracy"

Twice in Portuguese history (1910, 1974) this city with 5,000 years old remains has been the raising and spreading point for the Republic and democracy. This revolutionary character perhaps explains why Almada is the largest municipality in the country with a Communist government steady since the recovery of local elections. The economy of the city is very much in line with other metropolitan red belts; heavy industry -fishing, maritime and shipyards as it is located in the estuary of River Tagus- under a reconversion process in the last 2 decades. Tourism and urban related services are the growing market of a city with very low unemployment despite the crisis. 30 years of continued policies combined with strict budgetary control make of Almada the city with best economic health in Portugal. Nevertheless, the strong centralization of the country and austerity measures deployed after bailout funds injected by the EU, are putting at stake the progress of green development strategies promoted in Almada

3.4 - Development of Results

Chapters 4-6 are dedicated to the deployment and discussion of results. The 3 research questions formulated in Chapter 2 Objectives, are distributed in 3 respective chapters of Results, as follows:

4.-How green 'Green Cities' are?

5.- Green urban economy in 'Green Cities'

6.- Green Economy and the '3E Crisis' - Reflections

Discussion of results is integrated as a section of each Chapter. Posteriorly, Chapter 7 formulates General Conclusions and Final Remarks of the research as a whole.

Chapter 4 - HOW GREEN 'GREEN CITIES' ARE?

In order to approach the topic of *How green 'Green Cities' are?* a variety of quantitative and qualitative data were collected. 'Results' are presented in several subsections, whereas 'Discussion' is unified under a common reflection. Subsections of results (4.1):

4.1.1.- Green Development Strategies

4.1.2.- Environmental sustainability indicators and instruments

4.1.3.- Perception of low-carbon performance

4.1.- Results

4.1.1.- Green Development Strategies

As of this chapter, Green Development Strategies is a wide concept putting together sustainability plans, policies, programs and instruments promoted by the LG and/or other public authorities in the city and its surrounding region. Results are displayed city by city in a descriptive format, with bold text and tables indicating **highlights**. Quotes from the interviews direct the reader to Annex 1 where full-length texts may be found.

a.- TURKU

Turku's track record on sustainable development goes all the way back to 1996 when the city adopted the Aalborg Charter and produced its first sustainability report in 1997. The output of this process was Turku's 2001 Local Agenda 21 action plan, revised in 2005 side by side with Aalborg+10. **The city produces SD reports every one or two years, in which the sustainable development indicators and development trends in the urban region are monitored.** The fight against climate change started in parallel to LA21 with the initial GHG inventory in 1997 (extrapolated to 1990 and updated in 2003, 2007 and 2010). As a result, the city has already achieved a 15% cut in per capita emissions compared to 1990. In 2009 a 4 year Climate and Environment Program was passed and adapted for the Covenant of Mayors, aiming at -30% CO_{2e}/capita by 2020 (and -20% in total emissions). **It is very notable that the SD agenda of Turku has been steadily deployed along 4 electoral terms (1996, 2000, 2004, 2008) in which the city has been ruled by shifting coalitions of different political parties. Indeed, commitment, consensus and accountability are one of the strong pillars supporting sustainable development policies in Turku.** Other examples of this are: the consensus agreement including SD signed by all forces before the 2008 election, and the inclusion of Sustainability in the Law of Municipal Responsibility of Turku, as 1 of 5 Aims of the institution.

For an upgraded accountability and transparency the ecoBudget® program is implemented since 2010. As a result, yearly sustainable development targets, in energy, mobility, housing, etc., are provided and monitored (Table 8). According to *eco*Budget, yearly planning and programming of the LG's tasks allocate targets, measures, costs and monitoring indicators for sectors linked to the Climate and Environment Program. Furthermore, as of 2013 at least one *Eco-support Person* is designated to every administrative unit, service and municipal enterprise of the city. Given Turku's 14,000 workers -as the LG is responsible for services such as Universities or Hospitals- the *Eco-support Persons* program is a powerful tool the horizontal dissemination of the *eco*Budget approach. The City Council approves the yearly *eco*Budget and conducts progress evaluation and public accountability. Even future policies and decisions become a mandate this way. Despite Turku's remarkable SD targets and accountability policies, participation mechanisms on environment, climate, energy or green economy *"could improve and reach the level for town planning"* (LGEM).

Turku is implementing several projects aiming to deploy sustainable urban infrastructures. One ambitious initiative is the **Kakola underground wastewater treatment plant** (2009) built deep under the Kakolanmäki Hill. This facility provides multiple benefits; it has contributed to substantial abatement of pollutants flowing into the Baltic Sea, while offering a source of RES fed district heating and cooling (service for which there is a 2020 50% supply target from RES). **In partnership with SIEMENS Turku is exploring the pathway towards a sustainable urban development.** Half year cycles between 2012 and 2014 must deliver studies and proposals in a variety of topics, such as: impact of light rail; eco-district development; smart grid; E-mobility; intermodal transport intermodal; EE; and related financial instruments and mechanisms. As of 2013, 14 Infrastructure solutions and 1 platform solution for smart mobility and citizen services have been identified. Among the latter, **the Siemens PPP program is responsible for a comprehensive concept to support the construction of 2 new eco-districts** -residential district Skanssi and incubator urban lab Castle Town- by developing a toolbox which outlines relevant technologies, policies and best practices (smart grid, buildings, transport, water). **Parallel measures to retrofit building skins** are reaching sectors of the city with inefficient built-up stock.

Transport oriented planning defines Turku's growth perspective. According to the objectives Turku's MP, by 2035 at least 85 % of the new and developing land use (residential areas, commercial services, etc.) will be located in the developed pedestrian, cycling and intensive public transportation zones. Currently, 65 % of the population is living in these transport corridor zones below 6 km from the city center (where 55% of work-places are located). **A critical cornerstone for Turku's green urban future will be the construction of a metropolitan light rail network.** The distinctive devolution of powers system in Finland allows Turku to collect income taxes, giving the LG the chance to approach large scale and long-term projects with its own technical and economic resources. Nonetheless, the light rail -planned for 15-20 years from now- exceeds the Municipality's capacities and national support (30%) will be

necessary. For the city planners, the light rail will be the opportunity to offset policies aiming at reducing the use of private vehicles. Nevertheless, **controversy has arisen from parallel plans to develop housing towards the archipelago area.** An increasing demand for detached homes in the most naturalized peripheral sectors and the perennial competence between neighboring municipalities to attract resident population explain this strategy. For detractors, the impact on wilderness and the more vehicle dependency neutralize potential benefits.

Table 18.
Green development targets and highlights of TURKU.

- Sustainability is 1 of 5 Aims of the Law of Municipal Responsibilities.
- "Sustainably developing and well-balanced Turku Strategy 2009-2013":
  - Housing and Land Use Program
  - Climate & Environment Program
  - Competence, entrepreneurship and business
- National Commission for Sust. Dev.
- Internat. Programs and Networks
- Management and accountability:
  - Sustainability Report every one or two years
  - *eco*Budget planning and accountability system.
  - Horizontal integration with *Eco-support Persons* in all units
  - Green procurement criteria in 100% tenders (2013).
  - 2013: 30% daycare and education centers with green flag.
- Spatial Planning and Buildings:
  - Transport oriented MP (2035): 85% of developments will be located along pedestrian, cycling and intensive PT zones.
  - Valuable natural sites in the city protected by 2013.
  - Plans for 2 Eco-Districts
  - Skin Retrofit of stock
  - Strict EE standards for new buildings and renovations
- Climate and Energy:
  - 50% District Heating and cooling on RES by 2020; ongoing from new underground wastewater plant.
  - 100% RES for electricity by 2013.
  - +9% EE by 2016 versus 2005 (+20% by 2020)
  - GHG Inventories: 1997, 2003, 2007
  - -15% GHG / capita since 1990
  - Target -30% by 2020 vs. 1990 (-20% in total emissions).
  - Valonia: Regional LA21 and Energy Agency
- Sustainable Mobility:
  - 55% light modes and PT in 2013; target 66% in 2030
  - Bicycle path network plan by 2015, and completed in downtown area.
  - 2% increase in annual journeys by public transport.
  - -10% in internal city transports from 2008 to 2013.
  - Regional Public Transport organization by 2012.
  - Light rail network within MP 2035
- Waste & Water:
  - Kakola wastewater treatment plant
  - Reduced load entering the sea via the Aurajoki River.
  - Decrease in load from storm water.
  - <10% of community waste in landfills in 2016.

Source: Own data, from field work.

Outsourcing the energy supply is the other big topic under discussion in Turku. In order to cope with rising energy needs and an intended shift to an electrical energy system, the city is promoting a new 450 MW multi-fuel power plant (wood, gas, coal, etc.). A public-private partnership (PPP) is being created for this purpose, including one big Finnish Energy Company (Fortum), plus the municipalities of Turku, Nantaali, Raisia, Karena. Nowadays 90% of DH is coming from that utility, despite there are smaller plants operating as well (one woodchip facility, heat pumps and the waste incinerator). Interviewees consider that once the CHP plant starts to operate supply and control over energy will be out of municipal reach. For instance, the nominal capacity of the new facility suggests doubts on the impact on forests for biomass extraction and an increase in the share of coal to be used.

From the institutional perspective, Turku supports the shift to low-carbon development by joining and leading several national and international initiatives. As member of the "6 pack" -the 6 largest cities in Finland- they are signatories of a common agreement on climate change mitigation and adaptation. Together with Helsinki they take part in the Baltic Sea Challenge aiming at the improvement of this over-polluted sea. Actually, Turku holds the secretariat for the environment commission of the Union of Baltic Cities, a network that gathers more than 100 cities from 10 different countries. Turku is also home to the headquarters of Valonia, since 1998 the Agenda 21 and Energy Agency for 28 municipalities (450,000 inhabitants) in South West Finland, with the aim to coordinate and facilitate across the region implementation of programs in both areas.

At Finish level, Turku participates as well in the National Commission for Sustainable Development. And, **at the international level, Turku is a very active city in several of ICLEI's campaigns**, such as *Cities for Climate Protection*, *eco*Budget, *Procura+* on sustainable procurement, *Informed Cities* linking research, monitoring and sustainable urban management, the *European Partnership for Integrated Sustainability Management* and *CHAMP* focusing on local response to climate change. Turku's long track record of expertise has turned the city into a facilitator in many capacity-building activities included in the mentioned programs.

b.- ARENDAL

The size of Arendal has not been an obstacle for its engagement in unique international initiatives in the field of green economy.

Just one year after the Bruntland Commission (1988) formulated the notion of sustainable development, Arendal, with the support of the Norwegian Government, created a sub-node of GRID (Global Resources Information Database), a collaborative centre of the UNEP. This project-based body has become an important asset of Arendal's green profile. Over time, new and widespread green economy programs by the public and private stakeholders in the city have developed.

After the Earth Summit of 1992 a statement supporting the principles of Rio was promoted by several Norwegian cities, including Arendal, and the Ministry of Environment. **In 1999, Arendal adopted the Norwegian version of LA21. Later on (2003) Mr. Svein Tveidtal, Climate Ambassador of Arendal and Managing Director of GRID since 1992, was appointed as Director of UNEP.** Such distinction induced a tipping point in the city's commitment to fight climate change. The candidate to Lady Mayor of 2006 declared the city should turn climate neutral, an aim finally set for 2017. By 2007 Arendal was starting to "walk the talk" through fast payback investments in energy efficiency. To speed up action the city created the Climate Partners Network, a multi-stakeholder engagement program, later on replicated at different scales.

The Climate Partners Network (CPN) is a public-private network *"focusing on how a region can reduce GHG emissions and develop a green economy"* (CPN, 2008). Partners are two counties (East and West-Agder), three cities (Arendal, Grimstad and Kristiansand), some other public corporations including Agder University and a number of private companies. The 35 partners of CPN, the largest of its kind in Norway, employ 17,000-18,000 people. CPN was born as a pilot project funded by the central government for a period of three years. The current mission of CPN is to consolidate beyond this startup phase. By entering the network, the partners are obliged to:

- Hold an environmental certification (Norwegian *Eco-lighthouse*, ISO or similarly recognized standards), or start certification in the first membership year.
- Prepare annual climate footprint reports following the international Greenhouse Gas Protocol (WRI and WBCSD, 2001).
- Prepare an action plan to reduce emissions of GHG in their own organization.
- Pay an annual membership fee.

On a voluntary basis, members may additionally assume and pay carbon offsets to CDM projects in compensation for their climate neutrality deficit.

After 3 years (2011) CPN was responsible for reducing 19% carbon emissions among its 2-year members and 9% for the one-year participants. A number of new green products and services have appeared thanks to CPN, starting to create a regional green market, as for instance **Thon Hotel's** green conferences, by which events held in this hotel are carbon neutral and procured under sustainability criteria all along; transfer operations, food products, etc. **There are many individual experiences worth highlighting from CPN, due to the variety of members and sectors represented:** energy supply, RES, new and renovated buildings, public and non-motorized transport, waste-to-energy and recycling facilities, computer systems, hotels, public administration, social services... **Other companies are indirectly influenced and benefited, as in order to achieve carbon neutrality members are often required to choose eco-certified products and services.** This may lead to a change in provider or its engagement in a certification process. In some cases this shift demands for very specialized solutions, hence**, a key aspect of the model is training, consultancy and communication**, and new services in these fields are emerging between the participants. **East-Agder County**, responsible for the CPN Secretariat coordinates the production of sectoral training documents and activities -the Knowledge Notes-; **CO2 Focus** develops carbon footprint calculation and offsets' management; **GRID** and **Agder-Research** (University) provide training programs and technical consultancy; **Frameworks** delivers awareness raising and on/off-line dissemination services. In addition, CPN celebrates at least one annual meeting of its Plenary, besides those of the Executive Board, where the aforementioned affairs are discussed and planned. Running an active agenda is important because many members are not dealing with climate on a daily basis.

Climate neutrality (CN) has been a wonderful green benchmarking tool for Arendal. The CPN experience has pushed the climate action topic at regional and National level, and the project was included in a UN CN pilot network. CPN has the capacity to co-involve governments and businesses through tailored climate action. Sideways and upwards interest on CPN is on the rise. In 2012 10 National authorities (Ministries, State Agencies, etc.) employing 300,000 people decided to explore carbon neutrality through a pilot project based on CPN. Two years earlier, the Norwegian Government established mandatory climate and energy plans for municipalities, assuming that LGs have regulatory instruments that have an impact on 30% of the emissions within the municipality (Hoystand and Braend, 2009). By 2012, already 50% of LGs had voluntarily undertaken such plans, for which Climate Neutrality and the CPN provides an operational method to reach multi-stakeholder cooperation, a critical factor for success according to UN-Habitat (2011). Arendal's singular cases of commitment to CN -such as Thon Hotel, Hove Festival (the most popular rock festival in Norway) and the Norwegian Grand Prix (a powerboat race)- have awakened interest from the media, putting Arendal with a green label on the news. This is positively influencing the local residents' public opinion about the city's SD approach, and supporting the ongoing communication tasks through the local newspapers, the schools, to the employees, internet, etc. UNEP's Climate Neutral Network (CN Net) included Arendal and the CPN amongst its 13 founding members. CN Net concluded by the end of 2011 with some 300 members: 10 countries, 7 regions, 19 cities, 156 companies, 40 organizations and 11 universities, with an estimated reduction of 600,000 tons of CO_{2e} in 2011 (UNEP, 2011).

Planning and management activities of the LG also feed the CN track record. The Municipality of Arendal manages carbon neutrality through the LGEM, different LGTE and the Climate Ambassador, a unique independent figure designated to represent and promote consensus across the city and the different political forces. The city plans to cut government GHG 90% by 2017, aiming at last to be the example to follow and encourage society to engage in the challenge of fighting climate change. In practice, currently RES certificates are required to the electricity suppliers, the city is renovating the fleet with clean and efficient cars, and carbon offsets are paid through the CDM. Furthermore, 5 schools are heated with biomass (wood chips and pellets), and the city is focused on obtaining the *Eco-lighthouse* label for as many services and facilities as possible.

The city planning division is also contributing to the low-carbon efforts, through densification and pedestrian friendly strategies. Socioeconomic trends determine that Arendal will need 3,000 new homes throughout the next 10 years, within a process of an aging society. Health, dependency and climate related issues in Arendal, sum up to trigger the main idea of the new Master Plan (MP): satisfying

the growing residential demand while reducing transport needs. Indicators show that 63% of housing is occupied by 1 or 2 dwellers. Hence, new and renovated buildings should prioritize multifamily structures, smaller size of individual units, and include co-housing concepts, in contrast to the current 74% of single detached homes. Additionally, open spaces should promote socialization and exercise. To this end, studied for the new MP explored the areas in a range of 10-30 minutes (comfort travel time) either walking or biking from the city center. As a result, 2,000 dwellings will develop in the 1 Km radius from downtown, either from new constructions or renovation projects. A network of parks and paths will be completed in parallel, in order to connect the new residential sectors through soft mobility.

The new MP will also reorganize bus services and traffic for faster and more frequent expeditions. This requires removing from the city center and coastal roads the cars from people living in the seaside suburbs -which are also expected to grow on the long-term scenario- and commuting to the neighbor city of Grimstad (or elsewhere). There is a project to build a new road connecting these areas to the regional motorway, but through an important natural sanctuary. The alternative would be a tunnel several Km long to cross the whole city diagonally. **In the effort of generating a better public transport system and managing the city sustainably, the particular topic of diverting commuter traffic has produced the main controversy of the new MP.** Last but not least, climate adaption planning is under deployment for certain issues. According to sea level rise estimations, minimum height above seawaters at which construction is permitted has been established.

Parallel to CPN the Municipality created in 2012 the Green Incubator aiming to foster new green businesses. In 2010 the city's Promotion Department launched the campaign *"Go for the Green Growth"* to stimulate green startups and green knowledge based enterprises. This campaign took place while GRID's headquarters were being retrofitted to low emission standards (below 100 kWh/m^2 yr); an experience that led to the establishment of passive house standards higher than the national for all public buildings in Arendal. In 2012 a new facility financed by a local oil drilling company was inaugurated, the Knowledge Harbor. This 4 story building, also low-carbon, holds lifelong learning services, activities for scholars and 1,000 m^2 floor for the Green Incubator. Between 10-12 green companies already confirmed to relocate there. In total 50 office places are available for green, conventional and R&D companies, after a selection process. Parallel workshops on green business development, conducted by the municipality, support the process of turning Arendal into a green economy hub in the region and beyond.

Arendal's Climate Neutral commitment is also a rust-to-green reconversion driver, due to the extinction or delocalization of some of the larger and most polluting industries in the city, linked to the oil and gas sectors'. Fortunately, there is a lot of knowledge in the local industry, and still large sums of money flowing from the oil economy to back migration towards green economic sectors. This is the case, for instance, of Flumill, a company phasing out from oil & gas engineering into wave energy technologies and machinery.

Table 19.
Green development targets and highlights of ARENDAL & AGDER R.

ARENDAL	AGDER REGION:
▪ Climate and Energy • 2008: 1st inventory with the GHG Protocol method, scopes 1 and 2: (sources owned / controlled by the organization and indirect emissions from electricity purchase). • By 2017 - 90% GHG from the municipal services: RES Certificates from suppliers + clean and efficient cars in public sector + Carbon offsets through the Clean Development Mechanism. • 2008 Foundation of the Climate Partners Network: - So far, 34 member organizations with +17,000 workers, and generating a combined turnover of around $2.5 billion. - Results: -19% GHG for 2 year members and -9% for 1st year members • 2025 target: reducing total emissions in Arendal (government and community) 25% below 1990. ▪ 2010-2012: Green Incubator Arendal: • *"Go for the Green Growth"* program • 1,000 m2 in new green building for green startups. 10-12 green companies relocated so far; up to 50 workspaces. • Green training programs	▪ Spatial Planning: • Regional and local action plans must outline specific measures for coping with climate challenge. • Climate considerations assessed in land use and transport plans, infrastructure projects, etc. ▪ Education: • Campaigns in cooperation with knowledge institutions (Agder Research, GRID...) • Strengthening education and research on energy and technology ▪ Mobility: • Low and zero-GHG vehicles in public procurement • Facilitate use of low-carbon fuels • Emphasize reduced transport demand of land use planning ▪ Energy: • EE of public buildings and shift to climate friendly heating thru RES. • Cooperation between RES and EE companies and petroleum-based supply industry. • Facilitate development of RES: wind power, small hydroelectric power stations and bioenergy. Mapping of suitable areas for establishing wind power projects, both onshore and offshore."

Source: Own data, from field work.

At the regional scale Plan Agder 2020 sets climate as one of the hot topics for the decade. As reported in this plan, Agder is the leading region in Norway on entrepreneurship and export from processed goods. But the industry is to a high degree based on energy intensive raw materials processing (e.g. aluminum, nickel, and silicon). The region is also host to world leading producers of offshore equipment (drilling and mooring), and has also strong maritime industry clusters. There is likewise a strong potential for the production and distribution of clean energy, as Agder is one of Norway's biggest producers of hydroelectric power (Aust-Agder County Council, 2010). In order to address the challenges of the 2010-2020 period East and West Agder counties promoted a strategic development plan. In a very similar approach to the principles of the EU 2020 Strategy, Agder established 5 headline areas of development, namely: climate; quality of life; education; communication; and culture. No measurable targets have been announced in climate action, yet it is a crosscutting topic within the plan (Table 19). Given that the secretariat of CPN is held by East Agder County, continuity of climate neutral programs in Arendal is expected.

c.- JERUSALEM

Jerusalem's involvement in environmental issues and green economy is very much linked to the political changes occurred in the 2008 local elections. The 2008-2013 Liberal-Independent LG included as Deputy Mayor for Planning and Environment Ms. Naomi Tsur, former Director of the Society for the Protection of Nature of Israel (SPNI), key (both, person and organization) to Jerusalem's protection of The Gazelle Valley and the forested West Jerusalem Hills. Before that, under the rule of Ultra-Orthodox majorities, "*some things had happened because it looked good, but not for real will*" (SLDM; Annex 1).

At the national level, the first Environmental Law in Israel is the Abatement of Nuisances Law of 1961. According to Tsur "*it is now dead in the books of legislation; because of it we are one generation behind*" (SLDM; Annex 1). Only in the late 70s and 80s Israel started to think about environmental issues again. In fact, Israel's OECD membership process (2007-2010) represented to fulfill different interests and goals, including an accelerated update in environmental policies. **Changes in both the local and national contexts have driven Jerusalem to initiate a green city profile, through an array of environmental sustainability plans, programs, and approaches.** Most of the activity is flowing top-down from the Municipality to the society, except transport and energy policies that are State competencies. Several autonomous bodies (infrastructures agency and water utility) follow own agendas, yet under very close ties with the City Hall. A tradition in participatory democracy is feeding bottom-up processes as well.

Transport oriented planning aims to contain urban sprawl through densification of sectors nearby the recently inaugurated light rail and the BRT lines, in combination with a network of green spaces and nature sanctuaries threading the city with the surrounding natural belt. The reorganization and expansion of mass transit systems is weaving together Jerusalem east west (Arab low income communities - Jewish middle class). Traffic and parking restrictions in the city center, together with pedestrianization and requalification of buildings and public spaces along the light rail's main corridor are transforming Jerusalem's downtown, in special Jaffa Street, the most crowded and polluted one before the existence of the tram.

Jerusalem's urban densification is supported by the exclusion from development of open spaces; then turned into Jerusalem's green infrastructure system. It all began with the protection of the Gazelle Valley (2008), a 20 Ha stripe of undeveloped land between roads and housing, but home to a little group of gazelles and other wildlife. Threatened by massive residential plans, the SPNI advocated for its preservation with close-by dwellers producing a plan to turn it into an urban nature park, which indeed the Municipality finally adopted. Already during the 2008-2013 political period, the MP excluded forested western Jerusalem Hills from developments for 20,000 housing units. Since 2009, after a catalogue from the SPNI that studied 300 open spaces in Jerusalem, 151 urban nature sites and 43 km of parkland around the city (covering 1,500 Ha) undergo planning through ICLEI's international program Local Action for Biodiversity (LAB). Furthermore, a metropolitan-regional scale vision is approached with URBIS, a project aiming to assess and plan the conservation of ecosystem services. Engagement of stakeholders take place through an extensive forum including ministries, park authorities, academics, NGOs, etc. Coordination is seated on the Jerusalem Bioregion Center for Ecosystem Management, currently responsible for several of the derived biodiversity and nature programs.

The goal of achieving a sustainable urban and natural environment for Jerusalem is continued by a very ambitious plan to requalify the Kidron river basin. This holy valley runs from Jerusalem through the Judean Desert to the Dead Sea along 25 km, and it includes many of the Middle East's most famous cultural and historic sites for Jews, Christians or Muslims. But today it is a neglected area under two confronted governments (the Knesset and the Palestinian National Authority). Due to raw sewage, uncontrolled construction -even on the river bed-, pollution of the groundwater, poverty and abandonment of the farmland, this central corridor of the city has become a health hazard. LGs from both sides are leading and lobbying the process to create the infrastructures (wastewater treatment plant, urban requalification programs, etc.) to restore the Kidron river basin. **In parallel, Jerusalem has launched and leads internationally the Green Pilgrim Cities Network, an eco-touristic development program in cities with a tradition in pilgrim tourism. The Kidron river basin has strong potential to become the core asset for green pilgrimage in Jerusalem.** Therefore, the aim of the City Government is to create a transboundary ecotourism and religious pathway, by restoring cultural heritage and deploying facilities and services all the way from the downtown Jerusalem to the Dead Sea. The environment and options for economic development are setting common ground for collaboration between LGs; and, hence, pressing Israeli and Palestinian Authorities to cooperate. **The sewage plant location is the breakthrough factor in negotiation.** After a 1.5 years multi-stakeholder (40 to 50 from both communities) discussion, the Kidron Plan suggests placement where the inflow of water is maximized, south of Bethlehem.

The practice of participatory democracy and stakeholder cooperation is indeed broadspread in Jerusalem. A very interesting experience is the **community planning program** the city implements across some of its 28 District Community Centers. By establishing a District planner and a facilitator in the Community Center, small participatory workshops are initiated, in order to discuss and make local development proposals, followed by presentations to the community. Thanks to this program, **District spatial plans** covering local economic development, mobility, use of green spaces, etc. are being produced, and afterwards lifted to the Master planners. Other outputs of this process are the **Community Gardens**, by which the citizenship get involved in the management of parks and gardens (from planting and maintenance, to recreational and educational activities) and **pilot programs for organic**

waste composting with a target of 1000 families for 2012. The same approach is followed in the implementation of the **Healthy City Project**, which seeks community involvement in the development of healthy lifestyles and health resources adapted to the different boroughs of the city. In line with the prior, **41 organizations take part in Sustainable Jerusalem Coalition (SJC), a grassroots initiative born in 1998**. All kinds of citizenship (conservationists, universities, private companies, ethnic groups, neighbor associations, etc) participate in SJC, with the aim to influence long-range strategic planning of the city and its metropolitan area, combining economic, social and environmental development. The 2008-2013 LG interacted on a regular basis with this coalition for the discussion different sustainability processes in development (LAB, URBIS, CCP, etc.). **Another collaborative proposal from Jerusalem is GREENMAP™.** This online tool locates all types of green infrastructure in the city; parks, streams, habitats, scenic vistas, community gardens, etc. GREENMAP™ is an international platform with over 100 members from all 5 continents, such as Greenies in Gambia, Barcelona in Spain, HoChiMihn in China, or Springfield (IL) in the USA. Options of the system allow to widen the scope up to 170 different elements, from farmers markets and repair shops, to renewable energies and environmental NGOs.

Table 20.
Green development targets and highlights of JERUSALEM

- Spatial Planning:
  - • Densification and transport oriented planning
  - • Community district planning
  - • Upcoming green building standards
  - • Infrastructure Agency Moriah: Green and PV roofs, recycling of debris for cycling paths, reuse of water in religious baths.
- Green Spaces and Biodiversity:
  - • Jerusalem Bioregion Center for Ecosystem Management
  - • Green infrastructure network: Gazelle Valley, West Jerusalem Hills, 151 urban nature sites and a 43 km stretch of parkland around the city (1500 ha)
  - • LAB-ICLEI (2011)
  - • URBIS initiative: Ecosystem services planning and management; (2010; international network)
  - • Community Gardens
  - • Israeli-Palestinian Jerusalem Kidron River basin project (2010)
- Mobility:
  - • East-West Light rail + BRT lines
  - • Traffic + parking restrictions in city center
  - • Requalification and pedestrianization of Jaffa Street
  - • Green belt cycling paths
- Sustainable use of resources:
  - • RES and EE from sewage treatment
  - • Solid waste recycling program and facilities
  - • Regenerated water for parks
- Participative Governance:
- Networks & International Programs:
  - • Green Pilgrim Cities Network (2011, 1 of 7 pilot cities)
  - • Kidron Basin restoration Plan
  - • Israel's Green Growth Committee
  - • Forum 15: Convention for Reducing Air Pollution and Climate Protection; CCP - ICLEI (2009)
  - • Healthy City Project (WHO)
  - • The Jerusalem Green Map

Source: Own data, from field work.

Additional environmental sustainability activities are progressively being assumed by the Municipal Infrastructure Agency Moriah, as well as by the water utility Hagihon. Moriah is developing green + PV roofs in schools, recycling demolition materials for bicycle paths, implementing water reuse in ritual baths, installing efficient street lighting, integrating road landscaping... **Upcoming regulatory standards for green buildings must complement ongoing sustainable planning efforts.** Hagihon, in turn, is producing electricity from sewage biogas recovery and 1 million m^3 yr of regenerated water for the irrigation of parks, generating additional savings in energy as most water in Jerusalem is pumped from the Mediterranean 60 km away.

Last but not least, Jerusalem's green urban framework is wrapped up by **national and international benchmarking**. The city is party in the **Green Growth Committee** created at national level. Moreover, the Capital engaged Forum 15 -a lobby of cities- that in 2008 signed the **Convention for Reducing Air Pollution and for Climate Protection**, committing to a 20% reduction in GHG emissions by 2020 from BAU growth. In accordance, Jerusalem had joined **ICLEI's Cities for Climate Protection Campaign** by 2009 and it recently finished the city's GHG inventory. As previously mentioned, Jerusalem is also initiator of the Green Pilgrim Cities Network and it also entered LAB in 2011.

For Valerie Brachya, Director of the Environmental Policy Center of the Jerusalem Institute for Israel Studies, despite *"the Forum 15 process initiated programs, surveys, etc. about the action to undertake, the cities' pledge may be a 'pipe dream', as no assessment provided validity to whether this target is attainable"*[30]. Moreover, in Israel the cities are very conditioned by the country. Israel only has 2 levels of administration: the State and the municipalities; there are no regions, nor provinces to interphase between the national and local policies, even though in advantage this situation allows a closer relation between the Ministries and the cities. However, as Brachya points out *"in other countries LGs have high levels of independence and decision making, but **Israel is still very centralized**. A lot of the major affairs are determined at a national level, such as energy and transport. The LG is able to install solar panels on roofs, but to change energy supply is out of reach of the municipality".* **Even so, relevant action for the buildings and mobility sectors is still at aim of the cities'.** Departing from the national energy conservation standards of 2005, some local authorities have approved own regulations to enforce all new buildings and retrofits to become green buildings. Yet, action should exceed construction: *"if Jerusalem wants to act in energy efficiency it should regulate in planning and building; from new building areas to the design, in order to indirectly cope with energy and urban transportation"* (Brachya); an approach already in the City Hall's vision.

d.- BOLOGNA

Bologna's green development approach encompasses with a strategy at regional level.

Bologna analyzed for the first time its energy system in 1981; *"this was one of several pioneering studies to be carried out in Italy, to acquire the necessary tools for the rational management of energy within the municipal area"* (LGEM). Thereafter, municipal activity in the area of sustainability and green economy has been building up. **As one of the founders of ICLEI, it is active in CCP since its**

[30] Expressions of criticism are displayed for all 6 cities in Chapter 6. Even so, it was considered necessary to offer the opinions of the Ms. Brachya here, in order to stress the contrast of Israel's reality in comparisson to the rest of countries.

creation in 1993. In 1995 initial strategies addressing GHG were approved with the project *Urban CO_2 Reduction*. The following year the Local Energy Agency was created, and by 1999 a comprehensive LA21-Action Plan was adopted. More recently -2007- an updated Municipal Energy program was issued. Later on this plan was adapted to the SEAP format and approved by 2012, after the city subscribed to the CoM in 2008. Subsequent delays in these plans were the result of a governance crisis suffered by the city between 2009 and 2011. Criminal investigations over the Mayor (of that time) drove to his withdrawal one year after elected and to the appointment of a technocratic Commissioner by Rome. The resulting lack of political unity affected some programs, such as the CoM's SEAP. The newly elected City Government of 2011 retrieved the climate agenda, and **by 2013 the city initiated the works for Climate Adaptation Plan through an extensive participatory process**.

The municipality of Bologna spreads sustainability activities mostly in 3 of its 8 divisions, namely: urban quality; land quality and management; and community wellbeing. These divisions take care of services such as energy and environment, sustainable mobility, social housing, spatial planning, urbanism and strategic planning. **After 3 decades of green plans and policies the city has been able to curve down several per capita environmental indicators**: GHG emissions, motorization index, urban waste and household water and electricity consumption. Simultaneously, **there is a steady growth in positive trends**, such as: number of alternative fuel vehicles, electric buses and separate collection rates.

The temporary (2009-2011) break in Bologna's energy planning process was used to include the principles and visions of the new Master Plan (MP) of 2008 into the SEAP. As the MP observes, the future development of the city should: a) protect climate and the atmosphere, reducing GHG emissions and pollutants rising from heating and traffic; b) reduce noise pollution through an adequate placement of housing and roads; c) protect and improve water resources; d) improve soil quality, by regenerating permeability and preventing urban sprawl; e) value and steward natural habitats, the landscape, green areas, parks and protected areas, through ecological networks, in special riparian systems. Thus, **the 2008 MP sets initial concepts for urban mitigation and adaptation of climate change,** afterwards shaped into measures through the construction and urban space regulations. **Likewise, the Urban Traffic Plan of 2007 established noticeable targets in public transport and cycling**; increase of 40,000 (+17%) and 20,000 daily users respectively. The SEAP adopts all these mandates and prospects, revolving on the concurrent planning approach already initiated with the 2007 LEP. For instance, according to the MP 5,000 new homes will be needed in the next years; in a BAU scenario this would cause a +5% growth in GHG. The LEP tackles this potential rise with **strict green building regulations passed in 2009**.

By 2020 Bologna is committed to reduce GHG 20% compared to 2005 (-7% vs. 1990). As the SEAP registers, 19% of the CO_2 depletion target has already been obtained with actions in the 2006-2011 lapse, such as: building retrofit with 55% tax relief, efficient appliances in housing, financial aid for private vehicle renewal and conversion of cars to GLP or methane, "massive" expansion of solar panels, interventions in municipal buildings and equipments (street lighting, traffic lights, solar for HSW in sports facilities...), new planning instruments, etc (Table 11). **In a prior stage (1990-2000) an array of actions had been deployed in the area of energy production:** 2 MW hydropower plant (1995); gas based co-generation and methane DH for 1,800 dwellings (1995); CHP waste incinerator heating 2,300 homes (1990); and wind farm in Monte Galletto (1999) despite out of the municipal boundaries. Focus for the 2010-2020 decade will be for increased EE and GHG mitigation in housing (27%), tertiary and industrial sectors (27%) and mobility (20.5%). **Looking ahead, Bologna's SEAP uses the 'SMART' methodological approach**: Specific, Measurable, Achievable, Relevant and Time Bound. To the 27 actions already in place from the 2006-2011 period, the SEAP adds other 61. Actions cover many aspects, like investments in efficient appliances, heat pumps, energy retrofitting, etc. in all kinds of buildings (government, residential, tertiary and industrial), with even some A class constructions. In mobility, operations will deal with a wide range of topics too (public transport, cycling, biofuels, restricted areas, etc.). Other actions refer to RES, co-generation and CHP plants. Likewise, planning instruments are envisaged, as well as international projects and citizenship engagement activities. Investments of € 4.2 billion are calculated. Obviously, the evolution of the economic and political crisis in Italy will influence the final outcome of Bologna's energy sustainability plans. The key challenge will be refurbishing thousands of buildings, as payback periods are long (10-15 years) and costs enormous.

Parallel to the SEAP, Bologna is in process of producing a strategic plan looking forward to 2021. 'Environment, urban assets and mobility' is one of the 4 development axes. This domain includes a variety of topics for Bologna's 'Green City' progress. **One cornerstone project is the future intermodal hub planned on the central train station sector.** Other measures of the strategic plan are: further pedestrianization of the old quarter; reinforcement of the green infrastructure; restructuring of the metropolitan and urban transport systems, including new railway services; [social] housing measures including energy retrofitting; metropolitan agriculture and a metropolitan pact on soil consumption and urban renewal; green economy...

The LG's green development teams are very active in international projects, such as: ICLEI's ecoBUDGET® which generates an annual environmental balance as part of the municipal yearly programming and budgeting; *GAIA* a local PPP, funded through EU Life+, promoting tree plantation in compensation of industrial GHG emissions; EU Life+ *Blue Ap* aiming at delivering a climate adaptation plan with experimental measures included; Urban Api financed by the EU R&D 7th Framework for the development of decision support systems for urban and environmental planning

through modeling and data integration. Currently, a total of 5 international projects are ongoing, and 4 more are planned for the 2006-2011 period. The city is also active very active participation in networks like ICLEI and the Sustainable Cities and Towns Campaign.

Table 21.
Green development targets and highlights of BOLOGNA

- Energy:
  - • 2,300 dwellings heated by the waste incinerator and 1,800 through gas CHP and CH_4 plants.
  - • LEP 2007: map of energy demand at unit level of the whole city.
  - • 350 public buildings with energy audits. 10 with simulations for turning them A Class.
  - • 2013: contract with ESCO for +20% EE in LG buildings. Creation of Local Energy Agency and turn DH plant into CHP. Finance heat losses in public housing thru more sales and prevent energy poverty.
  - • Safety and efficiency control of single heating systems thru control sample every two years.
- Buildings:
  - • >10% (12,000) housing stock is public. Rent from 0€ to 1/2 market. Private promotions supply % new stock. Renovation operations are constant. Light renovation works, such as skin insulation, every year. Maintenance funds from rentals.
  - • 500-700 new/refurbished residential buildings per year. Since 2011 35% of all energy consumption in new/renovated buildings must be from RES, including 1 kV PV/person, in tertiary 0,5 kW/ 100m². Solar thermal 50% of HSW in housing, hotels, etc. More strict than Regional. Incentive: +10/20% construction capacity if B/A Class.
  - • 100 years of free housing in exchange for renovation of City stock. Green standards are mandatory. Sale for 1/3 of the value; currently 42 flats. 2 collaborative housing and co-housing projects.
- Mobility:
  - • Car sharing with +100 vehicles; expansion of trolley-bus network; starting new urban train system; e-vehicles for freight in city center.
  - • Incentives for car fuel substitution (CH4 and LPG); 2012: 15% of all cars, from 4% in 2003.
  - • Efforts for freight substitution thru subsidy + incentives and restrictions (city center upon pollution levels).
  - • PT: all 500 buses hybrid or CH4 (150 now; 2 gas points); in city center expand trolleybus.
  - • e-bikes (exploring replacement of fuel scooters; rate 14 : 100 inhab). 300,000€ to reach 1,000 e-bikes in 2012 (10% scooter return). Broad E-charging points plan. Future: scooters restricted in city center.
  - • Plan to reach 30% PT; so far 96 M users/y. With year pass for civil servants, from 600 to 10,000.
  - • Participative traffic planning and management: workshops, forum online, sessions... 3,000 contacts in last plan. Participatory lab for cycle network, district mobility, <30km/h zones, etc. "Secure routes" to school: "pedibus" (bus on foot with tutor). Closure of areas on weekends: "T" days with shows and other activities to enjoy the street.
- International activity: currently 5 international projects only the Environment Division; 4 more in the 2006-2011 period; 4 planned in the SEA
- 3,000 trees planted thru "carbon offsets" from local industries.
- Showroom of energy and environment in refurbished school

Source: Own data, from field work.

Green development is relevant at the regional scale of Emilia Romagna. Green economy is monitored regionally and in 2010 it represented >11% jobs, and about 23.5% of the economic turnover, according to the report *Green Economy in Emilia Romagna* (Ervet, 2010). Some 2,000 enterprises, 230,000 jobs and €61 billion are included in the green economy, together with 2,800 farming and forestry properties, 3,400 professionals authorized in energy certification, and environmental labeling companies. **The regional authorities are implementing successive Regional Energy Plans (REP). The 2008-2010 REP received € 90 million.** Energy saving targets were set for several sectors (residential 30%, transports 40% and industry 25% of the overall goal). Outcomes cannot be overemphasized: PV panels went from 15 to +6,000 between 2000 and 2010; yearly savings represent 1.7 MToe; installed RE power grew 400 MW since 2000 to reach 927 MW in 2009 (REP 2011-2013). Prior to this plan the Region had already gone through a transition from oil based to natural gas electric plants reducing 50% emissions from this energy production source. **For the 2011-2013 REP € 140 million were allocated**, in order to support expected total investments of € 2.6 to 3.7 billion in RES and achieve a 17-20% share of final consumption, and 471 additional KToe in EE. For the 2020 timeframe continued action in the energy field should deliver total use levels below those of 2007 (REP 2011-2013). Foreseen actions are very diverse, yet always with associated funds: € 5 M for R&D, € 12 M for industrial greening; € 3 M to the agrarian sector; € 10 M for housing and urbanism; € 15 M for sustainable mobility; etc. **Furthermore, the Region launched in 2011 the *Patto per la crescita intelligente, sostenibile e inclusiva*.** This pact literally reproduces the concepts of the EU 2020 Strategy. The most relevant social and economic stakeholders (province authorities, the Association of Municipalities, employer federations, workers unions, the Italian Banking Association, third sector organizations) subscribed it for a horizontal and vertical joint effort.

Last but least, **Locally born HERA corporation (1990) is a 61% public multi-utility serving 186 Municipalities in several Italian regions**. Hera supplies energy, water and waste services. HERA is continuously improving its environmental performance through R&D&I (e.g. anaerobic digestion acceleration thru CO_2 recirculation to increase the rate of CH_4 production). Facilities of HERA include 10 gas DH co-generation units in Bologna; 1 geothermal DH in Ferrara; PV, WTE, biogas from landfill, composting. They also have trucks and vehicles running on methane. In two cities where HERA owns the electric network they are building e-vehicle charging networks with the innovation that pumped electricity is paid thru the household bill. Hera is working on the concept of an energy-&-waste recovery cluster in Emilia Romagna. So far, to reduce transport of non-recyclable waste, a selection plant for the Bologna incinerator in under construction, while promoting recycling industries to locate in the same area.

e.- GIRONA

Girona's green profile started in the mid 1980s when the waste incinerator was inaugurated -after closure of a landfill in a natural space (1983)- and separate collection of glass began (1985), as well as sewage treatment (1987). Throughout the 1990s recycling reached most all materials in waste, public transport services began, together with air pollution control, pedestrianization of certain streets and biodiversity conservation actions. Likewise, the Aalborg Charter was signed (1996) and environmental advocacy led to new green measures, such as the first urban cycling paths (Table 13). The 2000-2010 period green policies spread to other LG responsibilities, like energy, parks and urbanism. In this phase **the city approved a new MP (2002) in parallel to works for the LA21 (2004), merging sustainable urban planning concepts into the new MP,** such as: a) compact and mixed uses city -the Mediterranean city model- generating a total built up

area of 13 Km^2 (a density of 7,461 inhab./Km^2) in about 1/3 of the municipal territory; b) green infrastructure (65% of total land): suburban green belt and protection of several "green lungs" within the urban area, amongst which the Santa Eugènia Hortes, a 42 Ha riparian flood plain -at walking distance from the center- dedicated to food production plots and conservation of natural habitats; or c) structural elements for sustainable and pacified mobility like exclusive bike and bus lanes, expansion of pedestrian and inverted zones, and peripheral parking lots (Table 13).

With LA21 (2004) Girona created the Local Sustainability Council (LSC) and established a system of sustainability indicators. Indicators were monitored yearly and evaluated by the LSC in order to publicly assess the city's sustainability status and progress. **In 2005 a first attempt towards eco-district planning was made, for an undeveloped patch of 25 Ha for 1,236 housing units.** The plan requires increased low-carbon performance buildings: +15% EE in winter and +30% in cooling, as well as RES requirements. Also, measures and recommendations regarding orientation, openings, crossed ventilation, materials and glassed galleries, must be observed. The whole plan allows constructions to fulfill LEED parameters. Other aspects include separate waste/rain water collection, infiltration of street drainage and eco-gardening criteria. Prospects to implement DH were considered, but energy and gas companies lobbied against it and this solution was finally refused. Unfortunately, the plan never got passed the urbanization phase due the crisis. Within this time-span **an Energy Action Plan was formulated (2007)**, followed by many investments, including: 2 and 1 schools respectively with woodchip and geothermal heating; 12 schools and sports facilities with thermal solar panels for SHW; around 120 MWh yr of PV electricity; a public bike-sharing service; 41% of LED traffic lights, and efficient street lighting reducing 24% energy use compared to 2007. The crisis initiated in 2008 drove to a conservative change of powers in the LG (2011), followed by austerity policies that slowed down low-carbon policies.

The Municipality of Girona aims at becoming a Zero Emissions Administration. In 2008 Girona subscribed the CoM while developing the EU-Life Program project LAKS (Local Accountability for Kyoto Goals). The mission of LAKS was to generate an emissions inventory method and pilot action plans for the mitigation of local GHG emissions. By merging both CoM and LAKS the city produced its Sustainable Energy Action Plan (SEAP) in 2011. The SEAP included a light rail network and a new energy-to-waste complex; a variety of waste flows were to be treated in a system of CHP facilities, in order to feed a new DH infrastructure. Additional measures focused of energy retrofitting of buildings for 16% of the city's 2020 estimated stock, increased public transport services and incentives for electric and hybrid vehicles, estimations of PV potential in roofs, etc. However, as many of these are cost intensive actions, **rationality in public expenditure derived from the economic crisis took the new City Council (2011) to freeze and conduct a full review of the SEAP. By 2014 an updated plan with a Zero Emissions Administration [ZEA] as the new strategic vision is under development.** A multi-stakeholder participatory process has initiated (2013) through the reconversion of the former Municipal Sustainability Council into the Municipal Board for Climate Change (MBCC). This body includes representatives from all political groups, environmentalist NGOs, the University, distinguished experts and certain economic sectors. Its mission is to suggest, discuss and assess the energy and climate planning tasks of the municipal staff aiming to a new SEAP by 2014. As part of the ZEA concept the Municipality is continuing actions from the 2008-2011 Energy Action Plan: renewal of public lighting and brightness reduction; remote control of lighting and heating in buildings (including management tools for the building operators, such as performance-expenditure charts); LED traffic lights; and rationalized power contracts. A new tender for the Municipality's electricity supply requiring 100% green certificates was launched in 2013 and 2 small hydroelectric centrals will be re-operated after substitution of obsolete turbines. However, stronger investments such as biomass heaters, PV or geothermal are on hold until savings generated from the prior actions provide reasonable funding.

At the end of 2013 Girona approved the Climate Adaption Plan (CAP). The plan identifies main effects of climate change, including +0,8 ºC to +1,8 ºC temperature rise for the 2050 horizon, increase in heat waves and tropical nights, probable decrease in precipitation, longer droughts and more frequent extreme storm events. To confront this scenario, the CAP defines major vulnerabilities and strategies in 4 areas, namely: biodiversity and forest management; water provision (supply and quality); health impacts; and communication and training. 51 measures are identified for the 2030 timeframe in these 4 areas, and a set of high impact and easy to implement actions are established for the short term (2013-2015). Measures and actions in other sectors (mobility, energy, buildings...) are left for their specific sector plans, which will be added to the CAP upon readiness. Seeking adaptability, *"the CAP is seen as a permanently open instrument"* (SLDM), with participatory workgroups to develop within the MBCC.

The upcoming Mobility Plan (MoP) must approach sustainable mobility, as cars are still dominators. Every day 160,000 vehicles enter or leave Girona, to/from cities and villages within 45 Km and Barcelona (100 Km) (Municipality / MCrit, 2013). In total, the city generates 427,000 journeys per day, of which 54% are in private vehicle, 8% in public transport, 35% by foot and 2.7% by bicycle (PTOP, 2006). Building upon strategies and measures from the 2000-2010 decade (Table 13), the MoP due by 2014 "*must shape the multi-modal city of the 21st century*" (Municipality of Girona / MCrit, 2013). Technically planned action is under discussion through the participatory Mobility Board, including social, economic and institutional agents. The philosophy behind the plan is to decrease pollution and emissions by preventing traffic jams and over-driving in search for parking. Green Zones under a yearly fee for locals and residents and increase in cycling paths are under design as well.

Girona is member of the Catalan Chapter of the international Smart Cities Protocol. Very much in line with the EU 2020 Strategy, *Girona Smartcity* is the connection of ICT with "*wellbeing, sustainability and competitiveness*", according to online heading statements online. Steered by an expert commission *Girona Smartcity* has produced specific lines of action: *Barri Vell 30*, to enhance tourism and business in the Old City center; *Sustainable Urban Management* focusing on public and private spaces, mobility, energy efficiency, etc.; and *University District* to promote the R&D&I engines of the city, such as the cluster *ICT Media* and the Science-Technology Park. In parallel, a University Chair was created and made responsible for a Master Degree specialized in Smart Cities since the 2013-2014 school year.

Table 22.
Green development targets and highlights of GIRONA

- Sustainable Development:
  - 2004: Agenda 21, Sustainability Indicators and yearly assessment by the Local Sustainability Council.
- Spatial Planning (2002 MP):
  - Compact-mixed city: 1/3 of land
  - Domeny Eco-District Plan (2005): +15% EE in winter and +30% in cooling, as well as RES requirements and LEED standards.
  - 30% social housing in new developments.
  - Green Belt and parks (65% of land)
  - Santa Eugènia orchards and natural area (42 Ha)
- Energy and climate:
  - Energy Action Plan 2008-2011: 3 schools on RES heating; solar SHW in 12 public facilities; 120 MWh/yr PV; 41% LED traffic lights; -24% energy use in street lighting vs. '07.
  - SEAP 2011. Under review due economic crisis. New vision Zero Emissions Administration (2014)
  - 100% green electricity contract for LG operations (2013) (50% in 2011)
  - Climate Adaptation Plan (2013): focus on forests and biodiversity, water, health and communication and training. 51 measures and a set of short-term (2013-2015) actions.
- SMART City program for "wellbeing, sustainability and competitiveness"
- RESPIR Ecotourism program
- Land stewardship with 2 herds of sheep (2006-2011)
- Mobility:
  - Metropolitan Transport Authority (2006): 47 member municipalities, within a system of 7 zones, common set of tariffs and unified negotiation. Increase from 4 to 6.7 million passengers between 2006 and 2011.
  - Dissuasive parking: 20 free parking lots display 2,150 spots at 5 to 15 min. walk from downtown.
  - 2009: bike-sharing with >200 bikes
  - Walking-friendly home-school routes with a network of playgrounds at less than 200 m from any school. More than 100 by 2008.
  - Mobility Plan (2014): 63 Km of cycling paths instead of the current 18.6. Progressive implementation of charging stations for e-Vehicles. Green Parking Zones (with fee) and traffic management
- Bottom-up initiatives:
  - Regulation of flyers in mailboxes (1996). Passed after campaign from a local NGO (ANG). Some 6,000 mailboxes (15-20%) take part.
  - Cycle-activism since 1996. Through rallies, press releases, transport competitions, etc. the topic is pushed within the LG, with many outcomes: parking, maps, paths, bike-sharing...
  - Organic catering ongoing in 5 schools after pressure from parental organizations, since 2006.
  - Others: *RES* Local currency; E-dit car-sharing community; E-Rutes program; Transition Towns...

Source: Own data, from field work.

The Old City center is a strong asset for year-round cultural tourism. **Conventions, top ranking gastronomy and eco-touristic attractions and services widen Girona's quality tourism profile.** European project RESPIR is promoting active tourism and eco-tourism, with new products under development, such as the cross-border cycle-touristic route *Pirinexus* that goes through Girona from France and the Pyrenees, to the Costa Brava. Also, nature tours in different languages in the city parks are offered. The Auditorium is focal point for international conventions, facilitated thanks to a recently inaugurated downtown TGV station and a low-cost airport 15 minutes away.

Bottom-up initiatives are feeding-into the city's sustainable development strategies. Girona's reduced scale contributes to an intense interaction between the LG, and the citizenship and local NGOs. Innovative experiences have become a reality thanks to this cooperation, such as: the regulation of commercial mailings and flyers in mailboxes; urban-cycling infrastructure planning and development; the *E-dit* car sharing community; organic catering in schools; *E-rutes*: EE and RES discovery and educational routes; the Transition Towns campaign; the local currency *RES*; etc. (Table 13).

f.- ALMADA

AL's track record in sustainable development is the product of 4 revolving decade-long development cycles. End of dictatorship (1974) and recovery of LGs (1976) were followed by a first cycle (1980-1990) dedicated to basic urban infrastructures and services. Hence, green city policies initiated with water supply and sewage, waste collection and treatment and closure of uncontrolled landfills. Upgrading this green profile, AL undertook protection of the Fossil Cliff of Costa Caparica, expropriation of lands for the Park of Peace, recycling campaigns, reforestation actions and the creation of a tree nursery. Social empowerment (associations, social assistance, food security, sports...) and parallel participation forums "*put the foundations for rich public participation until today*" (LGEM). The 1990s, spatial planning was the core challenge to approach. Actually, miss-functional planning inherited from the pre-democratic period is an ongoing burden. The city is still paying the non-development of a patch of land for 30,000 new dwellings on the west coast Caparica area, together with rearrangement of irregular settlements, one of them on floodable land at the tip of the estuary of Tagus River. More environmental policies came along the 1990s, such as green spaces, sewage treatment, solid waste recycling and starting of the LA21 process. An innovative program (1993) measured and assessed the impact of transport on air pollution, greenhouse gases and noise levels. Results were used to develop the Public Transports Infrastructure Plan, which included to create the metropolitan light rail of South Tagus.

The 'Green City' focus became the priority in the 2000's, with the *"Sustainable and Solidary Development of Almada"* LA21 strategy. Six integrated lines of action were defined. In a process involving 1,500 staff from all municipal areas and services, **in 2007 AL's LA21 was integrated into the Annual Corporate Action Plan (ACAP).** Organized in strategic objectives and areas of activity, each Department was offered to propose orientation lines and actions. This ongoing management procedure is permanently updated through biannual reporting and integrated planning tasks. **Ever since, yearly action plans are delivered -including objectives, budgets and policies to implement-, for Council discussion and approval**,.

Related outcomes from the 2000 decade strategy are: the **Local Strategy for Climate Change (2007)**, Draft of Local Ecological Structure, Noise Map, ICLEI membership and incorporation to the CCP campaign, the Children's A21 and creation of the Local Energy Agency (AGENEAL, currently a member of the network Energie-Cités).

Leading the whole process is the Portuguese Communist Party, in power since 1976. Long-term positive feedback between the LG and the citizenship cannot be avoided, in order to understand the '*hows*' and '*whys*' of AL's 'red-' and 'rust-to-green' evolution. In order to reverse the destruction of 10,000 of jobs in the extinguishing maritime industry, knowledge infrastructures were founded, such as: 2 local development agencies, the Madan Science and Technology Park, and universities. Adaptation to the new reality through economic diversification is proving effective; currently, 60% of working residents do it in town.

Green governance fosters steady progress. Several platforms promote the engagement of stakeholders in the city's sustainability transition. AGENEAL, the local energy agency was founded in 1999, including the Local Energy Forum with the participation of energy supply companies, waste management services, the water utility, the university, national authorities, transport companies, etc. Given the strong centralization of powers in Portugal, AGENEAL facilitates multi-level and multi-stakeholder governance over complex issues, like ESCO services for public lighting, implementation of RES, information to the community (increase in VAT from 16% to 21% for energy in 2012 prompted interest on energy saving), local energy planning, etc. **Through AGENEAL, by 2003 AL had its first Local Strategy for Climate Change outlined, which was updated in 2007 and later on (2011) adapted to the CoM SEAP format.** The agency is also responsible for energy certification of buildings, the local strategy on thermal regulation, EE management programs in schools, raising public awareness. One outstanding campaign, the ***"Better without my car"*** program, obtained the **European Mobility Week Award in 2010**-. In order to expand AGENEAL's multi-stakeholder model to other topics, AL is running similar platforms for: **Sustainable Tourism; Social Inclusion; and Climate Change**. For the latter, the Forum includes citizenship, local companies, the chamber of commerce, and a system of voluntary commitments.

Since 2004 the Local Agenda 21 of the Children involves scholars in environmentally friendly action planning. Throughout 6 months children (8-12) are involved in workshops and visits dealing with environmental issues of the city and the planet. Parallel education resources are created with the kids (movies, manuals...). At the end of the program each group has its own list of proposals and actions, which they end up presenting in a Forum. 2-3 children from each school together with the President of the Municipal Assembly present the Forum in front of the LG's executive body. Around 400 people including the district parishes, etc... attend the Forum. After the presentations, there is a political discussion and later on an open debate with the public. Topics from poverty and land use, to environment and school repairs are discussed. Children evaluate the experience very positively, "*in general they feel very proud and want to participate in the next edition*" (LGEM). Every Forum begins with a presentation by the LGEM assessing the actions developed the last year. Last but not least, municipal staff bindingly evaluates children's proposals, in order to explore their integration into the ACAP.

At present times, **the 4th progress cycle (2010-2020) is unfolding, namely *"Almada+: Sustainable, Inclusive and Eco-efficient Development"*, generated through participatory forums and across-the-board work in the LG**. 7 development axis were defined for the decade: 1) urban requalification and socio-economic development; 2) Environment, biodiversity and energy; 3) Urban mobility, accessibility and public spaces; 4) Education, training, knowledge and youth; 5) Culture, sport, solidarity and safety; 6) Information, participation and governance; 7) Modernization and valorization of public services. Building upon the LA21-ACAP experience *Almada+* is managed through annual planning and programming tasks.

Since 2007 AL's metropolitan area is connected by light rail, as suggested by the 1990s' Public Transport Infrastructure Plan. Redesign of mobility across the city has followed -restrictions for cars, restructuration of the bus network, new pedestrian areas-. Works in the main avenue included from renovation of sidewalks, pavements and lighting, to restoration of facades. The formerly most polluted, crowded (40,000 vehicles/day) and noisy street of the city is now a "*long relaxed public space in which to walk, shop and socialize*" (LGEM). The area is in consequence gaining interest as focus of investments and livelihood. 20 years of negotiations with the central government were necessary for the light rail to become a reality, proving the complexity of such cost-intensive investments. **Plans for service extension to neighbor municipalities will establish the 'metro' of the south shore of the Tagus River.**

Although public transport (PT) is not a municipal responsibility, in view of the arrival of the tram, the city developed a **Sustainable Mobility Plan** in 2003 (under review) based on 4 pillars: 1) modal change towards PT and soft/active systems; 2) better infrastructures for the latter; 3) new and more efficient technologies; and 4) involvement and awareness of citizenship. Many explicit actions have been planned and executed thereafter (Table 14). Critical issues include diverting 35,000 cars/day crossing the city towards the Lisbon bridge, due to bad communications with the highway, through the tram, street directions, traffic lights, etc... A related challenge is to reach agreements to allow bicycles on ferries, for both daily commuters and tourists going to AL's Costa Caparica, one of the most important seashore resorts in Portugal.

The Sustainable Environmental Planning and Management Department (DEGAS) is a strategic unit under direct accountability to the Mayor. This Department is responsible for facilitating and coordinating

the aforementioned decade-long development strategies (experience showed 4 year timeframes not to be enough). Likewise, **DEGAS acts as a municipal research unit delivering innovative environmental sustainability instruments to decision-makers and city planners.** DEGAS is not responsible for downright management services (waste, water, green areas, etc.). This allows freedom to work with a research-wise and crosscutting approach, producing multiple innovative instruments (Table 14). Among the latter, the **Energy Assessment of Planning Tool** is a decision-making support tool, to assess urban development plans and programs from a low-carbon perspective (passive energy, efficiency, RES, transport demand, energy infrastructures and services, access to public and urban services, GHG emissions, etc.). **The Food Security Assessment and the Local Agriculture plan are 2 other innovative resources promoted by DEGAS.** After studying the quantity and quality of natural and agricultural soils, crop / farming suitability and yields, DEGAS measured AL's food security deficit (area needed 12,300 Ha and total municipal surface 7,000 Ha including built up). Upon results, the Council endorsed a Local Agriculture Plan within the new MP of 2012, linked to programs for the development of the local agriculture the following years. Closely related, the new MP brings also the **Green Infrastructure Plan**, built upon studies about the local biodiversity; relevance, main threats, priorities, etc. Unique and tailored landscape ecology bio-indicators were generated, as well as a biding map with an articulated system of urban and natural areas, ecological corridors and the basics for a LAB-ICLEI plan. Other innovative resources delivered by DEGAS are the **Rainwater Network Climate Adaptation Plan** or the **Almada Less Carbon Fund** for the compensation of yearly GHG emissions from LG operations (Table 14).

'Sustainable City' benchmarking at National and international level. AL's singular political history "*is not appreciated by the dominant parties and powers*" (SLDM). Hence, sustainable urban transformation efforts contribute to a positive image and branding of the city at national level and abroad. **From the 1990s onward AL has engaged major international green campaigns and networks**, such as: ICLEI (CCP; *Agenda+; Procura+*; LAB); Energy-Cités; Worldwide Educative Cities Network; etc. Good practices have been distinguished with two international awards: 1st Prize of the European Mobility Week in 2010; 3rd prize in a competition on business incubators in 2011, for Madan Park. **DEGAS is currently contributing to many international projects: 3 Interreg, 4 IEE, 1 FP7, 1 BestEnergy** (with a staff of 10 people). AGENEAL receives yearly visits by other LGs searching to create their own energy agencies, and invitations to teach in Portugal and internationally. On the other hand, 30 years of strict economic agenda makes of AL the **only major public authority without debts in Portugal**, and "*topping the list of paying authorities; AL's model is now trustworthy*" (SLDM).

In the future, Riverfront urban requalification will continue to steer AL's major 'rust-to-green' shift. The 2012 Master Plan incorporates an ambitious proposal to transform the obsolete shipyards into a low-carbon Eco-District. The prospect is to create a district with off the rooftop energy efficient buildings, integrated RES, new construction technologies and materials, etc. altogether in a very privileged area of the city (the river, views to Lisbon, next to the intermodal transport hub). This represents a major opportunity to shift AL's former image; the heavy industry and dormitory city of the Lisbon Region. Riverfront urban requalification is a chance to wrap up AL's efforts to adopt a 'Green City' approach, and become the Portuguese reference in this topic.

Table 23.
Green development targets and highlights of ALMADA

- Sustainable Development:
  - 1980-1990 *Planning and Infrastr.*
  - 1990-2000 *Integrated Dev. Str.*
  - 2000-2010 LA21: *Sustainable and Solidary Dev. Strategy*
  - 2010-2020 *Almada +: Sustainable, Inclusive and Eco-efficient Dev. Str.*
  - Integrated LA21 & Annual Corporate Action Plan (since 2007)
  - DEGAS: Sust. Env. Management and Planning Department (2005)
  - Agenda 21 of the Children (2004)
  - Multi-stakeholder Platforms: Sustainable Tourism; Energy; Social Inclusion; Climate Change.
- Energy and Climate:
  - Local Energy Agency AGENEAL (1999): ESCOs, Energy Planning, energy certification of buildings, local strategy on thermal regulation, EE Management Programs in schools, public awareness, Solar SHW in all municipal sports facilities, Energy efficient lighting and HVAC systems in municipal buildings
  - CCP (2002)
  - Local Strategy for Climate Change (2003 / 2007) & CoM SEAP (2011; -22% GHG by 2020 vs. 2006), includes target energy retrofit of 13,000 housing units (38% of total).
  - Climate change Forum (including voluntary commitments)
  - Energy Assessm. of Planning Tool
  - Buildings EE and RES reg. stronger than National adoption EU DIR..
  - Almada Less Carbon Fund (2009) Financial tool to compensate yearly GHG emissions into EE and RES.
  - Support programs and tax reduction for Innovation and Eco-Efficiency
- Spatial Planning:
  - Eco-District requalification of the riverfront shipyards sector.
  - Food Security Assessment and Local Agriculture Plan
  - Green Infrastructure Plan and LAB process (16% of species under threat; 37% for fish). Monitoring of natural spaces and estuary waters by new bioindicator methodologies.
  - Rainwater Network Climate Adaptation Plan: original network includes flood prevention and groundwater recharge structures. Expansion of the 70s added separate pluvial and sewage drainage. The new MP will adapt all of it according to climate change precipitation regime forecasts.
- Mobility:
  - Costa Caparica cycle-path (1990s)
  - Sustainable Mobility Plan (2003):
    - Electric-Bus service in the historical centre (Flexibus)
    - Electric vehicles for gardening
    - Hybrids for the authorities (2005)
    - 100 buses on 20% biodiesel
    - Enhanced reality app for soft transport itineraries
    - Urban and peri-urban cycling plan, including connection to AL's central park.
    - "The Mobility House" Project: pilot green building for the mobility services next to light rail corridor.
  - EU Mobility Week Award (2010)
  - Light rail network (2007)
- Finicia Municipal Fund for the creation of new companies.
- Madan Park incubator for green and technological innovation
- Green public procurement policies (*Procura+* ICLEI program)

Source: Own data, from field work

4.1.2- Environmental sustainability instruments and indicators

Section 4.1.1 displayed in a descriptive format 'Green City' strategies, targets and measures of the studied cities. In order to allow comparison from a more objective perspective, section 4.1.2 is dedicated to exhibit results from closed answer structured questionnaires sent out to LGEMs. Four subsequent Tables (24-27) detail research outputs about environmental sustainability instruments and indicators, and climate change mitigation planning.

So far, results have been delivered according to the order of the fieldwork calendar. In this section (4.1.2) cities will be organized from lower to higher national income per capita, as this appears to be a relevant factor for the discussion of results (section 4.2). On the other hand, the 2 cities (Arendal and Jerusalem) from non-EU member countries will be displayed in *italics* text in the following Tables.

Table 24.
Policies and instruments for local sustainability and low-carbon development.

	Almada		***Jerusalem***		**Girona**		**Bologna**		**Turku**		***Arendal***	
Instrument	Year	Review	Year	Review	Year	Review	Year	Review	Year	Review	Year	Review
LA21/SD Action P	Yes	2006 / 2012 Almada+			2004 obsolete		1999 not completed		2001	2005	Died out	
Aalborg Commitments	Yes		2008 - Adapted		1996		2008 (Aalborg+10)		1996	2005	1999 - Adapted	
SD Indicators / Reports	1996		2010		2006-2011 Yearly	2013	2004	2011	2001	2008 each 1 / 2 years		
SD Council	Several	Climate change 2012	Several**	2008	2001-2011	2013 Climate Change						
[EU] 2020 Strategy					2012 Regional		2012 Regional				2011 Regional	
Eco-Budget/ ACAP	2007	Yearly					2004	2011	2010	Yearly		
Green Procurem. / *Procura+*	*Procura+* Fleet				2011 Electricity	2013 Electricity	*Procura+*		*Procura+*	2013 100% Tenders	2005 Electricity	
Green Infr. Plan / LAB-ICLEI	in MP 1990s	in MP 2012	2011 LAB-ICLEI		in MP 2002		in MP	2012	in MP	2012		2012
GHG inventory	2001	2008 BLY 2006	2010 BLY 2007		2011 BLY 2001		1995 / 2005	2005 / 2012	1997 BLY 1990	2010 BLY 2003-2007	2007 LG operations	2011-yearly
Climate Plan	2003	2007 / 2011	Upcoming		2011	2011 (ongoing)	1995	2012 SEAP (2007 LEP)	1997	2009 2013	2008	
Covenant of Mayors	2009	2011	2009 Adapted		2008		2008		2011	2011		
Carbon Footprint	Ecological Footprint								Ecological Footprint		2007	
Climate Impacts Report	2011 Water cycle				2013 Partial		2014				Upcoming	
Climate Adaptation Plan	2011 Water cycle				2013 Partial		2014				Upcoming	
Building Energy Eff. Map							2007					
Public Build. En. Eff. Plan	2003				2008		2008		2008		2004	
Solar Ordinance	in building code		1980		2007 in building code		in building code					
Green Buildings Regulation	2002 Thermal Eff.	2007 Above Nat. Reg.	Upcoming		2003 Voluntary	2007 Nat. Code	2009 Above Nat. Reg.		Upcoming		2009 Nat. Code	
Electric Vehicle Plan	Network of EV-stations						2010 CH_4 cars					
Green Electricity Procur.					2011 50%	2013 100%			2009	2013	2005	
Carbon Neutral Commitment	2012 LG Operations	Yearly			2014 LG Operations						2006 LG Operations	Yearly
Climate Partners Net. (CPN)											2008	2012
Local Carbon Fund	2012						2010				2008 CPN members	

Notes:
Source: Own data, from closed questionnaires to LGEM and LGTE.

Table 25.
Environmental sustainability indicators.

Indicator	*Unit*	Almada				*Jerusalem*				Girona				Bologna				Turku				*Arendal*			
Energy System		**1996**	**2001**	**2006**	**2011**	**1996**	**2002**	**2005**	**2009**	**1996**	**2001**	**2006**	**2011**	**2000**	**2005**	**2008**	**2010**	**1997**	**2003**	**2007**	**2010**	**1995**	**2000**	**2005**	**2009**
GHG Capita	*tCO_2pc*[a]		3.5	3.1				3.3 [2007]		6.4	6.06	8.1	7.2		6.25	7.46 [2006]	6.11 [2007]	11.1	10.9	9.4		6,78	5,9	4.27	3.57
Energy Capita	*MWhpc*		10.8	7.5						24.1 [1997]	25.4	27.4				25.7 [2006]				44				31.3	28.2
% Ren. Energy	*%*										3.9%					5% [06-09]				16.1				58.2	53.9
Electric. Capita	*MWhpc*		2.4	3.0		4	5	5.5	5.9		4.4									8.5	9			18.2	15.2
Domest. Elec.Cap.	*MWhpc*		0.9	1.3		1.2	1.4	1.5	1.5		1.4			1.25	1.33	1.27				3.1	3.4			18.2	15.2
% Ren. Electr.	*%*				35% [2009]					18% [1990]	23.5%	29.5% [2009]												100%	100%
District Heating	% Pop.									0	0	0	0	<5%	<5%	<5%	<5%								
Transport System		**1996**	**2001**	**2006**	**2011**	**1996**	**2002**	**2005**	**2011**	**1996**	**2001**	**2006**	**2011**	**2000**	**2005**	**2008**	**2010**	**2003**	**2007**	**2008**	**2010**	**1995**	**2000**	**2005**	**2009**
Bike + Car Share	*# Bikes + # cars*	0	0	0	0	0	0	0	0	0	0	0	260 + 0				184 + 40	0	0	0	0	0	0	0	0
Alt. Fuel Buses	*% total*				biod. + elect.	0	0	0	0	0	0	0	0		4 [2000]	134 [2005]	186	0	0	0	0				
El. Veh. Pub. Tr.	*# Syst.*				Tram + Bus +	0	0	0	Tram	0	0	0	0	21 [1995]	65 [2000]	64 [2005}	68	0	0	2	2	0	0	0	0
El. Veh. Charging	*# points*				>50	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	14
Motoriz. Index	*#/10^3c*							208 [2007]		487	526	581	632	564	575 [2002]	546 2005]	528 [2008]		434	449	459			510	557
PT Users	*#/1000 inh.day*				>131						94	75	136	674	686	709	688		309	305					
Pub. Tr. Use	% Tr.	51% [1991]		30%							7%	4%		25% [2001]						17%					3.3%
Road Tr. GHG	*% total*			31.5%				17%			40%				21.9%			22%	27%			42.8%	47.2%	47.2%	49.9%
Waste & Water		**1996**	**2001**	**2007**	**2010**	**1996**	**2002**	**2005**	**2009**	**1996**	**2001**	**2006**	**2011**	**2000**	**2011 (Region)**	**2008**	**2010**	**2003**	**2007**	**2008**	**2010**	**1995**	**2000**	**2005**	**2009**
Urban Waste	*Tons*		81,774	87,689	87,785	237K [1990]	307K [2001]	330K	391K	PERG	40,167	49,335	42,387							90				12,78	15,205
Urban W Capita	*Kgpc yr*		511	511	511	452 [1990]	448 [2001]	456	481	547	547	547	438	584	587	580	554			511				317	361
Separate Col.	*%*		3.2%	8%	9%		3.24%	3.24%	6.26%	9.1%	13.3%	29.2%	39.4%	18.8%	27.1%	34.1%	34.8%			40%				60%	60%
TotalH_2O Capita	*Lpc/day*		205.5	208 [2008]		204	205	213	189	--	--	197	173				229		237	239			416	503	510
Dom. H_2O Cap.	*Lpc/day*		~154	~152		122	120	117	111	175	201	171	151	184	185	172	160		138	137			256	310	304

Source: Own data, from closed questionnaires to LGEM and LGTE.

Table 26.
Climate Action Plans - Development status according to ICLEI's *Cities for Climate Protection* (CCP) methodology .

		Almada - Portugal	*Jerusalem - Israel*	Girona - Spain	Bologna - Italy	Turku - Finland	*Arendal - Non EU*
Per capita GHG emissions		2006: 3.1 tCO_{2e}	2007: 3.3 tCO_{2e}	2011: 7.2 tCO_{2e}	2007: 6.11 tCO_{2e}	2007: 9.4 tCO_{2e}	2009: 3.57 tCO_{2e}
CCP Milestone	**1 - Establish an Emissions Inventory - Year (BLY Year)**	2007 (2006) (prior: 2003 (2001))	2010 (2007)	2011 (2001)	2011 (2005) (prior: 1995 (1995); 2007 (2005))	2009 (2007) (prior: 1990 (1990; 1997); 2003 (2003))	LG Operations (2007)
	2 - Adopt a GHG and Energy Target and Year - Year (Target)	2020 (-22% vs. 2006)	2020 (-20% vs. BAU)	2020 (-21.9% vs. 1990) (under review)	2020 (-20% vs. 2005)	2020 (-30% vs. 1990)	2025 City (-25%) 2017 LG (-90%)
	3 - Develop a Local Action Plan	2011 (prior: Str. Clim. Change 2003; LEP 2007-2011)	Pending Approval	2011 (under review) (prior: LEP 2008-2011)	2012 (prior: LEP 2007-2011)	2009 (prior 1997; 2003; 2009)	LG Operations
	4 - Implement the Local Action Plan			LEP 2008-2011. LG Operations			LG Operations
	5 - Monitor, evaluate and report on results	reached -14% by 2006 vs. 2001 from prior plans		LG operations		reached -16% by 2013 vs. 1990 from prior action plans	Yearly: LG Operations

Source: Own data, from closed questionnaires to LGEM and LGTE.

Table 27.
Climate Action Plans - GHG emission inventories.

		Almada - Portugal		*Jerusalem - Israel*		Girona - Spain		Bologna[1] - Italy		Turku[2] - Finland		*Arendal[3] - Norway*	
		Tons	*%*	*Tons*	*%*	*Tons*	*%*	*Tons*	*%*	*Tons*	*%*	*Tons*	*%*
LG Operations	**Buildings**	3.680	0,66%	59.847	2,32%	4.673	0,79%	32.934	1,44%	Comm.		191	*11,1%*
	Vehicle Fleet	1.479	0,27%	79.460	3,08%	1.724	0,29%	39.255	1,79%	Comm.		1477	*86%*
	Public Lighting	8.248	1,48%	31.095	1,21%	4.974	0,84%	14.722	0,64%	Comm.		0 (RE)	
	Water-Sewage	14.744	2,65%	4.537	0,18%	5.904	1,00%	Build.		Comm.		0 (RE)	
	Gov. Waste			12.331	0,48%	13.840	2,34%	Build.		Comm.		Veh.F.	
	***Electricity*[4]**			90.942	3,53%								
	***Heating Fuel*[4]**			16.467	0,64%								
	Air Transport[5]											51	*2,9%*
	TOTAL	28.181	5,06%	295.679	11,44%	31.115	5,26%	86.911	3,87%	Comm.			*100%*
Community	**Residential**	114 057	**20,49%**	756.146	**29,35%**	191.627	**32,38%**	799.063	**34,9%**	E+H			
	Commercial	110 098	**19,78%**	651.499	**25,29%**	118.569	**20,03%**	646.366	**28,2%**	E+H			
	Industrial-other	89 393	16,06%	120.310	4,67%	12.125	2,05%	294.629	12,9%	90	0,01%		
	Private Transp.	175.470	**31,52%**	354.995	**13,78%**	238.458	**40,29%**	461.542	**20,2%**	446.600	**27,2%**		
	Com. Waste	39.440	7,08%	398.709	15,48%					22.800	1,4%		
	Agriculture							Industry		4.670	0,3%		
	Other												
	Electricity									425.500	26%		
	Heating									739.700	45,1%		
	TOTAL	528.548	94,94%	2.281.659	88,56%	560.780	94,74%	2.240.334	96,13%	1.639.360	100%		

Notes: 1: (Bologna) water and waste included in buildings and facilities (municipality, residential, etc.) emissions in project *LAKS*; 2: (Turku) Emissions from LG operations and Community not separate; residential and commercial GHG not separate and included under Electricity and Heating; Public Transport not separate and under Private Transport; 3: (Arendal) GHG from scope 3 of UNEP's inventory system. **Bold** amounts pinpoint sectors (Residential; Commercial; Private Transports) that gather the majority of GHG emissions; **red** and **green** indicate particularly high and low values within the sample.
Source: Own data, from closed questionnaires to LGEM and LGTE.

4.1.3.- Perception of low-carbon performance

A total of 52 subjects / organizations responded section *'Perception of low-carbon performance of climate and energy sectors'*. Questions formulated were 2: 1) *'Your city is engaged in climate change mitigation and adaptation. Please qualify [from 0 to 10] the city's performance on the sectors below* '; 2) *'Explain Why?*'

For the 10 sectors analyzed there was a range between 39 and 52 answers with scores (0-10) (Table 28). This shows that for certain sectors a number of interviewees declared 'Do not Know / No Answer' [DK/NA]. Altogether, there were 43 'DK/NA', adding up to 8.3% of total answers-; for sector 'industry' share of 'DK/NA' reached 25%. The number of answers for one same sector varied between cities; from 5-6 in the cities with less responses, to 10-13 where more results were obtained.

Table 28.
Average performance of climate and energy sectors.

Overall Av.: *a*) 5.88 ***b*) 5.84**	**ES**	**EE**	**TR**	**BU**	**IN**	**WW**	**GSN**	**NH**	**FP**	**RS**
Total responses	47	50	52	51	39	50	52	45	45	46
Av. Resp./City	7.8	8.3	8.7	8.5	6.5	8.3	8.7	7.5	7.5	7.7
Max Resp./City	10	10	13	13	10	13	13	12	13	11
Min Resp./City	5	6	6	6	5	6	6	6	6	6
Av. Method *a*)	5.11	5.30	5.66	4.80	6.28	6.89	7.19	6.12	5.97	5.42
Ranking *a*)	9	8	6	10	3	2	1	4	5	7
Av. Method *b*)	**5.12**	**5.24**	**5.79**	**4.81**	**5.88**	**7.05**	**7.38**	**6.13**	**5.77**	**5.28**
Ranking *b*)	**9**	**8**	**5**	**10**	**4**	**2**	**1**	**3**	**6**	**7**
Stand. Dev b)	1.79	1.24	1.00	0.94	0.94	0.87	0.97	0.57	1.11	1.53

Notes: ES: Energy Supply; EE: Energy Efficiency; TR: Transports; BU: Buildings; IN: Industry; WW: Waste & Water; GSC: Green Spaces & Nature; NH: Natural Hazards; FP: Food Products; RS: Retail & Services.
Source: Own, from interviews about performance in climate and energy sectors

Results are presented in average marks per sector and city (Table 29 and Figure 2). There are two possible ways of calculating the average mark per sector (*a*: average sector score with independence of the city: *b*: average sector score within each city and subsequent overall average). The use of *a* produces an average value in which all individual responses have the same weight; this option would be interesting in front a homogeneous sample (same number of results per city, or if cities could be considered equal, or for a single city). As this case study presents heterogeneous data, *b* appears to a better option for the analysis. Comparing both methods there is a slight variation in the final rankings of the sectors (Table 28); 'Industry' and 'Natural Hazards' exchange 3rd and 4th position, and 'Food Products' and 'Transports' switch 5th and 6th.

Average score (b) for the whole data set is 5.84 (Table 19), indicating an overall positive perception of low-carbon performance in climate and energy sectors. Even so, the average mark is on the low-positives within the 5-10 range. Braking data in sectors, two groups may be identified: 4 with average values above 5.84 and 6 below it. The above average group includes: 'Green Spaces & Nature' -7.38-; 'Waste & Water' -7.05-; 'Natural Hazards' -6.13-; and 'Industry' -5.88-. Underscoring sectors are: 'Transport' -5.79-; 'Food Products' -5.77-.; 'Retail and Services' -5.28-; 'Energy Efficiency' -5.24-; 'Energy Supply' -5.12-; and 'Buildings' -4.81-.

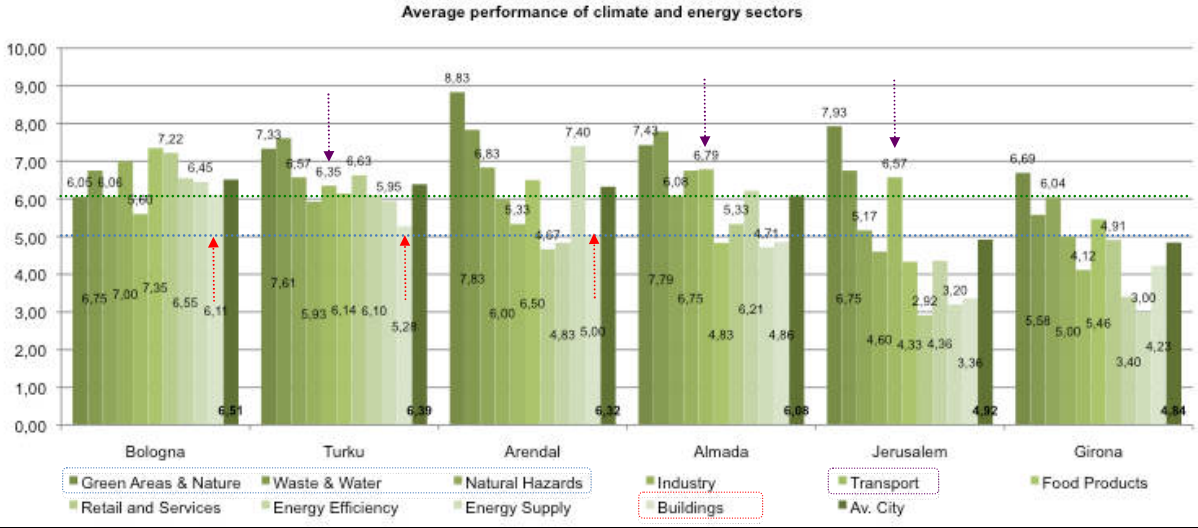
Standard deviations move from 0.57 for 'Natural Hazards', to 1.79 for 'Energy Supply', respectively indicating which sectors showed less and more different perceptions among the interviewees and the cities. After all, 5 sectors have more homogenous opinions, according to the standard deviation within a subjective range of 0-1: 'Natural Hazards', 'Waste & Water', 'Industry', 'Buildings' and 'Green Areas & Nature'. Four of these belong to the high-scoring group and the other is 'Buildings', which is the worst performing sector of all 10. With the obtained results, it seems that perceptions are more similar for better and worse performing activities, and more heterogeneous for those sectors with a relatively acceptable/negative development. Two topics hold highest standard deviations (Table 18): 'Energy Supply' (1.79) and 'Retail & Services' (1.53), for which city scale zooms are interesting (Fig. 2). The overall average of 5.12 for 'Energy Supply' increases 2.28 points to reach 7.40 in Arendal; in contrast, in Girona it loses 2.13 points falling down to 3. of For 'Retail & Services', Jerusalem's is 2.36 points below the overall sector average, whereas Bologna over-scores 1.94 points. The absolute best performing sector is 'Green Spaces & Nature' in Arendal (8.83); +1.45 points above the sector average (7.38). The worse sector at city level is the aforementioned 'Retail & Services', with a low 2.92 in Jerusalem. The Discussion (4.1.2) will analyze these results with the inclusion of twofold references, namely; *a*) the *'Whys'* argued by the respondees; *b*) 'Conflicts' and 'Potentials' collected through the '*Workshop about local conflicts and potentials on climate change and development'*. Given the extension of results, detail about *a* and *b* may be found in Annex 1. Nevertheless, essential outcomes of the workshops are embedded in table 30, which displays an integrated summary of results.

Table 29.
Perception of low-carbon performance in climate and energy sectors.

Sector	Bologna	Turku	Arendal	Almada	Jerusalem	Girona	Average Sector
Green Sp. & Nat.	**6,05**	**7,33**	**8,83**	**7,43**	**7,93**	**6,69**	**7,38**
Waste & Water	**6,75**	**7,61**	**7,83**	**7,79**	**6,75**	**5,58**	7,05
Natural Hazards	**6,06**	**6,57**	**6,83**	**6,08**	**5,17**	**6,04**	6,13
Industry	7,00	5,93	6,00	6,75	4,60	5,00	5,88
Transport	5,60	6,35	5,33	6,79	6,57	4,12	5,79
Food Products	7,35	6,14	6,50	4,83	4,33	5,46	5,77
Retail and Services	7,22	6,63	4,67	5,33	2,92	4,91	5,28
Energy Efficiency	6,55	6,10	4,83	6,21	4,36	3,40	5,24
Energy Supply	6,45	5,95	7,40	4,71	3,20	3,00	5,12
Buildings	6,11	5,28	5,00	4,86	3,36	4,23	**4,81**
Average City	**6,51**	6,39	6,32	6,08	**4,92**	**4,84**	**5,84**
Standard Deviation	0,57	0,69	1,41	1,11	0,83	1,68	1,16

Source: Own data from interviews about performance in climate and energy sectors

Figure 3.
Average performance in climate and energy sectors in every city.



Source: Own data, from interviews about performance in climate and energy sectors.

4.2.- Discussion

In order to facilitate an agile reading, in the discussion of results the cities' names will be abbreviated as follows: Alamada -AL-; Arendal -AR-; Bologna -BO-, Girona -GI-, Jerusalem -JE-; and Turku -TU-.

City governments (Musco, 2002; LSE Cities/ICLEI, 2012) highlight a range of tools for delivering green policy, including planning, raising public awareness, regulation and public funding; taxation is regarded as an important tool by most Asian cities. **In the studied cases, the exploration of 23 sustainability and low-carbon local policies and instruments (Tables 24 and 30) returns a range of results regarding their adoption; from as few as 7 in JE to 19 in AL, 18 in BO and 16 in GI; and in between these extremes, 12 in AR and TU (Regional and upcoming instruments not counted). LA21, as the foremost local SD policy, is or was present in all 6 cities at some point in time, yet only the 4 EU member cities managed to conclude the initial cycle with the approval of a Local Action Plan. Still, it has become obsolete in 2 of the latter cases (GI and BO). Review and updating has only succeeded in AL and TU.** In AR the LA21 process began but it died out in; In Jerusalem it was just recently initiated (2008) under a nationally adapted version. From the sample of 32 European cities included in *Urban Ecosystem Europe-Report* (UEE; Ambientalia, 2007) the great majority had committed to LA21; only 5 had yet to deal with a process of this type. However, as found for the explored cities, implementation of LA21 was uneven. The first step of drawing up a sustainability report had been taken by 80% of the cities, yet only 2/3 of the 27 cities engaged in LA21 reached the Action Plan (Ambientalia, 2007). Half of cities with LA21 in UEE had set a permanent consultative forum involving the local stakeholders; the same proportion as for the researched group -AL, GI and JE-.

Implementation of monitoring systems for the Local Action Plans (LAP) was low in UEE (11 out of the 27 cases), whereas **the research results display either sustainability reports or indicator systems for the 4 EU cities. Nevertheless, only GI provides an online website to check local SDIs. TU and BO develop ecoBudget®, outstanding in the sense of yearly accountability about environmental sustainability parameters and objectives of the Local Council; something done in similar terms by AL through the Annual Corporate Action Plan.** In regards to monitoring and reporting the Spanish region of the Vasque Country is a good reference[31]. The 2000-2010 regional balance of local sustainable development indicates that close to 70% of the actions included in LAPs had been executed by year 8 after the approval (IHOBE, 2012). Tailor-made software MUGI21 and annual updating from over 80 LGs has mounted a database with 6,000 SDI measurements. Strategic planning cycles guide IHOBE's regional support to the development of the LA21 processes, in addition to periodic revision of the LAPs. A similar status about the implementation of LAPs may be found in the Province of Barcelona. By 2010, from 102 municipalities action in execution or within a short term amounted to 80% of the contents of LAPs. Between 2002 and 2010 the share of fully developed actions had increased from 14% to 36%, whereas those in progress declined from 29% to 17% and periodic deployment grew from 1% to 16% (Diputació de Barcelona, 2010). In turn, the Sustainability Observatory for the Region of Girona (OSCG, 2011) found that 75% of 1,287 actions from 10 LAPs (drawing back to 1998 for the first approval) were either initiated or in place by 2011. Figures from all 3 regions show how LAPs are moving from paper to reality. Online integrated monitoring tools allowing the public to check progress on plans, programs and indicators, are rare, however. From the explored cases only OSCG (2012) delivers a website with periodic assessment of SDIs through maps at municipal and county scales (www.fsostenibilitat.cat). The RFSC framework is an interesting option as it hands out an interface for permanent monitoring and dissemination. The experience of Sant Boi de Llobregat (Catalonia, Spain) through the Planning and Evaluation Assistance Unit is remarkable as well. In this case, the LAP is shaped in form of an online dashboard, indicating percentage of achievement for city commitments, strategic objectives, summary of actions and specific actions (http://placiutat.santboi.cat/) (Gutierrez, F. 2012).

Delivering an objective assessment of the 'Green City' approach of the 6 case studies is not only complex, but perhaps also pretentious. The easiest way would be to observe the status and trend of different SDIs, following the example of the Green City Index (EIU, 2009). However, given the variety of realities, organizations and experiences encountered, it is unavoidable to say that context is a key factor to understand results. Simultaneous factors are concurring to shape a greener economy and more energy efficient communities, such as: international (CDM, OECD, EU) and national policies and instruments; local plans, policies and programs; slowed down consumerism due the economic and financial crisis; higher energy prices (*Peak Oil*, globalization and competition for resources); etc. Yet, not forgetting that global GHG emissions continue to grow in parallel to economic and industrial development (IPCC, 2014b). By combining both local and context information, the discussion of results will be an attempt to shed light on the question of *How green 'Green Cities' are?*

Drawing from a sample of 53 cities across the world, LSE Cities/ICLEI (2012) conclude that "*cities report substantial progress in achieving green objectives related to recycling, green space and water pollution... resource efficiency, energy security and air pollution are more challenging*". On the other hand, the same study also pointed out that "*cities in high-income countries report more success in achieving green outcomes, and tend to make greater use of environmental indicators to measure progress*" (LSE Cities/ICLEI, 2012). In turn, the UEE report (Ambientalia, 2007) issued specific concerns for air pollution, as -despite legally binding

[31] Certain experiences from the Spanish context will be highlighted, as these were included in the International Summer School on the Environment 2011 coordinated by PhD Castñaner, M. and Nuss, S., under the title of "Sustainable Development Governability at Local Level", and organized by the Institute of the Environment of the University of Girona. Access to the full program: http://www.udg.edu/jornades/ISSE/Programa/tabid/17337/language/ca-ES/Default.aspx

Table 30.
Summary of compared field work results.

	Almada	***Jerusalem***	**Girona**	**Bologna**	**Turku**	***Arendal***
$tCO_{2e}pc$ / TREND	3.1 / decreasing	3.3 / growth expected	7.2 / decreasing	6.11 / decreasing	9.4 / decreasing	3.57 / decreasing
SUST. POL-INST	19/23	7/23	17/23	18/23	13/23	13/23
CC Target 2020	-22% vs. 2006	-20% vs. 2007	-25% vs. 1990*	-7% vs. 1990	-30% vs. 1990	2025:-25%('90)
CCP phase	M4'06 RV'11	M2'12	M3'11 RV'12	M4'12	M5'09-RV'09	M2'08(GOV)
LA21	2006 RV'12	2008 Adapted	2004 Obsolete	1999 Obsolete	RV'05	Died out
Green Development Initiatives	*Almada+ Str.* + CAP 10 year SD Str. Sust. Mob. (light rail) Green Infr. Planning AGENEAL + SEAP Master Plan + Riverfront Clim. Adaptation Plan	SEAP Green Pilgrimage & Kidron Valley Project Sust. Mob. (light rail) Community Planning Green Infr. Planning Community Gardens	SEAP (*:review to *Zero Emissions Adm.*) *Smartcity* concept Green Energy Supply Bottom-up Cooperation Mobility Plan 2013 Clim. Adap. Plan'13	Regional GE Str. SEAP + Region. En. Plan Sust. Mobility Urban Requalification + Green housing progr. Master Plan Clim. Adaptation Plan	PAES+*Sust. Turku Str.* ecoBudget® Green Procurement Circular Economy Transport Oriented Pl. Eco+Smart City PPP Building Retrofit	Climate Neutral City Climate Partners Netw. Green Energy Supply Master Plan (MP) GRID + Green Business Transition Assistance *Green Incubator*
Ind. Climate-Energy	Low	Low	Medium	Medium	High	Low
Ind. Mobility	Medium	Low	High	Medium	Medium	High
Ind. Waste-Water	High + Medium	Low + High	Medium	Medium	Medium	Low + High
Climate Change (CC) / Development Challenges	Hydrological risks Legal reforms of LGs ES & TR in hands of national authorities	No national framework Growth of the detached home lifestyle Social/poverty issues Nat. control of ES & TR	GHG from BU-TR Skepticism Economic Climate	Air Pollution GHG from BU-TR Youth unemployment	Sprawl - TR - BU Outsourcing ES CC local benefits Conservative Soc. Unattractive City	Sea level + storms High Energy Use Sprawl Skepticism
CC-D Capacities	*Almada+:Sustainable Solidary & Ecoefficient* Planning skills Track record Innovative LG AGENEAL	Compact Planning Green Belt-LAB Education Political Commitment	Skilled Staff Active Energy sector Strong sectors: commerce, tourism	PAES + Intern. Proj. EU policies Urban requalification. Public engagement Economic structure Green businesses	*Sustainable Turku Str.* Green Procurement in 100% tenders and ES Committed Staff Light Rail Plan Attractive Nat. Cap.	Densification in MP CPN Green Regulations Neutral LG *Green Incubator*
Performance CE	General Ranking (high to low): GSN, WW, NH, IND, TR, FP, R&S; EE, ES, BU					
Average Perf. CE	6.08	4.92	4.84	6.51	6.39	6.32
Top 2 Perf. CE	WW, GSN	GSN, WW	GSN, NH	FP, R&S	WW, GSN	GSN, WW
Low 2 Perf. CE	ES, FP	R&S, ES	ES, EE	TR, GSN	BU, IN	R&S, EE

Notes: GSN: Green Spaces & Nature; WW: Waste & Water; NH: Natural Hazards; IND: Industry; TR: Transport; FP: Food Products; R&S: Retail and Services; EE: Energy Efficiency; ES: Energy Supply; BU: Buildings
Source: Own data, from field work.

regulations- 45% of the cities suffered excess of PM_{10} in at least one monitoring station and 90% were very far from coping with the 2010 NO_2 threshold. Parallel outcomes from the 6 case studies will be discussed further below. In relation to air pollution, the developed study did not look at this topic in particular, yet opinions collected expressed, in particular, satisfaction with cleaner atmosphere after industrial shutdowns (AL, TU, AR) and sustainable mobility interventions (AL, JE, BO).

According to the results of environmental sustainability indicators the majority cities register positive progress in certain areas (Table 25); for per capita GHG emissions, waste generation, waste recycling, water use and wastewater treatment.

Going into detail, in climate and energy parameters per capita GHGs are decreasing in TU, AR, BO, AL and GI; in JE only one measure is available so far (Table 25). Few data about energy parameters was obtained (energy use per capita, share of RES in total energy and in electricity, installed RES capacity). **Given the EU-27 13% RES in gross final consumption in 2011** (Eurostat, 2014)**, it can be said that TU -16.1% RES- is on track to reach the 2020 target. In AR the RES share is admirably high -53.9% for gross final consumption and 100% for electricity-**. The other cities are still far behind; 5% BO, 3.9% GI; no data for AL and JE was obtained. **The only city in our sample reducing household electricity consumption is AR (-16.5% in 4 years).** In contrast, **the remainder cities with results for more than one year -AL, JE, TU- are increasing per capita use of electricity, expressing how economic growth and energy use are still coupled factors of development** (IEA, 2012). Even so, in these 3 cities electricity use is 1.6 (TU) to 5 (AL) times lower than in AR. Electricity has a significant weigh in the Norwegian energy system (please see the City Profile in Annex 1); something in common with other cold countries, such as Finland (TU: 9 MWhpc/yr). The UEE Report (Ambientalia, 2007) also found significant decline in electricity use in Oslo (-26% in 5 years), showing that electricity is a key target sector for EE in Norway.

Moving on to waste and water indicators (Table 25), **per capita waste moves on the 450-550 Kgpc/yr range, in line with the average of EU-27 (2010: 492 Kgpc/yr;** Eurostat, 2014**), except in AR where levels are already very low (2009: 361 Kgpc/yr), even compared to the average in Norway (2009: 470 Kgpc/yr).** It would be of great interest to the remainder cities to learn from AR's success, given that income per capita in Norway is exceptionally high, and in consequence there is a greater tendency to hyper-consumerism. On the other hand, **waste generation per capita is only falling in BO and GI. In spite of LG efforts, undoubtedly part of this reverting shape is related to the economic crisis initiated in 2007.** For the Catalan Government this more sustainable consumption trend will continue regardless of an improved economic climate, as the crisis has retrieved the culture of local products, "DIY", repairs, etc. (TES, 2014). Actually, following falling waste stats in Catalonia, there's been a revision and downsizing of the treatment infrastructures planned for the 2014-2020 period (TES, 2014). **Recycling has increased to a remarkable level in GI, BO and TU (2010-2011: 35-40%) and is very high in AR (2009: 60%). Levels in AL and JE are lower (2009-2010: 10%), but growing.** As of

the UEE report (Ambientalia, 2007), likewise the explored cases, waste production was growing almost in every city and per capita generations moved in the range of 400-700 kgpc/yr; only Dresden had curved the trend and showed a low level of per capita waste -334 kgpc/yr-. Not differentiated waste was below 250 Kgpc/year in Munchen and Antwerp thanks to separate collection, a practice reaching up to 62% in Aalborg and 50% in Helsinki.

Household water demand is below 200 Lpc/day and decreasing in all cities but AR (Table 25). Even so, only JE with 111 Lpc/day is close to break the <100 Lpc/day found in Dresden and Heidelberg (Ambientalia, 2007). Secondary wastewater treatment reaches 100% in all cities but JE (50%), yet nutrient extraction takes place everywhere except in AR. The UEE report shows 100% of inhabitants served by water treatment in the studied cities. In order to compare at European scale, surprisingly EUROSTAT (2014) is a deficient source; no register about household or total daily water demand is available. And national time series on population percentage served by wastewater treatment are broken and very uneven -from 2% in Iceland (2005) to 95% in Germany (2007)-. It appears, in comparison, that the studied sample is on the right direction in water use, except for AR in household demand and JE in terms of wastewater treatment, yet with a new facility on its way.

In mobility, according to the UEE "*car users are invading cities, but local policies could succeed*" (Ambientalia, 2007). By enhancing modal split for home-to-work transport, success stories make the case, as for instance 58% of population in Prague moving on public transport, or Aalborg and Arhus with 20% and Copenhagen with 29% of mobility by bicycle. **Within the 6 visited cities, motorization index is only decreasing in BO (Table 25). Still, a lower value may be found in TU (459), yet increasing; and in JE, which holds the minimum level of motorization, with below half that of TU. GI (632) and AR (557) suffer higher motorization degrees and increasing;** no data was obtained from AL. The share of GHG emissions from traffic is high in GI and AR (≥40%) in correspondence to a very low use of PT (4% and 3.3% respectively). In the remainder cases the range of GHGs from traffic moves between 17% JE and 31.5% in AL (27% TU, 21.9% BO). The proportion of PT use in these cities is much higher: 17% TU, 25% BO and 30% AL (no data from JE). Decreasing motorization index in BO is combined with double the daily users of PT per 1,000 inhabitants compared to TU, and 5 or 6 times those of GI or AL. In effect, the Italian city offers a wide variety of transport alternatives: 184 shared bikes, 40 shared cars, 186 biodiesel buses, 68 electric trolleybuses, and regional train services.

The integration of SDIs in a subjective 'low-medium-high' scale of environmental impact (Table 31), helps understand how complex it is to determine *How green is a 'Green City'*. All cities show impact degrees on the 3 categories. Hence, despite necessary and educational, measurement methods may induce misinterpretations; between cities and between cities and countries. Relating numbers to known facts and to the socioeconomic, cultural and political background, allows to better analyze results. For instance, JE is mostly on the low impact division as a consequence of lower economic prosperity. However, it also falls on the high impact class; because the city is still catching-up in several urban environmental policies, such as wastewater treatment.

Table 31.
Study cases on a 'low-medium-high' impact scale.

Indicator Block	Low Impact	Medium Impact	High Impact
Climate and Energy	AL, JE, AR	GI, BO, TU	AL, JE, GI, BO, TU
Description	*AL, JE, AR: Low GHG* *AL, JE: Low En. use* *AR: Very High % RES*	*GI, BO: Fair Energy use* *TU: OK % RES*	*GI, BO, TU: High GHG* *AL, JE, GI, BO: Low RES* *TU: High Energy Use*
Mobility	JE	AL, BO, TU	GI, AR
Description	*Low Motorization* *Low Transport GHG*	*Fair Transport GHG* *High PT Use* *High Motorization*	*High Transport GHG* *Low PT Use* *Very High Motorizat.*
Waste and Water	JE, AR	AL, GI, BO, TU	AL, JE, AR
Description	*JE: Low Water use* *AR: Low Waste & High Recycling*	*Fair & Decreasing Waste / OK Recycling* *Fairly Low Water Use*	*JE, AL: Low Recyc.* *AR: High Water Use*

Source: Own data, based on environmental indicators of the study cases.

Building on this combined approach between numeric values and qualitative data from the visits, the next section tackles the 'green city' profile of the case studies from the low-carbon perspective. McCormick et al. 2013 states *"despite increased awareness of the urgency to respond to climate change and to promote sustainable development, there are few powerful initiatives that are decisively shifting urban development in a sustainable, resilient and low-carbon direction"*. Revolving on the track records of the 6 visited cities there are elements suggesting some of them may belong to McCormick's 'powerful initiatives', at present times, or in the near future. Regardless, one true fact -as already said- is that per capita carbon emissions are declining in all cities where more than one measure is available. At the continental level, the GHG emission reductions observed in Europe over the last two decades are a combined result of the economic restructuring that occurred mainly in Eastern Europe in the 1990s, and the policies and measures implemented by the EU, such as the ETS (EEA, 2014). Furthermore, many countries are registering sudden falls in energy demand and GHG emissions due the crisis (Eurostat, 2014). Nuss et al. (2014) argues that **most of the EU CoM -20% GHG target may be reached through top-down eco-efficient cumulative change in the vehicle and energy industries, combined with economic climate factors, leaving little room for local level breakthroughs. This "effortless" achievement of climate targets might feed to the same pile cities with ambitious plans and policies and determined leaders, with those just "going with the flow"; generating, at last, certain confusion on what is the nature of 'low-carbon' development.**

Cold numbers declare AR the most successful city in the sample. Between 1995 and 2009 GHG emissions were cut by 47%, and current level -3.57 tCO_{2e}pc- is half the European average -7 tCO_{2e}pc (LSE Cities, 2013)- and 1/3 the Norwegian level -10.7 tCO_{2e}pc (EEA, 2012)-. AR is close to the 2.4 tCO_{2e}pc (approximately) derived from

the EU 2050 Low Carbon Roadmap, which targets to -80% GHG emissions compared to 1990 following the IPCC's (2007) recommendations. **However, Agder Region is one of Norway's biggest producers of hydroelectric power (Agder Region, 2010) and since 2005 100% of electricity in AR is supplied from this RES source** -supported by smaller local energy plants-. Hydropower feeds both electric devices and heating and cooling systems, explaining such low-carbon footprint in AR. Hence, **it cannot be ignored that fruit of a favorable context success in fighting GHG emissions in AR is "complete". In consequence, bottom-up efforts could be considered to a certain extent complementary, but not fully essential. Or, is it just the opposite? Given that AR's energy system is already on track, for a credible 'Green City' profile it is imperative to establish local action contributing to an effective dissemination of the low-carbon society; one in which all sectors get involved. And this is the outstanding approach of the Climate Partners Network, in the sense that it brings together all kinds of economic agents under the mission of abating emissions.** Moreover, thanks to a purposive and procedure based membership, CPN poses economic offsets for unmitigated GHG from subscriber organizations, facilitating the translation of the local-global link of climate change into transformative action elsewhere, when it is not possible domestically.

AL and JE with per capita GHG in line with AR (3.1 and 3.3. tCO_{2e}pc respectively) somehow represent the opposite extreme to the latter. In both cities the economy is the relevant driver for low-carbon outputs. JE proofs that in absence of heavy industry, poverty and low household incomes keep emissions down. **Due to 55% unemployed workforce for religious / cultural reasons** (Jewish orthodox men and Muslim women in a 50-50 proportion approximately), **JE's per capita GHG emissions are 1/3 of Israel's average 9.3 tCO_{2e}pc in 2010** (World Bank, 2014). **Given the country's accelerated economic growth (**+4% annual growth rates for the whole 2004-2012 period, except in 2009 -0.8%- and 2012 -3.4%-; World Bank, 2014) **emissions are on the rise** (per capita and total)**. And so will be the case in JE, given that it is the country's poorest city (SLDM; RE) and, therefore, where major population lift from poverty may take place the next years to come. GHG emissions will furthermore grow considering Israel's energy and transport sectors are strongly centralized**, and the administrative structure has only two -national and local-. **Israel is energetically isolated** due to the long-lasting conflict with surrounding Arab nations. As a result, **plans for the decade are to develop domestic offshore shale gas and revert the country's 100% dependency on imports** (RE). Potential growth of RES sources will be minimal (RE). In this context "*Jerusalem cannot even discuss procurement of RES certified energy*" (LGEM). As detected by ICLEI/LSE Cities (2012), out of a global survey on 'Green Cities', 60% reported that *"national policy frameworks fall short of supporting the city's green agenda"*. **In this overall context, JE's commitment to decouple GHG emissions 20% from economic growth by 2020 is already a remarkable goal**, and, as reported, there is still room for local action (Table 20; SLDM; RE).

For AL the situation is a bit parallel to JE. Portugal is also very centralized, with energy and transports under national control and the same **only 2 levels of public administration** found in Israel, despite "*over the paper, the country is organized in regional units in order to access European funds*" (LGEM). Differing from Jerusalem though, socioeconomic context of AL appears to be more similar to that of Portugal in general; per capita GHG emissions for the city and the country remain closer -3.1 (AGENEAL, 2007) and 5.6 (World Bank, 2014) respectively in 2006-. On the other hand, **Portugal is currently undergoing strict structural reforms in return for the EU's economic bailout. Number** (from today's 308), **structure and competencies of Municipalities will be reduced**; and regions are expected to gain administrative and political structure and power, "*but not under democratically elected processes; instead, by direct designation of the central government*" (LGEM). In a city such as AL, with a long track record of forerunning in sustainable development (Table 23), **uncertainty is arising over the LG's capacity to continue the green transition** initiated in the 1980s. **So far**, however, in contrast to Israel, **concurrence of recession and State energy policies are curving GHG emissions**, at both the national and the local scales. Portugal's progress on RES is noticeable, representing more than 40% of the electricity and near to 25% of final energy consumption at the end of 2011 (EEA, 2012). By 2020 exterior energy dependence should decline to 74% according to the National Energy Strategy (2010), raising the overall share of RES to 31% and increasing EE in order to obtain a 20% decrease in final energy demand. The National Reform Programs (NRP) may induce new developments representing drawbacks in Portugal's energy policy, but so far the national and local scales are aligned towards de-carbonization.

GI and AL share national economic recession as driver for declining GHG emissions. Sudden abatement of 19% GHG took place in Spain in 4 years since the maximum of 2007 (EEA, 2012). In turn, total energy demand fell 12% between 2006 and 2012 (EUROSTAT, 2014). **But lower CO_{2e} emissions are happening together with important suffering, in form of more poverty** (+8% 2008-2011; EUROSTAT, 2014) **and unemployment** (>27% in 2013; EUROSTAT, 2014). Structural reforms induced from rescuing the financial and banking system are ongoing, led by the conservative central government in power since 2011. **Under the argument of cutting public deficit, reforms include dismantling of prior energy policies supporting RES.** Stimulus programs had allowed RES to grow substantially in installed capacity throughout the decade of the 2000s. By 2011, retroactive cuts on feed-in tariffs for solar PV were applied (CPT, 2012), followed by their suppression for any new RES facility in 2012 (Royal Decree-Law 1/2012) and total suppression of RES tariffs in 2013 (Royal Decree-Law 9/2013). Even so, RES continued to grow in generation and have diverted fossil sources such as coal and gas, thanks to the competitiveness of wind power, biomass or mini-hydroelectric (LEITAT, 2013). By the end of 2011 electricity from RES represented 33% of net generation (LEITAT, 2013); a share which increased to a remarkable 47.8% in 2013 (REE, 2014).

GI is not alien to the crisis-response political scenario just expressed. The 2003-2011 period the city pulled and allocated €8 million in RES and EE investments (Nuss, Llausas, Figueras and Morera, 2014). However, **as it occurred at country level, the political turnover in 2011's local elections brought a conservative approach to energy and sustainability issues.** Under the argument of rationality in public expenditure due to the economic crisis, *"investments in RES were slowed down"* (LGTE), shoulder-to-shoulder with full stop of other environmental programs, such as awareness raising campaigns and land stewardship agreements (Table 22). Furthermore, **cost intensity of structural low-carbon actions drove to freeze and review the 2011 SEAP.** This undesirable development was followed by a change in sustainable resource use patterns. **Energy use in LG operations grew in 2012 after a declining trend since 2008**, **as well as use of water in LG services and facilities** (Municipality of Girona, 2013). Parallel reduction in separate waste collection was reported as well, but it may be linked to other factors, as it is likewise happening at the regional scale of Catalonia (ARC, 2013); e.g.: informal collection of certain materials (cardboard, metals, etc.) from containers, by population sectors under poverty conditions. Even so, **new City Government programs such as the new urban Mobility Plan and the Climate Adaptation Plan are giving continuity to the green development agenda.**

Following the case by case discussion displayed so far, it would be the turn to zoom into BO and TU. Given that both cases are particularly interesting for the conclusive part of the present section, they will be reflected upon further on, yet specific comments will be integrated in the next paragraphs.

Parallel to per capita GHG and the overarching context, the development stage of local climate action plans is an additional source of assessment of the cities' 'Green City' profile. Using the 5 milestones of ICLEI's Cities for Climate Protection framework (Table 26) offers a simplified approach to local climate strategies. CCP was initiated in 1993 and could be seen as the methodological base of the current CoM. **According to the current status of the local climate strategies of the studied cities, three cities -AL, BO, TU- show longer experience in implementing climate policies. From them, AL and TU have completed one full CCP cycle, including reporting of results from prior plans** (-14% GHG AL vs. 2001; -16% GHG TU vs. 1990). After the adoption of CoM both cities set goals by 2020 building upon prior success: TU -30% GHG compared to 1990; AL -22% compared to 2006. BO is a forerunner as well. It joined CCP in 1993 and began climate action as early as 1995. Even so, emissions went up until the last measurement (Table 25). In response to this undesirable trend, BO's Local Energy Plan of 2007 established a -7% GHG target compared to 1990. In 2010, the adaption of this plan to a CoM SEAP kept the goal, which translates to -20% GHG compared to 2005. Unfortunately, the SEAP was sitting on the desk for at least 2 years, after the city's political crisis (section 4.1.1). The remainder 3 cities have shorter records in terms of strategies to tackle climate change and energy sustainability (Table 26), regardless that specific actions are ongoing since half the decade of the 2000s at least (Tables 19, 20 and 22).

In combination to climate action plans, other energy and climate instruments are worth mentioning. **Comprehensive Climate Adaption Plans and the assessment of climate change impacts are rare so far (only in BO); partial developments exist in AL, GI and AR.** An energy efficiency map of the built-up stock -reproducing an ongoing initiative in the 'Green City' of Freiburg (interview to LGEM of Freiburg; unpublished)- only exists in BO, despite the enormous value for planning climate action in the city of GIS based cartography displaying where inefficiency from buildings is more or less critical. Top-down regulations have steered local bylaws on EE & RES standards for new and renovated buildings. For the EU cities, except for TU, Directive 2002/91/CE induced EE & RES regulations at national and local levels. Still, **only AL and BO have enacted stronger EE requirements in housing compared to the national legislation.** New standards aiming at passive house buildings by 2020 from Directive 2010/31/CE (replacing the prior one) are yet to be developed. In AR, a national code following the track set up by the EU is in force since 2007, including a passive house standard horizon as well. JE is lacking green building regulations in correspondence to the absence of a national regulatory framework. **For all 6 cities, EE of private buildings is a major conflict / challenge to address, together with mobility**, according to the C/P workshops (Annex 1). Half of the cities (17/32) of Ambientalia's exploration in 2007 had some type of EE standard for private buildings. EE instruments (audits, plans, etc.) for public buildings are present in all 6 case studies but JE. Indeed, the majority of cities engaged in climate action account for this type of instruments (Ambientalia 2007; LSE Cities/ICLEI, 2012; LSE Cities, 2013). In BO and TU yearly budgets allocate funds to EE retrofitting of the public stock. As reported in the interviews (Clim Amb.-AR, LGEM-AL, LGTE-BO), **through the implementation of EE and RES solutions in its own facilities and services, LGs have learned a lot about the energy topic.** Besides, the exemplary role of LGs increases arguments for asking the local community and stakeholders to contribute.

As the next examples will show, **each city expands its low-carbon approach with additional specific tools and solutions**; very interesting from the practical point of view (Table 24). For instance, the Energy Assessment of Planning tool incorporated by AL in the new Master Plan of 2012 is an exceptional resource that no other city in the sample accounts for. As earlier described, this decision making support tool studies development plans according energy efficiency pathways. Regarding mobility, instruments to support electric and alternative vehicles are scarce in general. Even so, BO's measures have had a significant impact already; 15% of cars have methane or GLP engines thanks to substitution subsidies, a trend now arriving to scooters (electric instead of combustion). Noticeably, public procurement of certified green energy is already present in 3 of the cities (TU, GI and AR) and 2 other (AL and JE) can't put into practice due to state controlled energy supply. Planning

and management of the energy system is approached with the support of a majorly public multi-utility in BO (Hera) and a multi-stakeholder body in AL (the local energy agency AGENEAL). Local climate funds (AL, BO, AR) compensate economically unmitigated emissions from the LG (AL) and additionally from private organizations and industries (BO, AR). **Master plans either under revision (AR, AL, BO, JE and TU) or enacted (GI) are focusing on several low-carbon aspects: increasing densification and pedestrianization (BO, GI, TU), establishing green infrastructure networks and green rings (AL, JE, GI, BO, TU, AR), requalification of 'brown' fields into eco-districts (AL, BO, TU) and/or transport oriented planning (AL, JE, BO, TU), biodiversity and ecosystem services' resilience planning (AL, JE). The metropolitan scale is also becoming a framework for low-carbon planning (BO).**

Energy security is a complex issue for local governments, especially if it is to be achieved from RES. Even so, cities that define themselves as 'green' report more success than others in addressing this challenge (LSE Cities/ICLEI, 2012). For instance Stockholm that started to examine alternative energy sources and energy management in the 1970s (LSE Cities, 2013). **The studied cities are still far** from Stockholm's record (please see section 1.5), **except for AR as already mentioned** (100% regional hydropower based electricity supply for power and heating). Both BO and TU share with AR RES fueled DH, but for a much lower area of service. Actually, in BO only 5% of the residents use this heating system and not of all it comes from RES. Still, electricity from these combined heat and power plants and a local wind farm are pushing green electricity up in the mix. In TU the aim is to increase RES supplied DH up to 50% of the network by 2020, something that would be a big step forward in terms of both energy security and carbon emissions abatement. On the other hand, a new and larger multi-fuel CHP installation will expand local energy generation, but complaints are emerging due to the higher amount of fossil fuels it will use and from outsourcing to a private company (the major investor) a power plant owned by the municipality until now. Subsidies for efficient geothermal and electric heat pumps are also available for the public. In the remainder 3 cities -AL, GI, JE- DH technologies are still inexistent. From the latter 3, only GI explored its introduction in a pilot eco-district plan, but the natural gas lobby pressed and succeeded in stopping it; furthermore, the development plan never passed the urbanization phase since the crisis began in Spain. An attempt to initiate an energy security model was also approached through the SEAP with the proposal of a multi-technologies waste-to-energy compound (using organic waste, biomass from forest and parks, sludge, waste incineration) but it was dismissed after financial cuts at the Catalan level and political decisions by the government in power in the city since 2011. Nevertheless, other measures contemplated in the CoM's plan have been undertaken, such as retrofitting 1 small hydroelectricity plant and energy monitoring systems in public buildings. In AL, the local energy agency AGENEAL is working with different stakeholders to increase the city's management capacity on energy, quite limited as in Jerusalem due the central government's control over the energy system. Notwithstanding, both cities generate energy from sewage digestion and specific projects on PV are spreading and showcasing the cities' interest in taking an active role on energy provision.

Side by side to specific instruments and activities, GHG emission inventories are necessary in order to shape the local low-carbon trajectory. As the 6 cases show (Table 27) deployed inventory methods are heterogeneous, bringing about remarkable differences even at this starting stage of climate action planning. Four inventories -AL, JE, GI, BO-have built data systems that segregate LG and community emissions. AR doesn't measure community emissions as, so far, its focus is on Municipality resources and services. TU, in spite of a CoM city, does not account for GHG related to government operations, and these come included in the electricity and heating carbon accounts. One great value of the CoM (2008) is providing a common method to calculate and monitor local GHG emissions, even though the framework for the SEAPs is flexible, allowing signatories to choose their own approach to address territorial specificities (EU, 2010). Thanks to this, there are currently more than 5,000 CoM signatories (CoM, 2014). Notwithstanding the prior remark, TU's 20 years of experience in GHG monitoring and climate planning explain its own consolidated method.

In general emissions from LG operations are below 5.5% of the total, except in JE -+11%; due to low consumption (and low income) patterns of the citizenship-. Thus, the fact is that actions on the Municipality's facilities and services will have a limited effect on the overall goal of creating low-carbon cities; e.g. more efficient street lighting, traffic lights, RES for SHW in sports facilities, RES for heating in schools and service headquarters, electric fleet, etc. All these measures may reduce the LG's 5.5% (or lower) share of GHG, but the cumulative impact will be small. **Nevertheless, actions on LG facilities and services are educational and motivational levers** for the citizenship and the local stakeholders (UN-Habitat, 2011). **Furthermore, indirect reductions induced on community sectors may have a significant multiplier effect** (e.g. less private car use, thanks to better public transport).

From the emissions sectors 3 clearly call for the strongest decarbonization efforts: residential; commercial; and transport (Table 27). These add up between 70% to more than 90% of total urban GHG discharges, due to: an inefficient building stock that uses inefficient heating and electricity technologies; carbon intensive energy production; and transport fuels combined with the current individual mobility culture. Actually, buildings and transports still mount to 35.6% of total GHG releases at the EU level, despite significant falls in CO_{2e} from energy use in the residential and commercial domains (-12.2%) and from energy generation (-9.3%) between 1990 and 2008 (EEA, 2010). On the other hand, transport derived CO_{2e} grew 23.6% in the same period, reaching almost 20% of total emissions (excluding international aviation and shipping; EEA, 2010). Obviously, **the potential to abate**

emissions in energy production and in vehicle technologies is beyond the direct sphere of influence of the LGs. In this case, only the national and international authorities can really push changes through mandatory depletion targets and regulations (WI, 2009). Accordingly, the EU has enacted Directives in a variety of GHG emitting fields, reason why the interviews (Chapter 6 and Annex 1) collect that the EU is shaping the low-carbon agenda for many countries, even in non-member States[32]. **Potential action from LGs is however possible and affordable in the buildings, energy supply and transports sectors, together with waste treatment. These are the "*low hanging fruits*" according to ICLEI (2010a), because these sectors "*yield long-term returns even without their participation in carbon markets*" (ICLEI, 2010a).** For instance, through planning; interventions in mobility management; strict building regulations; or by implementing an RES supplied DH network (Tables 18-23). Not surprisingly, reproducing the findings from this research, cities from all over the world and representing a range of population sizes and a variety of income levels, point to urban transport, buildings and energy as key sectors for green economic growth (LSE Cities/ICLEI 2012).

Moving on with the analysis of results, the next comments will address stakeholder perception about performance of the cities in climate and energy. As aforementioned, responses to this exercise are anonymous.

As revealed through the case studies, **low-carbon transitions of cities require a multi-sector and multi-level approach.** Indeed, interventions to reduce carbon intensity deal with planning, mobility, energy, etc. and usually involve a variety of administrations and socioeconomic agents. Interviews with local stakeholders about performance in climate and energy sectors contribute to confront 'if' and 'how' LG and community efforts are effectively acknowledged (Table 29 and Figure 3). Of course, results are strongly conditioned to the number of questionnaires completed in each city (8.6 on average; table 28) and the distribution of responses among to the 4 green economy stakeholders targeted. These are issues that should be approached differently in further research in order to increase robustness of results.

According to the interviews, local climate and energy sectors rank from best to worst as follows (Table 29, figure 4): 'Green Spaces & Nature'; 'Waste & Water'; 'Natural Hazards'; 'Industry'; 'Transport'; 'Food Products'; 'Retail & Services'; 'Energy Efficiency'; 'Energy Supply'; and 'Buildings'. The first impression is that results follow a logical structure. **Positive values, high number of responses and low standard deviations** (Table 28) **refer to sectors with long-term accumulation of expertise by local authorities: 'Green Spaces & Nature' (1st); 'Water & Waste' (2nd). Intermediate sectors (4th-7th) address third party sectors, ergo, sectors not so directly dependent on LG action: 'Industry'; 'Food Products'; 'Retail & Services'.** In a logical correlation to knowledge dissemination, for the prior sectors number of answers is less (Table 18) (standard deviation is more varied in these cases). **Negative values (8th-10th)**, in turn, **go to sectors for which the public sector has strong responsibility, but of more recent inclusion in SD agendas; 'Energy Efficiency'; 'Energy Supply'; 'Buildings'.** Here, number of responses increase again. The only 2 sectors breaking this overall pattern are 'Natural Hazards' (3rd) and 'Transports' (5th); detailed analysis will provide insight on this situation.

From the perspective of the cities, 4 cities (BO, TU, AR, AL) perform better than the overall average -5.84-, whereas 2 fall below this mark (JE, GI); furthermore, the latter two obtain on average less than 5 points. The 3 wealthiest cities rank 1st, 2nd and 3rd, whereas the 3 '*poorer*' occupy the bottom 3 positions. **What emerges from the distribution of cities is a clear correlation between income and sustainable performance**, reproducing perfectly what has been described in the literature (LSE Cities, 2103). Fortunately, the ranking does not correlate directly highest income to the best performance, nor lowest income to the last position. Hence, it is necessary to discuss the cities' track record and current developments in order to explain results.

As of the exercise, BO and TU, not only are 1st and 2nd, but also the only 2 cities with approval scores (≥5) for all 10 sectors. Is this indicating that the these 2 cities hold the most mature and complex 'Green City' models? In contrast, JE and GI fail to reach the minimum level of satisfaction -5- in their performance in sectors linked to climate and energy. Not surprisingly, JE and Gi correspond to: a) JE the city with more endogenous poverty; and b) GI, the study case from the country suffering worse economic collapse (since 2007) within the sample.

The relationship income-performance reappears for 2 sectors in particular, namely 'Energy Supply' and 'Buildings', for which positive marks -5 or more- only happen in the 3 wealthiest cities. Thus, the presence and deployment of resources for sustainable means of energy provision and energy efficient housing, appear as an affordable step for those cities with more and long-lasting prosperity. Climate planning is expected to bring the remaining cities on board these fields of action, but economic constraints will obviously be an important limitation.

Two cities -BO and AR- concentrate top scores for all sectors but 'Transports' that reaches its peak in AL. Within BO and AR its interesting that the latter is not 2nd in the city ranking, but 3rd. And that the 2nd best performing city, TU, is not the most outstanding in any sector. Lowest performances for 9 sectors are also concentrated. In this case on the two less 'sustainable' cities, GI and JE. Just 'Green Spaces & Nature', the best performing sector of all (7.38 on average) falls in another city, and it is surprisingly BO, the 1st in the overall ranking of cities.

1st and 2nd positions on the city ranking also correspond to the lowest standard deviations; 0.57 BO and 0.69 TU. This means that opinions from respondees were more similar, therefore indicating that knowledge and

[32] Some carbon emitting areas legislated at EU level are: emission standards for vehicles; waste disposal, recycling and incineration; EE of buildings; the ETS industrial carbon market; RES; or the EU 2020 climate and energy national targets.

perception about the city's SD must be closer to factual reality. In effect, these two cities share a long track record of commitment to low-carbon development (BO: 1995; TU: 1990; Table 27), translated into a 'medium' environmental impact status for all 3 areas in Table 31, and relevant progress for different environmental sustainability indicators (Table 25). An array of structural actions shows that sustainable urban transformation of BO and TU is ongoing; e.g. district heating; energy recovery from waste; alternative fueled buses, buildings energy retrofitting programs, brown-to-green developments; electric public transport (BO); etc. AR, 3rd in the city ranking, combines its high scores to a more recent engagement in climate action (2007), leading to increased variability of responses (2nd highest standard deviation in the sample; 1.41). This may explain why AR is below BO and TU despite the city's excellent results in GHG and RES. **It appears, therefore, that history and scope of carbon abatement actions make a difference regarding perception of sustainable performance.** On the other hand, **the 3 best cities follow an order from bigger to smaller in population size.** So, not only economy and history matter, but also dimension of the city in terms population. In effect, scale as a proxy to intensity of use is often relevant in order to pay off certain investments, such as waste-to-energy facilities, district heating networks, or light rail systems (TRARGISA, 2006; Sala, J. 2009; TES, 2014). **Regarding the low scoring cities, JE accounts for the 3rd lowest standard deviation (0.83), whereas GI (1.68) for the highest in whole sample. Hence, there is a correlation of a steady socioeconomic situation (long-lasting broad-spread distress in JE) to more consensus on the city's sustainable performance; low in this case. And the contrary, a sudden and extreme change, such as the Spanish economic crisis, drives to more volatility of opinions. AL's track record is likewise correlated to better results from our exercise.** In spite of falling to the 4th position, AL belongs to the group of cities with a positive average score: 6.08 (Table 29). In AL, the city in the country with the lowest GDPpc, this has not been synonym of failure in sustainable performance. On the contrary, steady efforts for decades return with an average mark only 0.5 points away from the leading city (BO).

Only 3 sectors share in all cities average performance over the minimum acceptability level -5-, namely: 'Green Spaces & Nature'; 'Waste & Water'; and 'Natural Hazards'. The first two are very basic areas of urban environmental planning and management, with a long-term tradition in LGs (1970s at least), and thereby with expertise and observable results (Table 16). Two sectors to which LGs allocate significant resources, originally for a basic purpose of sanitation, street care and urban amenity, but nowadays because they are key to *glocal* sustainable development (EEA, 2010; LSE Cities/ICLEI, 2012; LSE Cities, 2013). For 'Natural Hazards' respondents focused more on the perceived risk than on planning and prevention, or climate induced risk. Ergo, good scores relate to the absence of catastrophic events, at least in the time span used by respondees to express their opinions.

'Green Spaces & Nature' is the best scoring sector out of the 10. It is interesting because this sector expands beyond LG domain and operations. Actually, the natural wilderness itself was one of the core aspects highlighted by the local stakeholders (Annex 1). Respondees from all 6 cities referred to the beauty, quality, amount and/or level of protection of the natural capital, showing the inherent value of nature (through ecosystem and cultural services) for the quality of life of city dwellers from any origin. The extent and good care of urban green spaces, parks and allotments were positively evaluated too (JE, GI, BO, TU). As well as the planning tasks (AL, JE, GI), in order to mitigate threats and pressure derived from investors wanting to build on green spaces, within the urban or in detached natural or crop land (JE, BO, TU, AR). Enhancement and development of the natural network were cited for climate adaptation and mitigation, and for ecological connectivity (AL, JE, GI). A weak offer of parks in the city center was common to BO and AL; the high costs of management were also mentioned (BO). 'Green Spaces & Nature' is the best sector in JE, GI and AR, 2nd in AL and TU, and 7th in BO. The fact that top scores go to 'Green Spaces % Nature', and that an important share of the latter includes the wilderness, an inherent element of the territory, may also be read as a defeat of the remainder sectors, which are, in turn, much more dependent on institutional and human intervention.

'Waste & Water' place 2nd on the overall ranking. Green efforts in these two traditional fields of urban sustainability have been ongoing for decades; from services and equipments, to educators and communication campaigns. **Noticeably, not only these obtain the expected results from environmental indicators (Table 25) but also from the perception of stakeholders.** Respondees appreciated fully developed wastewater treatment -with the exception of JE (50% raw sewage dumped) yet plans for a new facility are encouraging- and sludge digestion for energy recovery. AL's 100% sewage treatment is unique in the metropolitan area of Lisbon. In TU, high performance was also associated to the new treatment plant including generation of heat and cold and seen as the most advanced in the country. The good quality of the water was mentioned in AL, BO, TU and AR, with an additional complaint on the bad quality of natural streams raised in BO. The efficiency (AL) or not (GI and BO) of the network was cited as well; including a non-operating separate rain / sewage network in GI. The unsuitability of the network for extreme weather was mentioned in AR, as well as high availability of the resource and derived lack of awareness and saving practices (AR). Oppositely, a declining demand was relevant in BO and TU (and more cities according to the indicators; Table 25)-. Waste collection and treatment received best comments in BO, TU and AR, in accordance to high rates of separate collection and recycling (Table 25), and energy generation through incineration. In the Finish and Italian cases, the operation of landfills was criticized. In GI, infrastructures and services were seen as obsolete and needing change. In AL and JE separate collection and recycling requiring improvement were compensated by good collection services. Plans for a new treatment facility in Israel received the approval of respondees. Actually, despite Israel is already on the high-income category of the World Bank (2014), the

socioeconomic singularity of JE expresses the environmental problems that cities in middle- and low-income countries face more generally: water shortages, sewage treatment, over-crowding, informal land development, lack of infrastructure and insufficient public services (LSE Cities/ICLEI, 2012). Nevertheless, in summary, even with a large and diverse set of critical points to address, interviewees saw 'Waste & Water' as a sector positively progressing. This is also interesting because 'Waste & Water' are two areas of urban sustainability for which awareness raising has been very intense, therefore success also refers to community engagement and the emergence of a 'green culture'. On a city by city basis, 'Waste & Water' in 2nd in 3 out of 6 cases; in AL it is 1st; in GI 3rd; in BO 4th. The top mark is 7.6 in AL and AR, and the lowest 5.6 in Girona.

In LSE Cities/ICLEI (2012) cities identified as their most prominent green characteristics and assets 'green space, parks and natural landscapes' (55 times), followed by 'the transport system' (18 times), 'energy systems' (13 times) and 'waste management systems' (12 times). The research here presented included 10 sectors to grade, whereas in LSE Cities/ICLEI (2012) the aim was to define the top 3 aspects. Hence, results may not fully compare as methods in both enquiries are different. Even so, it seems no coincidence that two traditional sectors of urban management -'Green Spaces & Nature' and 'Waste'- lead in both quality rankings.

'Natural Hazards' is becoming more and more important as a local issue, due to potential disasters and extreme events induced by climate change and in pursue of social, economic and environmental stability. **Even so, in the visited cities a common perception was "absence of risk" in accordance to a null or very small track record of critical events**. Only the coastal cities of AR, TU and AL were actually worried about possible flooding events, either from sea level rise or storms; a frequent aspect of resilience planning LSE Cities/ICLEI (2012). In all 3 cases adaptive planning in under process (Table 15). In GI higher risk of droughts and forest fires were mentioned (as observed in the city's climate adaptation Plan). In contrast to the prior, in BO and JE hazards unrelated to climate change were expressed. Landslides and soil preservation in BO. In JE, earthquakes leading to particular construction measures, with poverty and access to adequate housing constituting the social dimension of the issue. After all, the conclusion in relation to 'Natural Hazards' is that **all 6 cities are still at the initial stages when considering the interaction of climate change and urban resilience**, with a lot of assessment yet to develop within a wider range of topics than the natural hazards registered in prior moments of history. Simultaneously, the trend of stability perceived by the interviewees led to positive marks as already said.

'Industry' is the 4th best performing sector according to the overall results. In several cities the explanation to this outcome came from the little amount of industry in general (AL, JE, GI), or from current absence of either heavy or energy intensive factories (AL, AR, TU) after closure and relocation. Therefore, **positive results are in part due to the lack of impacts derived from industry**; showing how these sort of economic activities still have an image of threat towards environmental quality of urban centers, and ultimately on people's sense of life satisfaction, particularly due to air pollutants (Silva, J., F. de Keulenaer and N. Johnstone, 2012; Gallup, 2010). As already said, **the extinction of certain industries in the 3 coastal cities (AL, TU, AR) drove to their transition towards knowledge intensive products and services. The carbon and pollution "leakage" of this shift would be object a whole other discussion** whatsoever. **Another aspect stressed by the respondees was the interest of big companies in becoming more efficient by economic reasons (GI, BO, TU, AR), due to environmental regulations (TU), and to innovation from growing environmental awareness and CSR programs (BO, TU, AR).** Thus, industries deliberately want to become more sustainable, also from the strategic perspective of business on the long run. Within the cities, 'Industry' ranks between 3rd (AL, BO), 5th (JE, GI) and 6th (AR, TU). In BO the good position relates to advanced SD programs (e.g. energy production in the agriculture sector), cutting-edge high-tech clusters (packaging, automotive) and instruments to facilitate eco-industrial districts. In contrast, the low rank in the other 2 wealthy cities (AR, TU) may deal with expectations of higher environmental standards in comparison to the remainder sectors, in spite of very remarkable green industry initiatives in both places (Chapter 4.1 and Annex 1)

'Transports' is 5th sector in order of performance. Most responders highlight their cities' steps towards a sustainable mobility and the quantity, quality and impact of public transport. **The 3 best scores -+6- are in AL, JE, and TU. These results do not seem casual. The first two cities recently inaugurated light rail systems,** with collateral benefits in many other areas, namely: air quality in the main urban corridors, redesign of the bus network, restoration of facades, streets and public spaces, pedestrianization and regulation of motorized traffic, etc. Ferrer-i-Carbonell and Gowdy (2007) concluded that there is a negative relationship between local environmental problems and life satisfaction. AL and JE express the opposite. The impact of the light rail is so transformative in a positive way, that an increased sense of pride and quality in relation to the urban environment is induced. LSE Cities (2013) refers to this process as *"the potential to lock in to physical infrastructure that induces changed mind-sets, behaviors and technological adoption and innovation is great"*. This explains, somehow, why **positive remarks to 'Transport' in TU likewise relate to the planning tasks for a future light rail.** There is range of other aspects positively valued, such as: buses and fleet running on electricity or alternative fuels (AR, BO, TU, AR) and the extent of the cycling network (AL, JE, TU), yet also requests for its expansion at metropolitan scale (AL). The 'Transports' sector is often the target of criticism. GI is the only city where transport fell below 5 -4.12-, in combination with opinions describing the mass transit systems as "*little*", "*inefficient*", with "*terrible timetables*" and "*badly connected to Barcelona and the Costa Brava*" (Annex 1). In contrast, one complaint raised in BO referred to the bad integration of the different public transport modes at regional level, yet the benefits of a single train-bus ticket

system were mentioned too. A demand for more service (in amount and frequency) was expressed in JE, arguing that a lot of people need buses in the city due conditions of poverty. References to the culture and abundance of private cars were common as well. For instance, in AR sustainable mobility was considered "*not a big focus*", because it is a small city with no car jams. Hence, promoting options besides the car must confront a "*mental problem*" (Annex 1). Even so, the LG was seen as going in the right direction. The dominant position of the car is also a problem in the regions around GI and BO due urban sprawl since the 1970s; a common complaint to all 6 cities as exposed in the C/P workshops.

Sustainable performance of 'Food products' - 6th sector in the ranking- addressed two main issues, as expressed by the interviewees: 1) food security and LG policy on food; and 2) the food market and public awareness. Regarding 'food security and LG policy on food' many opinions were critical to some extent. The lack of food security or assessment instruments at the local scale was cited in GI, TU and AL -here, food security was evaluated as possible for vegetables, yet under conventional production systems-. The absence of programs to support organic and local agriculture was brought up in JE and TU. In TU complaints were expressed toward the closure of school kitchens and outsourcing the catering service to a large private company only focusing on price. Positive references linking public sector and food products were made as well. For instance, AR has 1/2 worker promoting organic agriculture. Likewise, AL, JE and BO are developing vegetable allotments for the community. Last but not least, TU is implementing organic production in all publicly owned land. Regarding the 'food market and public awareness' comments were more positive in general. In first place, the fact that the citizenship's interest on food quality (Slow Food, 0Km, organic, organoleptic properties...) is rising together with the number of shops was to find it. Also, the expansion of markets with local, fresh and organic produce (AR, BO) and the recovery of the local agriculture (GI). In JE, in turn, one respondee referred to the city's access to a large variety of products from 50 to 70 Km. The significant social and economic impact of the sector was stressed in BO. In AR a regional target of 15% organic farming by 2020 has been established. On the other hand, dependence on imports and long distance products were highlighted as well (AL, JE, AR). And the carbon load of transport even within the short range (BO). A more critical vision came from Girona: the social tendency to shop in malls and go for the cheapest products, as well as organic food being "*rare and expensive*" and a "*fashion more than anything*". **'Food products' rates 1st in BO -7.4- in accordance to the reported remarkable gastronomic culture of the city and its region.** In contrast, the sector reaches a low 4.3 in JE, falling down to the 7th position in their particular ranking.

'Retail & Services' -7th sector- is the first of 4 sectors failing to reach the approval threshold -5- in 3 -GI, JE, AR- out of the 6 cities; moreover, in one city -JE- this is the sector obtaining the absolute lowest average performance -2.92-. **In general, comments on the sustainability of 'Retail & Services' addressed the fact the price and business are the driving forces of commerce and that green awareness is low and/or just starting.** Moreover, remarks went to the large share of delocalized production (GI), green washing practices (JE), and the ignorance (GI) and high consumerism (AR) of the public. On the other hand, despite ecolabelling was perceived as rare, ongoing experiences are helping to raise the word, such as: the CPN in AR; shopping malls with EMS and/or a green line of products in TU, AL and BO; green public procurement in TU and BO; and regional programs to support CSR in BO. **The commerce structure of the mixed city model is seen as a** *"principle"* **for sustainable 'Retail & Services' (GI), yet a shift in the business model is required, in order to associate small shops to quality (BO).**

The 8th sector in the ranking is 'Energy Efficiency', with BO, TU, and AL with average scores over 6, and AR, JE and GI falling below 5. **The 3 cities with an earlier engagement in climate action (AL, BO, TU) get positive feedbacks**, as for instance "*there is an active EE program with good targets*" (TU); "*there is a lot of replacement of lighting*", "*there are financial measures for EE in the regional energy plan*" (BO); or "*a lot done in LG buildings, lighting...*" (AL). Even so, it was common to all 6 cities to speak about the challenges ahead and the need to do more. **In TU and AR respondees stressed the fact that price drives the energy culture, and that it is still too cheap and in some cases over-abundant (AR)**. In contrast, in JE the economic advantages of EE are considered not to be explained enough, yet energy demand is little due to low incomes. A goal in TU is to get the 13,000 staff of the LG to contribute, as the available technologies are already being deployed. The compact downtown of AR and the new MP are assets for the city's EE. **In JE, given the national context, EE is the main strategy in hands of the LG to reach GHG reductions.** The inefficiency of housing and transports, and deficient management (e.g. burning lighting with daylight) were pointed to as core problems in GI.

'Energy Supply' is the **9th** and penultimate sector in sustainable performance, with **values on the positive range (5-10) for the 3 wealthiest cities** and on the negative (<5) for the remainder 3**. The top score is for AR -7.40- thanks to the quality of the service and the high share of RES** for both electricity and heating; the good climate strategy of the city was well-valued too. In TU some initiatives were highlighted (CHP plant, DHC with 50% RES, wood pellets in rural areas) yet the new mixed-fuel coal plant was criticized. BO's supply, ongoing actions and the regional plan got positive feedbacks too. However, critical opinions were raised regarding the natural gas based DH; even if more efficient than prior fuels, as the business is selling the gas, the promotion of RES moves away. As already exposed, AL and JE share State controlled energy systems. Hence, the level of sustainability of the ES is not in hands of the city. In JE, the country's commitment to a 10% share of RES was underlined, yet the current provision is "*old and dirty energy supplied from the shore*". In GI, several sources of local energy supply are operating (biomass, photovoltaic, hydropower, incineration, cogeneration in industries) but the topic is still

seen at its starting stages -as well in JE-, in addition to a "*fragile and not redundant network*" putting at risk the quality of the supply.

'Buildings' is the 10th and worst climate and energy sector in terms of sustainability, according to the exercise. **The common cause is the low EE of the built-up stock, even for buildings lifted after 2000** (GI), **and the slow progress in both green building regulations and retrofitting due to high costs and little funds.** Learning and experience are developing, such as in TU, BO and AR, with several projects by the LG dealing with skin refurbishment, energy retrofitting and high-performance buildings from scratch. In TU there's been some positive results from projects with ESCOs. Low-energy districts are on their way in BO and TU. But the challenge is enormous anyway, and capacities of the LGs limited; e.g. the medieval city center of BO with most buildings rating "G". In some places upgraded regulations (AR, AL, BO) have been recently enforced, with little impact so far. In JE, the issue is just starting, with neither regulations nor recommendations yet, and with the simultaneous challenge to tackle urban sprawl and detached homes (as in AR and TU).

The case of BO is very interesting in order to summarize reflections about the results from our expert perception exercise. BO is the city at the highest position in the ranking of cities. Simultaneously, in BO the sector 'Green Spaces & Nature' falls to 7th place, while this is the top scoring sector on average, and 1st in 3 cities and 2nd in the other 2. On the other hand, 'Transports' is the "least" sustainable sector in BO, when it is 5th on the general ranking for all cities. In contrast, the top 3 sectors in BO are 'Food Products', 'Retail & Services' and 'Industry', which in the overall ranking are respectively 6th, 7th and 4th. Last but not least, average scores in BO move between 5.60 and 7.35, neither very low, nor very high. In JE, the range goes from 2.92 to 7.93 and in AR from 4.67 to 8.83. Only TU may be assimilated to BO in this aspect (5.28-7.61). **Somehow, results from BO are "out of the box", in the sense that results not only stress success or failure in LG/public domains, or the inherent value of the natural conditions ('Green Spaces & Nature'; 'Natural Hazards'), but also the 'green' dimension the socioeconomic system in general.** Complexity of SD and the notion of 'Green City' with a green economy as described in the literature (LSE Cities, 2013) appear to be more represented. **For wrapping up this notion, it is interesting to return over the fact that 'Transports' is at the bottom of BO's ranking.** BO is the city with the most diverse and complete sustainable transport system found (Tables 21 and 25). But, furthermore, **BO is the only city having effectively curved the motorization index** (Table 25). In spite of these evidences, interviewees were most critical with the 'Transports' sector, showing that excellence is still at a distance. This is all very relevant, because **LSE Cities (2013) suggests the number of cars per 1,000 inhabitants as a proxy of environmental performance**, given the difficulties to standardize a common set of SDI (Tanguay et al., 2010; EIU, 2012). Car property data at the local level is widely available and usually comparable, and *"while car ownership data does not directly measure car use, levels of use and ownership are strongly associated ...* [to] *the sustainability of inhabitants' lifestyles and levels of resource consumption"* (LSE Cities, 2013). **In fact, motorization index is inversely proportional to the number of inhabitants of a city** (Nuss et al., 2010), fact that supports the thesis that urbanization contributes to increase resource efficiency (Romer, 2009). Hence, **once a prosperous city sees its motorization index fall, somehow the path to sustainability is proving successful.** Overall, notwithstanding the opinions about 'Transports', **according to the concept of LSE Cities (2013) BO is an example of 'Green City'** thanks to the aforementioned decreasing motorization (from 564 cars per 1,000 inhabitants in 2000 to 528 in 2008). **Together with TU, in fact. Because TU, in spite of bearing the second highest GDP per capita of the group, accounts for the lowest motorization index (459)**, besides JE (209, yet related to its 50% of households under the poverty level, approximately). **A falling or low motorization index is *"a useful way to grasp the sustainability of cities' urban form"* (LSE Cities; 2013), even at the metropolitan scale. Behind it lays the challenge of diverting the 'detached home & private vehicle' cluster**, observable in wealthy (Norway and Finland) and catching-up (Israel) economies, and in fact a problem for urban settlements at global level (LSE Cities/ICLEI; 2012). **Because tackling this process is not only a question of planning, but also a cultural shift. It is getting to the tipping point after which people start deciding that having a car is no longer a necessity in order to express status. And that quality of life can be reached equally or even at a higher level when remaining in the urban centers**, compared to daily commuting through traffic jams from / to a single detached home. **Issues, at last, related to an array of values that the 'Green City' must confront and transform, such as: individualism, consumerism, climate skepticism, low citizenship engagement, conservative values, etc. All these values were raised in all 6 cities through the C/P workshops and interviews, as conflicts in order to successfully move along the path of low-carbon development.**

As LSE Cities/ICLEI (2012) point out, **decades of steady work and strong leadership are necessary to overturn the abovementioned unsustainable culture**; just a small group of cities have a "*longer history of prioritizing green objectives, dating back 40 years or more*". And this is the reason behind Stockholm's environmental success (LSE Cities, 2013) and its international distinctions (first ever European Green Capital in 2010; 2nd in the European GCI at least in 2009 and 2012). Historically, *"public opinion (66%), a change in local political leadership (55%) and pressure from stakeholders (47%) have been the most important triggers for going green"* (LSE Cities/ICLEI, 2012). Prado-Lorenzo and García-Sánchez (2009) found that **strong political leadership and political stability are necessary in order to carry out the sustainability action plan** designed after the LA21 process. In order to approach this last aspect of 'Green City' development for the 6 cases, data about their LGs' political trend was gathered. **Throughout the last 4 electoral periods, results suggest that initiation and**

continuity of green agendas is dependent on progressive-leftist LGs (Table 32). Indeed, García-Sánchez and Prado-Lorenzo (2009) find a negative influence of right-wing parties on the implementation of LA21 in Spain. In contrast, Anderson and Mizak (2006) observe that the main predictor for pro-environmental law vote in the USA is whether the American legislator is a liberal (left-wing) Democrat. Besides this, **in AL, JE, BO, TU and AR committed decision-makers and staff were identified as strengths as well** ('C/P Workshops' in Annex 1). GI, in turn, exemplifies what García-Sánchez and Prado-Lorenzo (2009) concluded, given the evidences of downgrading the sustainability portfolio after the change in power in 2011. Doubtlessly, in a context of economic crisis it is necessary to control debt and practice financial prudency, but is it for budgetary reasons only, or due to ideological motivations in reality, that conservative political parties use the economic argument for stepping back in environmental policies? Even so, it may not be the wisest thing to remove environmental policies and investments according to economic theory; *"standard macroeconomics tells us that the best time to support low-carbon investment is during a protracted economic slowdown. Resource costs are low and the potential to crowd out alternative investment and employment is small. There is no shortage either of private capital or investment opportunities with potential for profitable returns. The green sector is currently one of the few vibrant parts of the global economy"* (LSE Cities, 2013). **Getting across the political spectrum that green economy programs contribute to a threefold environmental, economic and labor success is key to summon consensus around a challenge also beneficial on the long run** (LSE Cities, 2013).

Table 32.
Local elections results in the 6 studied cases.

Elections	AL	JE	GI	BO*	TU	AR
Year 1	2001	1998	1999	1995	1996	1999
% Participation	49%	42.3%	57%	304,106	59.7%	58.6%
Government	Communist	Conservative	Socialist	Left	Coalition	Labour P.
Year 2	2005	2003	2003	1999	2000	2003
% Participation	46.1%	38%	61%	265,816	51.5%	58%
Government	Communist	Ultraorthodox	Social. + Green	Right	Coalition	Labour P.
Year 3	2009	2008	2007	2004	2004	2007
% Participation	48.3%	42.7%	51%	261,450	56%	59.8%
Government	Communist	Liberal Indep.	Social. + Green	Left	Coalition	Labour P.
Year 4	2013	2013	2011	2011	2008	2011
% Participation	40.5%	37.9%	51.7%	215,534	58.6%	61.6%
Government	Communist	Liberal Indep.	Conservative	Left	Coalition	Conservative

Notes: * participants in number of votes
Sources: Own data, from closed questionnaires to LGEM / LGTE.

One conclusion, despite ups-and-downs, is that the 'Green City' is here to stay. As the case of GI also shows, alternative programs (ZEA plan, mobility Plan, LCAP) continue to emerge after a change in orientation of the LG. Prado-Lorenzo, J.M. et al. (2012) report, political competition improves cities' sustainability and this may be due to the fact that *"right-wing parties make an extra effort in matters of sustainability in order to attract voters with a progressive tendency"*. True or not, from a much more naive position it may be said that **the notion that a 'Green City' is better in many ways (in air pollution, in noise, in landscape, in technology, in security, in the use of resources, for business, for tourism, for communities, etc.) is truly making its way within the paradigms of urban development.** Confirming the latter idea, cities "*expect economic impacts from green policies to include growth, job creation, inward investment, innovation, entrepreneurship and attracting skilled workers*" (LSE Cities/ICLEI, 2012). Hence, in conclusion, **anyone in charge of a concrete locality must refer to the 'Green City, because it is establishing - through all its technological and sector specficities- the desirable future for the evolution of cities, just as running water and electricity were the cornerstones of city progress one century back.**

Chapter 5 - GREEN URBAN ECONOMY IN 'GREEN CITIES'

The majority of cities with a 'Green City' profile *"expect economic impacts from green policies to include growth, job creation, inward investment, innovation, entrepreneurship and attracting skilled workers"* (LSE Cities/ICLEI, 2012). Chapter 5 will display and discuss research results about the effective development of the green urban economy in the 6 study cases. Topics to analyze deal with the following questions: Is there really an emergence of a green urban economy? Which sectors are effectively operating? Who are steering these green economic activities? What barriers slow down progress of green economy in cities? How do green economic activities link to the EU 2020 Strategy concept and goals?

5.1.- Results

Results of Chapter 5 are the outcome of closed questionnaires to SLDM, LGEM and structured interviews to organizations of the 4 different green economy stakeholders targeted in this research (Public Sector; Corporations; Researc-Education; Civil Society), and are organized in the next 4 sections:

5.1.1.- Climate Change and Green Economy Frameworks

5.1.2- Sectors of the Green Economy active in the city

5.1.3.- Barriers to the Green Economy

5.1.4- Links the EU 2020 Strategy targets

Cities in Tables and figures are organized from lower to higher national GDP/capita, given the correlation found between economic reality and sustainability outputs (Chapter 4.3). Full-length results of the interviews may be found in Annex 1. Additional data in Annex 1 includes workers, market and turnover, growth perspectives for 2020 horizon, self-satisfaction assessment (at organization level)... and other information which will be integrated in the discussion, yet results are not displayed here in order to maintain an readable format.

5.1.1.- Climate Change and Green Economy Frameworks

The EU2020 Strategy delivers a parallel concept to UNEP's definition of Green Economy (section 1.5). Given their specific approach to low-carbon development, the general frameworks on climate change and GE policies were explored. Table 33 shows the Climate Change and GE frameworks for different levels of the administration (from State to Local, including Region, Province and County) in the 6 countries visited. Answers to these two subsections were facilitated by LGEMs and LGTEs.

Table 33.
Climate Change and Green Economy Framework at different administrative levels

	AL - Portugal					*Jerusalem - Israel*					Girona - Spain					Bologna - Italy					Turku - Finland					Arendal - Norway				
Eurostat NUTS[1]	N1	N2	N3	(L1)	(L2)	N1	N2	N3	(L1)	(L2)	N1	N2	N3	(L1)	(L2)	N1	N2	N3	(L1)	(L2)	N1	N2	N3	(L1)	(L2)	N1	N2	N3	(L1)	(L2)
Admin. Level[1]	S	R	P	C	M	S	R	P	C	M	S	R	P	C	M	S	R	P	C	M	S	R	P	C	M	S	R	P	C	M
CLIMATE CHANGE FRAMEWORK																														
Responsibilities	[2]													W																
Legislation	*					*					*					*					*					*				CP
Target																														
Plan/Strategy					RN[3]					**		2012	SS		RV			2012		RV					RN					CN
GREEN ECONOMY FRAMEWORK																														
Ass. Report																														
Policy / Leg.																														
Strategy												2012					2012			2013										

Notes:
1) EUROSTAT NUTS - Administrative Level: N1; S: State; N2; R: Region; N3; P Province; L1; C: County; L2; M: Municipality. Crossed cells correspond to non-existing administration levels; L1, L2 not present in NUTS.
2) Only factors with affirmative answer are coloured.
4) Abbreviations: RN: Renewed; SS: Support Structure; W: Waste when delegated by Municipalities; RV: Under review; CP: Since January 2010 in Norway it is mandatory for LGs to generate Climate Plans; CN: Climate Neutral.
5) *: All States produce sectoral regulations concerning GHG emissions (for the energy and industry activities, adoption of EU Directives, Carbon market, etc.) but none has a Climate Change general regulatory framework. In the case of Finland a Draft Climate Change Law was presented in 2008 but not approved yet.
7) **: Jerusalem is in process of approval of its Climate Plan/Strategy.
Source: Own data, from questionnaires and interviews to LGEM / LGTE.

5.1.2- Sectors of the Green Economy active in the city

The exploration of climate and energy related green economy was based on a list of 39 sectors linked to 9 larger fields of activity; based on: *Green Jobs: Towards Sustainable Work in a low Carbon World* (Renner et al., 2008).

Table 34.
Responses to the GUE Annex questionnaire and organizations

City	AL	JE	GI	BO	TU	AR
Responses	4	7	10	8	8	9
Organizations	2 PB	2 PB	3 PB	3 PB	3 PB	3 PB
	1 PR	1 PR	2 PR	4 PR	2 PR	4 PR
	1 RE	1 RE	3 RE	1 RE	3 RE	2 RE
	0 SO	0 SO	2 SO	0 SO	0 SO	0 SO
Total Interv.	14	20	22	14	13	14

Legend: PB: Public Sector; PR: Private Corporation; RE: Research / Education; SO: Civil Society
Source: Own data

Results of Presence / Absence of GE sectors are represented in a twofold comparative way. On one hand, sectors of GE related to LG operations (facilities and services). On the other, GE sectors within any of the organizations interviewed (Public; Private; Research & Education; Civil Society). Table 34 displays the number of responses to the 'GE Annex questionnaire' according to the typology of organizations interviewed. Table 35 summarizes the results of presence / absence of the mentioned economic sectors within the municipal facilities and services, and the type of management behind it. Answers were obtained from the LGEMs and LGTE from a variety of services and utilities. Figure 4 depicts results of GE sectors active in each city in (a) LG operations; (b) all kinds of organizations. Last but not least, Table 36 shows the presence / absence of GE sectors within the activity of all organizations interviewed in each city, and highlights significant change vs. Table 35.

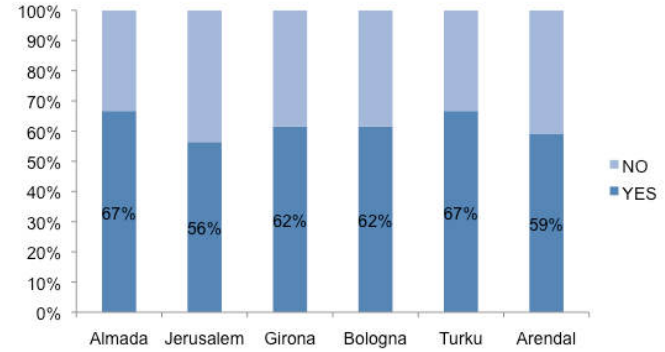
Table 35.
Sectors of GE in LG operations and management modality.

	Almada	*Jerusalem*	Girona	Bologna	Turku	*Arendal*	Sector
ENERGY SUPPLY							
Gasification/carbon sequestration							0
Co-generation (CHP)	PB			PB	PB		3
Renewables	PR/PR	PB	PB/PR/J	PB/PR/J	PB	J	6
TRANSPORT							
More fuel-efficient vehicles	PB/PR		PB	J	PB	PB	5
Hybrid, electric and fuel-cell veh.	PB/PR	J	PB/PR	PB	PB	J	6
Car sharing				PB/J			1
Public transport	PB	J	PB	PB	J	J	6
Non-motorized transport	PB	J	PB	PB/J	PB	J	6
MAUNFACTURING							
Pollution control	PB	PB		PB/PR	PB	J	6
Energy and materials efficiency	PB	PB		n.d.			3
Clean production techniques	PB	PB		n.d.			2
Cradle-to-cradle				n.d.			0
BUILDINGS & FACILITIES							
Lighting, effic. appl. and off. eq.	PB/PR	PB	PB	PB/PR	PB	J	6
Solar heating/cooling, solar pan.	PB/PR	PB	PB/PR	PB/PR			4
Retrofitting				J/PR	J	PB/PR	3
Green bluidings /insulation, mat.	PB	PB	PB	J/PR	PB	J	6
Passive houses, zero-GHG build.						PB/J	1
Water and sewasge systems	PB	J	PB	J/PR	J	PB	6
MATERIALS AND WASTE							
Digestion	PB	J	PB	PB	PR	PB	6
Waste to energy plants	J	Plan	PB	PB	PB	PB/J	5
Landfills				PB	PB	PB	3
Recycling	J	PB/PR	PB/J/PR	PB/PR	J	PB	6
Extended producer responsibility	PR		PB/PR		J		3
De-materialization	PB/PR		PB/PR	PB	PB		4
Durability and repairab. of prod.		PB	J			PB	3
RETAIL							
Efficient products/Eco-labels			PB/PR		PB	PB	3
Distance store-residence	PB	PB	PB	PB	J	PB	6
Minimization of product transport							0
New service economy					J		1
AGRICULTURE							
Soil conservation	PB	PB			J	PB	4
Water efficiency	PB	PB	PB		J		4
Organic production		J	J/PR	J	J	J	5
Reducing farm-market distance				J		PB	2
FORESTRY							
Reforestation/Aforestation	PB	J	Natural	J	J	Natural	4
Agroforestry			J			PB/PR	2
Sustainable Forestry Certification	PB				PR	PB/J	3
Halting Deforestation	J	PB					2
GREEN INFRASTRUCTURE							
Biodiversity Management	PB	J	PB/J	PB	J		5
Sustainable Gardening	PB	J	PB	PB/J			4

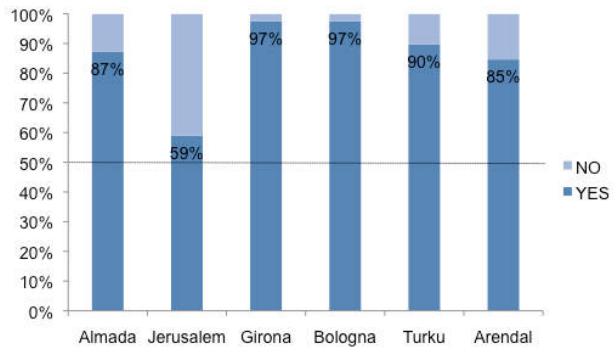
Source: Own data; List of sectors adapted from *Green Jobs: Towards Sustainable Work in a low Carbon World* (Renner et al. 2008) Responses from LGEM and LGTE.
Management: PB: Public; PR: Private; J: Joint or PPP (Public-Private Parthership).

Figure 4.
Presence / Absence of GE sectors Serie 1 i Serie 2

a) Within LG operations



b) Within the activity of all organizations interviewed in each city



Source: Own data, from field work interviews.

Table 36.
Presence / Absence of GE sectors within the activity of all organizations interviewed in each city.

# Presences	Sectors	# Sectors
6	Renewables; Hybrid, electric and fuell-cell vehicles; Public transport; Non-motorized transport; Pollution control; Energy and materials efficiency; ***Clean production techniques***; Lighting, efficient appliances and office equipment; Solar heating / cooling, solar panels; Green buildings / insulation materials; ***Passive-solar houses, zero GHG buildings***; Water and sewage systems, Digestion; Recycling; Soil conservation; Water efficiency; Organic production.	17
5	Co-generation; More fuel-efficient vehicles; Retrofitting; Waste to energy plants; Landfills; Extended Producer responsibility; Dematerialization; Durability and repairability of products; Efficient products / eco-labels; Distance store-residence; ***Minimization of product transport***; ***Reducing farm-market distance***; Reforestation/Aforestation; ***Agroforestry***; ***New service economy***; Biodiversity management	15
4	***Halting deforestation***; Sustainable gardening	2
3	***Gasification, carbon sequestration***; ***Car sharing***; ***Cradle-to-cradle***; Sustainable forestry certification;	4
0-2		0

Notes: ***Sectors*** going from 0-2 presences in LG activities and services, to 3-6 when including all organizations.
Source: Own data, from field work interviews.

5.1.3.- Barriers to the Green Economy

Interviews to/about GE activities included a block about 'constraints' in order to determine barriers to the GE (see section 'Activities, Constraints, Future' in the City Profiles of Annex 1). Upon analysis of responses, in order to aggregate specific barriers described by the interviewees, 5 large groups of barriers were generated, namely: 'Overaching Factors'; 'Government Action'; 'Business and market'; 'Research and Development'; 'Society' (Table 37). Factors within each group were also the result of joining together under a common concept similar topics.

Figures 5 and 6 distribute barriers to the GE in each city. In figure 5 according to the 5 larger groups of barriers. Figure 6, in turn, displays the barrier factors within in each 'factor-group'.

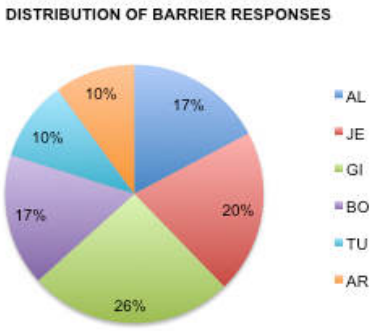
Table 37.
Barriers to the Green Urban Economy

BARRIERS	AL	JE	GI	BO	TU	AR	SUM
OVERARCHING FACTORS							
Not enough funding / funding rules / green taxing	4	**8**	4	**6**	**5**	4	**31**
Policy and legislation (contradictory: more use of fossil fuels; barriers to alternatives energy; tenders...)		4	**9**	**8**	**5**	2	**28**
The economic crisis (discourages investments)	**6**		**10**	4		1	**21**
The global economy (competition for profits with assimetric legislation; low price of fossil fuels...)	1				2		**3**
Potential positive effects of climate change (it discourages good practices)					1		**1**
SUM	**11**	**12**	**23**	**18**	**13**	**7**	**84**
GOVERNMENT ACTION							
Political Will / short term / changing interests / Banalization of SD / Conservative politics (CoM signed, but real action is little)	3	4	**11**	1	1	1	**21**
Knowledge / Technical / Economic barriers of green measures	**5**	4	4	2			**15**
Non cooperative auth. / administrative issues	2	**6**	3	1			**12**
Enforcement env. policies / Structure of the Adm.	3	**5**	3				**11**
GUE fields out of LG reach (centralized rule over energy, transport, etc.)	4	3	1		1		**9**
Not enough political incentives		1		3	1	1	**6**
Slow political decision making / planning process	1	1	1	1	1		**5**
Crisis / Bailout induced reforms	**5**						**5**
Urban sprawl - detached home lifestyle	1				1		**2**
Access to public information						1	**1**
SUM	**24**	**24**	**23**	**8**	**5**	**3**	**87**
BUSINESS AND MARKET							
Green market failures (Defficient info about green business, market gaps, market size, costs, distrust...)	2	1	2	3	1	5	**14**
Short term mentality / BAU positions (reluctance to change towards green business)	1	1	3	4	1	2	**12**
Insufficient structure (green is often not a priority yet; training and skills of workers; size of division...)			4		1	2	**7**
Pressure / Control from lobbies	1	2	2				**5**
Poor knowledge about the climate and energy crisis				1		2	**3**
Green washing (ongoing or to prevent)		1		1			**2**
Attract companies and activate APEAs				2			**2**
Protectionism in the EU					1		**1**
SUM	**4**	**5**	**11**	**11**	**4**	**11**	**46**
SOCIETY							
Unaware / Uninvolved citizenship (reaching out / else it leads to undesirable actions / slow growth of GUE)	3	**5**	4	1	2	4	**19**
reluctant citizenship (conservative, climate skeptics, individualism, bad perception - e.g., recycling-)	2	3	2		2	1	**10**
Ignorance about community planning / building processes	2	2	2				**6**
Funding and supporting the NGOs	1	1	2				**4**
Environmentalists / NIMBY movements		2			1		**3**
Distrust of the public authorities		1					**1**
SUM	**8**	**14**	**10**	**1**	**5**	**5**	**43**
RESEARCH AND DEVELOPMENT							
Focus of R&D and fund mechanisms (narrow, excluding, capacity to reach international funds...)	1	1	2	1	1		**6**
Knowledge gaps		1		1		2	**4**
Reluctance from the business sector				2			**2**
Management differences with the business sector			1	1			**2**
Rigidity and scope of the Universities			1	1			**2**
Costs of industrial research				1			**1**
Competiton between researchers (duplicities...)				1			**1**
SUM	**1**	**2**	**4**	**8**	**1**	**2**	**18**
TOTAL ADDITION OF BARRIERS X CITY	**48**	**57**	**71**	**46**	**28**	**28**	**278**
PERCENTAGE OF BARRIERS X CITY	**17,3%**	**20,5%**	**25,5%**	**16,5%**	**10,1%**	**10,1%**	**100%**

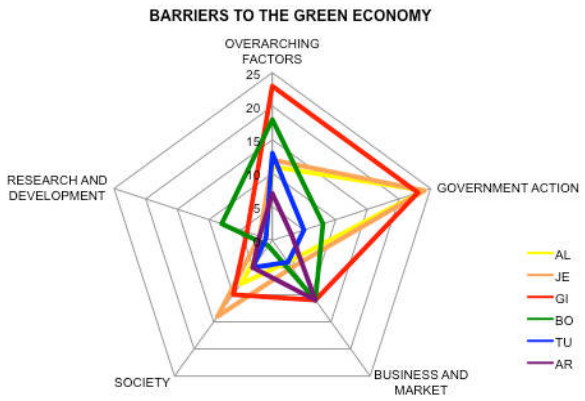
Source: Own data, from field work interviews.

Figure 5
Distribution of barriers to the Green Urban Economy

a)



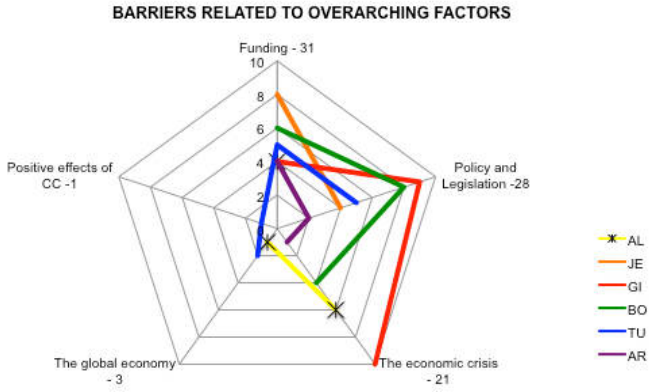
b)



Sourc: Own data, from field work interviews.

Figure 6.
Distribution of barriers to the Green Urban Economy, according to groups of barriers.

a)



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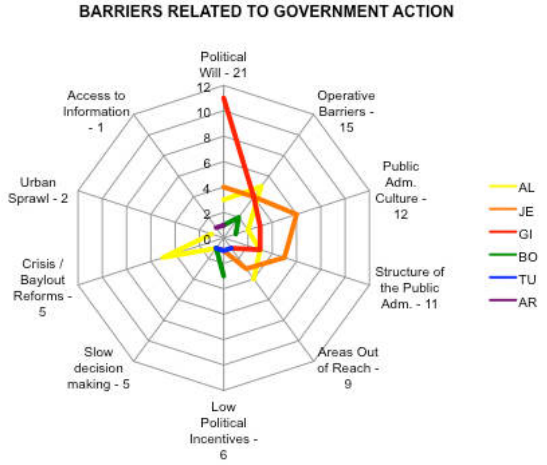
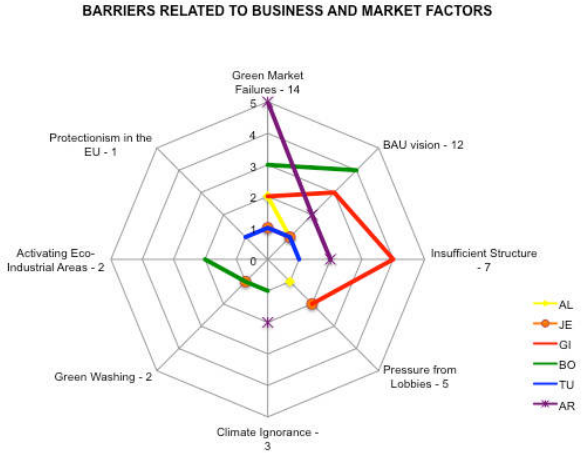
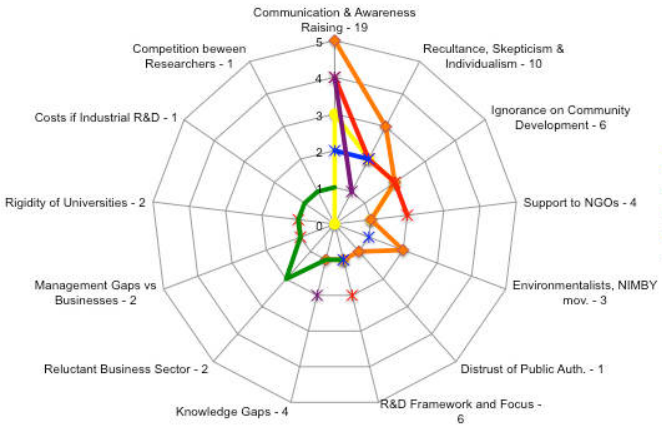


c)



d)



Source: Own data, from field work interviews.

5.1.4- Links to the EU 2020 Strategy Targets

This section contains results from 2 different questions, addressed to different target audiences.

In first place, SLDM/LGEM were asked to qualitatively assess the city's potential achievement of the EU 2020 Strategy targets (Table 38). Answers from 1 person in each city were collected. Results are therefore neither representative nor significant in statistical terms. The object of this exercise was just to gather the impression of a person with high ranking / expertise regarding the development of the city, in order to explore how realistic EU2020 and its goals are when brought down to the local scale in different places.

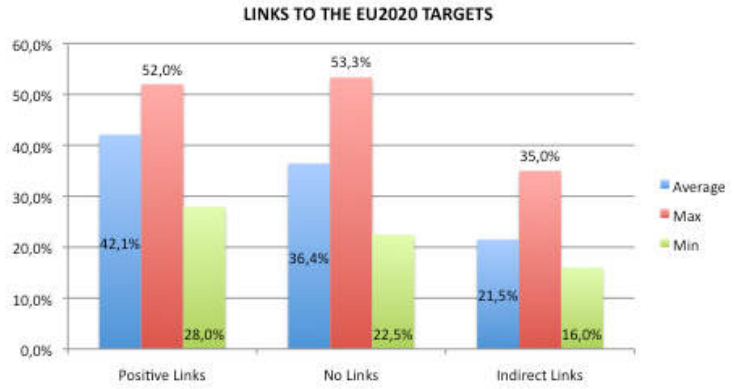
Seconldy, all the visited organizations were asked to explore their links to the 5 EU 2020 Strategy targets. A structured interview allowed the subjects to identify links in 3 modalities -'positive link'; 'no link'; and 'indirect link'- and to provide open arguments about 'why' if needed (Table 39 and figures 7, 8 and 9).

Table 38.
Potential achievement of the EU2020 Targets (qualitative)

EU2020 Target	AL	JE	GI	BO	TU	AR
3% R&D	20%	100%	50%	70%	90%	100%
Climate & Energy	40%	80%	25%	50%	100%	100%
75% Empl. 16-65	60%	100%	75%	80%	100%	100%
10%leavers/40%3ry	20%	100%	100%	85%	100%	100%
-25% poverty	0%	No	-25%	70%	100%	100%

Source: Own data, from interviews to SLDM / LGEM (1 person in each city)

Figure 7.
Distribution of links to the EU2020 Strategy targets.



Source: Own data, from field work interviews.

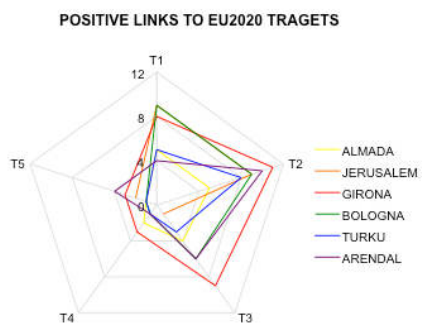
Table 39.
Distribution of links to the EU2020 targets.

	ALMADA	JERUSALEM	GIRONA	BOLOGNA	TURKU	ARENDAL	Total	%
				Positive Links				
T1	5	9	8	9	5	4	**40**	**28,4%**
T2	5	9	11	9	8	10	**52**	**36,9%**
T3	4	1	9	6	3	6	**29**	**20,6%**
T4	2		3	1	1	1	8	5,7%
T5	1	2	3	1	1	4	12	8,5%
Total	***17***	***21***	***34***	***26***	***18***	***25***	***141***	***42,1%***
				No links				
T1	2	5	3	1	3	3	17	13,9%
T2	2	5		1	1	1	10	8,2%
T3		13	4	4	3	2	26	21,3%
T4	4	13	9	6	6	6	**44**	**36,1%**
T5	1	4	5	4	6	5	25	20,5%
Total	***9***	***40***	***21***	***16***	***19***	***17***	***122***	***36,4%***
				Indirect links				
T1	1	1	3		1	4	10	13,9%
T2	1	1	3				5	6,9%
T3	4	1	1		3	3	12	16,7%
T4	2	2	2	3	2	4	15	20,8%
T5	6	9	6	5	2	2	**30**	**41,7%**
Total	***14***	***14***	***15***	***8***	***8***	***13***	***72***	***21,5%***
ANSWERS	***40***	***75***	***70***	***50***	***45***	***55***	***335***	***100%***

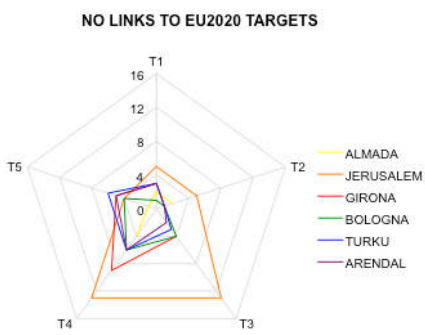
Source: Own data, from field work interviews.

Figure 8.
Distribution of 'positive links' / 'no links' / 'indirect links' to the EU2020 Strategy targets in every city (for all interviewed organizations).

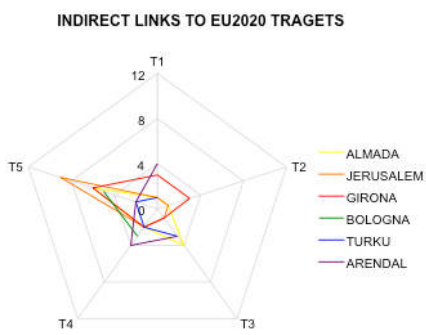
a)



b)



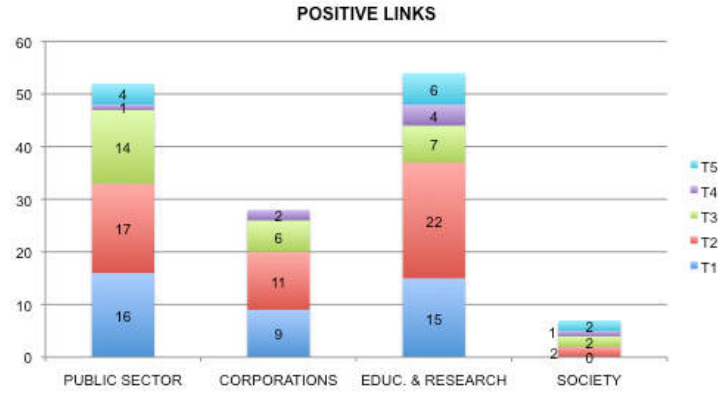
c)



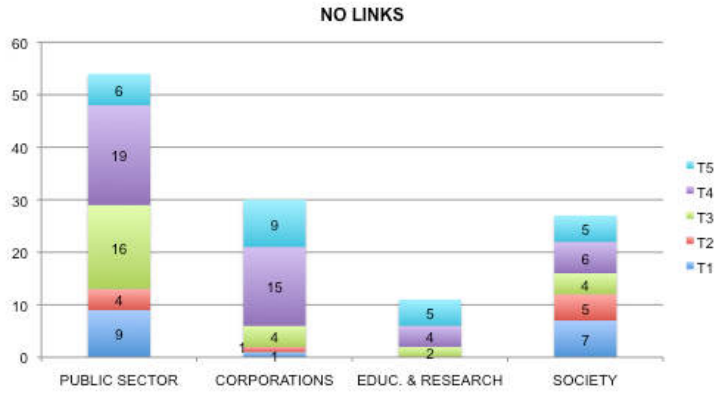
Source: Own data, from field work interviews.

Figure 9.
Percentuage distribution of 'positive links' / 'no links' / 'indirect links' to the EU2020 targets in every sector.

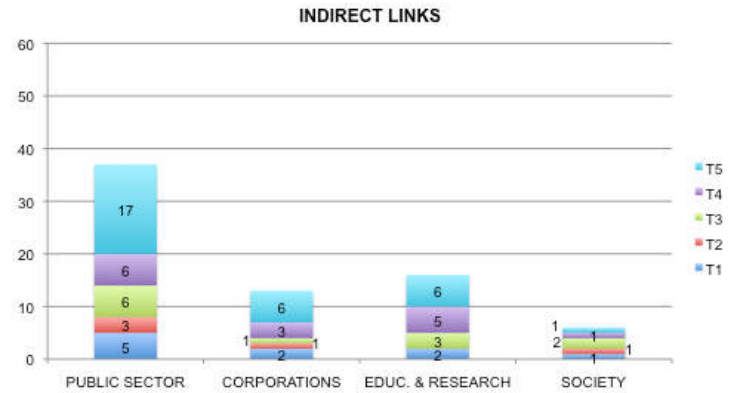
a)



b)



c)



Source: Own data, from field work interviews.

5.2.- Discussion

5.2.1.- Climate Change and Green Economy Frameworks

In regards to the Climate Change Framework (Table 33), almost all existing administrative bodies share responsibilities and have targets and/or strategies in place. As already discussed in section 4.2, 2 cities -TU and BO- engaged in climate action as soon as ICLEI's CCP campaign was launched (1993), and 2 -TU and AL- have already renewed their climate planning instruments at least once. The remaining 3 cities have a shorter track of experience. Even so, results in AR are outstanding thanks to a favorable context, from both the economic and energy supply perspectives, yet also thanks to a committed LG and innovative programs. Furthermore, **Norway is the only country with enacted binding regulation for the development of municipal climate plans.** In contrast, GI and JE must confront barriers from the national level. In Spain due to crisis induced reforms, which are recentralizing powers, cutting back support to RES and a conservative shift at all administrative levels. Geostrategic interests and a very centralized energy system in Israel hamper the LGs' options in climate action. In AL, despite the forerunning role of the city, current reforms derived from the national financial bailout are also having an impact on the LGs' capacity to undertake climate action. **At national level, specific climate legislation (not sectoral) is rare. Only Finland has discussed the possibility of a climate change act, yet so far it has not become a reality.**

The Green Economy (GE), in turn, is a new area, as proven by the scarcity of political instruments available (Table 33). Assessment reports evaluating the GE market in terms of economic and labor magnitudes are becoming usual nationwide, but few appear at lower levels and none on a municipal scale. A general regulatory body for the green economy exists solely in Spain -the Law of the Sustainable Economy- although currently "frozen" due the critical economic recession in the country. **Strategies to foster the GE are starting to appear in all countries, scattered through different levels of the administration, but very rarely in LGs. Several regions and provinces have more or less explicit GE Strategies. For instance, in the regions of Emilia Romagna (Italy) and Catalonia (Spain) strategies literally based on the EU 2020 Strategy have been passed.** These are multi-stakeholder agreements that must become the departure line for more specific arrangements and programs. **The Local Authorities are represented in these regional pacts by provincial level bodies or federations of municipalities. Even so, in these cases direct links to activities of LGs have not been found so far. The 2020 Strategy of the Norwegian region of Agder contains similar headline goals as to those in the EU 2020 Strategy,** although going a bit further by adding in transport infrastructures and culture and arts as well. **The Finish region of South-West Finland does not have a formal GE strategy. Instead, a state Super-Agency called the ELY-Centre is simultaneously developing a financial tool to support green R&D&I** (through a subsidiary research body named TEKES) **and programs to detect potential markets for green jobs** (through the social affairs division of ELY-Centre)

As seen in section 4.1.1, LGs from the visited cities account for a broad array of green development instruments, including strategies, plans, grants and subsidies, regulations, etc. In order to avoid repetition, this section will focus on those activities aimed at transforming the economic fabric; in shifting business and industries towards low-carbon pathways. In this regard, **AR is the only city where the LG has implemented a straightforward framework to support the creation of new green companies, and/or the migration of those in a BAU model; the *"Go for the Green Growth"* program. Thanks to this initiative, a green business incubator has been created in combination with the already operating Climate Partners Network** (CPN; formed by public and private institutions adopting yearly GHG reduction targets; see section 4.1.1). **Both structures add up to form a favorable environment for a green business ecosystem and for green start-ups.** On one hand, the physical infrastructure allows the activity to be initiated in a cost friendly manner. Furthermore, the incubator concept facilitates relationships, knowledge exchange, synergies and collaboration between the different green entrepreneurial ventures. On top of this, the CPN delivers an organized green market with consistent and growing demand and supply opportunities. The national replication of the climate neutral philosophy of CPN, through pilot projects for State bodies and administrations and large corporations (e.g. Thon Hotels) is increasing the market for AR's green companies. The potential benchmarking benefits of this whole process for early movers, such as in AR, are enormous.

Parallel experiences from the remainder of the cities, yet not necessarily steered by the LG, are also worth mentioning. Discussion of the latter will take place in the following subsection (5.2.2), when analyzing the presence/absence of GE sectors in the cities.

5.2.2.- Sectors of the Green Economy active in the city

a.- Presence / Absence of GE sectors in LG operations

As figure 4.a shows, the presence of green economic sectors in LG operations oscillates between 56% and 67%. In absolute terms this range covers 22 to 26 sectors out of a total of 39 and, overall, results are quite similar amongst the study cases. Hence, instead of comparing the levels themselves, it is considered more interesting to analyze which are the more recurrent sectors and which are not. A detailed analysis of each of the 39 sectors will not be conducted. Instead, discussion will proceed through comments related to those sectors considered to be the most worthwhile highlighting. From the perspective of management, **the 'Green Cities' studied use all the ways possible -Public, Private and Joint Public-Private- systems to carry out climate and energy activities related to LG activities** (Table 35).

The sectors with the highest frequency (common to all 6 cities) in LG operations are (Table 35):

- **'renewables';**
- **'hybrid, electric and fuel cell vehicles';**
- **'public transport';**
- **'non-motorized transport';**
- **'pollution control';**
- **'lighting',**
- **'efficient appliances and office equipment';**
- **'green buildings / insulation, materials, etc.' ;**
- **'water and sewage systems';**
- **'digestion';**
- **'recycling';**
- **'distance store-residence'**

From the qualitative perspective **one may conclude that more "conventional" sectors of urban management are more frequent.** In a certain sense, in spite of social and economic differences, **cities engage climate and energy friendly action in those areas for which municipal management is already mainstream**, such as: sustainable mobility; air pollution; public lighting and energy saving in buildings; water and sewage; urban planning and so forth.. **For these "conventional" sectors, activities are varied in all 6 cities** (e.g.: bus services, light rail and trolley-bus, bike-lanes, LED lighting, separate collection, etc.; for more detail please see section 4.1.1) **and results measurable with indicators** (Table 25). **The question then is if cities following a green development concept, will they demonstrate additional efforts in other sectors of the GE in LG operations and services.**

Within this highest frequency group (100% presence), 'distance store-residence' in particular is an extension of planning tasks for a sustainable urban form. The paradigm of the mixed-use city is leading to the development of urban districts which include diversity of activities -residence, shopping, culture, leisure, green areas, etc.-, consequently contributing to facilitating pedestrian friendly lifestyles. All 6 cities are currently engaged in such planning, yet contradictory processes are taking place simultaneously in a twofold manner in all cases: 1) detached home residential sprawl and 2) peripheral shopping malls. (see section 4.1.1 and C/P workshops in Annex 1)

Again **within the high frequency sectors, from our perspective, only 'hybrid, electric and fuel cell vehicles'; 'green buildings / insulation, materials etc.,' and 'digestion' might be considered as relatively new issues in urban environmental policies and management. The presence of these more "innovative" sectors in all 6 cities, yet is interpreted as a sign of "green forerunning" by our cities, in several cases ongoing activity is in reality at a start-up phase.** Apart from the light rail networks recently inaugurated in AL and JE, the most outstanding examples in the 'hybrid, electric and fuel cell vehicles' sector are in AL and BO. It is admirable that **AL has implemented a complete network of charging stations for electric vehicles, but so far, the number of electric cars in the city is still very small**. Even so, AL's extended committment to sustainable mobility is shaped through a fleet of hybrid cars for the Municipal Council and an electric bus service for the narrow streets of the old city center. **In BO, the decade long presence of electric trolley buses is perhaps the most "alternative" initiative linked to electric transportation** (within the 6 cases). Besides this, the LG subsidizes the substitution of conventional scooters through the acquisition of electric ones or e-bicycles; a similar subsidy facilitates replacing conventional engines in cars for ones using less polluting GLP or methane. **In the rest of cities the work has barely started**; occasionally an electric vehicle may be purchased for the LG's fleet and/or a few e-charging points have been scattered across the city. No specific plans or measures were found for the expansion of 'hybrid/electric' vehicles in the city, except for an agreement between TU and Siemens within a more general plan for sustainable urban development (section 4.1.1 - Table 18). In JE the company *Better Place* had the plan to create one of the first battery exchange stations, but it recently went bankrupt and all of its projects were abandoned. **Only AR can foresee the arrival of fuel-cell vehicles in the near future, because Norway is considered an early market** for this new vehicle segment given their exceptionally high income (Annex 1 - City Profile).

Similarly, **LG action regarding 'green buildings/ insulation, materials etc.,' is very heterogeneous among the sample of cities.** Here, **BO represents the most advanced location, with local regulations being stricter than national and regional regulations** (Table 21). **In addition, market incentives for green buildings from the private sector, funds for energy retrofitting of social housing and some high-performing units already built, contribute to the steady development and maturing expertise in this field. TU follows next on this list, with a few energy retrofitting projects having already been developed for social housing, along with plans to develop 2 eco-districts in the near future** (Table 18), and subsidies for efficient heating systems. **AR has some good examples also**, such as the energy efficient renovation of the UNEP-GRID headquarters, green building standards implemented in the new *Green Incubator* under construction, and a passive building for a new kindergarten unit (Table 19). **The rest of cities are, in comparison, taking some initial steps.** AL and GI adopted the new building codes derived from EU legislation. This will have a generalized effect on new and renovated dwellings. Outcomes will not be immediately obvious, particularly in GI where the current real estate crisis has slowed down (almost to the point of a complete halt) the activity in the construction sector, including the plan to develop a new eco-district. Still **in GI, expected enforcement of the EU Directive on EE of buildings by 2007 accelerated paperwork for building permits in order to avoid its implementation** (LGTE). After 2007, a lack of inspection/control resources by the LG further prevented any knowledge about the effective adoption of the regulation by constructors (LGTE). In AL, so far action has focused on LG buildings such as the renovation with high EE standards of the House of the Environment. In order to increase the new regulations' impact, **AL's SEAP**

intends to retrofit 10% of the city's built-up stock, yet the mechanisms to effectively execute this proposal have yet to be outlined. In parallel, the new Energy Assessment of Planning Tool will contribute to assessing the development of new sectors. Besides, the eco-district approach will dominate the renovation of the shipyards in the river-front area, and the new House of Mobility will be designed as an emblematic green building. In JE, the housing agency Moriah has begun to introduce green building practices into their properties (e.g. green roofs in schools) and there are 3 projects for green buildings; one of them being almost passive or very low energy demanding. Besides the City Hall is preparing its first green building regulations, and so paving the way for this question to become a common area of activity.

In conclusion, action in the 'hybrid/electric vehicles' and 'green buildings' fields is undoubtedly increasing in all of the 6 cities, but it is still neither mainstream nor mature. Instead, it appears that the majority is still in the learning process via some singular experiences. Lessons and transferability from one another would be of great interest as a way to accelerate the progress being made.

Four other sectors are also present in 5 of the 6 cities, namely:

- **'more fuel efficient vehicles';**
- **'waste to energy plants';**
- **'organic production';**
- **'biodiversity management'.**

It is interesting that 'waste to energy plants' are common ground for all 5 European cities, and in planning in Israel. As well as 'digestion' of sewage sludge (in the previous group), the possibility of a self-supply of energy through waste treatment technologies is a step forward towards the energy goals of a sustainable city (LSE Cities, 2013). On one hand, because it frees -or almost- the town from an environmental and social problem of great concern, i.e. landfills. Not only are dump sites significant GHG emitters and groundwater polluters, but once their lifespan is over, regulations (at EU level at least; Directive 1999/31/EC) require the closed facility to be monitored for 30 years which implies enormous additional costs to the town. On top of this, the creation of a new landfill is very usually the origin of great social conflict. Waste to energy plants are neither free of pollution, nor of social alarm and rejection, and have significant costs which lead to technological 'locked-in' situations (Corvellec et al., 2013). For instance, incinerator facilities need to work at 100% of their capacity for costs to be optimized, otherwise treatment costs increase (TRARGISA, 2006). Even so, the cost-benefit balance of phasing out from landfills, while producing and sending heat and power to the local grid is an opportunity to consider for cities going green.

The presence of the 'organic agriculture' sector in the LG operations of 5 of the 6 cities is good news. It is remarkable that this consumption model has crossed the boundary of private choice and has become an issue in LGs' public policy. Perhaps the most relevant cases are GI and BO, where organic produts are being incorporated into school catering and LG canteens. An initiative that TU is aiming at as well, together with the movement to make all the agricultural land in the municipality organic. In AR there is a similar project -linked to the CPN- that plans to insert the LG, schools, kindergartens and even restaurants into the organic supply chain. In JE, the Community Gardens are allowing district dwellers to grow organic produce in publicly owned gardens. AL doesn't have specific programs for organic agriculture, but the new Master Plan includes an evaluation of food security potential and assessment of the best lands (in terms of soil quality and ecological functions) for the recovery of agricultural activity. In conclusion, food is penetrating more and more the LGs' agenda, and this is significant in order to re-establish the bond between society and the land closeby.

The fact that 'more fuel efficient vehicles' and 'biodiversity management' have become a "treadmill" in 'Green Cities' is a good sign as well. The first sector shows that LGs are aware of their duty in doing their best at taking the lead in responsible consumption. 5 of the 6 cities share the practice of biodiesel being used for buses and trucks, having hybrid vehicles and renovating their fleet using 'fuel efficient' criteria when possible. Even so, **from the strict perspective of fossil fuel burning mobility (i.e. excluding 'electric vehicles') the example to follow would be TU with green procurement standards for 100% of their tenders, and plans to refine wastewater biogas for public transport buses.** AL's hybrid fleet for elected officials is noticeable as well. **Widespread 'biodiversity management' is also relevant, because it is telling that green infrastructure is no longer an aesthetic-leisure focusing asset only,** but rather natural capital *per se* that must be taken care of according to ecological conservation objectives and procedures. **Furthermore, given the importance assigned by the interviewees to 'Green Spaces & Nature' in the evaluation of the sustainability performance of the city (section 4.1.3). JE's Bioregion Center is an excellent prototype for understanding how to integrate multiple urban and metropolitan policies related to nature management.**

At the opposite end of the scale, **the least common green activities (0-2 affirmative responses) in LG services and facilities of the sample cities, are:**

- **'gasification/carbon sequestration';**
- **'car sharing';**
- **'clean production techniques';**
- **'cradle-to-cradle';**
- **'passive solar houses/zero GHG buildings';**
- **'minimization of product transport';**
- **'new service economy';**
- **'reducing farm-market distance';**
- **'agroforestry';**
- **'halting deforestation'.**

With the exception of 'halting deforestation', the rest of the sectors could be considered as fairly new or, in

general, with a short development history. This confirms the notion that, so far, "traditional" urban management sets up the cities' agendas based on climate and energy affairs. Indeed, it is logical that cities prioritize public transport over car-pooling because the first solves the accessibility needs to thousands of people every day. Along the same lines, caring about EE in LG services and facilities helps reduce yearly power costs, which explains the cities' focus on this topic. Nevertheless, people sharing cars and incentivizing low-carbon buildings signal a change in mindsets of the community; towards horizontal degrowth in overall and per capita resource use, something that is basic for an effective transition to a sustainable society. **But in order to trigger progress, regulation is often necessary, which is also politically erosive and may explain why even 'Green Cities' -as in our sample- hold back when adopting more challenging environmental policies.** Because, quite simply, new regulations would cause reactions from the car and construction lobbies -as referred to in TU and GI (C/P workshops, Annex 1)-, with arguments about slowing down trade, threats to competitiveness and jobs, barriers to personal freedom, technical and/or economical inviability of alternatives, etc. **Hence, for instance, in order to really promote car-pooling, putting pressure on the private car -e.g. through road pricing, such as in Stockholm (LSE Cities, 2013)- will be unavoidable, yet together with additional advantages for sharing journeys besides soft tolls, like discounts in public transport fares** (Cairns, S., Sloman, L., Newson, C., Anable J, Kirkbride A and Goodwin P., 2004). Even so, **reluctance from local stakeholders is to be expected; reason why for certain breakthroughs in green economy from superior regulatory frameworks are required,** such as Directive 2012/27/UE about EE in buildings. Discussions about future mandatory road pricing for EU cities are ongoing; following the recommendations of the White Paper on Urban Transport and Action 12 of the Action Plan on Urban Mobility, aiming to internalize the external costs of road transport (JEG, 2010).

Other under-represented sectors of the green economy may fall a bit far from municipalities and their activities, namely: 'gasification/carbon sequestration', 'clean production techniques', or 'cradle-to-cradle'. These are all new industrial fields for which LGs may become clients the day the technologies and business models are fully developed. Hence, **the private sector will lead the implementation of these sectors. Even so, cities may act as living labs for certain innovative technological approaches** (UN-Habitat, 2011). For example, heat and power supply are fundamental requirements of all cities. Biomaterials (forest biomass and energy crops, household and industrial organic waste, organic waste from parks, green spaces and tree pruning, sewage sludge, etc.) are an enormous source of energy -in both forms, electricity and heat- as well as being capable of delivering circular flows of soil fertilizer for both urban green infrastructure and local agriculture, through a production-treatment-recycling cradle-to-cradle system. With this vision, not only certain waste flows might be solved, but also a sustainable source of local energy and inputs for food production and urban keep-up tasks. This was the philosophy behind the waste treatment complex included in GI's SEAP, although then abandoned as previously explained (section 4.1.1.). **The fact that AR has created a local Green Incubator leads to the thought that it is in a great position to implement co-creation processes aimed at the development of downscaled and locally adapted initiatives.**

The lack of action in the 'minimization of product transport' and 'reducing farm-market distance' sectors somehow expresses the respect the LG have for the rules of the free market. In other words, cities consider the origin of the products feeding their communities as beyond their concern and range of action. **Even so, through EMS systems and green procurement policies LGs are in fact introducing mechanisms for environmentally friendly expenditures in their services and facilities.** Other newly recovered practices, such as farmers' markets and organic catering support the re-localization of production to be close to the consumption centers i.e. the cities themselves.

In between the high- and low-presence groups **there is a varied set of 15 sectors that have been implemented in some form or another in 3 or 4 of the 6 cities:**

- 'cogeneration';
- 'energy and materials efficiency';
- 'solar heating/cooling, solar panels';
- 'retrofitting'; 'landfills';
- extended producer responsibility;
- dematerialization;
- 'durability and repairability of products';
- 'efficient products/ecolabels';
- 'soil conservation';
- 'water efficiency'; -
- 'reforestation/forestation';
- 'sustainable forestry certification';
- 'sustainable gardening'.

This wide array of sectors may be grouped according to various analytical arguments.

First, **some activities are more likely to be linked to private companies and industries than to LGs, such as 'cogeneration', 'energy and materials efficiency', 'extended producer responsibility', 'dematerialization', 'durability and repairability of products', and 'sustainable forestry certification'.** Part of green business development strategies is to create and feed the markets with products and services from the sectors previously mentioned, and often with economic arguments to back them, as in the case of cogeneration for factories needing heat and power. Nevertheless, **as local authorities are large purchasers, they can also contribute to the penetration of green products and services into the local market, through procurement programs**, such as in TU, with its commitment to include green criteria in 100% of their tenders by 2013. The latter argument could also be used for the sector 'efficient products/ecolabels', as LGs should act as role models for citizens. By bringing together organizations that adopt an ecolabel and do business with

others already certified, the CPN in AR is creating a virtuous circle for the expansion of the green economy.

The second group is made up of the **'water efficiency' and 'sustainable gardening'** sectors. **These areas are the opposite of the first group, because they are very much linked to LG responsibilities through urban planning and management. It is indeed a surprise to find that some of the cities have neither of the latter sectors among their green profile priorities.** Actually, there is an absence of either one in the 3 top cities in terms of GPD per capita (AR, TU, BO), which also corresponds to the 3 most septentrional towns. Perhaps this indicates that water scarcity is not a problem there. Still, sustainability indicators (Table 25) show that all cities, except AR, have per capita water demands below 200 L/day for residential purposes and this demand is actually decreasing. Good practices in water use are indeed a reality, despite the results in this current section. The fact that there are no 'sustainable gardening' practices in AR and TU is remarkable. Biological control of pests, prevention of invasive species, organic gardening practices, efficient irrigation, etc. are more and more frequent in the management of green infrastructures. This contributes to delivering healthy urban environments (avoiding the dissemination of harmful chemical substances), to educating citizens in alternative agricultural and gardening methods, and to favoring a bigger and less costly market for these products and services. **The low level of 'sustainable gardening' clashes with the widespread presence of 'biodiversity management'; given that both sectors deal with the cities' natural capital.**

The third and last subgroup of sectors with a presence in 3-4 cities is formed by 'solar heating/cooling, solar panels'; 'retrofitting'; 'landfills'; 'soil conservation'; and 'reforestation/forestation'. These sectors share the fact that they are fairly location dependent. Therefore, to interpret the results in this case the environmental nature of each city must be considered and studied. Solar energy promotion requires certain yearly levels of solar radiation; in TU and AR long dark winters discourage the development of solar technologies. Management and closure of landfills is an issue only where there is actually one in the municipality (AR, BO and TU), otherwise the main policy is to prevent waste generation and increase recycling. 'Soil conservation' is a good practice deserving generalization, as it is present in all the cities except GI and BO. 'Reforestation/forestation' must take place whenever desertification, erosion and/or deforestation are impacting that territory. It appears that currently these are not problems in the study cases; indeed, in GI and AR forestation is an ongoing natural process. Nevertheless, progressive aridity induced by climate change may require 'reforestation/forestation' and its assessment in a few decades' time, at least in the Mediterranean latitudes (AL, GI, JE). Last but not least, 'retrofitting' is dependent on the economic environment. Unfortunately and despite the fact that it should become a priority in any city it is very cost-intensive. It makes a lot of sense that as part of the LGs activities, so far, it is only present in the 3 wealthiest cities.

b.- GE sectors in all kinds of organizations

In contrast to the previous results and analyses limited to the activities and services of LGs, figure 4.b depicts the presence/absence of green urban economy sectors in all 4 types of organizations interviewed during the study visits (public administration, private corporations, academic-research institutions, and NGOs and civil society groups).

In order to facilitate detail about changes between the two scopes of analysis (LG operations only vs. all responding organizations), Table 36 reveals how the inclusion of business corporations and research institutions has suddenly increased the presence of certain sectors that were either almost or totally absent in LG operations.

As previously suggested, it appears that some fields of the GE naturally belong to industrial and research activities, or are still not mature enough to go mainstream within the local authorities' domains. In effect, emerging niches such as 'Gasification, carbon sequestration', 'Cradle-to-cradle', 'Clean production techniques', etc., are at the forefront of green technologies (in a broad sense, as there is an ongoing debate about the "greenness" of certain technologies; i.e. carbon caputre and sequestration; please see section 1.4). Given that these sectors are linked to new potential markets, they are also under the spotlight of companies and researchers.

Other activities that experience remarkable growth when all the differing organizations are studied are: 'Passive-solar houses/zero GHG buildings', 'Car sharing', 'Minimization of product transport', 'Reducing farm-market distance', 'Agroforestry', 'New service economy' and 'Halting deforestation'. It is interesting to see how **business opportunities drive the private sector towards activities that the LGs in this study do not prioritize as much**.

Another interesting aspect of Table 36 is that **none of the 39 GE sectors is present in fewer than 3 cities**. **On the contrary, 32 sectors are recurrent in at least 5 cities; 17 of which appear in all 6 of them.** With this data it is possible to say that **the GE is indeed a wide ranging reality in the locations studied**, at least in relation to climate and energy activities, **even if the average number of interviews in each was as low as 16.2**.

Notwithstanding the remarkable dissemination of GE activities detected, several particularly outstanding initiatives coming from non LG organizations are worth specific mention. Cases related to the CPN in AR and bottom-up initiatives in GI will be ignored, in order to avoid repeating experiences that have already been discussed. The fact that no highlighting of an initiative in one or other city should not be taken to mean that the city lacks them. Selection responds to the researcher's subjective views and according to the interviewed organizations. Additional information about the latter may be found in Annex 1.

First, in the mentioned zoom to specific cases, **a circular economy, 'cradle-to-cradle' and 'extended producer responsibility' knowledge and know-how cluster seems**

to be emerging in TU, with relevant contributions from research institutions and industries (Annex 1).

The Project Based Institute (PBI) is a private research institution working on industrial symbiosis at theoretical and applied levels. Among several activities conducted in fields, such as carbon sequestration, waste to energy plants, transport or renewable energy, the PBI is in close cooperation with the TU Municipality, assessing the process of switching the local buses to biogas obtained from waste water treatment. According to the PBI, "*through industrial symbiosis, resources could be used in a much more integrated energy-material production cycle*" (RE).

Following the latter principles, Clewer -included in the holding of the largest fast food chain in Finland (Hesburger)- is heavily investing in green R&D and energy alternatives. "*The philosophy of the company is to create more cradle-to-cradle strategies;* ***industrial environmental synergies seeking solutions to make the company more independent and at the same time help save the planet, and produce healthier***" (CO). In this sense, for instance, the company is already recycling the used oil (from frying) and using it as fuel for their food processing factories. Another example is the company's research into using fish waste for algae production, which in turn is used in aquaculture to feed the fingerlings, thus creating a self-sufficient source of Omega 3 for the companies' meals. Last but not least, Clewer is developing biofilters for modular wastewater treatment plants for small communities, as more restrictive legislation on sewage disposal is foreseen for those isolated districts where sending the municipal network is uneconomical. For Clewer, the green economy is clearly a business opportunity and a way to adapt to a future scenario of restricted access to resources.

Likewise, Biota Tech -a subsidiary of Mediaura, a maritime company- is developing a completely closed-loop system of bio-factories to self-supply their ships with green fuel. The mother company is dedicated to the transport and construction of offshore wind farms. Managers are "*very worried about resource constraints, energy prices, oil depletion and climate change. Against these huge megatrends, economic growth will be very difficult, moreover if the oil prices keep rising*" (CO). In response to this, Biota Tech is working on potential activities to solve these problems. **The star project of the corporation is to build and run a comprehensive industrial ecosystem capable of bringing together water, material and energy resources in one common bio-economic process.** The compound, currently under design, will include –as a start- a biogas plant to treat organic waste. The heat and electricity from this will then be used in a system of aquaculture ponds and greenhouses to produce fish and vegetation/algae. As described for Clewer, fish waste will help the plants grow and vice versa. In turn, the fish oil (30% of its biomass) will become part of a biofuel mix for the wind turbine carriers. Last but not least, the remaining waste will be recirculated to the CHP biogas facility. If this system succeeds, Mediaura may well be in an advantageous position to confront the critical evolution in the fossil resources sector, as well as be able to cope with future anti-pollution laws than may be even stricter than the ones we have nowadays. "*It might be that the only growth that could be possible is green growth. But it must be profitable, even if it will probably in the long-term*" (CO).

Apart from this, the TU University of Applied Sciences (TUAS) is currently engaged in *e-Green.net*, a project devoted to the transition towards green business models of companies This project was funded by the EU Social Fund (until the end of 2013) and deals with CSR and extended producer responsibility. The aim is to strengthen environmental knowledge in businesses and companies in SW Finland in a two-phase process: 1) creation of a network: 16 corporations took part in this start-up process; 2) assessing companies -more than 100 already- in the planning of their green transition. TUAS facilitates contacts with firms providing solutions and directs the establishment of the green industrial clusters in the region i.e. in logistics, process management, water, bioenergy, efficient energy production, waste management, the food sector etc.. The success of the program encourages expanding it to other regions in Finland and elsewhere in the EU. One interesting finding of the project is that most companies in e-Green.net had not taken part in the Finnish Environmental Business Forum, arguing that they were not aware of practicing green economy before getting involved in this project. A parallel project is being conducted in AR. **GRID is offering assistance to industries and companies in their transition to a sustainable business model. It is a capacity building program departing from the local community of scientists (GRID, Agder Research) having generated energy-climate-economy scenarios**, which were afterwards disseminated among the business corporations, in order to alert about the threats of inaction in front of the potential changes linked to the '3E Crisis'.

In BO and the region of Emilia-Romagna, dissemination of the GE in businesses is formidable, amounting to +11% of the labor and approximately 23.5% of the total economic turnover (Annex 1). In accordance, green research is a strong asset as well.

Confcooperative is a confederation of cooperatives with 1,800 companies in the 9 provinces of Emilia Romagna. About 15-20% of the cooperatives' turnover is from the GE, representing 10% of Emilia Romagna's GDP. Green sectors include: co-generation and RES (PV on roofs, 2 agro-cooperatives producing CHP from energy crops, some with micro-aeolian); freight services with e-vehicles, public transport in BO; global service in public spaces (street upkeep, lighting, green areas and parks maintenance, etc.);, construction and housing rental cooperatives (>40 in BO) which are members of a EU network of sustainable building cooperatives (several A class dwellings); water treatment plants; waste collection and treatment; soil conservation; water efficiency; short commercial circuit promotion ; and sustainable forestry certification.

CNA, the Artisanat and SMEs national confederation, is running some programs to foster the green economy among their associates (16,000). In the GE, they have the Energy

Excellency Club a quality label for companies providing energy services: savings, renewables etc. CNA is also working on a closed-loop economy through a website to find and exchange materials and by-products between companies in the same municipality.

UNINDUSTRIA, with around 2,000 enterprises ranging in size from 10 to 500 workers, is involved in the green economy by promoting eco-industrial parks (APEA; Area Produttiva Ecologicamente Attretazata) in response to a national regulation in 1998. They offer audits on/assistance with energy, logistics and supply chains, water and waste, planning and communication. They have also created an industrial sustainability chart for the region, which might be extended to a national scale. UNINDUSTRIA also participates in Project GAIA, which pays for trees and grasses in public parks in BO (and also in an industrial park) in exchange for emission excess. Their "PV community" for residential and industrial roofs is also very innovative and generates profits, which are in turn invested in other actions.

ASTER is an R&D&I Consortium made up of the regional authorities, the 5 universities, the 2 National Research Centers, the Union of Chambers of Commerce and the regional entrepreneurial associations. ASTER sustains, coordinates and appraises research and technology transfer throughout the territory. Since 2005 ASTER has coordinated the Emilia-Romagna High Technology Network. This includes the Energy and Environment Platform which gathers together 7 industrial research labs (250 staff) engaged in environmental quality control, natural resource management, the development of renewable energy sources, analysis and reengineering of products, etc., , in an attempt to optimize the use and maximize the recovery of material and energy.

Other good examples of the GE in BO are Micro-Vett and Impronta Etica. Since 1986 Micro-vett has been designing and manufacturing electric traction systems (for cars, small freighters, 3-wheelers, etc.). They work on FIAT vehicles, IVECO and with some Chinese manufacturers. *"The greatest challenge is distance autonomy"* (CO) and to date a maximum of 200 Km has been reached. Even so, Micro-Vett sells around 1,000 vehicles per year and 60% of the company's turnover is from exports. Impronta Etica is an NGO working on green CSR for all kinds of companies, from supermarket chains to banks. They provide and disseminate applied research through pilot projects (e.g. green events, sustainable transport), methodological topics (PPP on energy, waste, etc.), researh on models and indicators, as well as green business assessment.

Apart from interesting bottom-up initiatives (Table 22), **in GI the university, through the campus of international excellence Euro-Mediterranean Tourism and Water Campus (e-MTA) and the S&T Park are leading green research and innovation, focusing on water, tourism and energy.** e-MTA is the backbone for synergic cooperation among the different faculties and researchers of the UdG, as well as providing opportunities in international networking and business for UdG teams and spin-offs. Tourism and Water are essential issues for socioeconomic and environmental sustainability in the province of GI, and topics of long-term collaboration between the university and the LGs in the region. **Water represents about 20% of UdG's R&D&I activity and ranges anywhere from treatments for drinking water, to ecosystem conservation, from water economics, to law, from land use, to flood risks, etc.** In accordance, the Regional Government of Catalonia created the Catalan Research Institute for Water Research (ICRA) in 2006 and located it in the UdG's S&T Park. ICRA has created 90 jobs and has a yearly turnover of three million Euros and plans to have a staff of 200 and €6M turnover by 2020. Other relevant water and tourism research related bodies are: the Laboratory of Chemical and Environmental Engineering, the Institute of Aquatic Ecology, the Institute of the Environment, the Underwater Robotics Research Centre, the Higher Institute for Tourism Studies, the Landscape Observatory and the Water, Territory and Sustainability Group. The S&T Park is facilitating common ground for public-private partnerships in R&D&I. As a result, several energy sustainability projects are emerging. One example is the RES production and distribution cooperative SOM Energia, created by several university professors. This alternative organization has attained 10,000 members in 3 years, people who want to switch to a 100% green supply of electricity, and it is already building its own renewable power plants (principally from biogas and PV). Another case is the platform e-Dit, a car-pooling experience from the UdG spin-off Centre Easy. This initiative, in which people from all over the region have joined, is based on creating an online UdG community of people sharing rides to/from home to the university,. The most innovative element is that it has a social currency "thumb" associated to it (recalling the hitchhiking sign) . Passengers are required to have ''thumbs'' and they are obtainable through purchasing items in local shops and stores. Drivers then earn "thumbs" from passengers and can spend them in car-related businesses (repair shops) in the form of discounts and special offers.

In a similar approach to GI, a strong asset for the creation and growth of the GE sectors in AL is the university's S&T Madan Park. Some 10% of the activities and workers in Madan Park deal with the green economy from an export focused approach. Growth is guaranteed (an estimated 20% by 2020) as environmental engineering "*is very strong in the Faculty*" (RE). Furthermore, between 2002-06 Madan cooperated in an international project to create a tool for the environmental management of industrial parks.

Last but not least, according to the results, and given the methodological factors previously discussed (number and typology of interviews per city), the city of JE is slightly behind the rest in terms of getting the green urban economy in motion. This could partially be explained by the fact that IS is "catching-up" economically and in environmental policy. Indeed, Israel wasn't invited to join the OECD until May 2010 (OECD, 2010). Hence, in contrast to western European countries, the country lacks a prior regulatory and policy track to provide incentives to certain green sectors. In addition, JE with its history of conflict, coupled with significant poverty issues, has not been able to upgrade

sustainable development standards until recently. As a consequence, the consolidation and variety of GE sectors is still under development.

5.2.3.- Barriers to the Green Economy

Figures 5 and 6 depict the results of barriers to the GE.

Figure 5.a represents the distribution of barriers between cities in percentages. Arithmetic sets an average of 16.7% for each city. According to this proportion 3 groups can be defined: 1) AL and BO with constraints close to the main level; 2) GI and JE who are above the average; and 3) AR and TU who are far below the average.

The fact that GI and JE account for higher number of barriers is consistent with the higher number of interviews conducted in these 2 cities, however JE (20% of the barriers) is actually closer to the average than to the high peak of GI (26%). As the analysis of Table 37 and figure 6.a show, **the answers in GI are very much linked to the economic crisis and recession** (in GI this topic was disclosed 10 times out of 21 in total). In a context of economic and social turmoil, complaints and dysfunctions in "the system" are more obvious and have a far greater impact. In contrast, the **low overall levels of barriers found in AR and TU may correspond to the greater capacity of these countries and their green agents to develop their activities thanks to being economically well-off,** despite several problems still being expressed.

Figure 5.b depicts the distribution of barriers in each city according to larger groups of topics. Two main groups emerge as most relevant in constraining the development of the green urban economy: **1) 'Overarching factors' and 2) 'Government action'; 61.8% of all barriers belong to these two groups** (with even weighting). Factor-groups 'Business and market' and 'Society' follow next with similar results; 46 and 43 barriers, respectively, around 32.0% of the total factors. Finally, the group 'Research and development' accounts for the remaining 18 barriers (8.5% of total).

Cities are neither affected in the same way by the factor-groups, nor by the more detailed barriers within these groups. Nevertheless, it is important to state that the absence of certain barriers in one or another city, does not mean that they have no effect there. Responses to the questionnaire were open, therefore, interviews with other agents may have given different results.

Before zooming in, it is interesting to briefly describe the **factor groups generated** (Table 37):

- 'Overarching Factors': formed by barriers that affect the development of GE in general. Factors included in this group have an impact in all sectors and may be the origin of many of the more specific barriers detected. The factors in this group can be:

a) 'relative to funding' (insufficient, regarding taxing and subsidies, economic incentives, regulations on funding, etc.);

b) 'relative to policy and legislation' (contradictory legislation, complexity and restrictiveness of it -for research, business...-, gap between policies and reality, etc.);

c) 'the economic crisis' (effects of recession on the economic system, on public expenditures, on policies, etc.);

d) 'the global economy' (the hyper-competitive international economic system; it reduces options of green agreements, it rewards cheaper and less environmentally friendly production, etc.);

e) 'positive effects of climate change' (local effects of climate change may be seen as positive, particularly in northern countries where higher temperatures can increase urban comfort, agriculture potential, etc.).

- 'Government Action': this group is formed by a wide range of activities (10) linked to the action of Public Authorities, either local or of a higher rank. The block aims at discussing aspects related to the performance of the public authorities. It includes from political will and the operative capacities of the administrative bodies, to land use policies and cooperation between administrations. The barrier 'policy and legislation' included in the prior 'Overarching Factors' could have been added here. Leaving it on a superior and cross-cutting position is due its relevance according to the interviews to any kind of organization.

- 'Business and Market': this groups focuses on the obstacles to the GE for private companies and in the current market conditions. The youth of the GE is perhaps a driver for several factors identified: insufficient structure of green enterprises / divisions; market gaps that induce market failures; BAU mentality of most corporations; green washing, etc.

-'Society': barriers coming from the citizenship's sociology, such as individualism and climate skepticism... Likewise, constraints caused by the important gap of communication and cooperation between the Administration and the general public.

- 'Research and Development': factors related to innovation, research, transference, etc. A major issue on this field was the regulation of research itself; the narrow focus it sometimes suffers, but also the competitiveness that drives to duplicities and useless projects.

Figure 6 exhibits in radial charts the results for each group of barriers to the GE. Boxes a), b) and c) are respectively for the barriers in groups 'Overarching factors', 'Government Action' and 'Business and Market'. Box d) integrates responses for 'Society' and 'Research & Development'. This merge was done merely for

representative reasons, in order to show all charts in one same page.

For Figure 6.a), 'Overarching Factors', overall values go from 7 in AR to 23 in GI. Yet, when reading the results in proportion to the total barriers obtained from each city, **it is actually in TU where 'Overarching Factors' is more of a concern for the interviewees, representing 46.4% of the 28 barriers detected there. For the 6 cities as a whole, barriers 'funding', 'policy & legislation' and 'the economic crisis' represent more than 95% of the group.** All cities manifest conflicts derived from funding issues, and it is remarkably high in JE and BO with 8 and 6 "votes" on these issues. Barriers linked to 'policy and legislation' are stated as a problem in all cities. In contrast, **'the economic crisis' appears in 3rd position, but only in the 3 Mediterranean cities (AL, GI and BO)**, in effect the 3 fieldwork cases where the economy is currently in recession or in significant turmoil.

It is interesting to observe how the barrier **'the global economy' was mentioned only in AL (a Communist voting city) and TU** (a mature city based on a very important public sector). It feels like **mainstream economics have such a strong intellectual penetration, that the GE agents concentrate on its consequences rather than going to the root of the cause**; a globalized neo-liberal economic model that under the banner of "the free market", defends *laissez faire* and short term private benefits while discouraging international regulation potentially leading to long-term wellbeing.

The following chart (6.b) represents areas **of 'Government Action'** that need to improve according to the interviewees. **Five factors out of 10 concentrate 78.1% of the complaints: 'political will', 'operative barriers', 'public administration culture', 'public administration structure' and 'areas out of reach'.**

Only the **lack/weakness of 'political will' is shared among all the cities**, showing how questions such as changing interests and the short-term vision of many politicians influences strategic agendas such as climate action; even in the mature democracies of Finland and Norway. It is notable that **in GI** opinions related to the **'political will' tally up 11 mentions out of 23.** In some places **the banalization of sustainable development itself is likewise an issue**, turning it into a meaningless and unreliable concept.

The next two factors, **'operative barriers' and 'public administration culture', are cited in the 4 southern cities.** 'Operative barriers' issues concern problems such as the LG's **workforce's lack of the necessary green skills** (e.g. biological measures in gardening, efficient driving, energy efficient building management, etc.), **technical inconvenience** of certain green technologies (for instance, in GI, how to implement a DH system when there is already a natural gas network and the energy companies are reluctant), or **economic barriers** (e.g. AL, GI and JE where energy retrofitting of the housing stock is too costly compared to the local economy). 'Public administration culture' brings together the failures of the public administration itself and its way of working. One problem detected was the **lack of cooperation** between different departments and levels of the public bodies. Another one, **competition**; for instance between neighboring municipalities. Excessive **bureaucracy and slowness** of administrative procedures - including all the participatory phases- were mentioned too. Both kinds of barriers were similarly highlighted in all four Mediterranean cities.

The fourth 'Government Action' obstruction to the GE is 'structure of the public administration'. Several remarks were made as to **the ranking of environmental affairs** by the public authorities, as well as in public policies. The placement of green affairs below other areas such as urbanism, economy and development, leads to the partial implementation of environmental policies and legislation, to **under-sized bodies and a shortfall of human resources**, and to a lack of credibility of this field. Other barriers arise from the structure of the public administration itself; i.e. **centralized systems** and lack of regional authorities in PO and IS; and **changes due to the crisis** (e.g. the potential disappearance of provinces in ES and IT, the disappearance of the Environment Department in Catalonia, staff layoffs and downgrading of PO's municipalities and so on).

In TU and AR, none of the the prior four barriers were mentioned. It is not possible to state that in these two cities the public administration works better than elsewhere. Even so, the fact that these cities belong to richer societies -hence with more public resources in general- and given their nation's track record in accountability and transparency in both public and private affairs, may somehow be related to the different perception obtained about the administration.

The next barrier in the dimension within 'Government Action' is **'out of reach'**. This takes into consideration **how the management of climate, energy and GE affairs is not fully in hands of the LGs.** In fact, as discussed in section 4.2, most of the CoM efforts to undertake depend on the community and businesses. In addition, **in places such as AL and JE**, many areas (transport, energy, education) are **under the umbrella of the national authorities**, leaving little room for LGs' initiative. Not surprisingly **these two cities represent 7 of the 9 citations of this constraint**.

From the last 5 barriers, 'not enough political incentives' and 'slow decision making' reinforce the importance of 'political will' in order to facilitate, or not, green policies. **'Crisis/bailout reforms' is a very specific ongoing concern in PO**, due to the *"very negative reforms"* (LGEM) that are about to be implemented in Portuguese LGs (section 4.2 and Annex 1). The remaining factors in the group are of little significance and will not be commented on.

The next block is **'Business and Market'**. This unit is formed by 8 barriers, 5 of which with notable relevance (cited at least 5 times). **More than half (56%) of the complaints issued in this group belong to 'green market failures' and 'BAU vision', both of which are common to the 6 cities.** The first item refers to failures within the green

economy market. For instance, **companies have difficulties in visualizing their environmentally friendly efforts; the size of the market is still small and turnover may not reach the required volume; green products, technologies and services needed for the green transition of a certain industry still do not exist; deficient information is projecting a negative image of some green activities and so on**. In summary, companies demand more visibility and support in disseminating the green business approach. In opposition to the prior barrier there is the **'BAU vision' and the 'pressure from lobbies'** (4th barrier). The fact that **most enterprises and their executives only focus on the short-term,** feeds the BAU ideas about business and industry, **making it very difficult for the green economy to penetrate private corporations and the market.** Moreover, in **certain sectors lobbies against green technologies can slow down or even stop a lot new sustainable initiatives**, such as the aforementioned case of the DH plan in GI. A similar case may be made for the light rail projects in JE and AL, long opposed by the bus companies and car lobbyists. Perhaps, as a derivation of the prior barriers, the last one to comment on in the 'Business and Market' group is **'insufficient structure'**. Several interviewees expressed the **negative effects of the small size of their company/division**. Indeed so small that despite the fact that there might be a large market to supply, potential activity was also limited, despite the skills and abilities of the members, or considering the innovative aspects of their product/service. In relation to the previous obstacles, mentions were also made for 'green washing', the ignorance of business owners and industries about climate change, 'protectionism in the EU' and the difficulties encountered by Italian authorities in activating eco-industrial districts.

Figure 6.d) reunites barriers related to the 'Society' and to 'Research and Development'.

The group **'Society'** is formed by **6 barriers, out of which 2 concentrate more than 67%** of the 43 remarks made, namely: **'communication & awareness raising' and 'reluctance, skepticism and individualism'**.

For the first factor **-'communication & awareness raising'- detected in all 6 cities**, a mixture of social and government related aspects were expressed. On one hand, the large proportion of the population that is still supposedly unaware of the magnitude of the climate and energy crisis. Ergo, **citizenship embroiled in the consumer society, and due to a lack of knowledge and consciousness, reproducing and disseminating unsustainable lifestyles.** On the other hand, the insufficient communication and education campaigns delivered by the authorities, although there were also lamentations about the **difficulties of reaching the public** despite the considerable resources applied. Last but not least, as reported by interviewees, the combination of the prior barriers partly explains the slow development of GE activities and the rather small size of their market.

'Reluctance, skepticism and individualism' was present in 5 of the 6 cities, refers to the **sociological bases** fostering the aforementioned lack of awareness. These are strongly interlinked social behaviors. Individualism is a strong driving force **of neoliberal economics**, as it consolidates self interests over collective aims; **personal freedom must be the top priority and deregulation is the ideal framework for it.** And individualism explains 'reluctance and skepticism'. Those people who reject restrictions on their "free will", find in 'climate skepticism' and 'reluctance to green innovations and progress' the intellectual positions to support them.

Another interesting barrier detected is **'ignorance about community planning/building processes'.** This concept **emerged in the three poorer cities, yet it is here where some of the most notable experiences in community development were identified** (The children's A21 in AL, the Organic catering for schools in GI and the District planning and Community gardens in JE). Perhaps the mere fact of practicing community development and planning is teaching the LGs about their own ignorance on this topic. Nevertheless, **the important fact is that LGs assume that community development is a field that needs to improve.**

NGOs also manifested their problems with funding and activism and LGs and companies shared a complaint on how environmentalists and NIMBY movements often slow down and even stop (with demonstrations, trials, etc.) the progress of plans and projects. **Distrust by several agents (RE, CO, SO) towards the administration was cited too.**

For **'Research and Development', the main obstacle (6/18 barriers) is the 'research framework' itself.** The barrier most mentioned within the latter was **the research framework focus being too narrow and excluding potential green innovation.** Another claim referred to the regulatory schemes that make it very **difficult to reach to international funds and cooperation. 'Knowledge gaps'** are an issue as well, for instance, illustrated by the fact that much basic research is still to be undertaken in order to approach the development of green solutions. Also reported were complaints about a **'reluctant business sector'** (many companies are just not interested in R&D&I), the **'rigidity of the university'** (how to open up and make the scope of activity and the exchange with other research teams and private corporations flexible, etc.) and the **'competitiveness of researchers'** (instead of cooperation that might lead to faster and bigger breakthroughs, avoid duplicity and needless research). As for cooperation with private enterprises, some researchers stated that 'management differences' (time-frames, procedures, methods, etc.) act as an obstacle to a more profitable exchange. The 'high costs of industrial research' is likewise a barrier to green R&D&I.

5.2.4.- Links to the EU 2020 Strategy targets

As revealed in Chapter 1.4 the paradigm of the GE is very close to the principles of the EU2020 Strategy. In order to explore the development of the green urban economy, we decided to specifically ask about this over-reaching instrument of the EU, which could be considered appropriate

to all 6 countries visited, given the crosscutting approach of its 5 targets (Table 38). We wanted to know how 'Green Cities' and green organizations integrate the topics related to the EU 2020 Strategy.

The first set of results from this section deal with the perception of SLDM/LGEM about the **potential of their city to achieve the EU 2020 Strategy targets** (Table 38). According to the results **there is a clear correlation between potential success and economic prosperity, either mature or product of current economic growth**. In this sense, 3 groups of answers may be identified. The first block corresponds to **TU and AR, where perception is that all 5 targets will be reached definitely or close to**, in accordance to the exceptional wealth of both countries. **JE** conforms the second group, with answers depicting **optimism in a natural response to the nation's rocketing economic growth**. **However, the ability to reach the poverty eradication target was discarded**, given JE's endemic poverty groups. **The 3 Latin cities represent the third group as a 100% success rate for any of the targets was seen as being exceptional**; only the education target was seen an fully feasible in GI. In general, estimations indicate that uniformly targets will be partially achieved. However, there is a division inside this group. **In BO, with thriving local and regional economies although in turmoil on a national level, the estimation potentials fall into the +50% range of values.** In contrast, **in GI and AL, both in a much more critical situation locally and nationally, several targets do not reach the 50% success potential** (investment in R&D; climate and energy; education in AL; and poverty eradication). Actually, a worrying increase in poverty is forecasted in GI, which is in effect taking place (EUROSTAT, 2014).

After all, it must be recalled that responses to the prior perception exercise were supplied by only one expert per city. As a consequence, results are totally testimonial, and in no case significant in terms of a statistical perspective. It is interesting to note though, that even with such a small sample, **there is a strong correlation of results with the current economic reality of each country and city**. It would be appropriate to repeat the study on a survey scale, in order to test whether the results of the qualitative approach used here, actually correspond to the general opinion, and to revisit the results in 2020, to compare them with the registered impressions.

In order to assess how the green economic activities of the case study cities link to EU2020, one exercise in the interviews was to describe its 5 headline targets and ask how the respondee's organization/activity related to each one of them.

Links from the activities to the EU2020 Strategy goals may be separated into 3 types, as follows:

- **Positive link**: When the concept of the target is an essential element or mission of the organization/activity

- **No link**: When the concept of the target does not relate at all with the nature of the organization/activity

- **Indirect link**: When the target may receive indirect positive influence from the organization/activity

Figure 7 shows the average distribution of links of GE activities to the EU2020 goals. For each link modality maximum and minimum value -each corresponding to one city case- have been included to express the variability of the results. **'Positive links' accumulate most of the responses, with a maximum of 52% in BO and a minimum of 28% in JE; actually, all cities ranged at least 40% except for JE.** 'No links' are notable as well, representing a total of 36.4%. In this case, the peak is for JE (53.3%) and the lowest share in AL (22.5%); the rest of cities stayed between 30% and 42.2%. 'Indirect links' are only 21.5% on average, with the highest value in AL (35%) and the lowest in BO (16%) and the remainder of the cases beneath 24%.

The breakdown of results for each target (Table 39) reveals that **targets T1 (R&D), T2 (climate and energy) and T3 (labor) concentrate most of the 'positive links'**, close to 86% (figure 8.a), although more than 65% relate to T1 (28.4%) and T2 (36.9%). In contrast, **T3, T4 (education) and T5 (poverty) represent over 77% of 'no links'**, with T4 close to half (36.1%) of this share. Last but not least, **the majority of 'indirect links' deal with T5**, with 41.7% of the answers.

From the analysis of this data, one may say that EU2020 is only partially integrated in GE activities. **Fighting climate change (T2) and innovation (T1) appear to be the most common purposes across the green economic activities of the 6 cities.** Thereby, one may say that **there is a technical-environmental approach to the GE.** On the other hand, the social dimensions of this new paradigm are more rare and often even absent. Only supporting labor stands out as the mission of some activities. Delivering **a better educated and skilled society (T4) is the least assumed value**, yet it turns out to be a collateral benefit for some (i.e. 20.8% of 'indirect links'). **Lifting poverty (T5) is the most shared indirect contribution; hence, a potential outcome, through jobs**, of the success of the green economic activities, but not usually part of their missions.

Figure 8 depicts the data from Table 39 on radial charts -(a) 'positive links', (b) 'no links' and (c) 'indirect links'-, providing a visual shape to the results. When reading the results at the city level, **all 6 cities share a similar pattern of links (Fig. 8)**. The hierarchy of weightings 'positive links'-T1-T2-T3, 'no links'-T4, and 'indirect links'-T5 is repeated in all 6 cases, with very few exceptions. Only in JE 'no links' to T3 (labor) exceeds the 'positive links' to this target. And only in AR and TU 'no links' are higher than 'indirect links' to T5 (poverty). Actually, in AR this also happens for 'positive links' to T5 (higher than 'indirect links'). Globally speaking, in a combination system with 30 cases, only 4 of them break the aforementioned order. According to the results, even with different number of responses in every city, there seems to be a trend indicating that GE activities within any of the 6 cities are committed to research, innovation and low-carbon development. The social dimensions of the GE are less integrated, besides labor to a certain extent -except for

the organizations interviewed in JE-. Lifting poverty is seen as an indirect benefit, yet in AR it is also an embedded mission for some activities.

Figure 9 (a-c) represents the distribution of links to the EU2020 targets in relation to the sectors of the respondees' organizations. **Sector responses follow the same structure of links to the EU2020 targets found at the city level. T1 (R&D), T2 (climate & energy) and T3 (labor) dominate the 'positive links' for all types of organizations, except for 'Civil Society' with a larger share of 'no links'.** T3 and even more so T4 (education) assemble most of the 'no links'. 'Positive links' to T3 (jobs) are not even relevant in the 'Corporations' sector. 'Indirect links' refer mainly to T5 (poverty) in the 'Public Sector', 'Corporations' and 'Education & Research'. 'Civil Society' has a more even distribution of links to the different targets within each link modality, yet the encountered organizations showed no 'positive links' to R&D (T1) activities at all (Fig. 9.b). Another aspect to highlight is that most answers from 'Education & Research' organizations are 'positive links' -54/81 (67%)-, especially with T1 (R&D) and T2 (climate and energy). This expresses to an extent, that there is a homogeneous idea of what green 'Research and Education' organizations do or not do. Even so, **it is surprising that 'positive links' to T4 (education) are also low in the 'Research and Education' sector, probably because the specific focuses of T4 are youth and tertiary education.** Once again the mission of increasing the education levels of society is not quite layered into the objectives of the GE organizations.

There is a consistent distribution of links to the EU2020 targets among the studied cities and sectors. Innovation, climate action and energy efficiency are the most recurrent missions. Fostering job creation is sometimes important as well, yet often as an indirect outcome of the organization's succes, as it likewise is to lift population from poverty. To increase society's education levels is the least integrated target of EU2020, For the EU2020 Strategy to succeed, it might be interesting to explore ways of integrating its social dimensions into organizations developing GE activities. Examples such as *Durapart* (AR), *Fundació Onyar* (GI) and *Green Pilgrimage-Kidron Valley* (JE) are very inspiring references to the latter statement (Annex 1).

Chapter 6 - THE GREEN ECONOMY AND THE '3E CRISIS' - REFLECTIONS

As explained in the Methodology (Chapter 3) the interviews included one last section, namely: *Discussion of the '3E Crisis'*. This section was headed by a reflection regarding the ongoing economic, environmental and energetic crisis affecting humankind at a global and local scale (please see Annex 2). The latter text, facilitated by the researcher, preceded the 3 following open questions:

1.- *Comment on the EU's role in shaping the international agenda.*

2.- *How do you envisage your city and your country in tackling the '3E crisis'?*

3.- *What else should be done to tackle the '3E Crisis'? Is sustainable growth the path to take?*

6.1.- Results

Complete answers from section *Discussion of the '3E Crisis'* from the interview are transcribed in the City Profiles (Annex 1). In order to analyze the large amount of qualitative information obtained, the researcher decided to extract typologies of messages from the answers, and with them build a quantitative dataset. Inspired by the methods of Discourse Analysis (Coulthard and Montgomery, 1981; Stubbs, 1983) the researcher identified 5 large modalities of messages -'Critical; 'pragmatism'; 'encouraging'; 'new paradigm'; and 'collapse'-, and 5 target topics -'EU'; 'City-LGs'; 'State'; 'GE'; '3E Crisis'- related to the 3 aforementioned questions. Table 41 summarizes the number of response fragments analyzed and the organization sectors from which the respondees came. Table 42 describes the 5 message typologies and offers specific examples taken out from the original answers. Figure 9 displays the distribution of message modalities among the 5 target topics. The following chart (Fig. 10) shows how target topics are spread amongst the cities. Fig. 11 (a-j) provides details of the responses for each city. Finally, Fig. 12 (a-b) exhibits the distribution of the target topics and the message typologies among the interviewees.

Table 40.
Text fragments analyzed fin section *Discussion of the '3E Crisis'*

	AL	JE	GI	BO	TU	AR	Total
Fragments	26	42	55	53	52	66	294
respondees	3PB	5PB	4PB	0PB	1PB	2PB	16PB
	1CO	1CO	3CO	4CO	2CO	3CO	16CO
	1RE	1RE	4RE	3RE	4RE	2RE	16RE
	0SO	0SO	3SO	0SO	1SO	0SO	4SO

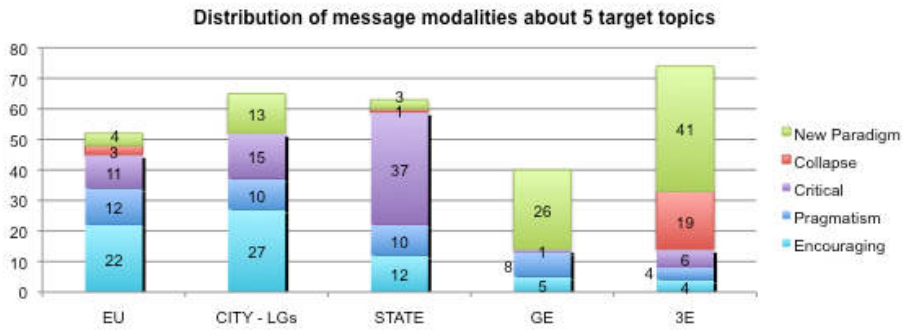
Source: Own data, from field work interviews.

Table 41.
Message typologies of text fragments from answers in the section Discussion of the '3E Crisis'

Message	Description	Examples
Critical	Negative reference to a situation (past, ongoing or future).	*"The EU is not radical enough"* *"TU reacts very slowly to everything"* *"The international level is too indecisive"* *"Neoliberalism is having strong impacts on AL"*
Pragmatism	Rational analysis of a reality that collides with expected developments.	*"Against the '3E Crisis', cities must plan for the environmental challenges, but also seek economic opportunities"* *"RES must be very well assessed to avoid sinking tourism and landscape in Catalonia"* *"Action in JE depends on national subsidies due to low incomes"*
Encouraging	Positive and inspirational vision of a certain ongoing development	*"Cities and regions have a great role as closest Adm. to people"* *"The EU has a very important role; it is the most progressive amongst the big players"* *"In BO they are anticipating the 20-20-20 agenda"*
New Paradigm	Description, proposals and ideas related to a new green paradigm of development	*"Public policies for a GE should be much stricter: e.g. 200% VAT for cars and excellent public transport, like in Denmark"* *"The path to a GE should combine technological innovation plus lifestyle change"* *"Eternal growth of GDP will face its end, giving space for new parameters to measure development (time, quality of life...)"*
Collapse	Visions of breakdown -economic, environ-mental, social...- for the future	*"Third WW might be for water"* *"Pessimistic. Humankind changes too slowly, we may run into financial and ecological collapse"* *"The way we are going we won't stop CC within safe limits"*

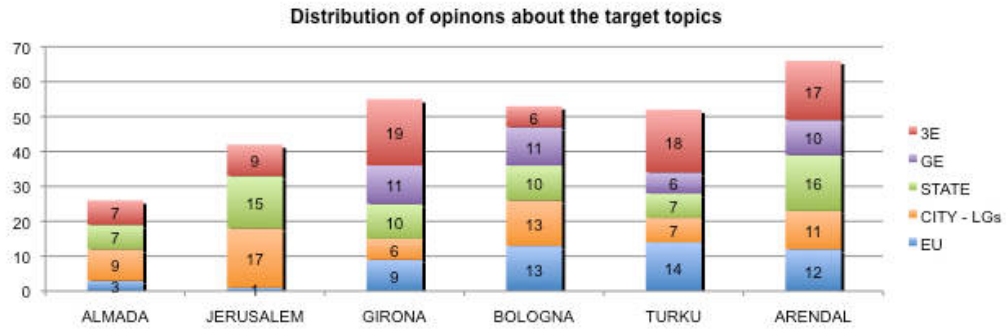
Source: Own data, from field work interviews.

Figure 10.
Message modalities for the 5 target topics



Source: Own data, from field work interviews.

Figure 11.
Distribution of opinions about target topics in each city.



Source: Own data, from field work interviews.

Figure 12.
Distribution of opinions about the target topics in each city.

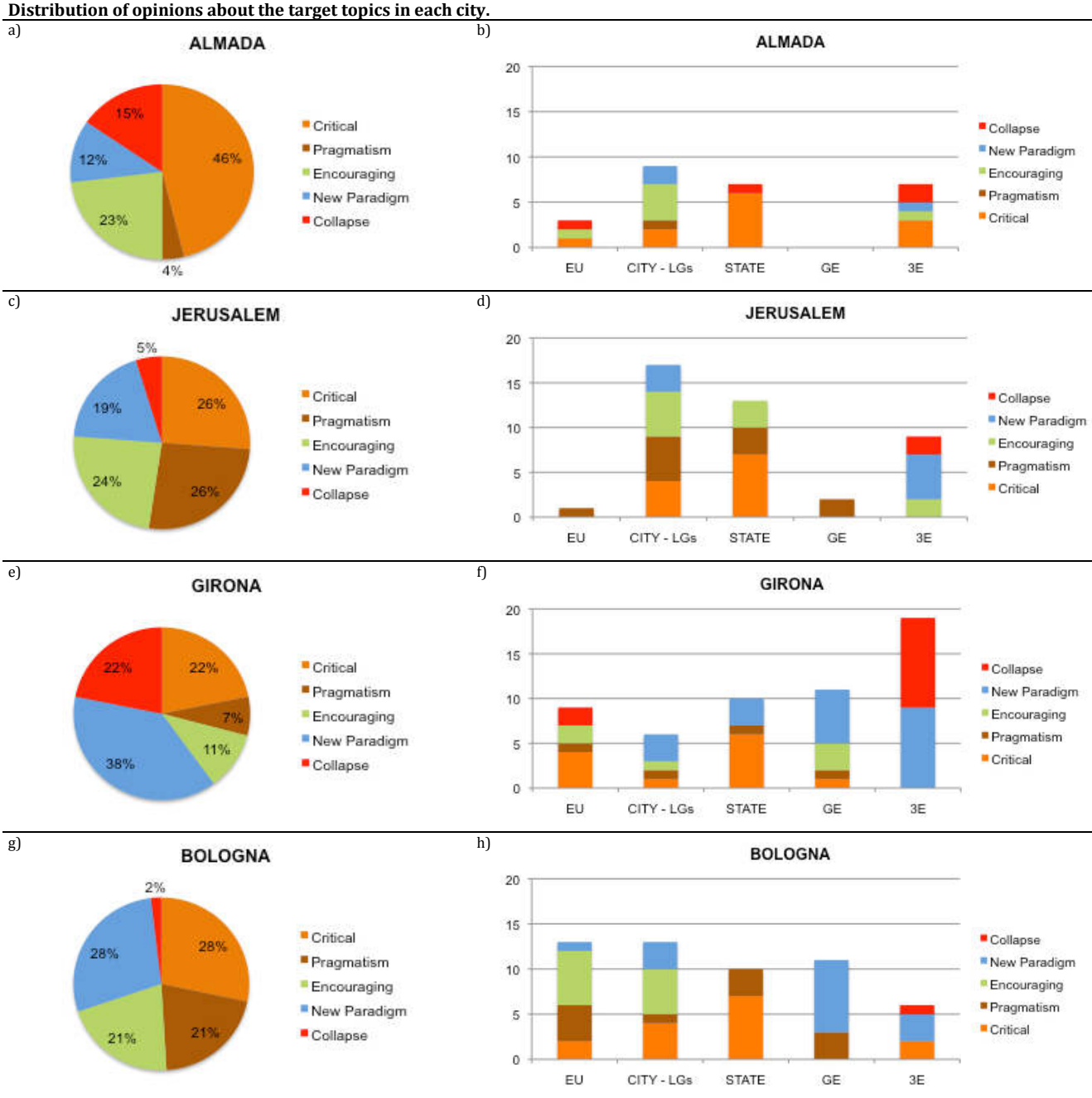
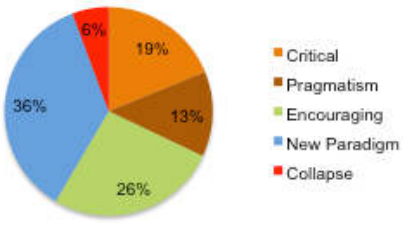
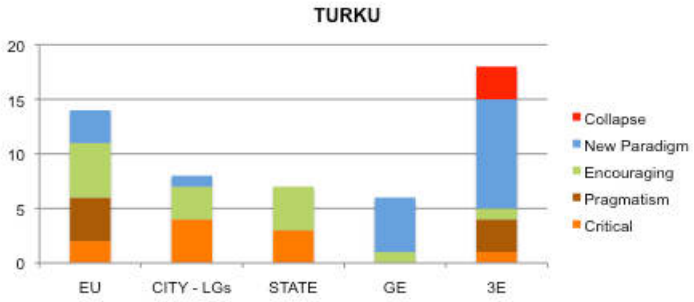


Figure 12 (continued).
Distribution of opinions about the target topics in each city.

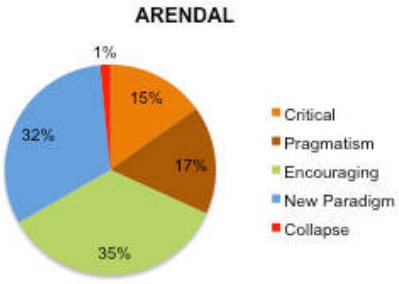
i)



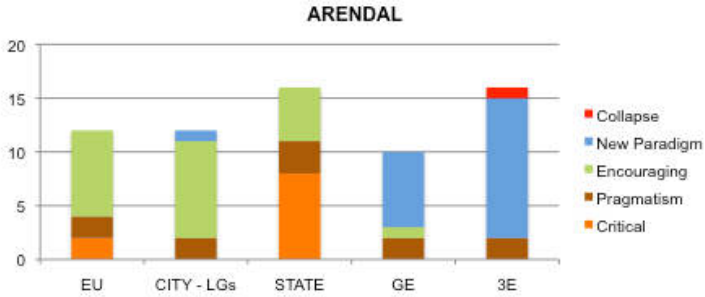
j)



k)



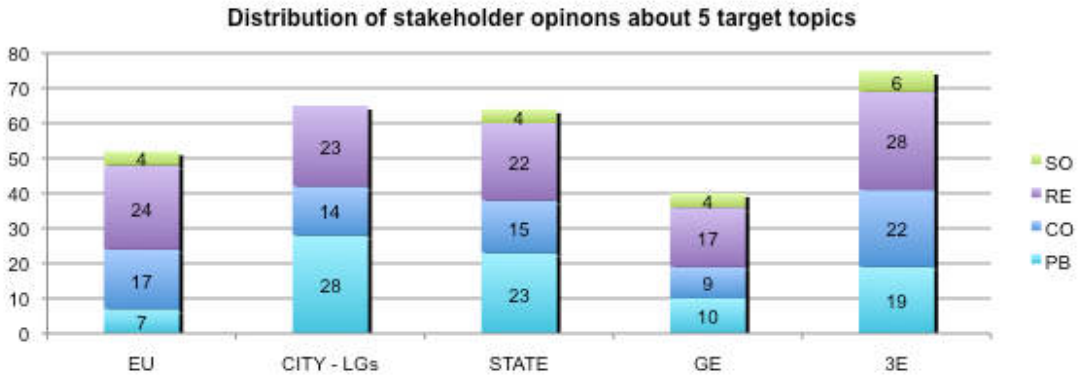
l)



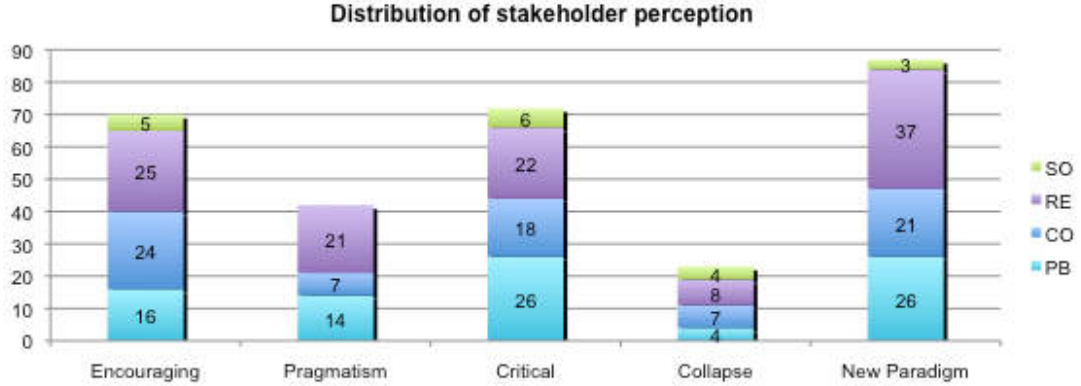
Source: Own data, from field work interviews.

Figure 13.
Aggregated stakeholder opinions on 5 target topics.

a)



b)



Source: Own data, from field work interviews.

6.2.- Discussion

In total 294 fragments of text were introduced in a data base, **which is an average of 49 per city, with the highest number being from AR (66 items) and the lowest from AL (26 items) (Table 40). The remaining 4 cities were near the average (JE 42, TU 52, BO 53 and GI 55).** Figure 10 shows the aggregated distribution of message modalities among the 5 target topics. **The topic with the most opinions expressed is the '3E Crisis', most of them reflecting on idea of overcoming the crisis through a 'new paradigm'** of development. Some of the 42 comments in this sense were: *"The only possible path is when economy and ecology converge"*; *"We are facing an age of change with ongoing tension between materialism and downshifting"*; *"We need to consume less and have different values. Society is understanding, but slowly"*; *"We should use 10 times more resources to deploy the technologies we already have to abate the problems*"; *"Incremental change to continue doing the same won't take near the safe operating space the Planet requires"*; *"We need better info about SD in strategic agendas of SMEs"*; *"SD should already be included in elementary education"*; *"Global agreements are hard, but local consensus is possible"*; *"Promote and prepare for radical change, through relocalized economy"*. **Respondees disclosed their ideas on how a sustainable society should be.** One with different values and methods to measure progress and wellbeing; lower pressure on the environment; crosscutting integration of SD principles in all sectors of society; and specific strategies to get in motion, such as the power of cooperating local authorities and the need for relocalized economies. At the same time, **a significant share (26%) of potential 'collapse' of the current socioeconomic system was registered** within the discussion of the '3E Crisis', **with three main arguments**, namely: **ecological disorders; conflicts over resources (water); and the end of growth and the ongoing form of development.** Another fraction of opinions about the '3E Crisis' were **'critical'** and fed from past and current realities, such as: **the incapacity of countries to reach agreements** -*"No agreements after Copenhagen"*-; **the adaptive and seductive capacity of neoliberal capitalism** -*"The neoliberal system knows the only way to continue growing is redistributing the available resources to customers in emerging economies"*; *"After 20 years building from debt we have lost the sense of needs and amounts"*-; and a **general reluctance to change** -*"Society changes too slowly"; "Sustainabilists are ahead from the rest; this generates a feeling of 'alien'"*-. **Finally, 'pragmatic' statements were made, cooling expectations on the 'New paradigm'**: *"If restrictions don't affect us we'll continue with BAU"*; *"Technology is not the solution, it requires a lot of resources"*; *"unemployment and overpopulation have different time frames"*; *"There is nothing ideal in the World, even with the GE paradigm (shared resources, standards of life…)"*.

The topics 'EU' and 'City-LGs' were those with more 'encouraging' remarks. For 'LGs', references highlighted the **importance of local action and cooperation** -*"very necessary"; "LGs should be able to contribute"*; *"...good attempt to lobby for CC from LGs"*- and, in accordance to question 2 (*How do you envisage your city and your country in tackling the 3E crisis?*), plenty of **positive self-references** came up, referring to the commitment, efforts and progress in fighting climate change and promoting the green economy. **'Critical' messages dealing with the world of LGs addressed the slow speed of change and the lack of confidence in top-down climate policies** -*"CoM is a facade"; "conservative trends for the past 20 years have stopped innovative development"*-. **The impacts of the crisis on LGs were likewise an issue**, for instance in Portugal. Opinions about **'New paradigm' and 'LGs' stressed aspects of urban management that should be reinforced**, such as: participative strategic planning; metropolitan planning; high density; RES to provide economic survival and resilience; EE in planning and buildings; retrofitting; public transport and organizations with high number of employees; etc. **Followed by notions on how the green urban economy should be** -*"green cities are a good idea, if there is a systemic look at SD"*; *"the GE activities should cover jobs lost in manufacturing"; "we need human capital based smart cities"; "defining the economic personality of the city"*). **'Pragmatism' was present too, focusing on the obstacles LGs face** in their contribution to climate action-"*little to do on a city scale; action must be national or continental"*; *"cities may be concerned, but not every citizen; personal action seems too small and useless"*; *"poverty and cultural unemployment are great challenges"*. **No references to 'collapse' were made at the local level**.

'Encouraging' opinions about the 'EU' underlined, in the first instance, the leading role it is having in shaping international policy on climate change -*"EU is on the front line"*; *"strong internationally"*; *"...most progressive amongst the big players"*; *"important and crucial for common action"*; *"very important; providing milestones"*-. The EU's influence over other countries and it's own Member States was also stressed -*"EU regulations will force the Member States to act"*; *"Necessary for progress in e.g. fisheries and biofuels"*; *"EU targets influence elsewhere, like Norway"*-. Even so, a number of opinions were also 'pragmatic' and 'critical'. **The 'pragmatic' category included the overall small impact of the EU on a global scale** -*"EU is not able to affect everything"*; *"actions too small for the crisis ahead"*; *"A big effort in EU is nothing globally. It's key to engage China, the USA…"*; *"20-20-20 is not enough; it's a balance to the lack of action from others"*- and the reality of priorities for different stakeholders -*"EU efforts in the climate change agenda depend on taking over topics currently more discussed in the news (economy, terrorism, crime…)"*; *"development priorities should be: the people, the economy, the army/geostrategic positioning"*; *"EU on track, but State speeds vary"*. **'Critical' visions were quite diverse, from badly performing aspects of the Community** -*"EU creates great frameworks; but how to reach the public? The EU stays at a bureaucratic level"*; *"The problem is to create common regulations on all issues, not only the economy"*; *"EU politics very linked to large business actors"*; *"at the international level the EU is too indecisive"*- **to the essence of the Union** -*"this is the problem in the EU; different cultures"*- **and how it is being affected by the crisis** -*"Standing still or going backwards due the crisis"*; *"the EU is broke and without a common project"*; *"Currently, even the EU is being questioned"*; *"After the*

financial crisis it seems that the European model of welfare is worthless"-. Actually, **the current crisis even motivated opinions of 'collapse**' -*"The EU project is at the edge of the cliff"*; *"Future maps of wellbeing may not include Europe, or southern Europe"*; *"The consumer society in the EU may end in collapse unless it produces"*-, yet also some aspects of a 'new paradigm' -*"a radical switch means uncertainty and risk"*; *"the EU must facilitate green technologies (with the USA)"*.

The 'State' was the object of the largest share of 'critical' perceptions (37; 57% of messages about 'State'; Fig. 10)-. **Negative opinions mostly focused on the government and the country as a whole** -*"Action in NO doesn't seem to follow the urgency"*; *"The only year with good environmental records in IS was 2008, with the crisis"*; *"The written policies* [in IT] *are left to the will of the next generation"*-. However, society and the media and were also criticized -*"Average Italian is suspicious of environmentalists; many NIMBYs are also against RES"*; "*Society* [in Catalonia and ES] *is not prepared for change; too selfish and individualist"*; *"The media* [PO] *have shaped the people's minds against the public system"*; *"Mass media discourages progress in NO, by focusing on coal plants in Asia"*-. **The gap between official statements and certain realities was also a topic in some cases** -*"FI is under a process of social class creation* [exclusion issues]*"*; *"Shelter pushes out change and innovation"*. **As well as the domestic developments of the international financial crisis** -*"Bailout reforms in PO are downgrading the LGs"*; *"Without the tariffs* [ES] *RES will get even smaller"*; *"Environmental affairs in second stage due to the crisis"*. Even so, the '**State' received some 'encouraging' messages too**, dealing with the forerunning and trustworthy commitment to CC of certain countries, ongoing action and emerging opportunities. **However, these referred only to Finland, Israel and Norway. In the countries where the crisis is being most felt, the 'State' didn't deserve any positive references at all**, according to the interviews. 'Pragmatic' expressions were registered for Israel, Italy, Norway and Spain; discussing domestic constraints for SD, the novelty of the topic, development priorities and contradictions. Opinions about 'new paradigm' and 'collapse' related to 'State' were insignificant. More detailed comments at country level will be delivered below.

The topic 'GE' obtained the lowest number of comments (40). **The majority of messages (26; 65%) approached the 'GE' from a 'new paradigm' perspective** -*"The future of the economy is sustainable growth/green growth"*; *"There is no alternative but a carbon-free economy"; "Degrowth and a carbon-free economy are needed"*; *"Important to consider other options such as degrowth"*; *"SD is a door opener, the carrot; the important thing is to take further steps"*-. **Visions were heterogeneous**, however, with the discussion **about the continuity or not of growth** leading to 'pragmatic' statements -*"Economic growth must continue because we cannot reverse our way of life to the old times"*; *"We must make the economy more sustainable, not create a new GE"*-. Another set of messages dealt with the **strategies and instruments to deploy this 'new paradigm' of the 'GE'** -*"to develop a GE we need to reach the public"*; *"If the laws and Governments focus on green, the market will adapt"*; *"need for stronger directions (restrictions, taxes…) for better development of the green industry and economic stimulus of the GE"*; *"The Public Sector should take part in innovation with rights over the developments, for green and brown innovation and to abate the power of patents"*; *"Investigation into waste management, water and recycling is basic due resource scarcity"*; *"CPN is a* [local and regional] *strategy for GG"*; *"Turn brown companies to green through Pigouvian taxation"*; *"GE is not buying ecolabeled from Taiwan, but relocalization, knowledge exchange, etc."*;-. The 'GE' was object of 'encouraging'; 'critical' and 'pragmatic' references as well. **The 'encouraging' group raised potential opportunities from the 'GE'** -*"Social corporations can work in environmentally friendly fields"*; *"Buildings near 0 energy in EU by 2021* [will be] *boost to GE"*. **The 'pragmatic' perspective addressed questions having an influence on the progress of the GE** -*"If the market demands, the rest comes"*; *"The higher the oil prices, the higher the incentives for green development"*; *"Companies say that green innovations are uneconomic, whereas for conventional this is only at the beginning"; "China and Asia are jumping ahead in solar"*-. The **'critical' opinion**, yet only one, must be taken into account -*"If GE are those sectors that can create jobs, **we might be inflating a new bubble**"*.

Reading the results at the city level offers new insight into how 'target topics' and 'message modalities' are related (Fig 11 (a-l)).

The 2 cities at the extremes in number of text fragments analyzed -AL and AR (Fig 10)- hold the most contrasting results.

AL, with the lowest amount of contributions (26), was dominated by critical responses (46%; Fig. 11.a.), more specifically **negative perceptions about the 'STATE' and the '3E Crisis' as the cause of the problems currently affecting the city** (Fig. 11.b.). Actually, 3 respondees were either the staff in the LG or a SLDM, explaining the latter focus on local impacts of the crisis. Messages reported included "*Portugal is under the power of Germany and France"*; *"AL would like to be more active internationally, but the central government wants to reduce competences and privatize services"*; *"Bailout reforms in PO are downgrading the LGs"*. On the other hand, **'encouraging' opinions were the second largest modality (23%) mainly directed to the LG itself** (4 out of 6), such as: *"AL has no debts and is engaged in many SD action internationally"*; and *"AL is trusted and has a steady project"*. The remainder perception classes were represented in much lower levels, besides 'collapse', with a 15% share (discussed further on).

AR accounts for the largest number of response fragments (66; Fig 11.k-l). In contrast to AL, **AR shows the highest level of 'encouraging' messages (35%)** among the 6 cities, mostly pointing to the topics 'EU' and 'City-LGs'. **The positive effect that the EU is having on Norway's environmental agenda and the self-pride produced by AR's Climate Neutral commitment** were often present in the answers; for instance: *"The EU is leading the green growth transition in policies and funds"*; *"The EU is important*

and crucial for common action"; *"AR is doing well, focusing on practical action (waste, Climate Neutrality, etc.)"*; and *"AR is making great efforts in setting goals and an agenda"*. Interestingly enough, **'encouraging' messages in AR are not self-referential of the LG staff and/or elected officials**, given that 5 of the 7 interviewees were either from private corporations or research institutions. **The 'State' in Norway deserved good references too, yet criticism got the highest marks** (Fig. 11.l) for this topic with opinions like: ***"Action in Norway doesn't seem to follow the urgency"***; *"Mass media discourage progress in Norway focusing on coal plants in Asia"*; ***"Shelter pushes out change and innovation*** [in reference to the safe economic and energy context in Norway]*"*. Nevertheless, a high share of opinions (32%) -representing the 2nd largest class- referred to the **'New paradigm'**, in relation to either the 'GE' or the '3E Crisis'; e.g. ***"the GE will generate political and economic winners"***; *"Solutions will be provided by the private sector; green R&D is very strategic*"; *"we need stronger directions (restrictions, taxes...) for a better development of the green industry and economic stimulus of the GE"*; *"Global agreements are hard, but local consensus is possible"*.

JE stands out for it's bigger percentage of 'pragmatism' compared to the other cities (Fig 11.c), yet within JE's opinions an even distribution of 'pragmatic' (26%), 'critical' (26%) and 'encouraging' (24%) messages was found. 'Pragmatism' pointed to context factors limiting the development of the 'GE', such as: *"Israel is catching up after joining the OECD, also in environmental affairs"*; ***"the GE is a very new topic in Israel.*** *A National green growth work team was just created"; "Israle lacks RES potential"*; ***"Poverty and cultural unemployment are great challenges in JE"***; *"In the 70s 70% of people in JE traveled by public transport, now it is the opposite. We need to reverse the trend"*. **The centralized system of the country motivates relevant 'criticism'**, as well as the lower position of the environment in the political agenda. Some examples of this are: ***"JE is very conditioned by the country****, by its centralized system. It's not fair to judge LGs then"*; *"It is not possible to buy RES certified energy, as the market is under State control"*; ***"The Ministry of Environment is not very concerned about CC action"***; and *"The only year with good environmental records in IS was 2008, with the crisis"*. As with AL, the greatest share of respondees came from the city government (5 out of 7), which may explain the strong focus on 'State' and LG issues. 'Encouraging' remarks continued in this trend: *"Israel needs local action to succeed"*; *"Israel's Forum 15 is a good attempt to lobby for Climate change from LGs"*; *"As wealth goes up in Israel the society can afford more green services and attitudes".*

The city of GI accounts for the highest percentage (22%) of comments about social, economic and/or environmental 'collapse'. The economic and social breakdown, ongoing in Spain since 2008, has left a generalized sense of unrest and distrust versus the future evolution of the '3E crisis'; this is observable in the following expressions: ***"Future maps of wellbeing may not include Europe, or southern Europe"***; ***"Is the crisis for relocating wealth and nothing else?*** *This is like a war without weapons in which we are little by little being excluded"*; *"In 50 years either we have a GE or we'll be suffering a lot"*. **Parallel to this, GI is the city with the most opinions when discussing the 'new paradigm' in absolute (22) and relative terms (40%** Fig. 11.e). **It is interesting to note that continued stress (over a period of 6 years) induced messages of both 'collapse' and alternative outcomes to the '3E crisis'**; including comments on the 'GE', such as: *"The crisis is bringing new realities; the opportunity to rethink the world, ethics, ecological responsibility"*; *"Optimistic. The GE is the way to a more efficient use of resources"*; *"the GE is not buying ecolabeled from Taiwan, but relocalization, knowledge exchange, etc."*; *"The grassroots will make the changes come through, not the governments".* **'Encouraging' messages in GI reached the lowest percentage within the 6 study cases; 11%, which is approximately half the level of the next city in ascending order**. In conclusion, the degree of reluctance towards the current situation and its agents (economy, politics, public authorities, etc.) is at a peak. In addition to the prior statements, GI is the city with more participants in this section of the interviews, a total of 14 (thanks to a more flexible calendar, allowing longer interviews when necessary). The even distribution of sectors amongst the interviewees (Table 41) increases the consistency of the essential discourse detected. The rest of cities stayed within the range of 5 to 8 respondees.

Returning to the issue of 'collapse', it is worth noting that in percentage values this perception was only noticeable in the cities of AL (15%) and GI (22%). In the other 4 study cases the 'collapse' scenario always stayed below the 6% level. There is a clear correspondence between the unfolding critical impacts of the '3E crisis' and the perception of 'collapse'. In contrast, where the economy is rapidly growing (JE), better off (AR and TU), or with a mature and diverse structure (BO), the notion of 'collapse' is remarkably lower.

In BO the main highlight is that all 'encouraging' messages are either for the 'EU' or the 'City-LGs' (Fig. 11.g-e); for instance: ***"Reinforcing the EU will build critical mass for the GE"***; *"The EU plays a fundamental role; no one would be doing anything otherwise"*; *"BO and Emilia Romagna are much more on track* [regarding the 20-20-20 goals] *than Italy"*; ***"The future is optimistic in BO. Thanks to a lot of cultural and education work there is a prepared society"***; and *"The economic structure of the region is an asset for distributed wealth"*. In concurrence to the other cities, most **opinions addressing the 'State' were 'critical'**; for example "***the written policies in Italy are left to the will of the next generation****", "in recent years Italy has not been able to adapt to the EU policies"*; and *"Italy prioritizes tourism over a low-carbon economy; it this a good idea?"*. 'Pragmatism' was also issued on a national level, but to a lesser degree, with sentences like: *"the current problem is GDP growth, if so 20-20-20 may become a target"* and *"The ability of IT to cope with the energy crisis is very limited (no RES program, using stock piles of fossil fuels...)"*. **The largest share of opinions in BO referred to the 'new paradigm' (30%), mainly discussing the 'GE' (9 out of 16).** Some text fragments are: *"New GE activities must cover the 30% losses forecast in*

manufacturing"; ***"There is no alternative but a carbon-free economy"***; *"EU, IT and BO should all increase pollution taxes. It's very important to that there are disincentives for polluters"*; *"We must leave GDP and use development or happiness to measure progress"*.

In TU, as in BO and GI, the highest share of reflections was about the 'new paradigm' (35%). The 18 messages in this class dealt either with the '3E Crisis' (10), the 'GE' (5) or the 'EU' (3), with expressions such as: ***"First World standards of life must go down"***; ***"We must promote and prepare for a radical change, through a relocalized economy"***; *"Investment in waste and water management, and recycling is basic to cope with resource scarcity"*; ***"The EU and the USA must facilitate the green technologies for the transition to low-carbon development"***. The group of **'encouraging' messages** stands in second position (27%) with comments **evenly spread amongst the 'EU', the 'City-LGs' and the 'State'** (and to a lesser degree for 'GE' and '3E Crisis'). 'Encouraging' opinions underlined the following aspects (among others): *"EU is on the front line"*; *"The EU is strong internationally"*; *"The EU is leading the green growth transition in policies and funds"*; *"FI is a frontrunner in environmental policies"*; ***"TU and FI will achieve the targets they are committed to"***; *"TU and FI have launched a new green growth R&D program"*. **It is interesting to observe just how strong the determination on the capacities of the country and the city to fulfill their goals is.** 'Critical' perceptions reached 19% in TU. In some cases the message claimed for more decisive climate action: *"EU politics is very much linked to large business sectors"*; *"The EU is not radical enough"; "TU reacts very slow to everything"* and *"it is still on a BAU strategy"*. When referring to FI, some undesirable social and economic trends were stressed: *"FI has very high rates of suicides and violent crimes"*; *"There is a process of social class creation in FI* [growing poverty]*"*. 'Pragmatism' represented 13%, with opinions such as: *"unemployment and overpopulation have different time frames"* when discussing the '3E Crisis'; *"The EU defends incremental change"*, meaning that no radical steps forward may be expected from the 'EU' institutions; *"Action from the EU is necessary, considering the high levels of consumption"*; or *"technology is not the solution; it still requires a lot of resources"* , in regards to the solutions to the '3E Crisis'.

Once results have been presented city by city, it is interesting to see the distribution of 'target topics' and 'message modalities' amongst the sectors represented by respondees (Fig 12). Several points of interest emerge as to how stakeholders focus their opinions. In the distribution of opinions about the 5 'target topics' (Fig. 12.a), it is observable that **'Public Sector' representatives were mostly concerned about the public sector itself**; 'City-LGs' and 'State' accumulate 59.8% of their opinions. In contrast, the remaining sectors ('Corporations'; 'Research & Education'; and 'Civil Society') have their opinions more widely spread over the topics. On the other hand, the '3E Crisis' stands as the most highly discussed topic and the 'GE' as the least (Fig 12.a). However, this contrast may be explained by the fact that these two topics are quite interlinked. Indeed, some general ideas about the 'GE' may be understood as being ways to overcome the '3E Crisis', or visions of the latter as potential developments of the former. Even so, **it is interesting that the '3E Crisis', a topic referring to change is the most inspiring (75 text fragments)**, followed closely by the 'City-LGs' (65) and the 'State' (64). Another visible aspect is that **'Research & Education' is the most "talkative" sector with 38.1% of all opinions**, despite the number of respondees (16) is the same for the 'Research & Education', 'Public Sector' and 'Corporations'. The reflective nature of scientists and academics is manifested through this data, with more ideas to share about each topic discussed. **'Civil Society' is clearly underrepresented** in the number of opinions, accordingly with the low number of interviews achieved (4). Looking at the distribution of perceptions (Fig. 12.b) there is a balance between 'encouraging' and 'critical' visions, but the relative weighting of the sectors in either topic varies. In regards to 'encouraging' opinions the highest number were issued by 'Corporations', while the 'Public Sector' takes third place in this 'message modality'. For 'critical' opinions these same sectors exchange positions. **Overall, the most frequent 'message modality' is 'new paradigm' and the least frequent is 'collapse'**.

Chapter 7 - CONCLUSIONS AND FINAL REMARKS

Research about the development of the Green Economy and the EU2020 Strategy in cities has driven to a broad variety of results and outcomes. Parallel discussion about the '3E Crisis' allowed to reflect on several topics related to the greater global picture. Conclusions and Final Remarks from this whole process are delivered in 4 blocks. The first block takes the form of 'Lessons Learnt'; ergo, as a list of empirical reflections extracted from the case studies. The second one, is a reflection on the adoption the EU 2020 Strategy at the local and regional levels, and given the current socioeconomic instability. In a third block, the researcher raises a set of 'Strategic Suggestions for Low-Carbon Urban Transitions', aiming to an effective and steady transition of cities towards decarbonization and socioecological sustainability. Conclusions are highlighted throughout the text in **bold** style characters. Finally, a fourth section displays the one essential reflection the researcher aims to share when thinking of the future to come.

7.1.- Lessons Learnt

7.1.1.- How green 'Green Cities' are?

- Research about 6 cities engaged in climate action (Almada, Arendal, Bologna, Girona, Jerusalem and Turku) has evidenced that **sustainable urban transitions and the development of green urban economies are complex topics approached in very different ways.** The concept of local green strategy is fuzzy and adapted to each reality. It is a proxy or common ground for an array of activities in a variety of fields pursuing to get low-carbon development in motion, such as:

Table 42.
Examples from the study cases of low-carbon activities in urban development sectors.

Spatial Planning	Densification: AL, GI, JE, AR	Eco-District Developments: AL, BO, GI, TU	Transport oriented Planning: BO, TU	Car-Free districts: BO
Energy Supply	Energy Security: AR, TU, BO	Local Renewable Sources: ALL 6	Green Energy Procurement: AR, GI, TU	District Heating: AR, BO, TU
Buildings and Lighting	Regulation (including RES): AL, AR, BO, GI, TU	Efficient Lighting: ALL 6	Energy Retrofitting: BO, TU	Energy Eff. Audits and Maps: BO
Mobility	Road & Parking Pricing: ALL 6 yet none for Road Pricing	Light Rail and BRT: AL, JE, TU	Alternative transport tech.: AL, AR, BO, TU	Soft and/or Shared Transp.: AL, BO, GI, TU
Waste & Water	Waste-to-energy: AR, BO, GI, TU	Recycling / Zero Waste: ALL 6	Wastewater-to-Energy: ALL 6	Use of regenerated H_20: JE
Industry	Sustainable Industrial Areas: BO	Sustainability Transitions: AR, TU	Industrial Symbiosis: TU	Green R&D&I Clusters: AL, AR, BO, GI, TU
Retail & Services	Carbon neutrality: AR, BO	Ecolabelling / Certification: AR, BO	Eco-tourism: AL, GI, JE	E-freight services: BO
Food Market	Organic food flows: AR, BO, GI, JE, TU	Food security planning: AL, TU	Food Gardens / Patches: AL, BO, JE, GI, TU	Alternative Economy: GI, BO
Green Infrastructure	Green. Infrastruc. Networks: ALL 6	Ecosystem services planning: AL, JE	Green-Blue roofs: JE	Sustainable Gardening: AL, BO, GI, JE
LG and community	Carbon neutrality: AL, AR, GI	Sust. Monitoring / Reporting: AL, BO, GI, TU	Green Procurement: AL, BO, TU	Collaborative Planning: AL, BO, GI, JE

Source: Own data, from field work and interviews in AL, AR, BO, GI, JE and TU.

- **Given that 90-95% of GHG emissions at the local level fall on community dependent sectors, the development of green governance mechanisms is a critical step for engaging businesses and the citizenship in CC mitigation and adaptation**, such as:
  - Pull instruments: Law of Municipal Responsibilities in TU and ecoBudget® in TU and BO, green procurement in AR, TU and GI -for energy-, funds for cleaner-tech vehicles in BO and for low-carbon measures in AL...
  - Governance processes: decade development strategies of AL, the Municipal Climate Change Board of GI, community planning in JE, participative mobility planning and management in BO...
  - Multi-stakeholder cooperation: the Climate Partners Network in AR, AGENEAL in AL, Community Gardens in JE, collaborative housing programs in BO, bottom-up initiatives in GI...
  - Co-learning experiences with Universities and/or companies: Prospects for biogas buses and Eco-Smart City concept

PPP with Siemens in TU, Indicator system for local natural areas in AL, car-pooling program in GI, ...

- International projects and networks: ICLEI, CCP, LAB, LAKS, Green Pilgrimage, UBC...
- Adaption of the LG's structure and functions + support structures: House of the Environment in AL, Eco-Support Persons in TU, integrated Spatial and Environmental Planning in BO, CILMA in GI, Valonia in TU...

- **The green profile potential of cities is strongly conditioned by the National context.** In regions of Norway the over-abundance of hydro-powered electricity allows for very high rates of RES in the network, contributing to very low per capita GHG at local level in AR. Excepcional wealth also makes of Norway an early market for young technologies, such as CCS and fuel-cell vehicles. In Israel energy is a strategically centralized affair. The country is currently developing own energy sources, despite carbon intensive (e.g. offshore shale gas), as a means to avoid imports from and within a region in long-lasting conflict. For Israel, GHG abatement is a totally secondary target in its economic catch-up and national security process, reason why LG commitments in climate action are even seen as *"wishful thinking"* (RE). In countries in crisis (i.e. Portugal, Spain and Italy) National Reform Programs and policy swings aiming to the recovery of growth undermine the consistency of green economy policies and even the role and capacities of regional and local governments themselves.
- **The structure of the Administration -centralized vs. decentralized; few levels vs. many levels- is a significant determinant of the cities' capacities to stimulate low-carbon development.** Centralized models (Israel and Portugal) restrain city action in topics such as Energy Supply, Energy Efficiency and Sustainable Mobility. The absence of intermediary regional levels (also in Israel and Portugal) impedes the coordination of policies between municipalities and the establishment of strategies. **Decentralized systems (Finland, Italy, Norway and Spain) allow for much more bottom-up initiative** (Green Energy procurement, District Heating, Waste treatment facilities, Transport management, etc.), and the development of regional policies, bodies and processes (e.g. Valonia in Finland, the *"Smart, Sustainable and Inclusive"* strategy in Emilia Romagna, *Catalonia 2020* in Catalonia). Too many administrative levels (5 in GI, Spain) can generate inefficiency: overload of bureaucracy, dispersion of competences, breakdown of funds, excess of structure... The total number of LGs (336 municipalities in Finland for 5.4 million inhabitants vs. 947 in Catalonia for a population of 7.5 million) is likewise a source of inefficiency in the implementation of sustainability transitions.
- **The metropolitan and regional scales are crucial in urban sustainability transitions.** In the domain of spatial planning, competition between municipalities leads to the proliferation of planning and housing without low-carbon standards. Mobility management, comprehensive and thriving green economy markets (BO and Emilia Romagna; AR and Aust-Adger) and support system resources' resilience (water, energy, food) are critical areas for the development of low-carbon metropolitan regions.
- **Progress in local sustainability policies is varied. Local Agenda 21 appears to be considered obsolete and taken over by climate action planning** in several cities, namely: AR, BO and GI. Only AL and TU have reviewed and created an updated version of LA21 and completed a full CCP cycle. Climate adaptation is just starting, with plans or measures under development, yet in some cases partial (AL, AR, GI, TU). All cities follow to an extent ICLEI's 8 principle goals for a sustainable city, **but comprehensive future visioning and resilience are still embryonic topics**. **AL, BO and TU provide the best examples** of mid to long term visions, **through target setting, strategic planning and accountability mechanisms**.
- **Progress in environmental sustainability indicators is observable in all cities**, yet mostly for "traditional" fields of urban environmental management for which top-down regulatory frameworks have existed for longer time (waste generation and recycling, water use and wastewater treatment, air pollution). However, notwithstanding the ongoing economic crisis, **per capita GHG emissions are declining in 5 of the 6 cities** in parallel to climate action planning and improving ratios of energy use and RES and an increasing offer of public transport. **Areas such as green buildings and green procurement are under progress** through newer regulations, yet indicators are still unavailable. **Behavior of environmental sustainability indicators is heterogeneous (Table 25), with a combination of high and low impact patterns for the majority of cities.**
- **Two sectors -transports and buildings- concentrate most of the challenge for a sustainable urban transformation.** Coping with the latter must consider these sectors' GHG quota, the lock-in magnitude of their inefficient technologies and systems, the costs and funding possibilities of transformation, contradictory spatial planning and housing demands, and the cultural attachment to individualism and reluctance to change.
- **Expert opinion about sustainability performance of low-carbon sectors (fig. 3) correlates to results from environmental sustainability indicators and basic factors for urban quality.** Only **3 sectors share in all cities average performance over the minimum acceptability level -5-, namely: 'Green Spaces & Nature'; 'Waste & Water'; and 'Natural Hazards'.** The first two are very basic areas of urban environment planning and management, with a long-term tradition in LGs (1970s at least), and thereby with expertise and observable results (Table 25). For 'Natural Hazards' good scores relate to the absence of catastrophic events, rather than on risk planning and management tasks. **Worst marks go to those sectors currently being incorporated in the low-carbon agenda -'Retail and Services'; 'Energy Efficiency'; 'Energy Supply' and 'Buildings'-.** Actually, from the latter, **'energy supply' and 'buildings' prove to be**

income related sectors, by performing on the positive range (>5) only in the 3 richest cities (AR, TU, BO). Performance of **the mobility sector is very much associated to highly attractive services, such as the light rail (AL and JE)**. The prior statement is confirmed with the lowest value for 'Transports' in BO, the only city with falling motorization and, in reality, where the widest offer of sustainable mobility may be found (table 16). 'Industry' performs fairly well by fastly adapting to regulations and short- and long-run savings from EE measures.

- **Assessment of sustainable urban performance by expert perception appears to be an appropriate method for evaluating *How green are Green Cities* from a complex approach. 1st and 2nd positions in our ranking correspond to BO and TU, also the cities with lowest standard deviations (0.57 and 0.69) and the only 2 cases where no sector stays below the 5 point threshold.** This means that opinions from respondees were more similar, therefore indicating that knowledge and perception about the city's SD must be closer to factual reality. **Indeed, BO and TU correspond to the cities where, despite high per capita incomes, motorization is either decreasing (BO) or already low (TU), an evidence of 'Green City' according to the literature (LSE Cities, 2013).** On the other hand, **the top scoring city is linked to a more complex deployment of the green economy.** In this sense, whereas at least 2 of the overall best 3 sectors ('GSN'; 'WW'; 'NH') are on the top 3 in 5 cities, in BO neither of them appear, and instead the 3 better scoring sectors are 'Food Products'; 'Retail & Services' and 'Industry' (6th, 7th and 4th respectively in the general ranking). Further development of this methodology with a larger number of cities and surveys will contribute to test both consistency and validity.
- **There is a correlation between income and performance marks. Complementary factors such as size and ongoing economic crisis modulate the outcoming order of cities. The 3 best cities (BO, TU, AR) have the 3 highest GPD/capita within the sample** (at national level) and follow an order from bigger to smaller in population size. **Regarding the low scoring cities (AL, JE, GI), AL leads in coherence with a longer track record in SD**. **JE and GI fail to reach the sustainability approval level** -5-. Whereas JE accounts for the 3rd lowest standard deviation (0.83), GI shows the highest variability (1.68) amongst all 6 cases. Hence, **there is a correlation between a steady socioeconomic situation (long-lasting distress in certain areas of JE) with more consensus on the city's sustainable performance (low in this case). And the contrary; a sudden and extreme change (the Spanish economic crisis) drives to more volatility of opinions.** AL's track record has also been proxy to better results. In spite of falling to the 4th position, AL is in the approved group of cities (average score 6.08; table 19). In AL, the city in the country with the lowest GDPpc, this has not been synonym of failure in sustainable performance. On the contrary, steady efforts for decades return with an average mark only 0.5 points away from the leading city (BO; 6.51).
- **The 3 richest countries in the sample (in terms of GDP/capita; Norway, Finland, Italy) account for the most mature and comprehensive urban environmental sustainability systems**, such as: RES supplied District Heating, funds for clean-tech vehicles, biogas buses from the local wastewater plant, carbon offset programs, retrofitting programs and funds, ecodistrict planning and development, co-housing initiatives, decreasing GHG per capita, etc. **The transition management approach in the private sector also shows a North-South** (wealthy-less wealthy; industrialized-less industrialized) **divide. Outstanding circular economy initiatives may be found in companies from TU, AR and BO**, whereas these are still theoretical concepts in the other 3 countries.
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7.1.1.- Green urban economy in 'Green Cities'?

- **The Green Economy is a young concept** in all 6 countries. **There is lack of general policy frameworks or legislation**, besides the "frozen" (*de facto* repealed) Law of the Sustainable Economy in Spain. **Nevertheless, policies for the GE are unfolding through sectoral approaches and instruments** (Energy supply and RES, transports, buildings, etc.). Furthermore, **there is an expansion of regional GE strategies** (Catalonia, Emilia Romagna, Aust Agder), **and assessment reports measuring the economic and labor impact of the GE** at regional (Catalonia, Emilia Romagna and South West Finland) and / or national scale and even forecasts according to potential developments (Israel). **At the local scale there is no exhaustive information about the scope and magnitude of the GE in any of the visited cities.** This research has proven unable to provide detailed insight in this sense.
- **All 39 sectors of the green economy linked to climate and energy are operating within the studied cities, through operations from either the LG or other types of organizations.** At least 56% of GE sectors are related to LG activities (max. 67%). This share grows up to 85%-97% for 5 of the 6 cities when the study scope spans to other organizations (corporations, R&D, NGOs). Even so, **the degree of development of each sector is very variable.** Newer activities such as 'hybrid, electric and fuel cell vehicles'; 'green buildings / insulation, materials...' and 'digestion'. The least common green activities (0-2 affirmative responses) within LG services and facilities are 'Gasification/carbon sequestration'; 'car sharing'; 'clean production techniques'; 'cradle-to-cradle'; 'passive solar houses / zero GHG buildings'; 'minimization of product transport'; 'new service economy'; 'reducing farm-market distance'; 'agroforestry'; and 'halting deforestation'. All

these sectors increase to 3-6 frequencies when non-LG operations are included. Hence, **it appears that some fields of GE naturally belong to industrial and research activities**, or are still not mature enough to go mainstream within the local authorities' domains. **None of the 39 GE sectors is present in less than 3 cities. On the contrary, 32 sectors are recurrent in at least 5 cities; 17 of which in all 6 of them.** With this data it is possible to say that the GE is indeed a wide ranging reality in the studied places, at least in relation to climate and energy activities, even if the average number of interviews in each was as low as 16.2. Even so, **when exploring the links of GE activities to the EU 2020 Strategy targets, organizations mostly focus on T1 (R&D) and T2 (climate & energy) and to a lesser extent on T3 (labor); T4 (education) is unregarded and T5 (poverty decline) seen as an indirect benefit**.

- **The majority of barriers to the GE (62%) are concentrated with even weights on 2 factor-groups, namely: 'Overarching factors'; and 'Government action'.** Constraints linked to 'Business and market' failures and 'Society' follow, with 46 and 43 barriers respectively, adding up to 32.0% of total barriers. Finally, 'research and development' accounts for the remainding 6% obstacles to the GE. **Problems with funding** (insufficient; rules; not strong enough green taxing; etc.), **legislation** (contradictory: more use of fossil fuels; barriers to alternative energy sources; priorities of tenders; green regulations too soft...) **and the economic crisis itself** (e.g. it discourages investments) **represent the strongest 'Overarching' barriers to the GE (95%). In 'Government Action' 78.1% of complaints deal with five factors: 'political will', 'operative barriers', 'culture of the public administration', 'structure of the public administration' and 'areas out of reach'. For group 'Business and Market' over half (56%) of complaints relate to 'green market failures' and 'BAU visions'** (both in common to the 6 cities). 'Business and market' refers to an array of issues, such as: companies' problems in visualizing their environmentally friendly efforts; the small size of the market or the companies; non-existing green products, technologies and services necessary for the green transition of a certain industry; negative image of some green activities derived from deficient information... In summary, companies demand for more visibility and support in disseminating the green business approach. In opposition to the prior barrier there is 'BAU vision' and 'pressure from lobbies' (4th factor); in summary, short term visions about business, industry and profits. In this context, penetration of the green economy in private corporations and the market is very difficult. Moreover, certain sectors lobby against green technologies and stop or slow down sustainability initiatives. **The group 'Society' is formed by 6 barriers, 2 of which accumulate more than 67% of remarks, namely: 'communication & awareness raising' and 'reluctance, skepticism and individualism'.** The first factor was detected in all 6 cities and represents a mixture of social and government related aspects. On one hand, the large amount of population still unaware of the magnitude of the climate and energy crisis. On the other, deficiency of communication and education tasks delivered by the authorities, yet regrets about the difficulties of reaching out to the public despite the steady resources applied in it. 'Reluctance, skepticism and individualism', issued in 5 of the 6 cities, refers to the sociological roots deep below the aforementioned lack of awareness. Actually, reluctance to migrate towards sustainable development appears to be the essential barrier in common to all factor-groups. **An underlying conservative mindset is expressed through an economic rationale, indecisive or awkward politics, individualism-&-consumerism, and BAU approaches. Altogether it conforms a socio-techno-institutional complex blocking the development of low-carbon economies.** Progressive political affiliation of City Councils in the majority of cities has contributed to the initiation and steadiness of sustainability pathways. However, the resilience of humankind's innate reluctance to change and global colonization of neoliberal economics (in favor of individualism, deregulatory policies, laissez faire economics, discounting the future, etc.) are such strong forces, that even in 'green cities' with 30 years of practice in sustainable development, progress of the green economy must still overcome a large variety of barriers. On top of this, the 2 cities with the lowest share of barriers are those with wealthiest national economies (AR and TU), further feeding the notion that green economy is only at reach for the rich, when one of its founding principles is fighting poverty and social exclusion.
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7.1.1.- The Green Economy and the '3E Crisis' - Reflections

- **The EU policy framework provides the reference to follow for all countries in the sample, enlarging the Union's impact range. The EU accumulates a large percentage of encouraging messages** when discussing the international response to the 3E Crisis, **yet visions of degradation of its welfare model and/or a North-South divide arise, together with the continent's loss of competitiveness against the emerging economies.**
- **LGs obtain the highest share of encouraging messages, whereas the States receive the majority of criticisms. This confirms the shift towards the local level, as there where there is more hope in coping with the challenges of the '3E Crisis'**; ergo, the effective transition management towards a sustainable economy.
- **In countries / regions with thriving economies (Norway, Finland, Israel, Emilia-Romagna) perception of the future is mainly optimistic, linked to sustainable and green Growth** and reflections on a post-3ECrisis "new paradigm". Perception about reaching the EU2020 Targets is also positive (≥50%) except for the reduction of poverty

levels in JE.

- **In countries with economies in crisis (Portugal, Spain, Italy -at national scale-) perception about the future is much more pessimistic, including visions of potential collapse. In GI (Spain) where the crisis hit the hardest, collapse relegates hope to a "new paradigm" of development.** Reforms induced by bailout funds and rescue measures are downgrading these countries' Public Administration at all levels, and their capabilities to undergo sustainability transitions.
- **Visions of a 'new paradigm' include (among others): opportunities for the GE, the need for alternative ways for measuring development besides GDP, regulatory changes, a relocalized economy, bottom-up initiatives, and new ethics and values. Even so, Growth stands as the referential course of progress. Degrowth and potential collapse of the current system are not widespread notions, yet there is a shared idea about risk of trespassing sustainability limits due excessive and broadening per capita resource use.**

7.2.- Deployment of the EU 2020 Strategy.

EU2020 is a strategic shift of the EU's economy, driven by concurrent challenges in economic competitiveness, social welfare and environmental sustainability, and expressed in specific goals for each country through the National Reform Programs (NRP). **Deployment of EU2020 is taking place in all 6 cities -even in those in Non-EU Member States-, but not always in a comprehensive manner nor under an explicit overarching political instrument.** Only AL (2012-2020), BO (2012-2021) and TU (Law of Municipal Responsibilities and Sustainably Developing TU Strategy), account for official strategies driving the cities towards the threefold EU2020 concept. The remainder cities contribute through sectoral plans and instruments to the EU2020 goals, such as: the Climate Partners Network and the *Green Incubator* in AR, the Zero Emissions Administration program in GI and the Green Pilgrim City program in JE. At the regional level, Emilia Romagna (Italy), Catalunya (Spain) and Aust-Adger (Norway -not an EU member-) have approved strategies inspired -intentionally or not- on EU2020. In the two first cases multi-stakeholder agreements support the process. The absence of regional authorities in Portugal and Israel excludes both countries from this supra-municipal approach. In Finland, regional green R&D&I and labor programs are steered by the regional headquarters of a national development agency (ELY-Center).

According to the EC (2011) reaching the EU2020 targets will largely depend on the decisions adopted at local and regional level. For a more effective transition, a multi-level governance scheme is under development. To support this scheme, the Committee of the Regions (CoR) published in 2012 *Delivering on the Europe 2020 Strategy. Handbook for Local and Regional Authorities* [The CoR Handbook from hereon]. Under the philosophy that *"no one can act alone"*, this release aims a facilitating *"coordination of policies, budget synchronization and a shared commitment towards the joint implementation of the 2020 Agenda"*. **The CoR Handbook suggests the regions to develop a long term vision based on a territorial SWOT analysis, for planning the transition process.** A vision *"based on sound territorial foresight and careful analysis of the trends and future challenges facing the region"*, because *"taking informed decisions based on facts and figures demonstrates good governance"*. On the other hand, whenever possible, multilevel governance should be shaped in a contractual form *"identifying actions to be taken by each tier of government, funding and deadlines -in order to coordinate and synchronize their policy agendas"* (CoR, 2012). **The CoR Handbook reports about initiatives expanding across the continent, similar to those found in this research.** At the regional level Catalonia, Central Denmark, Flanders (Belgium), Skånse (Sweden) and Styria (Austria) are cited. Following the approach of our study-cases a series of social partners think and co-create with the authorities the agenda of objectives and projects to undertake. In the case of Flanders an initial 2050 vision was established, leading to 337 projects by 2014 monitored twice a year by a transition management collaborative body. On top of this, every year the Government of Flanders publicly accounts for the progress towards EU2020. Styria's Economic Policy 2020 involves the active location of business around three guiding themes: mobility, clean-tech and health tech. In Skånse, the EU2020 harmonized development program will go through a 'Territorial Review' by the OECD for recommendations and policy implications. Another interesting tool for the implementation of EU2020 are the 'Territorial Pacts' -a top-down modality present in Poland and Romania-, which establish a multi-level contract for the localized adoption and funding of actions addressing the EU2020 targets. At the municipal scale, the highlighted cases are:

Table 43.
Examples of local and regional adoption of EU2020.

- Solna Municipality (Sweden): has aligned its city budget and action plans with Europe 2020.
- Eskilstuna Municipality (Sweden): has developed its own strategic targets with measurable indicators on the basis of the Europe 2020 strategy.
- Achterhoek 2020 (Netherlands) Eight municipalities and one water board are working with a variety of umbrella associations, a Chamber of Commerce and numerous civil society organizations to preserve the region's vitality going forward to 2020. It is a cooperative model, set out in a covenant.

Source: CoR - *Delivering on the Europe 2020 Strategy. Handbook for Local and Regional Authorities* (2012)

EU2020 is the first large scale experience aiming at a regime reform through comprehensive concurrent multi-level planning. With targets set-up at the EU and national levels, it drains down -on a voluntary basis- to regional and local action and planning. Not even the ESDS followed this methodology, as EU, national and regional-local goals and objectives used to be separated issues. EU2020 is a continental spanning learning by doing process, for which "best practices from other regions and cities, especially those most similar [to each other]" (CoR, 2012) will be very helpful. In this sense, **Catalonia could very well feed from the Flemish and Danish cases.** So far, the Catalonian ECAT 2020, despite supported by a plural agreement, is an in-house steered process, whereas **multi-stakeholder governance is a common treat** to the other two regions cited by CoR. The Danish partnership between employer organizations, education and research institutions, municipalities and the region is a very stimulating model that could be easily adopted at the county and/or province Catalonian scales. The Flemish transparency and accountability instruments are unexplored methods in the latter region as well. **In countries without regional authorities, such as Portugal and Israel, municipalities must take the lead** and cooperate for a coordinated deployment of EU2020 strategic action.

In the 2007-2013 period 30% of the EU € 334 billion regional funds were to be directed to green growth activities (EC, 2011). Hopefully, under **the "Common Strategic Framework 2014-2020"** ([CSF]; EC. 2011) the latter share will grow, as the new framework **translates the objectives and targets of the EU2020 into investment priorities on low-carbon**

development, climate adaptation and risk prevention, protection of the environment and resource efficiency, and sustainable transport. The capacity to obtain EU funds -in this case from the CSF- won't be conditioned by the fact of having or not a local/regional strategy aligned with EU2020. However, as the Institute for Environmental European Policy (IEEP, 2012) noted *"funding will be available for developing strategies and action plans for low-carbon development which can help improve the governance and planning processes for tackling climate change on all levels of governance"*. **CSF can thereby encourage local authorities to sign-up for EU2020**, yet also for the *"long-term decarbonization agenda of the EU running to 2050"* (IEEP, 2012). On the other hand, the CSF also pretends to activate the horizontal principle of sustainable development and climate change, potentially increasing the impact scope of the investments. Even so, this requires further development according to IEEP (2012), as *"in the past, the lack of understanding on how to deal with cross-cutting integration principles reduced the sustainable development principle to a mere 'tick-the-box' exercise"*. Nevertheless, *"importantly, clear language on the need to 'climate-proof' investments is included* [in the CSF] *by stating that future expenditure should be made resilient to the impact of climate change and natural disasters"* (IEEP, 2012).

Considering the permanent competition for funds, some **cities and regions included in our research with ongoing EU2020 inspired strategies, are on the forefront for approaching the CSF 2014-2020.** As aims and necessities have already been defined, putting the plans in motion may speed-up in the cities and regions already on track, and in a wide array of fields, such as: water supply, nature protection, climate adaption, eco-innovation in SMES, urban transport, RES, urban and rural regeneration, etc. At the start of the prior regional funding program EE and RES investments moved at as slow pace (EC, 2011), because they were not seen the priority they are today. In addition, *"the financial crisis, restricted public budgets, administrative bottlenecks and insufficient technical expertise"* (EC, 2011) delayed the development of these fields, matching the barriers to the GUE identified in our research. **In cities and regions in countries where the economic crisis is still heavily unfolding (Spain, Portugal and Italy) delays may continue and expand to all areas of low-carbon development due to financial drawbacks and political shifts.** On top of this, **administration reforms derived from the NRP, such as the re-centralization of powers, suppression of local autonomy and downsizing of the LG's denounced by AL's representatives -ongoing in Spain and Italy as well-, may short-circuit local and regional investments.**

According to the EU's Inforegio platform (2013) only a few regions from Germany, the UK, Finland and Sweden are currently (based on EUROSTAT data from 2011) at the 2020 levels in the social dimensions of EU2020 (education, labor and poverty eradication). The rest of the EU is behind. **Regarding our 4 EU adherent cases, out of Inforegio's 6 categories -2 positive and 4 negative- South-West Finland is the only region covering the social aims of EU2020.** Emilia Romagna is on the 1st level below the thresholds, and Catalonia and Setubal on the second under-grading rank. **Compared to other EU regions our 4 cases appear not to be in the worse possible scenario.** Interviews to 1 local elected officials / environmental manager in each of the 6 cities suggest that **reaching the majority of EU2020 targets will only be possible in cities from high-income economies** - AR and TU - and in JE thanks to the current economic growth of Israel (Table 38). Even so, full achievement is not expected for poverty eradication neither in TU nor in JE, nor the -20% GHG target in the latter. AL, BO and GI assume complete success for none of the 5 targets due the economic crisis. Indeed, **as a result of the crisis there have been setbacks in social cohesion that might increase the difficulty for some communities to achieve the EU2020 targets; certain goals have "moved away"** according to the interviews. This subjective impression obtained from a very little number of survey is confirmed by the EU2020 indicators (EUROSTAT, 2014). For instance, in Catalonia the EU2020 employment goal is 10.5 points higher that the current levels in the region, because unemployment went from 6.6% to 22.1% between 2005-2011 (EUROSTAT, 2014). Likewise, public policies against social exclusion have been undermined (Catalonia is 4 points behind the EU2020 goal) as well as R&D expenditure (1.7% of GDP, whereas the EU2020 level is 3%).

The EU2020 and the CSF may leverage talent development for a green economy in the better-off territories, driving to an increase in the number of thriving regions across the EU. A process that in a virtuous cycle may mount-up EU funds for supporting regions catching-up. But, as inter-regional solidarity is managed by nation-states, the overall cost-benefit impact of the CSF may be undermined. In nation-states in crisis, central governments will need to steer funds and policies towards the most deprived territories in order to foster a distributed progress to the EU2020 targets. It is plausible that regions with a country-wide economic engine role, such as Emilia-Romagna and Catalonia within our cases, see their potential improvement abated from a threefold combination of factors: impacts of the international financial crisis; the NRPs; and the domestic redistribution policies. In countries where inter-regional solidarity has created a long-term donor vs. dependent regional structure -i.e. Spain and Italy-, this may lead to an increase in regional claims for sovereignty, such as it is already happening in Catalonia.

In summary, the EU2020 is a continental challenge for which progressive adoption by regions and LGs is a critical factor for success according to the EC (2011). Forerunning cities and territories -category in which our cases may be included- are preparing for the 2014-2020 CSF, in order to speed-up the deployment of green economy activities that will contribute to the *"smart, sustainable and inclusive"* growth of the EU. However, the overall potential progress may suffer setbacks due to reforms derived from policies managed by the nation-states, which are undermining regional and local autonomy and capacities. In addition, crisis induced negative impacts have moved certain EU2020

targets to perhaps unreachable levels is some regions. How will the EU approach this shifting scenario is still not clear.

7.3.- Notes for a Strategic Framework on Low-Carbon Transitions.

This research concludes with the presentation of a strategic framework for low-carbon transitions management. It is the integrated outcome of the researcher's professional and academic background, the PhD research process, and a growing literature on the topic of transitions management. This strategic framework aims at supplying a theoretical and methodological keynote to cities and communities engaged, or willing to, on the development of low-carbon transitions and green urban economies.

Many inspiring initiatives may be extracted from the visited cities. Perhaps, as suggested by Ambientalia (2007), it will be from a process of piecing them together that a shared and standardized green city concept will emerge. Whatsoever, **currently each step ahead is a great challenge, it requires a great deal of effort, even there where a certain set of favorable conditions are met -particularly high income, strong local autonomy, bold commitment to climate action and quite supportive national frameworks**; such as in TU and AR to be more precise-**. Even in these cases neither climate skepticism nor social reluctance against green development measures stop being an issue; in mobility management, EE standards for buildings, waste treatment technologies, etc.**

Moreover, **a relevant share of the LGs' low-carbon actions has an important "learning by doing" dimension.** The LG assumes the allocation of investments into experimental or at least not mainstream technologies, such as geothermal heating and cooling, electric buses, new lighting appliances, smart sensors, etc. **Pioneering cities are turning into live labs for eco-innovation with the associated risks**, in form of unexpected deficient performance of the new products or services, and/or rejection by the public opinion. Considering that the scope of LGs' operations is rarely more that 5% of total GHG emitted by cities (in developed economies at least), often the impact of actions is more exemplary than significant in quantitative terms.

Given the variety of realities studied (Table 44), with small and medium sized cities, different cultural and religious backgrounds, very opposite economic situations -yet within the developed economies-,... **the array of SD experiences and GE activities found is noticeable. It has proven certain that cities committed to climate action are effectively engaged in developing low-carbon economic activities. Private companies, research institutions and environmentalist NGOs are also shifting towards green products and services, in anticipation to market needs of the nearby future** derived from the threefold economic, environmental and energy crisis. As our study's aim was not to compare with cities without an explicit compromise to fight climate change, it cannot be assessed whether the GE trend found is essentially stronger or similar to that happening in the latter.

Table 44.
Brief description of the diversity of the 6 study cases.

- Population size: from 42,000 in AR to 780,000 in JE.
- Extension: from 39 Km² in GI to 273Km² in TU.
- GDP per capita: from ~15,000 €/capita in Portugal and Israel to 56,000 in Norway.
- Cultural-religious background: Nordic-protestant, Latin-catholic, Arab-Jew-Muslim.
- Political culture and responsibilities: from very centralized in Portugal and Israel to almost full decentralization in Finland -income tax, Universities, health care-.
- Economic fabric: services and tourism in JE and GI; requalifying former heavy industry hubs -AL, AR and TU-; mixed production model in BO; province/regional capitals -BO, GI, TU-; national capital -JE-.
- Consumption patterns: heterogeneous behavior depending on local policies and power shifts, income and regional / national context.
- Current social-economic situation: sheltered wealth in Norway; fast growth within a militarized conflict in Israel; bailout funds in Portugal; financial and unemployment collapse in Spain; regional prosperity in BO, yet nested in a crisis at national level; long term thriving economy in Finland, but under a growing process of class creation.

Source: Own, data from field work interviews and online sources.

All 6 cities portray outstanding experiences. BO has curved down private transport parameters and deployed a mature and wide array of sustainability policies, instruments and infrastructures. The unique economic structure of Emilia Romagna is also contributing to fast adoption of green business models in the private sector. TU's decreasing per capita GHG is noticeable, in spite of economic growth, together with large urban sustainability infrastructures, bold accountability tools and innovative public-private partnerships; even so, the city is still at the top in per capita GHGs. Circular economy initiatives in TU's public and private sectors, are an emerging focus of research and development that contributes to a comprehensive vision of a low-carbon economy. AL has developed a in-house structure that puts sustainability on a supervisor and innovative position within the LG's organizational and planning schemes. Decade long strategic '[re]vision-planning-action' cycles foster multi-stakeholder governance of the transition to sustainability of the city. The Climate Partners Network in AR is an outstanding reference for third party engagement in climate action and green economy, and riveted by the city's *Green Incubator* supporting green start-ups and mutual synergies. GI offers a good information platform about sustainability indicators, and it benefits from the proximity factor of a small city through usual cooperation between the Local Government

and civil society in different sustainability programs. JE set in motion very innovative bioversity and ecosystem services plans and programs, such as URBIS and LAB, in combination with participatory planning and management at district scale. A new GE niche is developing through the "Green Pilgrimage" program, contributing in addition to transboundary cooperation with Palestinian local authorities. In both AL and JE, light rail infrastructures have contributed to extraordinary urban requalification of central corridors of the city. **Environmental sustainability indicators measuring progress exist for different sectors, yet some unwanted trends continue to exist and in some cases expand.** For instance, **urban sprawl and private car use derived from arguable spatial planning are ongoing, questioning if the cities' overall movement is towards a smaller ecological and carbon footprint, or if larger instead** -despite per capita efficiencies may be on the rise-.

Staring at the overall low-carbon picture of the 6 cities, despite the great deal of efforts being put into management and governance in order to legitimize and engage their communities and stakeholders, **after all, it appears that the transition to urban sustainability is moving on slower than desirable, expected and perhaps possible.** Therefore, **why are urban sustainability transitions slow?** And, **how to speed-up low-carbon development?**

There is an ongoing discussion in the literature about the economic model that should replace neo-liberal capitalism, with different authors and institutions arguing Natural Capitalism (Lovins and Lovins, 2008) Green Growth (UN, 2011), Degrowth (Latouche, 2003), A-Growth (van der Bergh, 2011), etc. Parallel to the latter debate, **Transitions Management** (van den Bergh, J.C.J.M. , Truffer, B., Kallis, G., 2011) **is emerging** shoulder-by-shoulder to the prior economic theories, **as the academic and technical body of knowledge for putting new development ideas in motion .** Altogether, these disciplines have one same **ultimate goal; to provide alternative exits to socioecological collapse; something difficult to avoid** for Motesharrei, S. et al. (2014), **according to models based on the human-nature dynamics of past cases of collapse dating 5,000 years back.** Foundations of collapse are seated on two pillars, namely: *"stretching of resources due to the strain placed on the ecological carrying capacity"*; and *"the economic stratification of society into Elites* [rich] *and Masses (or 'Commoners')* [poor]*"* (Motesharrei, S. et al. 2014). It is undeniable that **the present global socioeconomic "conundrum"** follows this exact same pattern. It **is a macro-structure of complex systems** for the delivery of life satisfactors (goods and services) **very concentrated in terms of flows** (capital, decision-power, energy, raw materials, property, etc.), **while super-atomized -in 7 billion *'commoners'*- in terms of necessity-driven decision-making.** Decision-making from *"commoners"*, in turn, **operating under the so called *"bounded rationality"***; i.e. individuals that make decisions according to the information they have, to their cognitive capacities, and in a limited amount of time (Simon, H.A., 1957). *"Since Machiavelli (1524) it is established knowledge that **people shy away from change for the cost of it, even if it would improve their situation**"* (Lorek and Spangenberg, 2014). In other words, as seen with the research, the general public makes decisions based on conservative individual interests and capacities; with a general reluctance to change, and putting the stress on safety, comfort, stability, etc. Then, no wonder the distance between left and right politics is everyday fuzzier; nor that fights are usually for the stripe of centrist voters. The bottomline is that radical changes are not necessarily beneficial to those in power. Actually, it is for the best of power to keep the *"commoners"* busy with decisions within the scope of *"bounded-rationality"* and shying them away from change. In this framework, and following basic game-theory, **nation-states have evolved to basically perform as managers of their domestic *status quo***; never-ending bipartisan battles for the crumbs of the economy mashed with discourses of rationality and efficiency. As a result, **governance is seated on ill-performing States in terms of adaptive capacity and readiness to change**, and ruled by short term political action. **Globally speaking it is to wonder if governance may be possible otherwise, as no-one can impede a sovereign state to take environmentally wrong decisions**; damaging either for themselves (e.g. USA's rocketed fracking industry despite derived seismicity, water pollution, etc.) or for the international community (e.g. destruction of rainforests in Brazil). In summary, **the current governance model is a minimum consensus based regime.** This is a very simplified analysis, but it does express the nature of the ill-evolving international negotiations about climate change and the transition to a socioecologically sustainable society (authors). **As long as there is one strong economy unwilling to assume caps in its emissions balance, agreements and steps from the rest will be unlikely.** The only region in the planet where this trend is broken is the EU (EU Roadmap 2050), yet it may also be explained by the absence of raw energy resources. Sadly enough, all the prior arguments reinforce the de-regulatory neoliberal theses, in both the domestic and international domains. ***'De-regulation for a steady status quo'*** would be the conclusion; **for the perpetuation of a very effectively locked-in techno-institutional complex absurdly leading us to global collapse.**

How to cope with such uninspiring context, yet producing visions of hope for factible sustainability transitions?

Cities are becoming the counter-forces to the rigid States and transnational powers, in regards to the transition to a sustainable economy. Ohmae published in 1995 *The End of the Nation State: The Rise of Regional Economies*, to describe how **the Nation State is no longer the optimal unit for organizing economic activity**, and **the rise of City-States that form agglomerations of economic power** (Khana, P. 2009). As Kaufman (undated) retrieves from Ohmae's book: *"Nation-states were once needed to provide the 4 I's of economic growth: Investement, Industry, Information and Individuals... Nation-building was the bourgeois desire to have a field of order in which markets, people and resources could be controlled and harnessed for stable industrial activity... Such a field is **now** unnecessary because **the important economic decisions are taken at the level of the economic region,** regions* (such as Hong-Kong-South China or Southern Ontario-Michigan [a.n.: or the

Euro-Mediterranean Region]) *which often cross national boundaries... economic activity is now able to locate in the most favorable regional climate"*. Consistently to the prior ideas, in the global economy **cities need and want to be on the maps and networks of international relevance.** As Khana (2009) stresses, so far **90% of the World's economic activity is concentrated in 40 dots -cities-**. No surprisingly, **efforts in this direction are a key affair in any local agenda.** Efforts that observable in the 6 studied cities, either developing some distinctive character or initiative (e.g. pilgrimage and now *Green Pilgrimage* in JE, or the Climate Partners Network in AR), by topping-up infrastructures such as airports (BO and GI), a high-speed train station (GI) or an R&D&I compound (all 6 cities), and/or by joining special international clubs (ICLEI, CCP, CoM, Healthy Cities...). Because *"cities market themselves to create or change their image with the intended goal of attracting business, tourism and residents"* (Short, 2006).

In addition to Ohmae and Khana's growth driven notion of City-States, **Rosen, L. (2013) identifies a series other breakthroughs in global governance for the 21st century (Table 45)**, which can easily be related to the field of transition management.

Table 45.
Breakthroughs in global governance for the 21st century.

- 1.- The rise of the city-state may very well be a common pattern of the 21st century replacing national governments.
- 2.- The emergence of direct democracy facilitated by universal connectivity.
- 3.- The emergence of region over nation.
- 4.- The development of a global loosely constructed federalism.
- 5.- Corporate players and NGOs no longer sit on the sidelines but become participants in governance.
- 6.- Traditional political parties are usurped by organized social cause movements

Source: Adapted from Rose, L. 2013.

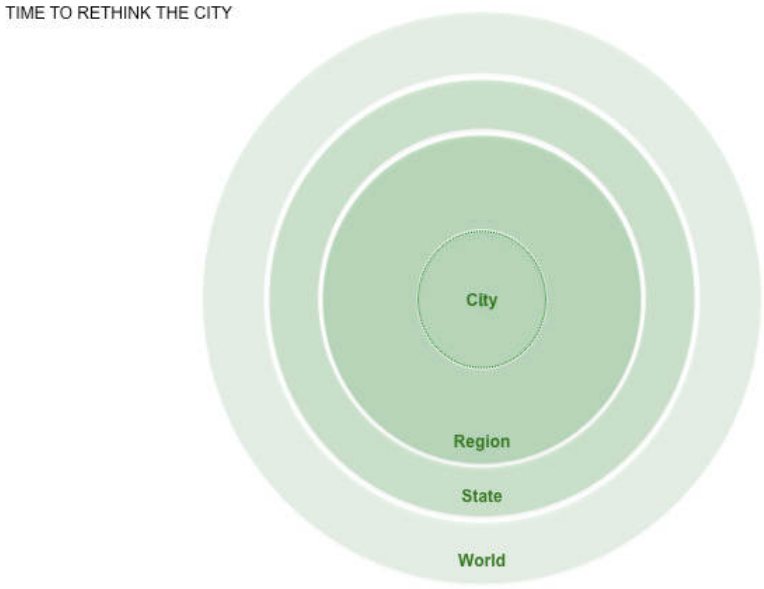
A very stimulating vision for this 'rise of the City-State' scenario, is the 'Charter Cities' launched by Romer, P. (2009); **a proposal for newly born cities created in uninhabited land, through partnerships between nations and with a special statutory charter.** A city-scale administrative zone governed by a international coalition -as an opportunity for win-win contributions from co-development- in order to set-up new rules which avoid the traps (bureaucracy, oligopolies, revolving doors, inefficient subsidies, etc.) of the current regimes. As Romer puts it, a city based on offering *"rules to change rules"*, *"choices for the people and choices for the leaders"*, and *"the infrastructure and conditions for economic activity"*. In conclusion, cities set-up to create governance, business and wellbeing friendly environments in deprived regions of the Globe. Romer estimates that this transition would increase built arable land from the current 3 % to 4% by creating new charter cities for 1 billion people, yet reducing the global ecological footprint through scaled-up and concentrated services now actually missing in many places (safety, health care, electricity, water...). A first pilot for a 'Charter City' was under negotiation in Honduras, but Romer is currently out of his own project. E. Malkin from the New York Times (2012) reports that this is due to*"the sort of opaque decision making that his plan was supposed to change"*, revelaing that *"an internal contradiction in the theory is playing out: To set up a new city with clear new rules, you must first deal with governments that are trapped in the old ones"*.

However inspiring, **the 'Charter Cities' model is perhaps not the most suitable for the transition of cities and regions in industrialized economies**, where the urban conditions to deploy in the former are usually already in place. **Even so**, the practical results of **'Charter Cities' may motivate regime system changes anywhere.** Actually, the same approach 'new settlements-new rules' is a driver for ecodistrict experiences (Kronsell, 2013; Quitzau et al 2013; Nuss et al., 2014), yet essential motivations differ.

The concept of City-State automatically suggests to rethink the boundaries of the city; it brings about the notion of intermediate geographical and population scales of sovereignty (Fig 13). Vast national territories with tens or hundreds of millions of people seem no longer to be, neither the proper dimension for socioecological governance and management, nor for transition management. Instead, **regions** (whatever the precise dimension) **crowned by a visible capital appear as a plausible alternative.** It is well established that cities are open systems requiring vast amounts of resources from other systems much beyond their administrative and urbanized boundaries (Terradas, 2002). This clarified, the region becomes a critical element for the success, sustainability and resilience of cities. It is the premier catch area of costumers for urban services -administration, culture, education, leisure, shopping- (Castañer, M.; Gutiérrez, O.; Vicente, J., 2009). It also provides support system resources for the city -water, energy, food, waste disposal, natural environment, carbon sinks, land for residence, workforce- (Nuss et al, 2010). From the industrial perspective, regions facilitate close-distance spatial settings for complex networks and clusters (European Regional Economic Growth Index, 2013). Furthermore, regions still retain locality and its associated cultural features -identity, sense of belonging, intertwined communities, bottom-up social control and initiatives, political accountability, etc.-. Hence, in reality, **these future City-States should target a regional scope; i.e. City-State Regions**, which define socio-territorial units merging localism, regionalism and globalism. **An intermediate scale allowing to practice new forms of sovereignty, including bottom-up decision-making capable of confronting the mentioned techno-institutional power complex.** Iceland is the perfect example, with 2 outstanding governance initiatives

emerging bottom-up thanks to size of the country. First, the *Icesave* referendums after the global financial collapse of 2008, which rejected paybacks with public funds for international deposits in private banks. On the other hand, the ongoing process of writing the new Constitution of the *"commoners"*.

Figure 14.
Rethinking the city for the development of Green Economies



Source: Own.

If Regional City-States (RCS) represent the scale of the future socioecological units, how to govern them for an effective development of sustainable economies?

Socioeconomic capitals contribute to the expansion of economic activity at a regional level. **However, this also tends to happen in a polarized structure** (Nuss et al, 2010). There is a concentration of economic and administrative power in and for urban centers, whereas the more rural domains that are stewards of the biophysical matrix remain ill-prepared for its proper sustainable management (Nuss et. al 2010). This suggests that compensation and co-management mechanisms, such as **Payment for Ecosystem Services (PES) should develop between neighbor municipalities at the regional level, in order to guarantee socioecological justice within the cities' immediate area of influence** (Puppim de Oliveira et al, 2013). Furthermore, **this** sort of "resource-vacuum" towards urban nodes **is also an issue between regions under the influence of a strong metropolitan area.** For instance, in Catalonia, the success of Barcelona's Province Authority in signing a € 250 Million deal from the EIB (plus € 250 Million more from local partners) for climate action, may somehow be decreasing -due distributive aims of the EU- the potential of the remaining 3 Catalonian provinces to attract comparable endorsements (in spite of the existence or absence of will and efforts by these). In similar terms, the investment in public transport at Catalan level strongly favors Barcelona's metropolitan region, driving to a very deficient service across the rest of territory (OSCG, 2007). Subsequently, **sustainability transitions of Regional City-States will thereby require a multi-level perspective** ([MLP]; suburban, urban, inter-municipal, regional, inter-regional, national, international) **in order to foster balanced progress of each unit.** In this sense, **RCS should grow into networks for the creation and management of cooperation interfaces.** Already enacted experiences at this larger scale prove that is possible to generate inter-regional socioecological compensation mechanisms. For instance, in Brazil (Puppim de Oliveira et al, 2013) and Costa Rica (PaxNatura, 2013), where basic resources for support systems of urban areas (such as water) depend on sustainable management of distant natural regions, reason inter-regional PES has been introduced.

Ultimately, **the RCS-networks approach suggests that current techno-institutional regimes must be completely transformed**. In accordance, governance and planning are the key leverage points for transformative change (McCormick et al., 2013). **But this is a very difficult task due to established interests and rigidity of existent settings** (administrative, legal, government of public-private) (Hamann and April, 2012; Quitzau et al., 2013, Romer, P. 2009; Trencher, G.P., Yarime, M., Kharrazi, A., 2013,), with resistance arising from anywhere; within the LG, upper ranking administrations, the private sector, the citizenship and even the academia when it is involved (Puppim de Oliveira et al., 2013; Quitzau et al. 2013; Trencher et al. 2013). To overcome these barriers, transition management scholars and practitioners stress the importance of **multi-stakeholder processes promoting co-learning and co-creation**, public-private-partnerships (PPPs), knowledge development and organizational learning. Among these, **two relevant approaches are Collaborative Intermediary Organizations (CIO) and Purposive Performance** (Hamann and April, 2013). It is assumed that transition to sustainability is a process for which *"no single actor or organization possesses the all encompassing knowledge, resources or capacity to solve*

complex, interwoven sustainability problems on their own" (Trencher et al. 2013). In response, **CIOs are** becoming frequent, because they offer **multi-stakeholder *"platforms for deliberation and collaboration"*** (Hamann and April, 2013). CIOs may receive other names and more refined definitions, such as Urban Transition Labs and Living Labs (European Networks of Living Labs). Anyhow, the fundamental mission of these bodies is to bring together disparate actors within one same socioecological unit (from District to Region) and conduct co-creation dynamics. Hence, to establish new techno-institutional regimes **steering sustainable urban transformation through purposive performance; ergo, action aiming at specific outcomes; circumscribed to concrete goals.**

Regime change processes must earn community credibility in order to be successful. One plausible step in this direction is to engage agents working in the broad world of socioecological sustainability. Nowadays, this shouldn't be too hard, given that **within "conventional" businesses the adoption of a green profile is no longer rare, and solid ground for alternative initiatives in many sectors is growing**, such as: ethical-sustainable banking and/or insurance companies; RES and EE cooperatives and enterprises; locally developed smart and applied R&D&I activities; green building companies and architects; electric, non-motorized and shared transport experiences; local organic and sustainable food chains; alternative education methods and collectivities; alternative health and personal development institutions and professionals; environmentalist and solidarity NGOs; complex systems and global change researchers; governance, mediation and inclusion practitioners; etc. All of the prior activities may be easily found in cities. Else, there are enough information, expertise and cooperation networks as to attract their implementation and/or replication.

A wide field of action is opening up for any LG wanting to initiate low-carbon transition projects and, in consequence, if a CIO must be launched composition and functions may vary a lot. However, **it appears that presence of universities and academia is a critical structuring factor** (Trencher et al, 2013) with multiple benefits to the process (Bhagavatula, L., Garzillo, C., Simpson, R., 2013). As learnt in our research, the university and/or research institutions are closely working with LGs in decarbonization R&D&I. Likewise, universities are playing a leading role in the migration to sustainable business models of the industrial tissue (in TU and AR at national and regional scale respectively). **Motivation and roles of the university in regards to sustainable urban transformation are often multiple** (Trencher et al., 2013). A leading position is preferable, despite CIO partnerships are often formed and coordinated by the administration or bridging organizations. Post-traditional roles such as revitalizer/retrofiter, builder/developer, director/linker and empowerer/facilitator are jumping into the scene. Universities enroll in transition management for missional motivations, but there are various win-win potentials too: funding opportunities from earmarked green stimulus programs; scientific or scholarly outcomes from locally applied research; social contributions for underserved populations leading improved community relations and image of the university; developmental / strategic motivations through which the university adopts a spearheading role in regional innovation systems in order to shape the future of the surrounding socio-economic fabric; Entrepreneurial developments from green innovation.

Activities derived from CIOs are of very disparate nature (Trencher et al., 2013), from the creation of green-tech clusters, to the planning of sustainable multi-use city-districts and when in campus their construction, and 'rust-to-green' or 'brown-to-green' requalification programs and projects for degraded areas / communities, to the development and coordinated testing of strategic visions at different scales (e.g. the '2000 Watt Society Pilot Region Basel' in Switzerland). As deductible, CIO experiences can be very ambitious, but transition to a sustainable economy it likewise is.

Once the mission and body of a transition management project are clear, challenges will still appear in many ways (Trencher et. al., 2013). Resistance to collaborate will even emerge from the scientific community itself. Credibility of the proposals, generated -for instance- from the struggle between the different cultures of basic and applied scientists. Steady action and engagement of the multiple partners. Funding, as it often depends of external sources. The degree of consolidation of the supporting instruments for the CIO (headquarters, personnel, offsets for contributors, etc). Also, political changeability. **Nevertheless,** in spite of shortcomings and ups-and-downs, **putting in motion CIOs and/or university-LG collaboration for transition management has proved beneficial** (Hamman and April, 2013, Trencher et al., 2013, Nevens et al., 2013, Bhagavatula et al., 2013). Actually, **interest in CIOs is increasingly relevant even at the EU level**, as suggested by the EC (2011) in regards to the EU2020 Horizon funds, and more specifically, with the governance approach for the implementation of local infrastructures within the Urbact Program through multi-stakeholder Local Support Groups.

Table 46.
The 5 phases cycle of Transition Management

TM	1) process design and system analysis	2) problem structuring and envisioning	3) back casting, determining major pathways and agenda setting	4) experimenting	5) monitoring and evaluation

Source: Adapted from Nevens et al., 2013.

Transition management processes are structured in 5 phases (table 46) (Nevens et al. 2013); very similar to the CCP-ICLEI methodology, indeed. **The majority of experiences do not have an end date once begun**, because even if CIOs initiate within a closed project and calendar, practice leads to continuity of this governance platform. This suggests that

communication and relationships within the CIO should pursue some sort of steady consensus. In this sense, **visioning appears to be a very powerful tool for bridging disparate positions in a constructive manner.** It is a lever for understanding why sustainability transitioning is necessary in environmental, social and economic terms. But moreover, **envisioning allows to associate a change trajectory to *"appealing and inspiring visions"***, to *"a narrative of desirable systems"* for the future (Nevens et al, 2013). It is a "blank canvas" on which -given some notions of the future- everyone can print their ideas and hopes for a sustainable collective progress.

Once a common vision is attained, **the utterly difficult task is planning the pathway to get there**. **The back-casting method** (Lovins, 1976; Robinson et al. 2011) **"*breaks down the long-term sense of direction into mid- and short-term targets and actions*"** (Nevens et al., 2013). Then, it becomes more feasible to share, explore and deliberate about alternatives, in order to reach plural agreements and commitments on what, how, when, etc. transition actions to undertake. In this sense, Hamann and April (2013) suggest to leave implementation apart from the CIO activities; to delegate deployment of action to more specialized organizations (the LG, PPPs, outsourcing, new tailored institutions, etc.). In this setup the CIO would still have the missions of monitoring, evaluation and feedback into the transition roadmap and action plans.

This fast scan over transition management theory undoubtedly draws back to many of the experiences reported through the case studies. Piecing both theory and practice together it is possible to reach the last stage of this Strategic Framework for Low-Carbon Transitions, by defining **2 strategic priorities for low-carbon development of RCSs, namely: 1) the Green Knowledge & Green Economy Cluster; and 2) The Resource Synergic Infrastructure System**.

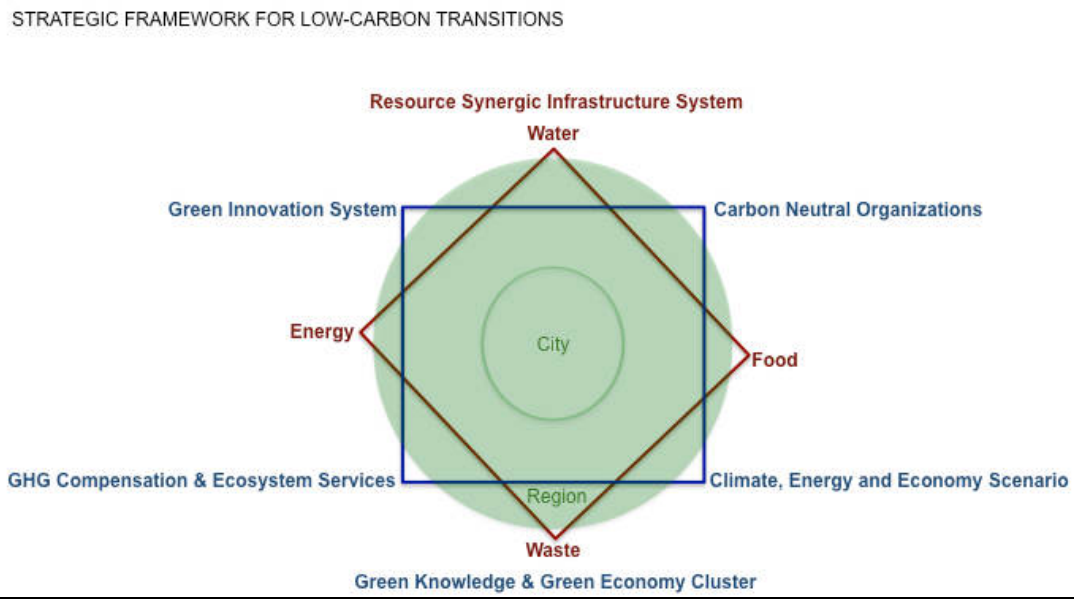
Departing from the notion of the CIOs, **this research suggest a new governance scheme for territories willing to undertake low-carbon pathways; i.e. the 'Green Knowledge & Green Economy Cluster' (fig. 15).** The main idea behind this is **to link -at local and regional scale- green innovation and knowledge sources to financial resources, economic activities and green development needs**. Given the increasing risk of collapse under the 3E crisis, definite visions of mid- to long-term resilience have evolved from necessary to urgent. It should become a priority to invite local researchers and scholars to develop interwoven scenarios of climate, energy, economy and society, following the example of Agder-Research in AR, who facilitates visioning processes and transitions to sustainability for industries. Scenarios that should be delivered and discussed by a local sustainability support group -a CIO type structure- with the mission to hereby define plans and roadmaps leading to a green, fair and adapted future. With the vision and aims ready, it would be possible to determine the necessary green innovations and investments to develop. It is plausible to think that the availability of many of the latter will be neither right away, nor from the local industrial and knowledge capital. Hence, in order to prompt locally adapted R&D&I, there should be an impulse of co-learning projects and PPPs, with the inclusion of both the R&D&I sources (Universities, entrepreneurs, factories, etc.) and end-users (LG, retail & services, industries, farmers, households, etc.). To this end, a local green innovation system should be created, for which several references from our fieldwork are inspirational. For instance, AR's Climate Partners Network and the *Green Incubator*, as they provide a model for encouraging green entrepreneurship and how to bridge it to conventional activities in a decarbonization process. In addition, this model fosters both the dissemination of low-carbon activities across a wide variety of sectors, as the shaping of a strong green branding profile to that community. When possible, these instruments for a green innovation system should be integrated into large R&D infrastructures and networks, such as the Science and Technology Parks in AL, BO, GI and TU. How to insert socioecological resilience for crisis-adapted development is perhaps the unanswered question for the latter cases, in order to avoid tunnel-vision of innovation systems, such as it might occur with GI's focus on Smart Cities and water management, and in TU with biotechnologies. Finally, the 'Green Knowledge & Economy Cluster' should implement financial mechanisms to feedback the local-regional green economy. As part of the scenario-vision-planning generation process, economic values should be assigned to ecosystem services, as well as 'polluter pays' taxes and/or fees for environmentally degrading activities. Then, from either voluntary mechanisms (such as GHG compensation by CPN members) or regulatory instruments, permanent green cash-flows would be possible, allowing to finance green R&D&I, climate adaptation and mitigation activities, resource resilience projects, etc. AL and BO offer two success stories in this sense, with their local carbon mitigation funds. Furthermore, entailment of the CPN concept would be a lever for the expansion of the local and regional green market. Of course, application for national, international and private financial funding would be required. Most probably this would actually represent the larger share of funds for the local green innovation system. Still, locally developed financial mechanisms would demonstrate good governance before financial institutions, and supply the unavoidable co-financing amounts.

The second element of this Strategic Framework for Low-Carbon Transitions is the Resource Synergic Infrastructure System (fig. 15).

Coyle (2011) described urban sustainability supporting systems; transportation, energy, water, natural environment, food production/agriculture, solid waste and economy. Trencher et al. (2013) put the focus of sustainable urban transitions on 4 areas: 1) transformation of space: urban development; 2) consumption and production in cities; 3) circulation: trade and transportation; and 4) ecosystem, social and knowledge services. **Inspired on the industrial symbiosis project of Biota Tech-Mediaura Corporation in TU, we suggest to design and create Resource Synergic Infrastructure Systems, for resilient sustainability of basic urban resources. Our hypothesis is that in any given future scenario the most elementary stability of urban areas will depend on the capacity to supply in quantity and quality water, food, energy**

and waste treatment. In the current setting all 4 factors suffer from non-resilience. Food, agricultural inputs and energy are highly dependent on imports. Energy production is usually centralized in large distant facilities. In case of disruptions of power plants or networks, energy cuts have an impact across extensive territories. For the case of water, purification and treatment require large amounts of energy, often linked to the same insecure networks. Waste, in turn, is an enormous issue for cities. It requires large amounts of resources in form of budget, workforce, equipments, facilities and energy. When not adequately managed waste becomes a very big problem, as it attracts pests, it can induce soil and water pollution, it may be the source of diseases, etc. Altogether, the supply of water, food and energy, and waste management is essentially insecure and incapable to adapt to strong disturbances. However, water, food, energy and waste may be integrated into a single system with remarkable synergies. Food and food waste are the simplest circular economy to apply, as one is the source of the other (through composting and agriculture). Moreover, it is possible to anaerobically digest food waste generating energy; electricity, heat and fuel (biogas). Actually, at a wider scope, when waste in general is separated in different flows (food waste; biomass and tree pruning; sludge; packaging's; furniture, etc.) and treatments (recycling; digestion; composting; incineration), it may become an enormous and constant source of materials (soil substrate, fertilizer, raw materials for goods...) and energy (heat, power and biofuels). Water, in regenerated form may be an irrigation source. And, in its prior wastewaters form it is also a source of reusable material (sludge) from which energy is likewise obtainable. Altogether, urban physiology resources which can be transformed into energy, in order to deploy safety networks for basic infrastructures (water plants, schools, hospitals, etc., and of course the household network, or for transports if the flow level allows to), while giving resilience to the most basic elements of survival, namely: food and water. **Urban autarchy is an emerging possibility under this Resource Synergic Infrastructure System. Given the uncertainty and increasing danger linked to the 3E Crisis, autarchy should no longer be a symbol of authoritarian isolation, but a source of resilient sustainability.**

Figure 15.
Green Knowledge & Green Economy Cluster + Resource Synergic Infrastructure System.

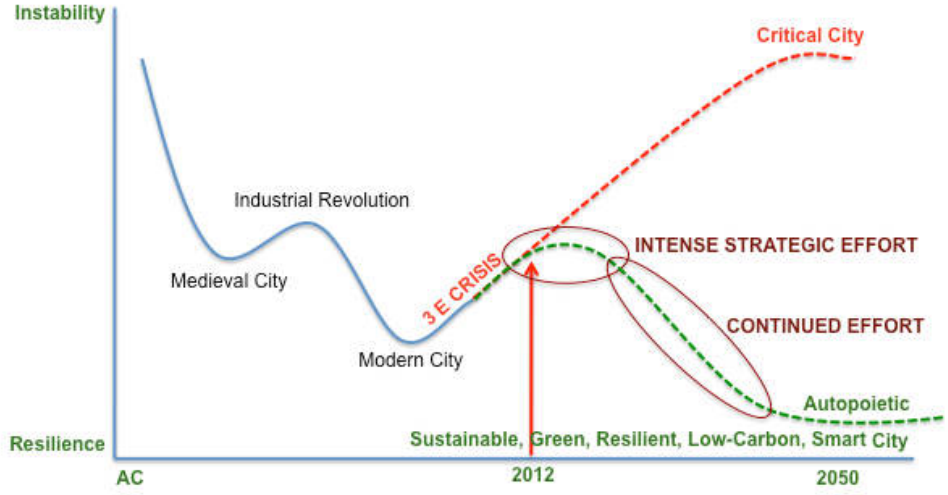


Source: Own.

7.4.- Final Remarks

Local Governments have taken a step forward turning cities into a global sustainability movement. However, as seen with the research, despite commitment and action are steadily growing, progress is slower than necessary. Because the challenge is enormous and it broadens at a faster pace than responses implemented at any scale (Chapter 1.Fig. 16). Alternatives to this situation require to rethink the economic system, the governance system and even the urban physiology systems. If sustainability is to be attained, degrowth appears to be the only pathway to follow, for arithmetical reasons. Because in a world with growing population and an expanding middle class, but with finite material and energy resources and a series of planetary boundaries of environmental equilibrium (Rockström, et al. 2009), it is unavoidable to cut down humankind's footprint and adjust it to what the Planet can bear. As Victor (2008) writes, the next step is to develop *"slower by design, not by disaster"*, for which one essential challenge to address is the insatiable desire for consumerism, combined with the superficiality of the *"liquid modernity"* (Bauman, 2000) and the declining capacity to endure efforts directed to the common goods; the global *"california-ization"* of culture (Ohmae 1995 in Kaufman, E.). Indeed, part of these desires are the product of unsatisfied basic needs that a large bulk of humanity is still seeking to conquer. But very often the psychological end-line is also the consumer ideal; the possibility of unlimited freedom of choice and ownership, no matter how the goods and services have been produced, nor their impact. An ideal very strongly nurtured by the mass culture and the omnipresent commercial propaganda. An ideal, on the other hand, which is legitimate and to an extent even natural, yet censurable in terms of sustainability.

Figure 16.
From the '3E Crisis' to a necessary Low-Carbon future.



Source: Own.

Today we know that even in global environmental mathematical models the only social dynamics for hope is what the Geophysicist B. Werner (2012) named *"resistance"*; i.e. movements of *"people or groups of people"* who *"adopt a certain set of dynamics that does not fit within the capitalist culture"* (Werner, 2012, qoted in Klein, 2013a in press). According to the author these dynamics represent the most feasible source of friction in order to *"slow down an economic machine which is careening out of control"* (Klein, N. 2013). As a new component of the model, resistance includes *"protests, blockades and sabotage by indigenous peoples, workers, anarchists and other activist groups"* (Werner, 2012, q. in Klein, 2013a). Furthermore, the complex model presented argued the *"futility of Global environmental management"*, revolving on the idea that so far the track of enacted environmental policy has in overall terms been ineffective. Klein (2013b) in a recent interview went one step further and by saying *"look at the track record of Kyoto, of the UN Clean Development Mechanism, the European Union's emissions trading scheme – we now have close to a decade that we can measure these schemes against, and it is disastrous. Not only are emissions up, but you have no end of scams to point to".* Continuing, Klein (2013b) affirms *"this was a massive corporate giveaway, and they* [the right-wing] *were right that it wasn't going to bring us anywhere near what scientists were saying we needed to"*. In consequence, she considers that *"there is a very deep denialism in the environmental movement among the Big Green groups"*, in the sense that the latter have adopted a position of suiting economic growth to sustainability through environmental measures, something increasingly refuted by science (Nature, 2012).

Werner's science-based reasoning for action is not isolated. Klein (2013a and b) explains how many other relevant academics are trespassing the boundaries of neutral science and turning into activists; joining the protests in the streets, initiating advocacy projects and/or publishing very "disturbing" papers about the critical degree of unsustainability humankind is getting to (e.g. *Climate Change: Going Beyond Dangerous... Brutal Numbers and Tenuous Hope*; Anderson, 2012). Some referential cases are: former Nasa Scientist James Hansen, Glaciologist Jason Box -world-renowned expert on Greenland's melting ice sheet-, or Kevin Anderson -the deputy director of the Tyndall Centre for Climate Change Research-.

After all, perhaps, the profound challenge that cities, headed by their LGs, must undertake is this activist view of urban sustainability transitions. It is the "elephant in the room". **It is dropping the politically correct narrative** of considering that transition to sustainability and the cultural *status quo* are and must be compatible. It is understanding and lifting to the highest priority of local development that a new cultural regime must emerge, expand as fast as possible and overtake the ongoing consumerist and self-centered society. For the latter to happen, **cities should be able incept a new governance system capable of pushing the transition to sustainability on the upper layers of the techno-institutional complex. And for their citizenship, LGs should aim at replacing brands and commercial lobbies as the community's premier reference in production-consumption practices.** This requires gaining loads of legitimacy and trust within the value-system of individuals and stakeholders. Hence, there should be a much closer and stronger interaction between the LG and the community; going all the way to door-to-door education if necessary, in order to enable the people to learn and practice post-Growth lifestyles.

The visited cities are indeed putting remarkable efforts into new forms of governance; in getting their communities and stakeholders on board the low-carbon challenge. Parallel unique experiences are setting up the cities' green development milestones. Hopefully, this research has contributed to a better understanding of the reasons for sustainability transitions, behind and ahead, as well as some practical approaches to those concerned in reaching a fair and sustainable future for us all.

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ANNEX 1 - CITY PROFILES

The following Annex section develops full-length results for each of the 6 cities in a standardized format, the City Profiles. This section was initially supposed to constitute Chapter 4 (Results) of the PhD dissertation, but due to the its extension it was considered more efficient to provide focus Chapter 4 on those results that would be discussed in detail, and leave for an extended read all the information collected for each case study. City Profiles are ordered according to the visits calendar.

The City Profiles are structured in the next subsections:

- Presentation

- Summary and Highlights of the City's Green Development Profile

- Low-Carbon Economy in the City's Country

- Climate Change and Green Economy Framework

- Green Urban Economy in the City.

- C/P Workshop of Development and Climate Change

- Interviews (Subjects)

- Interviews (Organizations): General Information and Socioeconomic Aspects

- Interviews: Activities, Constraints, and Future

- Interviews: Links to the EU 2020 Strategy Targets

- Performance of Turku in Climate and Energy Sectors

- Reflections about the '3E Crisis'

Due to budgetary restrictions, text revision and correction of Annex 1 has been conducted at a basic level, through the Spelling and Grammar tool of Microsoft Word 2008 for Mac.

Turku - Finland

TURKU - The Market Place

Turku, founded in the 13th century, is the oldest city and the first capital of Finland. The region where it is nested is named Finland Proper after this historic bond. The first university in the country was created in Turku as well. Today, after 200 years of Helsinki as the capital, Turku is the 5th largest Finnish city with ~180,000 residents. It lies on a very complex section of the Baltic coast, surrounded by thousands of islands and some 60 km until the open sea, at the mouth of the Aura river in the southwestern corner of the State. Unemployment in 2010 affected 13% of workforce, despite the city's large maritime sector suffered a period of crisis. The University with 35,000 students and the Municipality with 14,000 workers (7.8% of the inhabitants) drive much of the economic life in Turku. Thanks to the unique Finnish decentralization policies, Turku Municipality is responsible for all the education system (from kindergarten to Universities), Health Care (incl. Hospitals) and even income tax collection, managing a total budget of 1,300 M€. The huge public body is however a management challenge. And urban sprawl towards the coast and islands clashes with sustainability plans.

Coordinates: 60º27'N - 22º16'E
Population 2012: 179,529
Surface: 273 km² (metro: 2,331 km²)
Mayor: Aleksi Randell - Liberal-Conservative
Vote turnout 2008: 58.6%
Municipal Budget 2010: € 1,272,439,000
Per capita income 2010: 34,100 €/inhab.
Unemployment 2010: 13 %
Website: http://www.turku.fi/
Study Visit: 1-5 November 2011

Summary and Highlights of Green Development in Turku

In 1996 Turku committed to both the Aalborg Charter and the European Cities SD campaign. This led to the Sustainable Development Program (SDP) of Turku (2001); a planning tool monitored by yearly environmental reports and sustainability indicators. In 1997 the first GHG inventory of the city was commissioned. By 2005 an updated SDP had been approved, in response to the signature of "Aalborg + 10 commitments" and a baseline review. The 2006 SD report included a measurement of the ecological footprint based on 2001 data, and the aim to reduce 20% GHG by 2020 from the 1990 levels (despite CoM did not exist by then and the city joined in 2011). Planning and implementation of the SD objectives is supported by ecoBudget®, a tool to integrate environmental issues in the budgeting and accountability cycle of the local Council. Another topic in Turku's SD Agenda is the Baltic Sea Challenge to improve water pollution, a cooperation effort from the Union of Baltic Cities, of which Turku holds the Environment Secretariat. Green economy is actually an emerging affair in general, with relevant knowledge transfer projects in the Universities, as well applied innovation from key economic sectors such as the maritime, energy and food industries. Sustainability in Turku is included in the local laws and in a consensus agreement signed by all parties before the last election (2008).

- Sustainability is one of the 5 Aims of the Law of Municipal Responsibility of Turku.
- Sustainably developing and well-balanced Turku Strategy 2009-2013:
  - Housing and Land Use Program
  - Climate & Environment Program
  - Competence, entrepreneurship and business
- ecoBudget® planning and accountability system
- GHG Inventories (1997/2003/2007); -15% GHG / capita since 1990; target 30% by 2020 (vs. 1990).
- 50% district heating on Renewable Energy (2020), 100% for electricity (2013)
- 66% public and light rail transport (2030), bicycle path network (2015)
- Green procurement criteria in 100% tenders (2013)
- Eco-support persons in all units

Low-Carbon Economy in Finland

Finland is one of the few countries where the rate of renewable energy is already above the 20% European target for 2020. Wood, peat (6% approx.) and hydropower, combined with some wind, ground heat and solar, covers about 30% of Finland's energy demand. Another 19% is supplied by nuclear power, and the rest (~61%) comes from fossil fuels. Even so, "Finland has experienced great pressures on its sensitive environment, as expressed by high energy and material intensities", according to the OECD 1997-2008 Environmental Performance Review. Actually, in 2006 Finland's GHG emissions had increased by 13% compared to 1990, well above the Kyoto commitment of 0%. It is the counterpart to the steady path of economic growth experienced by Finland for the period, which positioned the country on OECD's the top half members in terms of GDP/capita. Nonetheless, by 2012 average 2008–2011 emissions in Finland had fallen 2 % below the base-year level, proving that Finland is reliable when it comes to reach its commitments.

Parallel to this Kyoto effort, a new long-term climate and energy strategy was submitted to Parliament in 2008, in order to achieve the -16% GHG set up in the EU 20-20-20 framework. A target of 38% share of renewable energy by 2020 was included in this strategy.

- National Strategy for SD 2006. Timeline 2030. Aiming at innovation, change management capacity and economy using renewable resources.
- National Renewable Energy Action Plan (2010)
- National Carbon Tax (CO2 Tax) on the carbon content of fossil fuels since 1990.
- National Bio-Economy Strategy 2009: new working methods to the global challenges that decreasing natural resources and climate change bring about.
- National Foresight Report on Long-term Climate and Energy Policy; aim -80% GHG 2050 vs. 1990
- National Strategy and Action Plan for the Conservation and Sustainable Use of Biodiversity
- Natural Resource Strategy for Finland.
- Taxes on Fossil Fuels and Electricity. Raised energy taxes to encourage saving and energy efficiency.
- Interim Report of the Green Growth Strategy: Implementing our Commitment for a Sustainable Future (2010)
- Waste Charges-Policies: Tax on disposable drink containers; Deposit-refund system (1950's); Landfill Tax (1996); Eco Charge to promote waste separation since 2008 (currently in 188 out of ~450 municipalities); full process charges;
- Program on Sustainable Consumption and Production; process about greening the economy, or how to create wealth with a smaller footprint.
- Registration Tax on Passenger Cars revised in 2008 to guide consumers towards fuel-efficiency.
- Sustainable Public Procurement 2009. Resolution for all public actors to adopt sustainable procurement.
- Panel on Environment Innovation 2009-2011 to support dev. and implementation of environmental innovations.
- Assessment of the environmental impacts of material flows caused by the Finnish economy with the ENVIMAT model (2009)
- Identifying the eco-innovations needed for material efficiency and waste reduction. (2011)

As the prior list suggests, Finland's instruments for deploying a Green Economy are extensive and varied. However, for the 2010 and 2011 versions of the Climate Policy Tracker (CPT) Finland deserves an F (in its A-G ranking), despite it is improving. Different aspects drive CPT to this low grading: a) the feed-in premium for renewable energy introduced in January 2011 shows low ambition levels for solar, wind and geothermal energy; b) the decision about a climate law hasn't been materialized yet; c) plans to reduce energy taxation for energy-intensive industries shall result in lower incentives to save energy; d) connection of peat taxation to its CO_2 emissions is still absent, as well as action in the transport sector, where there are no instruments to promote electric vehicles or a modal shift.

In contrast, Finland is putting specific efforts in Bio-Economy. A national strategy is guiding the development of this new concept, the main impact of which is the replacement of non-renewable resources by bio-based ones, e.g. in production of energy, plastics, and medicines. As reflected in the interviews, the bio-economy is a topic engaged in both private and public activities and enlarging the range of the Finnish green economy.

Last but not least, a key issue in Finland is atomic energy, as the country is among the few currently promoting this source of power, with its 5th reactor in construction and planned to operate by 2015. Whether it should be considered a climate related green economy practice, or not, is still an open discussion considering safety and costs on the long run of plants, dismantling and radioactive waste. In the Finnish case, the Nuclear Energy Act amended in 1994 established that all waste should be disposed in Finland; reason why the first deep geological repository for spent fuel was created in 2000. Plans to increase the share of nuclear power plants could continue in the political agenda of the country, as "Finnish public is among the most nuclear power-friendly nations in the EU: in a 2008 survey, production of electricity by means of nuclear power was supported by 61% clearly above the EU average of 44%" (Wikipedia, 2012).

Finland is indeed on track to develop a low-carbon economy, but it must rapidly curve down the 12.5 t CO_{2e}/capita (2011), quite specially in the energy sector -but not only- (EEA, 2012). Nevertheless, for the OECD (2009) despite Finland's CO_2 and energy intensities are high among their countries, *"it is in a good position to benefit from the opportunities of globalization, including environmentally-friendly investment".* Openness to international trade and foreign direct investment; high education level of the population; a strong innovation record; and the role in diplomacy given to sustainable development, are the main arguments for the international organization's positive forecast for Finland. From the perspective of the EU 2020 Strategy, the issue of carbon emissions reduction is the main challenge Finland must solve, as the vision behind the policy -low poverty levels, and high education, labor and R&D- is already embedded in the social and economic model of the country.

Climate Change and Green Economy Framework						
	Adm. Unit	State (NUTS1)	Region (NUTS2)	Province (NUTS3)	County (LOCAL1)	Municipality (LOCAL2)
	Name	FINLAND	Southwest Finland	Southwest Finland		Turku
Climate Change	CC Responsibilities	Climate, Energy, ETS, EU mandates	20 year Regional Dev. Plans	Environmental permits, provision / rescue serv.		Energy, Public Transp., Waste, Waters, Buildings, Spatial Planning, Green Areas
	CC Target	G14% - E20% - R38%	20-20-20	--		CoM SEAP:20-20-20 --> -20% GHG vs. 1990
	CC Action Role	Mostly passive: finance, legislation, taxing, adoption of EU mandates.	Support Programs for Local Governments	Passive: Support and Finance		Active
Green Economy	Assess. Report	Nat. Bioeconomy Strategy 2009	Expected for 2012	--		--
	GE Legislation	Sectoral (list above)	--	--		--
	GE Strategy	Large Green R&D financial tool in place	Green R&D financial tool	R&D financial tool // e-Green Network		e-Green Network
EU 2020	3% GDP R&D	Pretty close as a city regarding municipal budget to education. Good cooperation between cities, business and academia since the late 80s. Large investments on maritime industry, biotechnologies, and IT: 2 projects for ships running on LNG; biogas projects, etc.				80-100%
	20-20-20	Looking at goals of the city, these are fully met. Emissions targets for sure. 30%-20% vs. capita				100%
	Work Age 20-65					100%
	Education					100%
	Lift 25% Poverty	However, for the first time in years income differences are increasing at national level				100%

Green Urban Economy in Turku

Turku's approach to the development of a Green Urban Economy is based on 4 pillars:

1.- Commitment, consensus and accountability

2.- National and international benchmarking

3.- Public private partnerships for green innovation

4.- Development of closed loop economies

Turku's track record on sustainable development goes all the way back to 1996 when the city adopted the Aalborg Charter and produced its first sustainability report in 1997. The output of this process was Turku's 2001 Local Agenda 21 action plan, revised in 2005 side by side with Aalborg+10. Following a thorough exemplary role the city produces SD reports every one or two years, in which the development trends in the urban region are monitored. The fight against climate change started in parallel to LA21 with the initial GHG inventory in 1997 (extrapolated to 1990 and updated in 2003, 2007 and 2010). As a result, the city has already achieved a 15% cut in per capita emissions compared to 1990. In 2009 a 4 year Climate and Environment Program was passed and adapted for the Covenant of Mayors, aiming at -30% CO_{2e}/capita by 2020 (and -20% in total emissions). **It is very notable that the SD agenda of Turku has been steadily deployed along 4 electoral terms (1996, 2000, 2004, 2008) in which the city has been ruled by shifting coalitions of different political parties. Commitment, consensus and accountability are one of the strong pillars supporting sustainable development policies in Turku.** Other examples of this are: the consensus agreement including SD signed by all forces before the 2008 election, and the inclusion of Sustainability in the Law of Municipal Responsibility of Turku, as one of its 5 Aims of the institution.

In coherence, to increase accountability and transparency, since 2010 a Sustainable Development Budgeting (ecoBudget®) program is being implemented. According to this system, the yearly programming and budgeting planning process allocates targets, measures, and indicators in € and environmental units for all bodies linked to the Climate and Environment Program. Therefore, it is possible to monitor and evaluate progress achieved for the approved measures. At least one eco-support person will be designated for each administrative unit in all sectors, municipal enterprises and affiliated companies by 2013, facilitating a comprehensive extension of the *eco*Budget program in the City Hall. Thanks to this integrated sustainable planning and management, a large set of climate and energy actions are already nested in many of the LG's departments and companies. Even future policies and decisions become a mandate this way.

- -30% CO2epc by 2020 (and -20% in total emissions)
- +9% EE improvement from the 2005 level by 2016
- +20% EE improvement from the 2005 level by 2020
- New construction will be low-energy construction and renovation will aim at improving energy efficiency.
- 50% of district heating from RE by 2020.
- 100% of the electricity purchased by LG from RE in 2013
- Share of light and PT > 55% in 2013; 66% by 2030.
- By 2010 decision program for cycle and pedestrian.
- By 2015 downtown cycling network complete.
- +2% increase in annual journeys by public transport.
- Regional Public Transport organization by 2012.
- Decision on PT system by 2010.
- Sustainable development criteria will be taken into account in all city tenders in 2013.
- -10% in internal city transports from 2008 to 2013.
- <10% of community waste in landfills in 2016.
- Less wastewater emissions in low-density areas.
- Decrease in the load caused by storm water.
- Centralized wastewater treatment will be profitable.
- Reduced load entering the sea via the Aurajoki River.
- Valuable natural sites in the city protected by 2013.
- 2013: 30% daycare and education centers with green flag

From the institutional perspective, Turku rounds its shift to a low-carbon development by joining and leading several national and international initiatives. As member of the "6 pack" -the 6 largest cities in Finland- they are signatories of a common agreement on climate change mitigation and adaptation. Together with Helsinki they take part in the Baltic Sea Challenge aiming at the improvement of this over-polluted sea. Actually, Turku holds the secretariat for the environment commission of the Union of Baltic Cities, a network that gathers more than 100 cities from 10 different countries. Consistently to this compromise, one of the top green corner stones of Turku in the recent period is the underground wastewater treatment facility operating since 2009. This plant is producing heat and cold out of wastewater, then distributed throughout the city by district heating. Turku is also home to the headquarters of Valonia, since 1998 the Agenda 21 and Energy Agency for 28 municipalities (450,000 inhabitants) in South West Finland, with the aim to coordinate and facilitate the implementation of programs in both areas in the entire region. At Finish level, Turku participates as well in the National Commission for Sustainable Development.

At the international level, Turku is a very active city in several of ICLEI's campaigns, such as *Cities for Climate Protection*, ecoBudget®, *Procura+* on sustainable procurement, *Informed Cities* linking research, monitoring and sustainable urban management, the *European Partnership for Integrated Sustainability Management* and *CHAMP* focusing on local response to climate change. The experience of Turku has turned it into a facilitator in may capacity building activities included in the mentioned programs.

From the perspective of planning, a big issue in Turku's sustainable future is the construction of a light rail network for its metro area. The distinctive devolution of powers system in Finland gives Turku the chance to collect its own income taxes, and

approach large scale and long-term projects with its own technical and economic resources. Nonetheless, this strategic infrastructure, planned for 15-20 from now, exceeds the LG's capacities and national support (30%) is considered essential for its implementation. For the city planners, the light rail will be the great opportunity to offset policies to reduce the use of private vehicles. **Nevertheless, as exposed by the interviewees, a controversy is arising from the city's plans to develop towards the archipelago.** An increasing demand for detached homes in the most naturalized peripheral areas and the perennial competence between neighboring municipalities to attract resident population explain this strategy. For its detractors, the impact on the wild environment and the effect on vehicle dependency neutralize potential benefits of this expansion.

Outsourcing the energy supply is the other big topic under discussion in Turku. In order to cope with rising energy needs and an intended shift to an electrical energy system, the city is promoting a new 450 MW multi-fuel power plant (wood, gas, coal, etc.). A PPP structure is being created for this purpose, including one big Finnish Energy Company (Fortum), plus the municipalities of Turku, Nantaali, Raisia, and Karena. Nowadays 90% of DH is coming from that plant -there are smaller plants, one woodchip facility, heat pumps, and the incinerator-. Once the CHP starts to operate, for some production, supply and control over energy will be out of municipal reach. For instance, the nominal capacity of the new facility suggests doubts on the impact on forests for biomass extraction and an increase in the share of coal to be used.

Despite Turku's remarkable SD policies, whereas mechanisms of participation are extensive for town planning and other issues, because the law is very clear about it, they are absent for environment, climate and energy. Moreover, when it comes to the topic of green economy, citing a LGTE (Pekka Salminen) *"the city hasn't discussed and studied enough the green economy. It could be more emphasized in Turku's city strategy"*.

Turku's research and economic stakeholders prove green economy as a hot and driving topic.

The first example comes from the Turku University of Applied Sciences (TUAS), currently engaged in *e-Green.net*, a project devoted to green businesses. This project funded by the EU Social Fund (until end of 2013) deals with CSR and extended producer responsibility. The main idea is to strengthen environmental knowledge in the businesses and companies in SW Finland, in two phases: 1) Creation of a network: 16 corporations took part in this start-up process; 2) Assessing companies -more than 100 already- in planning their green transition. TUAS facilitates contacts with firms providing solutions and leads the establishment of the green industrial clusters in the region: logistics: process management; water; bioenergy; efficient energy production; waste management; food sector; others. The success of the program suggests its expansion to other regions in Finland and elsewhere in the EU. One interesting finding of the project is that most companies in *e-Green.net* do not take part in the Finnish Environmental Business Forum, arguing that they were not aware of practicing green economy before getting involved in this project.

TUAS complements market oriented R&D activities with a common training program feeding into all degrees called "environmental know-how". Students are encouraged to undertake creative challenges and produce solutions adapted to the emerging green needs of companies. This two-way door helps the students get a better picture of what the enterprises do and require, and enterprises can use students' fresh ideas in their development process. The community of 6,000 students in TUAS may potentially benefit from this program if cooperation with the private sector continues to grow as desired.

TEKES, the Finnish Funding Agency for Technology and Innovation has created a SW Finland office to support green R&D. Only in 2011 TEKES distributed 10 M€ in the region of Turku for public and private projects in the field of green economy. Beneficiary activities deal with many of the green sectors linked to climate and energy: use of energy in buildings and households, building retrofit, implementation of efficient lighting and appliances, more fuel efficient vehicles, hybrid and electric vehicles, public transport, digestion, waste to energy plants, etc. Projects may focus both on research or technology transfer. Thereby, TEKES could perfectly be assimilated to a CoM supporting structure from the financial viewpoint. The public body devoted to accelerate thru funds the migration to environmentally friendly industries, local governments... Moreover, TEKES belongs to a larger state super-agency (ELY Centre) working on labor, social and other issues. In parallel to this green economy R&D fund, ELY Centre is producing surveys and forecasts on the emerging needs in green jobs in the region. An interactive approach of both programs is facilitating a better adaptation of training and technological support to the green economy.

Another top driver of innovation in Turku is "closed-loop economies", and at least three outstanding experiences are worth mentioning.

The Project Based Institute (PBI) is a private research institution working at the theoretical and applied levels on industrial symbiosis. Among several activities conducted in fields such as carbon sequestration, waste to energy plants, transports or renewable energy, PBI is in close cooperation with Turku Municipality assessing the process to switch the local buses to biogas obtained from sewage waters treatment. According to PBI "through industrial symbiosis, resources could be used in a much more integrated energy-materials production cycle".

Following the latter principles, Clewer -included in the holding of the largest fast food chain in Finland (Hesburger)- **is allocating heavy investments into green R&D and Energy alternatives.** "The philosophy of the company is to create more cradle-to-cradle strategies. Industrial environmental synergies seeking solutions to make the company more independent and at once help save the planet, and produce healthier" (Jukka Nikkanen, Executive Manager of Clewer). In this sense, for instance, the company is already recycling used oil (from frying) as fuel for their food processing factories. Another example is the company's research on using fish waste for algae production, which in turn is fed to new growing fish, creating a self-sufficient source of Omega 3 for the

companies' meals. Last but least, Clewer is developing biofilters for modular waste waters treatment plants for small communities foreseeing more restrictive legislation on sewage disposal for detached districts where sending the municipal network is uneconomical. For Clewer green economy is clearly a business opportunity and an adaptation path to a scenario of restricted access to resources.

Likewise, Biota Tech -a subsidiary of Mediaura, a maritime company- is developing a completely closed-loop system of bio-factories to self-supply their ships with green fuel. The mother company is dedicated to the transport and construction of offshore wind farms. Managers are "*very worried of resource constraints, energy prices, oil depletion and climate change. Against these huge megatrends economic growth will be very difficult, moreover if the oil prices keep on rising*" (Esko Pettay - Development Director at Biota Tech). In response, Biota Tech is working on the potential activities to solve these problems. The star project of the corporation is to build and run a comprehensive industrial ecosystem capable of bringing together water, material and energy resources in one common bio-economic process. The compound, currently under design, will include -as starters- a biogas plant to treat organic waste. The heat and electricity from the latter will be used in a system of aquaculture ponds and greenhouses to respectively produce fish and vegetation/algae. As described for Clewer, fish waste will help the plants grow and vicecersa. In its turn, fish oil (30% of its biomass) will become part of a biofuel mix for the windmill carriers. Last but not least, the remaining waste will be recirculated to the CHP biogas facility. If this system succeeds, Mediaura might be able to confront in an advantageous position a critical evolution in the fossil resources sector, as well as stricter pollution laws than today. "*It might be that the only growth that could be possible is green growth. But it must be profitable, even if probably on the long-term*" (Pettay, E.).

C/P Workshop of Development and Climate Change

Climate Change

Conflicts; Challenges:		Opportunities; Capacities:	
▪ Urban dispersion towards the archipelago ▪ Vehicle dependence ▪ Old housing stock ▪ Inter-municipal competition ▪ Fossil fuels dependence ▪ Energy supply outsourcing ▪ Alternative energies implementation ▪ Undesirable practices of the citizenship ▪ Lack of legislation	▪ Weak forerunning of the city ▪ Shortcomings in regional cooperation on spatial planning issues ▪ Weak public participation ▪ Integration of goods and services (e.g. buildings) in the budgeting system ▪ Finance for high investments ▪ Lack of climate impacts assessment ▪ Effect of potential local positive impacts of climate change on society	▪ Plans to develop the cycling network in the City Centre (2015). ▪ Public Transport Services ▪ Light Rail Plan and Inter-Modal Station Project ▪ District Heating network (>90% population) ▪ DH increasingly powered by RE (50% by 2020) ▪ 100% LG electricity supply from RES by 2013 ▪ Social awareness, ▪ Increasing e-work	▪ Basic environmental education at all levels ▪ Increasing Regional Cooperation in all the environmental and technical sectors (water regional compound, waste, energy, etc.) ▪ Political will for Sustainable Turku ▪ Long experience in SD ▪ Competent and motivated staff ▪ Eco-support Persons Program to all services ▪ Good data ▪ Eco Budgeting and Green Procurement

Development

Conflicts; Challenges:		Opportunities; Capacities:	
▪ Poor livelihood and attractiveness of center ▪ Attractiveness and typologies of housing ▪ Aging population ▪ Economic structure: industrial relocation ▪ Image: Dependent on local public sector	▪ Work situation of immigrant population, ▪ State legislation promoting unsustainability ▪ Little of regional cooperation, ▪ Power of local lobbies on political blocks ▪ Uncertain long term political commitment ▪ Effects of EU economic crisis	▪ Archipelago and the Sea, ▪ Central positioning in the region, ▪ Environmental quality (air, water, forests, peace) ▪ Social attitudes improving	▪ Public education system and high volume of young educated people ▪ Networking exp. – learning from others, ▪ Potential cooperation with stakeholders ▪ Existing cooperation with Universities and the business sector (e.g. ESCOs)

Brief highlights:

- In the fight against climate change, the cluster 'urban sprawl-vehicle dependence-old housing stock' sets the main sources of GHG. Despite the increasing metropolitan cooperation among LGs, competition and shortcomings in spatial planning are still present. Actually, Turku itself has plans to expand with new sectors of detached homes nearby the archipelago and the sea, which may lead to an increase in mobility. The plan to build a light-rail system is expected to counterbalance the negative impacts of the latter plans.
- The process of outsourcing the local energy supply is seen as a loss of control over the energy model of the city. Nevertheless, important commitments have been reached in regards to Renewable Energy supply. Results from the long track record of the city in climate action is building up into visible outputs (100% LG electricity supply for RES in 2013, 50% District Heating from RES by 2020, light rail plan, etc.)
- Potential positive effects of global warming may alter the citizenship's perception of climate change, and discourage desirable practices on energy use. Weak public participation and conservative powers build on top of this, yet, an important asset of Turku are its human resources (motivated staff, eco-support persons in all LG services); experience and political will for a Sustainable Turku; and educational programs at all levels. Altogether, communication capital to facilitate the society to correctly react to climate action.
- The image and social-economic trends of Turku (poor livelihood, aging population, industrial relocation, dependence on the public sector) challenge its capacity to attract young people and dynamism. The city's positioning in the region and its natural and environmental values compensate the prior image of Turku, together with the interesting opportunities for the large contingent of young educated people, given the extensive cooperation between the universities, the private sector and the local administration.

<table>
<tr><th colspan="2">Interviews (Subjects) Turku</th></tr>
<tr><th>Public Sector</th><th>Education - Research</th></tr>
<tr><td rowspan="2">Municipality:
▪ (W) Mayor of Turku
▪ (M) Head of Environment Department
▪ (M) Advisor to the Vice Mayor
▪ (M) Climate and Air Quality Expert
▪ (M) Environmental Management Expert
▪ (W) Head of Social Programs*
Regional Authority:
▪ (W) Valonia-Energy Advisor</td><td>▪ (W) TEKES Research Agency
▪ (W) PBI - Research Institute
▪ (W) Turku Univ. of Appl. Sciences</td></tr>
<tr><td>Private Sector- Corporations
▪ (M) Clewer - Pipeline Executive Manager
▪ (M) Biota Tech - Mediaura Development Manager</td></tr>
<tr><th>Civil Society</th><th>Cancelled / Partial</th></tr>
<tr><td>▪ (W) Assoc. for Conservation of Nature</td><td>▪ Head of Public Transport Department - Municipality
▪ NGO: Friends of the Earth
▪ Turku School of Economics (only section Reflections about the '3E Crisis')</td></tr>
<tr><td colspan="2">Brief highlights:
▪ The interview program was balanced between Municipality representatives (50%) and other corporations.
▪ The number of interviews (13) was below average. This allowed timely meetings and extensive interviews. Turku was the first study visit in the calendar, thus some slight changes were introduced in the interview forms afterwards, in order to better catch the interviewees spontaneous way of answering.
▪ All four target sectors were represented in the interviews.
▪ Gender representation amongst the interviewees was considerably balanced: 7 women (W), 6 men (M).</td></tr>
</table>

Interviews (Organizations): General Information and Socioeconomic Aspects										
Interview	**Year**	**Activity**	**Management**	**Jobs**	**2020 Jobs**	**Turnover**	**2020 Turnover**	**Prod/Service**	**Market**	**Performance**
		% Green	**PB/PR/J**	**#**	**#**	**€ /USD**	**€ /USD**	**Units**	**L/R/N/E/W**	**0 - 10 points**
Env. Department	--	100%	PB	461	--	150,000,000€	--	177,326 (pop.)	L	8.7
Air Quality	1989	100%	PB	3	3	170,000€	250,000€	177,326 (pop.)	L	8
Valonia	1998	100%	PB	20	21	1.300.000€	1.000.000€	SWF: 28 mun. / 450,000 inhab.	R	8
PBI	1996		PR	5	>5	--	--	R&D companies, some public	L/R/N	6.3
Nature Conserv. Ass.	1968	100%		1	--	80,000€	--	3,500 members	R	8
Turku University of Applied Sciences	1992	--	PB/J					6,000 students + 100 companies	R-E	
TEKES	1983	--	PB	>1	--	10.225.000	So far, steady growth of budget	2011: >6 Beneficiaries	L - W	7.5
CLEWER - PIPELINE	1987	100%	PR	60	160	400.000€	--	sewage treatm. for indust. & households	W	9
BIOTA - MEDIAURA	1986	10%	PR	30	60		6M€	Closed loop industry	E	8.5

Brief highlights:

- Organizations expect to grow in economic turnover (with the exception Valonia), but precise answers were avoided in several as difficult to forecast.
- Performance marks are in average high, showing satisfaction with the activities in development, besides PBI expressing self-exigency of more projects and results.
- The R&D and private activities have clearly an international aim, whereas the rest focus more on the local and regional pursuit of sustainability.
- Opportunities for green job creation appear mainly on the private sector, in return to very positive perception of the companies' development in emerging green markets.

Interviews: Activities, Constraints, Future			
Organization	**Activities**	**Constraints**	**Future**
Env. Department	▪ Green Activities: green procurement, waste recycling, water management, etc. ▪ Energy efficiency and renewables: heat pumps, building retrofitting, efficient lighting, energy procurement, etc. ▪ Air pollution control and sustainable mobility: biogas fueled buses, bicycle lane network, light-rail planning, etc. ▪ Soil conservation and biodiv. management, green areas...	▪ Poor knowledge of private stakeholders produces undesired practices and reactions. ▪ In some cases also funding.	▪ At city level priority is in developing traffic to a lower emission direction
Air Quality	▪ Monitoring air quality in Turku and neighboring cities (4). The industry pays roughly 1/2 of the bills of the Air quality multistakeholder cooperation group (in the area of these cities, expanding through several years): Relevant emissions sources: Nantali Coal Plant, traffic, Port of Turku and Port of Nantali (oil tankers and oil refinery). Big industries must join the group and pay for the monitoring in order to get the environmental license ▪ Responsible of GHG inventory of Turku --> an external company makes the calculations and the municipality provides data and validates. A thorough calculation has been done for 5 times with a European model widely used in Finland (1990, 1997, 2003, 2007, 2010).	▪ Positive-negative effects of climate and air quality policies. The change towards electric transport and biofueled public transport will reduce GHG, yet the latter may no be good for air quality. ▪ Energy production out of reach after outsourcing the new plant and the supply. ▪ There is an important phenomenon of more and more individual homes. This disturbs the energy demand image (more W/capita as more area/capita) ▪ There will be no power over energy supply as the new multifuel power plant is built by a PPP (450 MW), so the main source will be coal as now.	▪ The change towards electric transport and biofueled public transport, yet the latter may no be good for air quality. ▪ Since energy production is out of reach now, the main focus of the municipality should be on energy efficiency for the next years. Efficiency from buildings, traffic, city planning, etc. is what is left in the new scenario. ▪ The practice of sustainability (GHG inventories, energy consumption and efficiency, etc.) should be more visible in all the activity of the Municipality. There must be more cooperation, information systems and strategies to make visible in the practical work of every Dep. The IT Dep. has a key role in this sense. Knowledge should be more long lasting and independent of the organization itself.
Environmental Management Expert	▪ See Env. Department	▪ There could be more financial and political incentives both for private companies and citizenship to produce / work / live in more sustainable ways. It is the carrots and sticks culture that makes people change habits. ▪ Political decision-making culture in Turku is making the changes slow. The left and right ruling parties are equally strong. So, they are always trying to get the other party to reach agreements, thus it takes long.	▪ To develop a sustainable transport culture (currently 28% GHG). This will require high prices for parking private cars in the city centre and enabling sustainable transport modes better than now, prioritizing them. ▪ Sustainable energy production (28%).
Valonia	▪ Agenda 21 and Energy Agency of South West Finland. It serves 28 municipalities and 450,000 inhabitants, with the aim to coordinate and facilitate the implementation of programs in both areas in the entire region.	▪ Funding is very unbalanced. From 1M€ only 150,000 from the municipalities, the rest from projects, larger authorities and private sector (Turku-Energia). So, Valonia is very strongly dependant on project money. There is always lot of uncertainty on the following year's budget. ▪ Commitment from LGs: e.g. involvement of the cities in CoM insufficient, yet signed at regional scale. Valonia's involvement in CoM without funding wouldn't be positive.	▪
PBI	▪ Applied research institution which works in sustainable industrial ecosystems and bio-economy, always in cooperation with private and public partners ▪ One project with the city of Turku studies and designs the re-use of biogas from the underground sewage plant for public transport fueling. ▪ Areas of activity in green economy: Carbon sequestration, Renewable, Public transport, Cradle-to-cradle, Waste to energy plant, Organic production.	▪ Society: in Finland people are generally very much resistant to change. This affects diffusion of green tech, new modes of production (e.g. organic farming), etc. ▪ Business: cost and money issues too often take over the sustainability principles. Short-term focus of business actors doesn't allow to focus on sustainability ▪ Policy and Legislation: in Finland in certain cases legislation and policy related to renewable energy not only unsupportive, but even obstructing. There is feed-in tariff for biogas, but it is only for CHP plants. In the transport field it is not given, so it blocks the expansion of innovations	▪ Restructuring of production patterns towards being sustainable ▪ Diffusion of knowledge about sustainability, potential for industrial symbiosis ▪ For example transport resources could be integrated on a much more integrated energy-materials production cycle. ▪ Cooperation from business sector and favorable legislative conditions will be required for any of the prior to develop.

Organization	Activities	Constraints	Future
Nature Conserv. Ass.	▪ Environmental education programs and "nice" activities. ▪ Nature advocacy and public opinion generation. ▪ Management of natural areas + biodiversity conservation. ▪ Public Participation as conservation stakeholder	▪ Society: Lack of volunteers, lack of human resources, quite often invited to participate in projects by the municipality but as there is only one professional it is hard to be there. The 1970s model is not attractive for young people. The National Nature League involves youth, but in SWF there is no section because of no volunteers. ▪ Society: Walk the talk. For example, only after Fukushima the people started to worry. At local level it could be an oil spill. The Baltic Sea is the most polluted sea in the World. Draining water come from the rivers around, little streams, etc. with a very big problem of eutrophization from farming, forestry and peat. At Baltic scale, the big sewage waters. This is something many people are concerned about at all levels. But, why are the people not reacting to it?	▪ Increase members through "nice" courses and trips; for climate change no one cares. So, reinforcing appreciation for nature may be the way to get people involved in more activist affairs, to produce environmental "awakenings"; ergo people starting to do what they say ▪ Promotion of ecosystem services --> pricing the services may provide a better understanding language for the authorities and the population. ▪ Put pressure to stop the idea and policies of unlimited growth, as growth is the problem. It would be nice that Turku was more pioneer on SD.
Turku University of Applied Sciences	▪ Part of our R&D activity -but not only- is to raise awareness on green economy and "environmental know-how". Project E-green.net (EU social fund till end of 2013) links companies, teaching and students. About environmental responsibility and know-how of businesses in SW Finland. Two phases in the project: First) Creation of the network (16); Second) (100) Helping companies that are planning environmental business: students do applied research and projects to green the companies; facilitation of contacts between corp.; Building the environmental cluster (8 clusters: logistics, process management, water, bioenergy, efficient energy production, waste management, food sector, others)	▪ Finance: R&D activities are mostly financed by external sources (EU, state, Funds etc.), setting limits for activity. ▪ Information about green businesses: the Business Environmental Forum lists companies involved in the different sectors. Most of the companies in the project's list are not in this Forum, as they do not consider they are doing environmental business, yet they are doing efforts to become more sustainable. There is a matching process at European level for environmental business statistics. (There is a Finish national report 2009 --> link on email).	▪ Increasing the cooperation between enterprises and educational organizations, based on this innovative pedagogy: incorporation of student to R&D projects linked to enterprise interests and projects. This is one of the most important tools for developing understanding between enterprises and educational institutions. By using this methodology students get a better picture from needs of enterprises, and enterprises can use students' fresh ideas in their development process in the field of environmental knowledge for example.
TEKES	▪ TEKES is the Finnish funding agency for technology and innovation. It is part of a larger State Super-Agency dealing with labor, social and other issues: ELY-Centre. TEKES has recently created a regional division to support green economy R&D among public and private corporations. ▪ In 2011 it manage 10M€ in funds for projects just in SW Finland: 0,7M€ in energy use in traffic, 3,2M€ in energy use in industry and other use of energy, 4M€ in clean production techniques, cradle-to-cradle, re-materialization and durability and reparability of products. Also, 1M€ in use of energy in buildings and households.	▪ The Global Economy and international competition; the struggle with Asia to continue being competitive and capable of exporting and economic growth of Finland. ▪ Lack of structure: Not enough projects until now --> there wasn't a person in the region, this could be one of the reasons to the lack of projects. ▪ R&D local strategy: the Finish University of Turku, the Science Park of Turku has been very focused on ICT and medical biotechnology. There hasn't been an organization with the mission of promoting green tech projects in SW Region. In fact the interests were elsewhere. ▪ Policy: Not walking the talk. The city and region are going opposite way of a forerunner. The heating syst. is based on charcoal & oil. It makes it very difficult to encourage companies into environmentally friendly activities. ▪ Funding rules: Funding is limited to companies that contract services to other for their R&D. Those with projects based on their own staff cannot apply.	▪ TEKES has just launched a program on Green Growth without a focus on a particular but for any kind of activity searching this target; it is the way for a sustainable economy. In this region there may be standard clean tech projects, but also potential for merging fields like ICT-clean tech as there is large ICT knowledge. ▪ A good definition of the green sectors to impulse. There are plenty processes in Turku going on the right direction, so there is optimistic perspectives. The region is still processing what fields of green growth are more interesting; different actors discussing: e-Green Network, employment division is interviewing the sectors for future perspectives, worker profiles, etc.; the Regional innovation organizations are also deciding future ways (Science Park). ▪ Favorable conditions for SMEs: Many of the companies are small. They must have own good situations to go on with R&D to apply for money from the Government or the EU with the current system.
BIOTA - MEDIAURA	▪ Biota Tech is an engineering design comp. , subsidiary of the larger group Mediaura, a shipping company. They deal with closed circulation industries, developing projects in alternative fuels for ships, offshore wind-farms, and industrial ecosystems, which combine biogas and electricity generation, with aquaculture and biofuel, prod.	▪ Policy and legislation are always behind ▪ Funding: Public funding for green innovation is still necessary. They couldn't do without. ▪ Global economy: Fossil fuels are still very cheap. ▪ Society: NIMBYs in Finland, e.g. wind-farms.	▪ Green growth vs. resource constraints, energy prices, oil depletion, climate change. The sectors Biota is working on are the potential activities to solve these problems, so they expect profits, probably on the long term. It might be the only growth that could be possible is green growth.

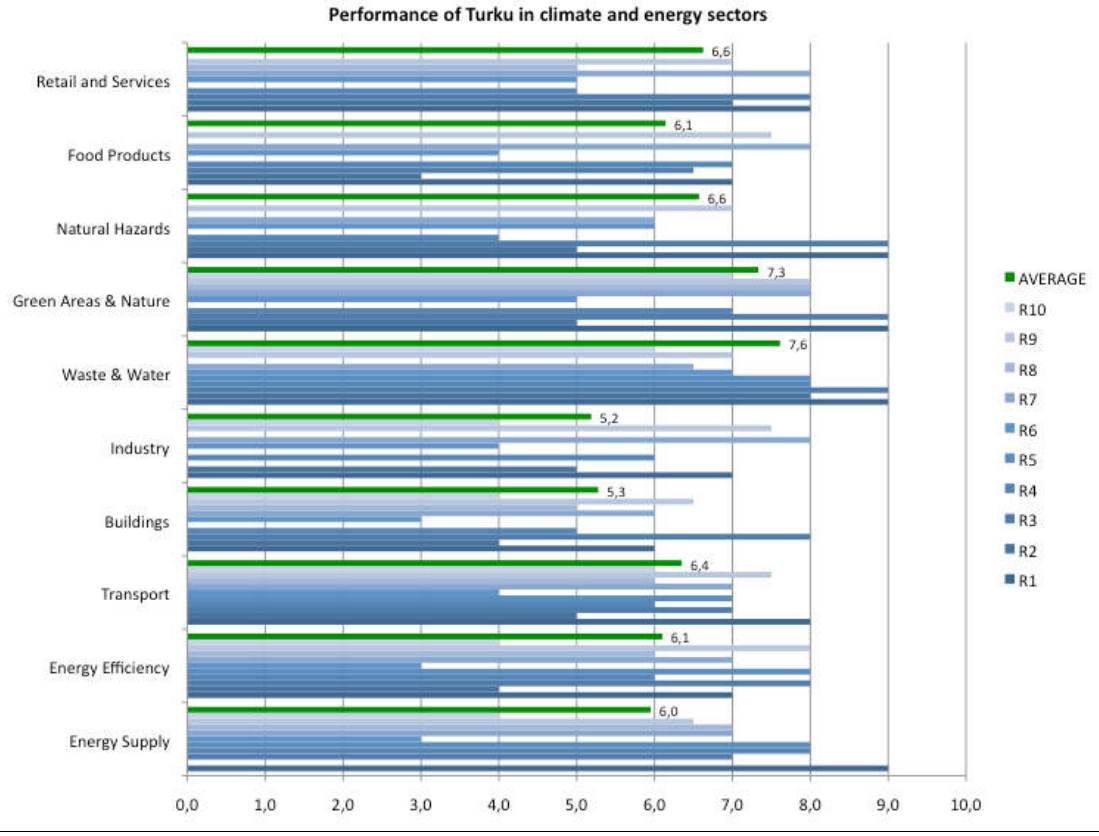
Organization	Activities	Constraints	Future
CLEWER - PIPELINE	▪ Clewer is a subsidiary of the larger company Pipeline. It has created and patented a new system for wastewater treatment method for residential units or small groups, and industries, innovating according to new legislation. ▪ The larger group of companies runs the largest fast food chain in Finland. They have started to introduce closed loop processes in their business, such as recycling fried oil as fuel for their factories and reduce energy dependency.	▪ In Finland legislation is limiting; the wastewater legislation has been changing many times and the citizenship is confused, even about the interpretation of the legislation itself and what are the right technologies. ▪ Market Protection: At EU level there is a lot national protection of markets - Germany, France...- because this is a very close sector to construction, which is very protected.	▪ The company has really good patents and technologies. The challenge is to create the commercial strategies that will solve different needs of customers. So localize and customize. Giving the right information to markets is the key challenge to put the product into the street. There are no similarly good technologies and patents out there; the big steps ahead are in reaching the customers. ▪ To create more cradle-to-cradle strategies. Recycling waste to the own business process: oil, production of algae from fish waste, and growing fish from these same algae with high levels of omega 3. Industrial environmental synergies: solutions make the company more independent and at once help save the planet, and produce healthier.

Interviews: Links to the EU 2020 Strategy Targets

Interview	T 1 - 3% GDP in Research & Development	T 2 - 20-20-20 Climate and Energy Package	T 3 - Age 20-65 75% in workforce	T 4 - <10% early sch. leavers + Tertiary Age 30-34 >40%	T 5 - Poverty Lift 25 %
Environment Department	▪ It doesn't apply at city level.	▪ It applies at city level. Turku can fulfill the target	▪ It applies at city level. Turku can fulfill the target	▪ It applies at city level. Turku can fulfill the target	▪ It doesn't apply at city level.
Air Quality Department	▪ There is cooperation with the Univ.: e.g. a project to combine micro-scale climate science to local episodes and phenomena. Suitable for city planning: avoid elderly housing in heat island areas, density and eff., forecast of pollution emissions	▪ Target 2 is already in place at the municipality level. Much more difficult to extend it regionally.	▪	▪	▪
Valonia	▪ A bit out of reach.	▪ It is the main area of activity of Valonia.	▪ Valonia takes interns; this may facilitate occupation, also Valonia contracts people without necessarily an expert profile, so unemployed people may obtain temporal work at Valonia. These may stay for three or four years if there is a good project and satisfaction with the worker.	▪ There is a lot of collaboration with TUAS. For example courses on material eff. / sust. Consuming conducted by Valonia and its experts. Hopefully this increases student interest and reduces school leavers. Valonia provides training for teachers in the green flag program for schools.	▪ Out of reach of Valonia
PBI	▪ Relevant R&D is the core activity of PBI	▪ Our projects devoted to renewable en. should contribute to net reduction of GHG	▪	▪	▪ In the future, PBI's research might concern increasing SD (and decreasing poverty as a result) in developing countries, such as India.
Nature Conservation As.	▪ Not directly linked as their focus is biodiversity management and environmental advocacy. Yet, the targets are important.	▪ Not directly linked, as their focus is biodiversity management and environmental advocacy. Yet, the targets are important.	▪ Not directly linked, as their focus is biodiversity management and environmental advocacy. Yet, the targets are important.	▪ Not directly linked, as their focus is biodiversity management and environmental advocacy. Yet, the targets are important.	▪ Not directly linked, as their focus is biodiversity management and environmental advocacy. Yet, the targets are important.
TUAS	▪ Part of R&D activities want to arise awareness of green economy and env. know-how.	▪ Diversified education guarantees multifaceted skills, which take env. Issues into account. ▪	▪ Not directly. Indirectly as an innovative education center	▪ Not directly. Indirectly as an innovative education center	▪

Interviews: Links to the EU 2020 Strategy Targets					
TEKES	▪ It is the main objective of TEKES	▪ Green Economy and Tech. is the new focus of investment	▪ As part of ELY-Centre it follows the employment strategy of Finland	▪	▪
CLEWER	▪ Heavy investments allocated	▪ Heavy investments allocated	▪ Even in recession they are hiring	▪	▪ Indirectly, through job creation
BIOTATECH	▪ Strategic Area of the company	▪ Strategic Area of the company	▪ Mediaura is a growing company, employing all ages.	▪	▪ Growing jobs, workers from all nationalities, backgrounds etc.,

Performance of Turku in Climate and Energy Sectors



Notes: Anonymous section

COMMENTS about performance in climate and energy sectors	
Energy Supply	**Energy Efficiency**
▪ CHP, excellent DH/C system and good share of RES. ▪ The topic is out of reach now ▪ New coal plant, extending biomass, biogas, etc ▪ 50% District Heating Plan by RE ▪ Advanced heat and cold recovery system from wastewater ▪ New power plant problem and partial opportunity; Extraction of trees is also harmful. ▪ Traditional company of the city ▪ New cooling system by the water treatment plant. Countryside areas supplied by wood chip, wood, etc. No windmills, no solar. ▪ Old fashioned and bureaucratic type of companies, not able to react to new needs ▪ NC	▪ Active energy saving program implementation with good targets, some innovative solutions. ▪ Efforts on buildings, street lights, a lot left yet ▪ Finnish houses very insulated, energy culture grows with energy prices ▪ Techniques in place but actions from the 13.000 workers not ▪ NC ▪ Not much info. on the issue; it seems that in many offices lights are on all night, schools with bad windows; Christmas candles... ▪ Slower pace than what would be possible ▪ NC ▪ There are interesting private companies investing in this topic ▪ NC
Transports	**Buildings**
▪ Good PT, reasonable bicycle lanes, compact city structure, first hybrid busses, biogas coming as a fuel ▪ Past act. not effective. Next reg. auth. & light rail plans are key ▪ The development trend is positive ▪ Hybrid bus, plans for light rail. Yet, biking routes bad in the city ▪ Attempts to switch public transport to renewable fuels, research is undertaken, but not yet implementation ▪ Good things: new hybrid buses, + new shipping technologies, - big logistics, + light rail plan ▪ Integration of the reg. services must improve / Biofuel in buses ▪ But they are working on new biogas buses ▪ Just now plans arrive. Private companies have been active already for example with new technologies for fuel efficiency ▪ First hybrid buses	▪ Old building stock, slow retrofitting ▪ New buildings have EE regulations, yet more buildings more emissions. Need to retrofit all the prior housing stock. ▪ NC ▪ Good results of ESCO projects / but not very supporting in passive housing, etc. for the citizenship ▪ DK/NA ▪ Hopefully in new buildings env. performance will be considered ▪ New campus will be environmentally excellent but not now ▪ Compared to Germany we are doing nothing. New buildings yes, but the problem is the old stock ▪ NC ▪ NC

COMMENTS about performance in climate and energy sectors	
Industry	**Waste and Water**
▪ Mostly connected to central heating networks, some innovative companies ▪ Not much energy intensive industry in Turku. ▪ DK/NA ▪ Big companies actives, SME with no resources and knowledge ▪ DK/NA ▪ Industries are under strong controls, and there is an effort from environmental performance; not more due logistics areas ▪ There is cluster in process ▪ Big differences between fields of industry and between companies. ▪ NC ▪ NC	▪ Best wastewater treatment in Finland, jointly with neighbors, good quality drinking water with declining consumption figures, very high recycling figures, energy recovery from waste ▪ New WW plant, biogas, landfill recovery and other activities ▪ NC ▪ New water plant, and good plans ahead ▪ Advanced heat and cold recovery system from wastewater ▪ New wastewater plant / Incineration is maybe not harmful but it is not educational for waste reduc. and recycl.; landfill very old fashioned ▪ Recycling must improve to minimize incineration ▪ Problem of not separate networks for water at European level ▪ NC ▪ NC
Green Areas and Nature	**Natural Hazards**
▪ Nature 2000 network with all valuable areas included, voluntary conservation areas as well, much emphasis on nature issues in land use planning ▪ Stable situation; it is a great asset but the new Master Plan is considering housing in the Islands. ▪ NC ▪ Big park areas in the city are threatened by construction. ▪ DK/NA ▪ Nature is taken care of. The new areas are hard to establish (not much good will for new areas). Turku has lately been actively building on areas classified as Parks in the Urban Plan. Another issue is building in islands as the Master Plan states. ▪ Beautiful territory ▪ Many green but not many natural conservation areas ▪ It is progressing ▪ NC	▪ Turku is mainly a beneficiary city of climate change (heating needs go down), no big flood risks, storm water manag. is OK. ▪ Green infrastructure not optimized to stop risk of floods; needs more planning and urban densification. For oil spill accident there's been training and preparation; housing level rules against water rise. Sewage is not good enough in some areas ▪ Risk of flooding in harbor area planned ▪ Not prepared. People do not really understand about it (floods) ▪ DK/NA ▪ Existing prevention measures in front of flood risk ▪ Nuclear hazard is a very big hazard, although Finland is very prepared for risk, but not for oil spill for example ▪ Not an issue ▪ NC ▪ No big natural risks ahead
Food Products	**Retail and Services**
▪ Role of nearby food has been recognized and partly utilized, availability of organic food and drinks has improved ▪ For economical reasons public kitchens have been centralized and organic produces are left out of these circuits. ▪ NC ▪ Organic and local is increasing among the citizenship / no plans about food security ▪ DK/NA ▪ School kitchens closed down, so now all from big companies only concerned about price not quality. "The Polish Carrots Case". Public policy is not clear or even pro-organic, but citizenship and shops are more and more into these products ▪ National Centre on Expertise Program for food sector is very active in Turku, promote organic and local networking (producer-service) ▪ Eco-production increasing in whole Finland ▪ NC ▪ Lack of information	▪ Criteria for public procurement has some good environmental components, service providers are mostly aware of env. issues ▪ Recycling centers around the city ▪ E-services, there is discussion in the sector, marketing efforts ▪ Skanssi (big shopping center) has raised environmental awareness (LEEDS certificate for the building in Turku -only 3 in Finland- also for the action in process; all in an ecodistrict) local menus in restaurants ▪ DK/NA ▪ Environmental systems might be growing in the city, but still apparently rare ▪ New shopping centre with LEED label; other than that not much. The biggest local shopping chain is involved in EE and so. ▪ Only forerunners are dealing with it ▪ NC ▪ Lack of information

Reflections about the '3E Crisis'

EU's proposals and role in shaping the international agenda

- Clewer: EU is at the front line on environmental policies. EU and USA technologies must help solve the issues of resource scarcity. Yet, if humankind is really willing to do something, things can be done.
- PBI: EU is not able to affect everything by its policy, and it is impossible to take a grip on developing countries. Politics are largely based on the interests of large business actors, and a radical switch to new industry organization, dematerialization, etc. would mean significant risks, losses and uncertainty. No one would try to create it for himself or herself based on free will. That is why incremental change is promoted in EU. It might be so that by obstructing the economy of EU by its government it will lead to inability to compete with developing countries.
- Nature Ass: EU is probably not radical enough. Yet, there are questions such as fisheries and biofuels that will have to be dealt by the EU for progress to take place. It has been a disappointment that all these international meetings since Copenhagen have not been able to set a more sustainable agenda. Also the G20 and other forums for economic solutions.
- TUAS: EU is leading GG transition in: 1) Policies: Strategic paper, like EU Roadmap 2050, this is important to Local Governments; and 2) Funding these programs --> if there wasn't funding for this e-green-net project there wouldn't a project at all.
- Biota Tec: EU has been strong internationally, but in reality the actions are even too weak for the real crisis we face.
- Economist: These policies must be developed commonly, so EU is important and crucial, and it has the opportunity, as it is a closer and more similar community in order to take ambitious mandates and new regulations. Even more considering that we are so high consumers and we depend so much in other regions. For the education it should be more standardized that SD is an obliged content at all levels and for all studies. EU could guide more in this sense.

Where do you envisage your country and your city in tackling this crisis

- Air Quality: Turku reacts very slowly to everything. It is still on a business as usual strategy, very little changes are made as long as it is not mandatory to do something. Target 2 is already in place at the municipality level, although the practice of sustainability should be more visible in all the activity of the Municipality. Much more difficult to extend it regionally.
- Clewer: Finland is at the front in environmental policies like the EU (the political disturbance of the *Basic Fins* will be a temporal issue). Finland will achieve the targets because the country is like this, people will do its share because they always fulfill their commitments.
- Nature Ass: Despite economic success and high quality of social services, Finland has one of the highest suicide and violent crimes, home violence, alcohol consumption stats in Western Europe. In contrast to Bhutan, money does not necessarily bring happiness. It is said that current teenagers and people young on the crisis of the 90s are suffering from it (mentally). This is a sad country. There is a trend of social class creation currently in comparison to years ago. Today, poor people are probably going to stay poor; young people in particular.
- TUAS: Finland and Turku will achieve the commitments of the EU because there is a strong cultural behavior. From the ground level it is difficult to see / know if we are reaching the goals. There are very interesting experiences of monitoring: ussikaupunki --> carbon neutral, they are counting Carbon emissions themselves.
- Biota Tech: Most definitely Turku is not the more environmentally friendly city in Finland, Finland as well in the pattern as the rest.
- Economist: Need to improve public transport in Turku.
- TEKES: TEKES has just launched a program on Green Growth without a focus on a particular but for any kind of activity searching this target: GG program -> the way for a sustainable economy. The main reason to hire Elina in this region is that the amount of environment and energy projects funded has been lower than expected for a place being the second in Finland (GDP, population). Eurostat is developing a process to collect the present status of green sectors in Europe. The same is happening at Finish level by Finish Institute of Statistics. Something will be published soon at www.tilastokeskus.fi.

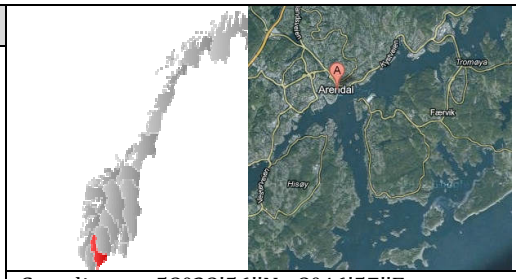
What else should be done to tackle it? Is "sustainable growth" the path to follow?

- Clewer: All the western countries must invest a lot on waste management. It is absolutely necessary. One crucial is clean water. There have been already some water wars; some consider the 3rd world would start from the access to clean water. So, stop polluting the seas, and the recycling and reusing is very necessary because there are not enough resources. The EU and USA have the technologies to deal with these issues. On the long term, if humankind is really willing to do something, things can be done. The eternal growth of GDP will hopefully face its end. Only GDP for measuring happiness doesn't make any sense, we need other facts and parameters: time, quality of life, products, etc. with a bit less GDP.
- PBI: Speaking about the 1st world countries and their level of welfare, it might be so that the standards of life need to go down a little. This is fair enough though. Degrowth and carbon-free economy are needed. There is a need for radical change, which no one likes. However, a too radical change is not a good idea, since it may ruin everything in one moment. Our approach is, for example, to promote and prepare for radical changes, e.g. through relocalized economy, yet through incremental steps and by engaging the business sector, since it is the driving force, for policies as well. There is unfortunately nothing ideal in the world, so it is impossible to create the world where everyone has equally good standard of life, and the resources are shared fairly.
- PBI: If it is not possible to solve all the problems, there should be an attempt to at least not to create more. The so-called "green efforts" are not fair or reasonable enough. Under "not fair enough" I understand the actions that are claimed to be reducing the impact of e.g. production, but which in fact are not. By not reasonable actions I mean the "environment-preserving" activities that look as if they contribute to sustainability, but in fact are just displacing the environmental burden from one area to another, or to be exact from one location to another, which doesn't change the overall global situation. One example is when European countries decrease the emissions made by the production sector due to extensive outsourcing of energy-intensive production to e.g. an Asian country.
- PBI: Green cities are a good idea to make a change on a local level and taking a systemic look at sustainability problems: instead of barely attempting to reduce CO2 emissions, the overall local EE may be improved together with waste management, jobs, quality of life, etc.
- Nature ass: Climate and environment have "died" away from the conversations and daily issues. Perhaps if the Greek situation is solved there may be a renewal of the SD agenda. At this point to talk about sustainable growth is 40 years late. The only credible option is to slow down. It is not very encouraging that still today there are climate skeptics coming from USA.
- TUAS: It is possible to have a Green Growth, and E-green-net works with +100 companies that work on Green Growth. It is also important to consider all other options as Degrowth. At one point over-population and resource crisis will affect all of us. At the moment there are three discussions on the society. 1: Green Growth; 2: Degrowth; 3: Traditional economy. These are very separated discussions, with no communication. In a few years there will be. There are different time frames: 50 years for overpopulation in front of unemployment now.
- Biota Tech: We should be using ten times more resources to deploy the technologies we already have to abate the problems. The planet is not big enough for our levels of consumption. The financial markets are not able to deal with these issues; these are "market failures". Capitalism should be restricted in some aspects. All the countries and governments still want the people to consume more and more to recover growth. Very worried of resource constraints, energy prices, oil depletion, and climate change. The crisis must be profitable, probably on the long term.
- Economist: The equation is not possible; i.e. to provide materials for all the expectations of production. Seeing the numbers of the world (people <10USD/day) and expecting for the same standards for all of us is impossible. There is a need for degrwoth and slowing down to confront these issues. Companies must be involved; in small and medium size companies investments in ecoinnovations are expensive at the beginning. There is a need for more and better information about the interest and risks of including SD aspects in the strategic agenda of SMEs or not. We must not need to wait to the law, as it is much slower. Big companies are also aware and have a policy about it. Education is basic to the challenges as mono-disciplinary perspective is no enough, from the very elementary studies SD should be included to deliver systemic understanding of the problems. Learning by doing studies should be promoted. Technology is not the solution either as it needs a lot of materials;

Arendal - Norway

ARENDAL - The Valley of Eagles

Arendal is a small city (pop. ~42,000) in the so-called "Bible Belt" running along the SW coast of Norway. The region where Arendal is nested is famous for receiving more annual hours of sun than elsewhere in the country. This aspect, together with an outstanding nature and good access to the surrounding islands, has helped Arendal become a popular touristic destination and a second residence resort. With very low unemployment, living standards in this city exceed the average of Norway. Nonetheless, Arendal is completing its reconversion towards a service and tourism economy, after the heavy industries linked to oil drilling that it hosted were removed and relocated to developing countries. In this transition, the town is doing important efforts to foster a green renaissance of the local industrial activities. A remarkable cluster of institutions and programs are bridging green research, development and innovation practices to the traditional economic activities of Arendal, as well as to those newly born.



Coordinates: 58º28'56''N - 8º46'57''E
Population 2011: 42,229
Surface: 270 km²
Mayor: Einar Halvorsen - Conservative P.
Vote turnout 2011: 61.6 %
Municipal Budget 2011: € 1,300,000,000
Per capita income 2009: 56,865 €/inhab.
Unemployment 2011: 3.5 %
Website: www.arendal.kommune.no
Study Visit: 21-28 Nov. 2011

Summary and Highlights of Green Economy in Arendal

The small size of Arendal has not been an obstacle for its engagement in very distinctive initiatives in the field of green economy.

Just one year after the Bruntland Commission (1988) formulated 'Sustainable Development' Arendal stepped into this arena. With the support of the Norwegian Government Arendal created a sub-node of GRID (Global Resources Information Database), a collaborative centre of the United Nations Environment Program (UNEP). This project-based body has become a green asset for Arendal, leading over time to new and widespread programs from the public and private stakeholders in the city.

After the Earth Summit of 1992 a statement supporting the principles of Rio was promoted by several cities, including Arendal, and the Ministry of Environment of Norway. In 1999, Arendal adopted the Norwegian version of LA21. Later on (2003) Mr. Svein Tveidtal, Climate Ambassador of Arendal and Managing Director of GRID since 1992, was appointed as Director of UNEP. Such a distinction for the town and one of its citizens induced a tipping point in the city's commitment to fight climate change. The candidate to Lady Mayor of 2006 declared the city should turn climate neutral, with commitments for both the municipality and the community. By 2007 Arendal was starting to walk the talk thru fast payback investments in energy efficiency. The following year the Climate Partnership was founded bringing on board the challenge of neutrality all sorts of organizations in town. At current times, this campaign has expanded at regional and national level.

- 2008: 1st inventory with the GHG Protocol method, scopes 1 and 2:
  - Sources owned / controlled by the org. and indirect emissions from electricity purchase.
- By 2017 - 90% GHG from the municipal services:
  - RE Certificates from suppliers + clean and efficient cars in public sector + carbon offsets through the Clean Development Mechanisms.
- 2008 Foundation of the Climate Partners Network:
  - So far, 34 member organizations with +17,000 workers, and generating a combined turnover of around $2.5 billion.
- 2025 target: reducing total emissions in Arendal (government and community) 25% below 1990.
- 2010-2012: Green Incubator Arendal: 1,000 m² in new green building for green startups.

Low Carbon Economy in Norway

Norway's share of renewable energy in final consumption exceeds 60%, much more than for any of the other countries in this research. This remarkable level of RES -achieving 98-99% for electricity from hydroelectric plants- disagrees with the Norwegian average per capita GHG: 10.7 tCO_{2e} (EEA, 2012). According to the strong presence of renewable sources one would expect global warming emissions to be much lower. Actually, in the last 20 years several sectors -manufacturing industry, heating, agriculture and waste- have become more efficient and decreased their CO_{2e}. But in the same period discharges boosted for transports (road and air) and oil/gas production (+90%; Statistics Norway, 2012) counterforcing efficiency from other activities.

In fact, Norway is respectively the fifth and third largest oil and gas exporter in the world (current fossil fuel export revenues constitute more than 20% of the GDP). Heavy industry on ferroalloys -linked to mining, oil and gas drilling, piping, maritime and fishing, etc.- is also an important asset of Norway's economy, and a large source of GHG. Not surprisingly, the official figures state that in 2011 Norway was trespassing its Kyoto Protocol target (+1% vs. 1990) by some 3.3 $MtCO_{2e}$ (53.4 versus 50.1), a level even further away of the -9% the country self-committed to. With barely 5 million inhabitants, oil and gas make of Norway a very rich country, but with high emanations of greenhouse gases as well. Nevertheless, while the steady economic growth of Norway has led to +6% total GHG since 1900, there's been a reduction of 9% in per capita emissions for the same timeframe. Actually, when downscaling the issue to the local scope it may shrink substantially; for instance 3.6 tCO_{2e}/capita in Arendal for 2009.

Fighting climate change and developing a green economy in Norway is a hot topic due its industrial tissue. As a consequence of environmental regulations and labor costs and benefits, there's been a process of relocating in developing countries some of the most polluting factories. This, together with free trade agreements has generated an intense public discussion on the issue of carbon leakage. Even so, Norwegian GHG emissions have continued to build up from oil and gas exports, mostly from Government owned companies. By implementing carbon offsets the country is now financing eco-friendly technologies, carbon sinks, and adaptation to climate change in third countries; economic compensations derived from Norway's target to reduce 30% its GHG by 2020 compared to 1990 levels and become carbon-neutral by 2050. According to OECD/IEA (2011)"Meeting the 2020 target will be challenging, because both the country's electricity supply and energy use in buildings are already essentially carbon-free. However, with its large petroleum revenue, the country is well placed to invest in new solutions for a low-carbon future". Actually, income from the fossil industry is feeding into the Government Pension Fund of Norway created in 1995, currently equivalent to 140% of the nation's GDP. And Norway is the only western country with a state budget surplus, and yet the crisis it suffers almost no unemployment. Ergo, funds for green research and development are widely available.

Norway signed its National Climate Agreement in 2008. Consistently, public spending for research, development and deployment of clean energy more than tripled from 2007 to 2009. In per-capita terms, public funds for R&D&I on energy in Norway are the third highest among the IEA member countries. Enova, the government agency delivering this support, gained 137 M€ from 2008 to 2009 for green stimulus packages.

In parallel, the country expects to increment its wind and biomass based renewable electricity production. An energy surplus aimed at supplying the EU's market in their effort to reach the 20-20-20 climate and energy goals by 2020, and the future cut of 80% GHG in *Roadmap 2050*. The massive hydropower capacity of Norway will be integrated in this international energy system as backup, either to accumulate energy when excessive wind, or as source against deficit.

In contrast to the previous view, the IEA *World Energy Outlook 2010* welcomes Norway to increase oil and gas production and recovery, in response to a global rising energy demand scenario for 2035. "It urges the government to continue to do so by opening new acreage for exploration and by offering additional favorable fiscal and regulatory incentives, when appropriate" (OECD/IEA 2011). However, in a controversial decision from the OECD/IEA's perspective, Norway has excluded new gas burning plants from the latter energy prospects, despite the relative abundance of the resource in their seabed. Only facilities with CCS will be accepted, ruling out the technology because it is not competitive so far. OECD/IEA (2011) criticizes this position, stating "in times of low hydropower... power is often imported from the region's coal-fired plants to meet demand in Norway. As a result, more CO_2 is emitted than would be necessary... Combined-cycle gas turbine plants would help reduce the carbon intensity of power generation, because under the EU Emissions Trading Scheme (EU-ETS), of which Norway is part, they would help push power plants with higher CO_2 emissions per kilowatt-hour gradually out of operation". Nevertheless, Norway is developing 2 of the 5 large-scale CCS plants, showing a bold commitment to this technology in the transition to a low-carbon future.

Increasing consumer participation is essential in order to produce "negawatts"; ergo, meeting incremental demands through savings. In this sense, the outstanding wealth of Norway has turned it into a lab and "early" market for green innovations requiring important individual/household investments, but with high return in energy efficiency. For instance, a critical sector in climate mitigation such as housing / buildings is guaranteed to improve in Norway thanks to a strict building code passed in 2007 and the adoption of the passive house standard as target for 2020. Likewise, incentives for electric and hydrogen vehicles are broad and very attractive:

- Drive in the bus/taxi lane
- No car taxes and No VAT
- Lower yearly road tax (€50 vs. €350)
- Free toll booth (€3,25 in the Oslo-region)
- Free parking on public spaces
- Free car transport on public ferries (passengers pay as usual)
- 50 % reduction on taxation when driving a company car (up to 200€ per month)
- Higher mileage allowance (50 vs. 37.5-48 cent/Km)

In the international forums, Norway's privileged economy helps pushing for climate friendly agreements. The white paper *Towards greener development: On a coherent environmental and development policy* from 2011, advocates for Norway's role as a bridge-builder among nations in the green development issue; intensifying the role of Gov. in promoting RES and sustainable management of natural resources; being a driving force in creating global systems for maintaining ecosystem services; facilitating adaptation to CC in developing countries.

Climate Change and Green Economy Framework

	Adm. Unit	State (NUTS1)	Region (NUTS2)	Province (NUTS3)	County (LOCAL1)	Municipality (LOCAL2)
	Name	NORWAY	Sørlandet		Aust-Agder	Arendal
Climate Change	CC Responsibilities	Energy, flexible mech., CDM, Transport, oil-gas production	Regional Energy Plan		2020 Reg. Dev. Strategy, Public Transport	Climate Plan, En, P. T., Waste, Waters, Build., Spatial Plan., Green Ar.
	CC Target	2020: -30% GHG vs. 1990 2050: Climate Neutral	---		2020: -20% GHG	Climate Neutral Adm./ 2025: -25% GHG vs. 1990
	CC Action Role	National CN network + *Cities to the Future*; CC Adaptation Strategy. Funds, support, regul.	Follow up of State policies from the regional statesman		Search municipal cooperation	Active
Green Economy	Assess. Report	---	---		---	--
	GE Legislation	Sectoral (list above)	---		---	---
	GE Strategy	---			Climate Partners	Climate Partners / Green Incubator
EU 2020	3% GDP R&D	No Comments				100%
	20-20-20	No Comments				100%
	Work Age 20-65	No Comments				100%
	Education	No Comments				100%
	Lift 25% Poverty	No Comments				100%

Green Urban Economy Strategy of Arendal

Green Urban Economy in Arendal is an explicit process with two overarching initiatives, after which others develop. Planning activities support the aim to reduce the carbon footprint.

1.- Climate Neutrality and the Climate Partners Network, outstanding for:

- **Multi-stakeholder engagement and driver of energy efficiency and innovation**
- **Benchmarking of Arendal and replication of the model at several scales**

2.- Green Incubator and *"Go for the Green Growth"* campaign.

- **Direct provision of resources and opportunities for green entrepreneurship.**

3.- Sustainable urban and strategic planning

The city of Arendal engaged climate change mitigation and adaptation in 2007 with the promotion of Climate Neutral Arendal. It all started in 2006 when the candidate to Mayor declared she would make the city climate neutral with commitments for both the municipality and the city. It was very much debated: what is climate change, what is more efficient to cut GHG, etc. *"This helped raise questions, search for answers and funds for investments, etc."* (Climate Ambassador). The most successful output of this process was not the LG's pledge to go climate neutral by 2017, but generating a multi-stakeholder process in the same direction, the Climate Partners Network (CPN), and its replication at different scales.

Before the Climate Neutral commitment the city was characterized by an economy based on heavy industry linked to the oil and gas sectors, complementary technology and materials supply. Due the extinction or relocation of some of the larger and most polluting industries, the city is currently facing a huge change. The city needs to move on from the carbon and oil business, and **Climate Neutrality has become a reconversion driver towards new green businesses**. Fortunately, there is a lot of knowledge in the local industry, and still large sums of money flowing from the oil economy. Both assets will be very helpful, as there will be a need of arenas and backing to support the change of local businesses. This is the case, for instance, of Flumill, a company migrating to wave energy technologies and machinery from oil & gas engineering.

CPN is a Public Private Partnership network in the Agder counties "focusing on how a region can reduce GHG emissions and develop a green economy" (CPN, 2008). Partners are two counties (East and West-Agder), three cities (Arendal, Grimstad and Kristiansand), some other public corporations including Agder University and a number of private companies. The 35 partners of CPN, the largest of its kind in Norway, employ 17,000-18,000 people. CPN was born as a pilot project funded by the central government for a period of three years. The current mission of CPN is to consolidate beyond this startup phase.

By entering the network, the partners are obliged to (from website):

- Hold an environmental certification (*Eco-lighthouse*, ISO or similar recognized standards), or start certification in the first membership year.
- Prepare annual climate footprint reports following the international Greenhouse Gas Protocol.
- Prepare an action plan to reduce emissions of greenhouse gases in their own organization.
- Pay an annual membership fee.

On a voluntary basis, members may additionally assume and pay carbon offsets to CDM projects in compensation for their climate neutrality deficit.

After three years of operation, CPN is responsible for reducing 19% carbon emissions among its 2-year members and 9% for the one-year participants. As described further below, a number of new green products and services have appeared thanks to CPN, starting to create a regional green market. The fact that the membership is associated to obtaining of the Norwegian eco-label Ecolighthouse -or similar-, ensures standardized management procedures and verification, and prevents *green washing* temptations.

Arendal's experience has pushed the climate action topic at regional and National level, and the project is included in a UN CN pilot network. Due the remarkable ability to co-involve governments and businesses, 10 National authorities (Ministries, State Agencies, etc.) decided to explore climate neutrality following Arendal's model in 2012. Two years earlier, the Norwegian Gov. established mandatory climate and energy plans for its municipalities, assuming that LGs *"have regulatory instruments that have an impact on 30% of the emissions within the municipality"* (Hoystand & Braend, 2009). By then, already 50% of LGs had voluntarily undertaken such plans. Overall, adopting Climate Neutrality and the Climate Partners Network provides a method to disseminate and tailor climate action to all sorts of organizations, sideways and upwards. Moreover, in the local fight against climate change multistakeholder cooperation is capital in order to achieve and hopefully trespass the mentioned cap.

There are many individual experiences worth highlighting from CPN; the next are a little hint:

- **Nettbuss:** Developing green bus services thru economic driving, engine-off technology when stopped, saving the best buses for the longer distances and introduction of biodiesel (30%) in most bus services. They plan to introduce hybrid buses in the future.

- **Thon Hotel:** Energy supply from hydroelectric and methane from a landfill. Currently, they are retrofitting the building to further reduce energy demand and emissions. Creation of the *Green Conferences* concept, by which all event services (transport, food, inventory...) must be eco-certified. For transport from airports, stations, etc. they also promote options to avoid plains and they manage shared travel. The hotel even offers to offset emissions generated from the conferences. Success of this product is such that currently all +60 hotels in the chain are implementing the *Green Conferences*. They pay CDM offsets.

- **Durapart** (Social Services Public Agency): It has built and runs a Kindergarten green building. An initiative in progress is green printing services. Promoting sustainable mobility among its workers: paying bus fares, sneakers and bikes repairs to those leaving the car at home, car sharing, walking, etc.; they also have an electric vehicle for the use of the workers. Currently working on energy labeling of their offices. As a nonprofit part of the revenue goes to a "climate fund" for energy investments. They will pay CDM offsets.

- **BGM Architects:** Since 2006 they design and raise all new buildings energy efficient. They specialized in energy and materials efficiency, wood, insulation, passive-solar houses, zero-GHG buildings, sustainable water and sewage systems. Customers start to search BGM for their specific products.

CPN includes corporations from a very wide range of sectors: energy supply, renewables, new and renovated buildings, public and non-motorized transport, waste-to-energy and recycling facilities, computer systems, hotels, public administration, social services. And indirectly many others through the actions the members must undertake to fulfill their climate neutral commitment. This often requires very specialized solutions. **In accordance, a key aspect of the model is training, consultancy and communication**, and new services in these fields are emerging between the participants. **East-Agder County**, responsible for the CPN Secretariat coordinates the production of sectoral training documents and activities -the *Knowledge Notes*-; **CO2 Focus** develops carbon footprint calculation and offsets management; **GRID** and **Agder-Research** (University) provide capacity building training programs and technical consultancy; **Frameworks** delivers awareness raising and on/off-line dissemination services. In addition, CPN celebrates at least one annual meeting of its Plenary, besides those of the Executive Board, where the latter affairs are discussed and planned. Running an active agenda is important as many members are not dealing with climate on a daily basis.

The Public Administration is also feeding into the CN track record. Actions flow from both the planning and management activities.

The Municipality of Arendal operates its energy sustainability activities through an Environmental Manager, the local Climate Ambassador (Clim. Amb.) and staff. The presence of the Ambassador provides a consensus figure to the city and the different political forces. The city plans to cut government GHG 90% by 2017. The strategy behind setting the example in public services and facilities is to reach out and engage the society. Therefore, a critical mission is to push sustainability into all municipal divisions. Breakthroughs are taking place , but *"steps are slow and small -although the need would be for leaps- because it is based on building consensus... something that could be done in 4-5 years will take 15-20 years*" (Svendsen). To prompt action they had to find "souls on fire", those workers enthusiastic about change and new solutions. For instance, currently 5 schools are heated with biomass (wood chips and pellets). Despite certain resistance at the beginning, by selecting the right people alternative boilers are expanding. At current times, the city is focused on obtaining the Eco-lighthouse label for as many services and facilities as possible.

The leading action of the municipality -with the support of GRID- has driven Hove Festival held in Arendal, the largest rock festival in Norway, to go climate neutral. Also a powerboat race (Norwegian Grand Prix), establishing at least the culture of compensating emissions when not avoided.

The city planning division is also contributing to the low-carbon profile efforts through densification and pedestrian friendly strategies. Trends determined a need of 3,000 new homes for the next 10 years in a process of aging population. For a sum of health, dependency and climate related interests the main idea of Arendal's new Master Plan is to satisfy the growing residential demand while reducing transport needs. Indicators show that 63% of housing is occupied by 1 or 2 dwellers. Hence, new and renovated buildings should prioritize multifamily structures, smaller size of individual units, and include co-housing concepts, in contrast to the current 74% of single detached homes. Additionally, open spaces should promote socialization and exercise. The plan studied the areas in a range of 10-30 minutes (comfort travel time) either walking or biking from the city center. As a result, a target of 2,000 dwellings will develop in the 1 Km radius from downtown, from both new construction and refurbishment projects. In parallel, in order to connect the new settlement points and foster soft mobility, a network of parks and paths will be completed. The plan also observes the reorganization of bus services and traffic for faster and more frequent expeditions. This requires removing from the city center and coastal roads the cars from commuters to the neighbor city of Grimstad (or elsewhere) living in the seaside suburbs, which are also expected to grow on the long-term scenario. Thereby, there is a project to build a new road connecting these areas to the regional motorway, but through an important natural sanctuary. The alternative would be a tunnel several Km long to cross the whole city diagonally. In the effort of generating a better public transport system and sustainable urban management, the particular topic of diverting commuter traffic has produced the main controversy of the plan. Last but not least, climate adaptation in spatial planning is already under deployment, regarding the minimum height from seawaters at which construction is permitted according to sea level rise estimations.

At the regional scale Plan Agder 2020 sets climate as one of the hot topics for the decade. *"Agder is the leading region in Norway on entrepreneurship and export from processed goods. But the industry is to a high degree based on energy intensive raw materials processing (e.g. aluminum, nickel, and siliceous). The region is also host to world leading producers of offshore equipment*

(drilling and mooring), and has also strong maritime industry clusters. There is furthermore a strong potential for the production and distribution of clean energy as Agder is one of Norway's biggest producers of hydroelectric power" (Agder Region, 2010).

In order to address the challenges of the 2010-2020 period, East and West Agder counties promoted a strategic development plan. In a very similar approach to the principles of the EU 2020 Strategy, Agder established 5 headline areas of development, namely: climate; quality of life; education; communication; and culture. Through this plan the transition towards a green economy is turned into a yardstick at regional level as well. In the specific field of climate change, the following actions will be undertaken:

- Regional and local action plans must outline specific measures for coping with climate challenge.
- Climate considerations and adaptations will be assessed in the development of munic. plans, major development plans, land use and transport plans.
- Climate considerations always included for localization and the prioritization of infrastructures.
- Information campaigns in cooperation with regional knowledge environments (Agder Research, GRID...).
- Cooperative measures between RE and EE companies and petroleum-based supply industry.
- Priority: low and zero-GHG vehicles in public procurement.
- Facilitating use of climate friendly fuel
- Emphasizing reduced transport demands at each level of land use planning.
- Improving EE in public buildings and ensuring a smooth transition to climate friendly heating thru RE.
- Strengthening educational and research env. in respect of all fields of energy and technology.
- Paving the way for technology develop. in order to reduce energy loss in the power line networks.
- Facilitating development of renewable energy by developing wind power, small hydroelectric power stations and bioenergy.
- Mapping of suitable areas for establishing wind power projects, both onshore and offshore."

In spite of the prior list, no measurable targets have been announced. Even so, putting climate at the forefront of the regional and county policies is expected to guarantee the continuity of climate neutral programs in Arendal and the Climate Partners Network itself, given the direct involvement of both counties as members of the network, and headquarters of the Secretariat in the case of East-Agder County.

Rounding the circle of Arendal's green economy approach, **the municipality created in 2012 the *Green Incubator* aimed at fostering new green businesses.** In a first phase the local Promotion Department launched the campaign "Go for the Green Growth" (2010) to stimulate green startups and green knowledge based enterprises. The campaign took place in parallel to the County and the City retrofitting the headquarters of GRID to "low-emission standards, below 100 kWh/m^2 yr" (GRID). The investment was a bit higher than usual, but the long-term operation savings make it more economic. The experience led to the establishment of passive house standards higher than the national for all public buildings in Arendal. Several green products and services companies moved to this office building, such as Frameworks and Agder Research.

In 2012, a new facility was inaugurated, the Knowledge Harbor, a private investment from a drilling company right on the shorefront. This 4-storey building, also low-emission, will hold lifelong learning services, activities for scholars and 1,000 m^2 floor for the new *Green Incubator*. Between 10-12 green companies already confirmed to relocate there. In total 50 office places will be available for green, conventional and R&D companies, after a selection process. The municipality is conducting workshops on green business to support this process of turning Arendal into a green economy hub in the region and beyond.

Climate Neutrality has been a wonderful green benchmarking tool for Arendal. The innovative methodology of Arendal for multistakeholder climate action has been a great resource of national and international positioning. "Besides taking part in a UN project, Arendal will probably be picked as one of the 5 Norwegian pilot cities for a CN policy with the support of the Ministry". Europe is very interested in developing PPPs on climate governance following Arendal's example; partnering through some EU programs is more than probable with Swedish and Danish regions" (Clim. Amb.). The single cases of Thon Hotel and the rock festival have awakened strong interest from the media, putting Arendal on the news for its green profile. This is influencing positively public opinion of local residents about the sustainability commitments of the city, and supporting the ongoing communication tasks through the local newspapers, the schools, to the employees, internet, etc.

C/P Workshop of Development and Climate Change

Climate Change

Conflicts; Challenges:		Opportunities; Capacities:	
▪ Old leaking water network ▪ Risk of floods on sewage and drainage system ▪ Sea level rise ▪ Climate skepticism ▪ Too many cars ▪ Mixed bus-car lanes ▪ Rain intensity increase ▪ Frost/Wet snow on energy grid ▪ Impact on water quality (subst. in runoff) ▪ Fast growing city	▪ Rise of sea temp. (effects on carbon cycle) ▪ Energy use in buildings ▪ Detached home lifestyle ▪ No Green procurement and trade ▪ Small supply of local food ▪ Extreme wealth of society & consumption ▪ Lack of community and green transportation systems ▪ Building standards ▪ Paradox for tourism and crop yields of a warming climate in a cold country ▪ Transformation areas potential	▪ Climate Partners Network ▪ Climate Neutral Administration ▪ Dedicated and committed politicians and administration ▪ Mandatory municipal climate plan in Norway since 2010 ▪ GRID's positive effect ▪ Garbage recycling system ▪ Densification strategy in the Master Plan ▪ Road network suitable for PT ▪ Ferries and water transport	▪ Wood stock for energy market ▪ Water supply capacity and quality ▪ Green business incubator ▪ North Sea Treaty against eutrophication of the Baltic Sea

Development

Conflicts; Challenges:		Opportunities; Capacities:	
▪ Growing impacts of the international crisis ▪ Aging population, increase of pension and health costs ▪ Unsustainable consumption. levels ▪ Fast growing city	▪ Reduction of pastures ▪ Conservative values of the soc. ▪ Dramatic terrain - problem for biking, walking, aging pop. ▪ Integration of new labor force ▪ Dynamic enterprises	▪ Wealthy city ▪ Government incentives ▪ Well educated decision makers ▪ Good education system ▪ Highly educated society ▪ Very flexible society	▪ Individual options available ▪ Strong population growth ▪ Social equality ▪ North Sea Treaty against eutrophication of the Baltic Sea ▪ Effect on tourism and economy ▪ Compact center and city plan

Brief highlights:

- Natural hazards (floods, sea level rise, snow and rain storms, etc.) are among the relevant conflicts derived of climate change in Arendal. So far, the city has only adapted building regulations to safe heights above potential sea level rise. Climate change impacts assessment and adaptation plans are on their way.
- Despite the noticeable rates of recycling and low GHG emissions, several factors determine a society with high consumption patterns: "extreme wealth", detached home lifestyle, energy use in buildings, lack of green procurement, building standards, and "too many cars". In a reality of a fast growing city with important areas under potential transformation, it will be necessary to deploy green regulations to counterbalance a larger ecological footprint of the city. In this sense, the LG is already on track through a densification strategy in the Master Plan, as well as the city's pledge to a carbon neutral administration, combined with dedicated and committed politicians to the climate change issues and the fact that local climate plans are now mandatory in Norway.
- Climate skepticism, conservative values and the potential benefits of global warming for Arendal (better climate, crop yields and tourism) cluster against climate action. The Climate Partners Network and the Green Incubator will help bring on board different stakeholders through a business friendly perspective.

Interviews Arendal

Public Sector

Municipality:

- (M) Mayor of Arendal
- (M) City Planner
- (M) Former Environmental Manager
- (M) Environment Department Techn. Expert
- (M) Climate Ambassador

Regional authorities:

- (M) County of Aust Agder - Climate Partner Secretariat
- (M) Green Incubator Initiative Manager

Civil Society

- --

Private Sector / Corporations

- (M) BGM-Architects
- (M) Thon Hotel-Director
- (W) Nettbuss-Communic. Manag. (Public company)
- (M) Durapart-Env. Manager (Public company)
- (M) Frameworks-Executive Manag.

Education - Research

- (W) GRID-UNEP-Techn. Expert
- (W) Agder Research Institute

Cancelled

- Water Technical Expert
- Chief City Administrator - Municipality
- Knowledge Dev. Program - Municipality
- Arendal Renovasjon Corporation - Private company
- Flumill Corporation - Private company
- Agder Energi Varme Corporation - Private company

Brief highlights:

- 14 interviews were successfully conducted, yet 6 more were cancelled throughout the study visit week.
- Representation of sectors and activities was diversified and balanced between LG members and other organizations, except for civil society organizations as none were interviewed.
- Gender distribution was particularly unbalanced for women; only 3 out of the 14 interviews.
- The interview with the former Environmental Manager was key in obtaining information about the city's track record in SD policies and action, and data about sustainability indicators. At the time, there wasn't a replacement in this position, leaving a certain sense of vacuum on these topics.

Interviews: General Information and Socioeconomic Aspects										
Interview	**Year**	**Activity**	**Management**	**Jobs**	**2020 Jobs**	**Turnover**	**2020 Turnover**	**Prod/Service**	**Market**	**Performance**
		% Green	**PB/PR/J**	**#**	**#**	**€ /USD**	**€ /USD**	**Units**	**L/R/N/E/W**	**0 - 10 points**
Clim. Partners Network	2008	100% (in the Climate Program)	J	17,000 (empl. of member org.)	.--	2,000,000.000 €	.--	34 members (5 LG + 1 Univ. + Pr. Corp)	R (N net. recently launched too)	8
Agder County - CN Partner Sec	2009	100%	PB	1	>1 (Regional Dev. Plan)	878,587 € (all env. programs of County)	No targets determined	CP Sec., Reg. Dep., PT, Wood Const Fund	R	7
Nettbus - CN Partner	1857	100%	PB	900	900	14,212,440 €	14,212,440 € (risk based future model)	>90% of regional bus service	R/E	8
GRID-UNEP - CN Partner	1989	100%	PB	35	50	5,168,160 €	7,106,220€	Env. Comm. and SD assess. priv. sector	W	8
Thon Hotel - CN Partner	2006	--	PR	25	>10,000 (Thon chain)	3,876,120 €	+20-30%	Hotel and convention center	E	10
Agder Research - CN Partner	1989	100%	J	4	13 (10-15)	387,612 €	1,356,642	SD Research and Ass. for Priv. Corp.	L-W	7
DURAPART - CN Partner	1971	--	PB	1 (direct for CN and Env.)	--	<100,000 €	--	Social Services Agency	L	--
BGM Architects - CN Partner	1988	100%	PR	14	30	2,713,284 €	5,426,568 €	Sustainable Architecture	R	8
FRAMEWORKS - CN Partner	2003	100%	PR	6	10	490,975	1,292,040	Env. comm. and internet services	L-E	7
Green Incubator - CN Partner	2010	100%	PB	1	3	129,204		Nursery and support for GE start-ups	R	5

Brief highlights:

- Almost all organizations expect to grow in economic turnover and jobs, independently of the size or the market. Engagement in environmentally and climate friendly activities seems to be a source of optimistic prospects for the future.
- In the case of Thon Hotels, the experience in Arendal is foreseen to expand all across the firm, with a tremendous potential in terms of green jobs and green economy.
- Only the Green Incubator at its start-up phase evaluates a performance below 7 (5). The rest of companies and organizations show a notable degree of satisfaction with their own activity (7-8) with even a mark of 10 for Thon Hotel, expressing the great success the climate partners program has been for them.
- In contrast to other cities, most of the companies consider that 100% of their activity is already within the definition of green economy.

Interviews: Activities, Constraints, Future			
Organization	**Activities**	**Constraints**	**Future**
Climate Partners Network (CPN)	▪ CPN is a regional PPP network in the Agder region of Norway aimed at reducing GHG and develop a green economy. Partners are 2 counties, 3 cities, other public partners including Agder Univ. and private companies. The 35 partners employ a total of 17,000 people. ▪ Members are obliged to: 1) Hold an environmental certification, or start one in the first year; 2) Prepare annual climate footprint reports following the international Greenhouse Gas Protocol; 3) Prepare an action plan to reduce own GHG; 4) Pay an annual CPN fee. ▪ On a voluntary basis organizations finance offsets in case of not reaching carbon neutrality. ▪ In 2011 CPN 2 year members have reduced GHG emissions with 19%, and 1-year members with 9%. New green products and services have been developed including a concept for certified green conferences, climate neutral publications, new hybrid buses in the city of Arendal, new low-emission buildings, climate leadership programs, increased focus on green purchasing, in particular from the public partners to develop a green regional market.	▪ Society: Involvement of the employees is still low, so Scope 3 of corporate GHG Protocol is still not possible. So far, GHG inventories include Scope 1 and 2, which cover sources owned / controlled by the organization and indirect emissions from electricity purchase. ▪ Society and knowledge: Climate awareness and skepticism. Society is not fully aware of threats and opportunities. There's more out there than they know. ▪ Climate leadership is still a constraint because the companies do not prioritize it yet.	▪ The Knowledge notes: reports on climate neutrality for each of the sectors represented by the Partners; e.g.: green conferences, waste, green electricity, plus-energy houses, bio-energy. Areas in which knowledge is increasing to improve business opportunities. ▪ Now one of the challenges is to get the workers more involved in emissions reduction. Next meeting of the climate leaders will focus on how to involve the workers. ▪ One other goal is to find a EU project to generate an international network project on climate neutrality. ▪ Create a platform for the cooperation of business and university on climate action, one big component is green procurement.
Agder County - CPN Secretariat	▪ Agder County acts as secretariat of the Climate Partners Network, coordinating the yearly agenda, and developing specific tools such as the Knowledge Notes. ▪ Agder C. runs several other environmental programs: Reg. Dev. Program based on the "Regional Development Plan Agder 2020"; Funds for Public Transport; and grants for a Wood Construction Fund. ▪ There is a strong effort to work with other networks. Actually, following the example of Arendal there is now a network at national level: Klimate Lift // Promise. It is not so strict on reporting, but very big companies are involved and it is supported by government actions. They have much more budget so can do bigger events. It is important for CPN to make part of this larger network. ▪ Every company sets its own goals (climate neutrality is voluntary), yet there is a requirement to become ecocertified (ISO 14001, Ecolighthouse) in the first year.	▪ To keep members active there has to be active action from the Secretariat, but this is limited due to resources (human and financial). Many of the companies are not working on climate issues on their every day activity, then it is task of the secretariat to keep the momentum. ▪ So far, 2012 may be the last year with public funding of the project, funds for 3 years is the normal in Norway. So, how to make it self-sustainable after that. The network needs at least one full time employee.	▪ In the Regional Plan climate is one of the 5 hot topics for the next years, setting goals for 2020 (business, university...). New policies and tools will come out of it. It is an asset to push for some more funding for the CPN. Arendal is backing this possibility. ▪ Increase the network by transference of Arendal's Model at national and international level. Work with other networks and create European Projects. There is an Interreg Program, but all funds are allocated until 2014. ▪ Value Creation: how to translate the good practices into added value. The national CN network is preparing a Scandinavian Conference about climate activities and value creation. More focus on products and services -> how to buy and sell climate friendly products and services. There is a network in Sweden, but more developed on green products, so very complementary.
GRID-UNEP - CN Partner	▪ GRID is a Governmental Communication and Capacity Building Organization set up by the Norwegian Gov. ▪ GRID's UNEP constituency is to act as policy advisors and development. At some extent they work with industry, for example on CSR. Yet, Most of the current "customers" are national gov. officials. A hot topic in GRIS is geology of the marine environment for policy advising. ▪ Now they want to work on training municipalities on green economy. They believe is that green economy is a topic that everyone must fill with their own meaning. They are working on training now, with the target of developing a language of green economics that is practical and useful for local governments and other actors. ▪ Other: they have experience in working through NGOs to work with the community - but it didn't succeed. They are also working on payment for ecosystem services; providing training on this topic.	▪ Society-Knowledge: GRID is and it is not part of UNEP. It follows the official and negotiated approach in their printed and published tools. It is the political correct message, yet GRID has decided to work around ecological economics, so a great challenge is to open the vision of their customers (Government Authorities, even Companies) to a more comprehensive systemic change. Ecological economics must be brought out of the academic circles to communicate it and not get alienated.	▪ Training with a network of LGs (20) on GE in a practical and useful way and language, to work on a specific vision of what GE would be. A program of three-week trainings through a year and in between meetings online and dialogues and tasks, based on the "U" Theory (Otto Scharmer): the facts, the blind spots, what innovation is possible; org. dev. and systems process change. Starting in early 2012 and launch it as a follow up to Rio ▪ Payment for ecosystem services ▪ "Green economy in a Blue world": Concept development on green economy on the Arctic and ocean industries (deep sea mining of non-renewable natural resources). Showing the issues at stake in Arctic regions due the ice melting and climate effects; also follow up on the TEEB report on oceans. ▪ Secure internal funds, plus additional external funding for the whole program, find the practical tools to use...

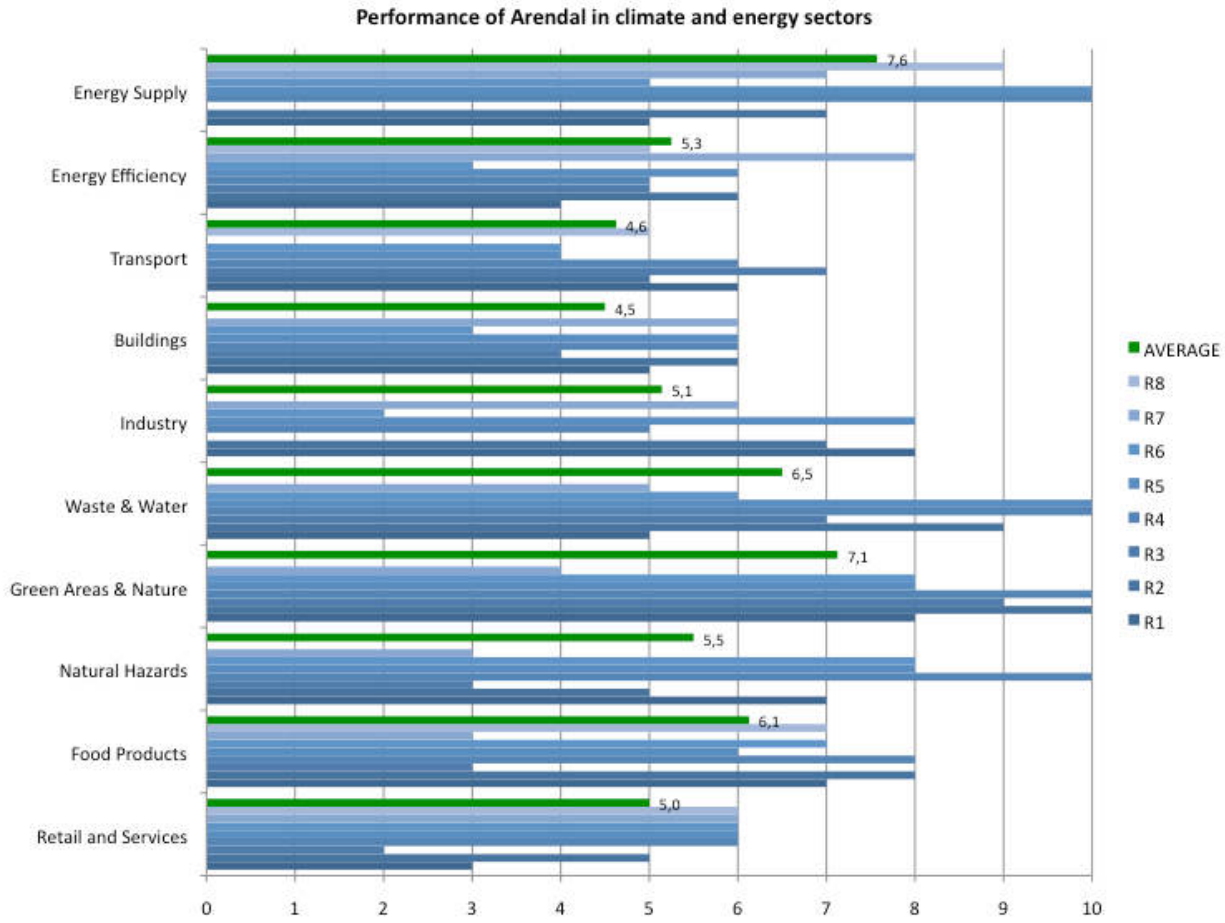
Organization	Activities	Constraints	Future
Nettbus - CN Partner	▪ Nettbuss started as a shipping company in 1857. Later on it incorporated buses, and it was bought by the National trains company (NSB) in the mid 90s. ▪ Nettbuss Sørlandet runs from Oslo to Stawagnes. Yet, they have a sister company in Copenhagen and a similar one in Sweden. In the Region of Sørlandet they have 900 workers, Bus drivers on low emission vehicles // The whole company in NO, DE, and SW has 7000 employees. ▪ The company is producing green bus services. They are very focused on what can they do by themselves: economic driving, engine off when stopped, the best buses for the longer distances, introduction of biodiesel (30%) in most bus services. They planned to build a biodiesel factory but this had to stop after the crisis.	▪ Economy: Due the crisis bus building companies have stopped innovating, they are just focusing on maintaining business. No green innovations currently available. ▪ Policy: The Company wants to influence the market but they depend on the requirements of the tenders, which are not as strong in Agder region than in other areas of Norway where environmental values will account for 30% of the points of the contract. In Arendal technical conditions must be achieved and the price is the key factor to win the contracts. Hopefully the next year requirements will increase and help improve environmental performance of the PT sector. ▪ Policy: Too little traffic problems in medium size cities like Arendal, so car is still very competitive. Incentives to PT and disincentives to cars are still insufficient in many cities. In addition to this, the bad management of several constructions going on the roads and streets slow down the buses. ▪ Policy: A new tax on biodiesel (closing up prices to conventional diesel) is holding back a big biofuel plant project from Nettbuss.	▪ They hope that tenders will be stronger on environmental demands (50%) so that it will boost the green bus services. ▪ From the technological perspective they expect to explore hybrid-plug-in buses. ▪ It will be also interesting to work on biodiesel, despite tax issues. However, changes in the tax system to incentivize alternative fuels would be needed. ▪ At the level of Norway the main aim is to take space to cars, particularly in big cities such as Oslo. Creating comparative advantages for bus and PT really delivers more clients. Taxes on car circulation in cities, BRT lanes, etc. will help a lot. The goal is to have networks of BRT to improve time of journey in cities. Then bus will be on schedule and even faster than car.
Thon Hotel - CN Partner	▪ Thon Hotels is 60+ chain. In Arendal 2006 the hotel in Arendal was added (from 1886 for construction workers). In 2006 the chain lost a huge contract with the Norwegian defense mainly the company didn't have an environmental certification (about >2000 rooms). Then decided to certify the chain with Ecolighthouse label. The Arendal hotel was certified in 2008 (only one in the region then). ▪ Joining CPN was a great opportunity to hook up with city actors. Then they decided to go for climate neutrality (CO2 Focus is the consulting firm). By 2010 the hotel became climate neutral (first in Norway). ▪ The chain started to talk to Robert, wanting this profile to become a product; then is when the developed the concept of green/climate neutral conferences. They have an Ecolighthouse certification of the activity, by working on the transport, food, hotel, inventory, energy, events... they even offset the generated emissions. The conference organizers buy the emissions from Thon who buys them from "CO2 Focus". All the suppliers must be certified. ▪ Since joining CPN the hotel receives its energy from hydro and methane from landfill. Currently, refurbishing the building, further reduce energy demand and emissions. The hotel itself generated the set of requirements with the help of Ecolighthouse; the external third party to assess and certify the process. From the transport perspective Thon has a certified set of partners. They also manage group transport from airports, stations, avoid plains... ▪ The hotel sector is very dynamic. The great chains worldwide also worked on green conferences but dropped it, now restarting closer to the Thon model. They have experienced a boost from national media, from customers and business. Clients that wouldn't necessarily use them are coming thanks to the climate profile. Next year there will be a big conference by the Arendal Komune because of the green product. By going green they are experiencing lower costs (energy) and increased business: win-win! Saving hundreds of thousands of NOK on commercials as they have been directly on the news.	▪ Market: the capacity to find and deliver certified products and services for all the sectors covered by the hotel. So far, they have created the Green Conferences product, which guarantees environmental performance from transport to food, and optional carbon offsets for the customers. ▪ Society: on a national basis there is still a lot to do on promotion and spreading the word.	▪ For the last 4 years there's been already a great growth. The next years it will slow down but continue to rise, yet the activity will be more sustainable on the lorg term. Green conferences will help increase the market. Expected growth of 20-30% by 2020. ▪ Use the Green Conference product on a national basis. There's going to be a decision process to implement the model into the whole chain. ▪ A new approach will be to promote distributed conferences between several hotels of the network, really getting to avoid long distance transport. ▪ Thinking 20 years ahead of time to become the outcoming winners of the economic crisis. Going green is the right strategy for this challenge.

Organization	Activities	Constraints	Future
Agder Research - CN Partner	▪ Agder Research is a non-profit limited company set up and owned by the University of Agder (49% Agder Research Foundation) + other regional public shareholders. It is a regional research institute working on interdisciplinary social sciences in many fields of green economy: process industries, retail and services (entertainment, hotels, tourism...), R&D on CSR, in academics: link between sust. and innov.. Private companies pay for specific jobs, but also state bodies pay for other research. More flexible conventional university. ▪ Trainings: sustainability implemented as a driver for innovation. They talk of lacking resources on the next few years; who doesn't adapt to it will seize to exist. Working for the WBCSD they made a Scenario based publication: "Coalition 2050", that's how business engaged. Aim: adapting each industry to the emerging opportunities. There is a cluster of very big process industries (10 big companies: aluminum). Also part of Agder-R. providing SD for other kinds of sectors like culture, like the zoo.	▪ Global crisis: Lacking natural and energy resources on the next few years will be determinant; who doesn't adapt to it will seize to exist. ▪ Knowledge: A lot to learn yet though, we are in front of a different global crisis, so it is really a challenge to convince companies that sustainability is the future: risks are higher of not focusing than otherwise. ▪ Public policies: Support from the public sector is necessary. As long as the welfare works well it is a public mission to push for a sustainable economy. The absence of a stable framework for green progress keep companies them behind (CO2 price now and in the future). ▪ Society: Skepticism in a society of very high standards of living.	▪ The plan is to extend the "2050 Coalition" and SD course driven innovation approach and tools to more companies. ▪ There will be work on strategic activity, for example on communication. Linking the immediate problems that the companies have to the global drivers. Linking their business to the global setting. Making them aware to their vulnerability. ▪ Local, regional and governmental support is key to extend the green economy approach. ▪ Another important sector to work on is public awareness. Provides access to the right information, in order to push back skepticism and produce attitude changes in the population. ▪ They will also promote ambassadors and leaders from the business sector: the pioneers. Those than can send a positive message.
DURAPART - CN Partner	▪ Durapart is as Social Services Agency. It belongs to the administration but it is run autonomously as a private company. Durapart is not dedicated to a specific Green Economy product or activity, but it linked to climate mitigation as member of CN Partners. Yet, it has developed particular experiences of green economy as a new Kindergarten Green Building. ▪ Promoting sustainable mobility among its workers. Paying bus fares, sneakers and bikes repairs to those leaving the car at home, car sharing, walking, etc. They have also an electric vehicle for the use of the workers.	▪ Society: the will of society to purchase green products and services will be the main driver for mainstreaming GE. The green market is still young, but climate skeptics are reducing fast because effects are more obvious. ▪ knowledge to provide really carbon free products. It is difficult to follow the whole carbon cycle of some of the products and services required. Therefore, how far is it needed to dig in order to measure the carbon footprint. Is it really possible to calculate or not? Another company multiplied its footprint by 10 to consider all the cycle included and bought offsets for the overall amount	▪ Green printing: An initiative in progress as a part of the carbon partners and for GRID reports. ▪ Carbon free kindergarten facility.
BGM Architects - CN Partner	▪ There are actually 2 firms: BGM Architects (1988) + Construction company (1993). Since 2006 they design and raise all new buildings energy efficient. The company has specialized in energy and materials efficiency, construction with wood, insulation, passive-solar houses, zero-GHG buildings, sustainable water and sewage systems. As a private and distinctive product, now it sells very well.	▪ Training and skills of workers on energy issues. ▪ Society: Rise awareness of the costumers, because many do not know much about green buildings. After 6 years experience, customers start to search BGM for their special products. ▪ Economy and market: The technology for green buildings is there but it is often not commercial.	▪ 0 en. houses and +en. houses; until now passive and low. ▪ How to produce economic and enough electricity at residential level. The easy part of green building is to heat the houses, the difficult and expensive is electricity. ▪ Cooperation: Stable networking with potential partners // they always work with INNOVA (program only for passive houses and houses for the future) the local University, and with a bank that helps financing green housing.
FRAMEWORKS - CN Partner	▪ Description: consultancy, developing web solutions in the context on environmental communications. The typical customer is public sector: local authorities, regional authorities, especially work with the state of the environment report ▪ Also worked on communications and education on a national market ▪ A lot of self initiative to promote deals with potential clients ▪ With CPN: CO2 Focus measured their GHG inventory and it was low as they are already on a climate friendly building. They worked on scope 3 (workers transport) and they investigated how to find climate neutral servers. ▪ CPN Webinars: facilitated by Frameworks. The conclusion was to close down the network due lack of funding.	▪ Legislation at least on the Norwegian market, too little demand to report so far. ▪ Public funding. ▪ Knowledge and access to good quality public information: 400 local authorities, but on average there aren't national systems to manage the data. ▪ Tough market as they work ▪ Now, the emissions of Frameworks are growing because the business is growing, and the start point was very low.	▪ The company is leaving the green and opening up to other products for data communication. ▪ They also plan to focus on products for climate reporting as it will probably become mandatory.

Organization	Activities	Constraints	Future
Green Incubator - CN Partner	▪ Pre-created in summer 2010. In 2012 they move to the new building. The building is a private investment from a drilling company. The owner contributed to the knowledge center in the first floor. Level two is for lifelong learning. ▪ The incubator (1,000 m^2) offers spaces and free advisement to startups at intermunicipal (4 muninc.) level. ▪ They have a very strong sector on oil/marine industry (drilling, anchoring) now greening. They want to turn the current centre of knowledge into green products/services. ▪ Between 11-12 companies; 50 office places in the new building, now under selection both conventional and R&D. They are doing workshops on what is green business. It is important to connect the businesses with Agder Research and CSR. Flumill.no: product energy from tides; links to university on robotics; Agder Reseach-CSR; GRIT - Purity.no; (from 240.000NOK, in 2012 100M NOK). It started as a backup company and Svein involved to include the green dimensions; Ecolize: new system to remove lice from salmon, using only 10% of the medicine and products in water; Frameworks: Environmental communication; an industry designer researching on cradle-to-cradle materials for toilet production.	▪ To know what green business is; what criteria define a green business. To see that the green part is solid, and avoid falling into green washing. ▪ To get finance for the services	▪ One of the goals is how to get the companies to work together. Now they are competitors and perhaps the green business will bring them to cooperate. They want to be a national basis for these ideas. ▪ Starting a project on sustainable fishing: the fishing industry is in crisis. ▪ Important to acknowledge the competence of the area, make as short as possible to go from knowledge to competence to get to the market; today this means green ▪ It is very important that the companies earn benefit from being in it (not only money, also cooperation, knowledge...). If necessary change directions to make the best for the customers - little money on organization. However, adaption -through the research- must come with marketing benefits as well.

Interviews: Links to the EU 2020 Strategy Targets					
Interview	**T 1 - 3% GDP in Research & Development**	**T 2 - 20-20-20 Climate and Energy Package**	**T 3 - Age 20-65 75% in workforce**	**T 4 - <10% early sch. leavers + Tertiary Age 30-34 >40%**	**T 5 - Poverty Lift 25 %**
Clim. Partners Network	▪ On R&D the network is working on this climate notes, providing results to the companies for their performance.	▪ CPN members develop the carbon footprint and take steps to cut own emissions: 8% per year so far.	▪ Green economy has an aim to build green jobs, it is an economic strategy so it will contribute to the sustainable wealth.	▪ CPN influences the University, but also 1ry and 2ry schools and HS. Sustainability topics grow, hopefully reducing early leavers.	▪ CPN and Go4Green have an aim to build green jobs, it is an economic strategy, so it will contribute to the sustainable wealth.
Agder County - CN Partner Sec	▪	▪ Regional plan for 2020 includes climate in 1 of the 5 hot topics. It sets goals for the region involving business, university... ▪ The County Auth. has committed to Climate Neutrality. It will drive continued efforts to reduce GHG	▪	▪	▪
Nettbus - CN Partner	▪ Nettbus had a project to build a biofuel plant for its fleet, but it had to be dropped due the crisis.	▪ Nettbuss is Climate Neutral and is working for reducing emissions. Improvement of PT will also help reduce emissions from cars.	▪ Nettbuss has increased substantially its work force in 2011 +450 workers.	▪	▪ The company hires drivers from all origins and provides capacity building on language and other social integration aspects
GRID-UNEP - CN Partner	▪ Holistic contribution through communication and capacity building	▪ Direct involvement through the Climate Neutral Commitment	▪ Holistic contribution through communication and capacity building	▪ Holistic contribution through communication and capacity building	▪ Holistic contribution through communication and capacity building
Thon Hotel - CN Partner	▪ Not directly	▪ Commitment to CPN means to set and achieve GHG depletion targets. The impact on target 2 of the whole chain can be very large once all hotels engage. Also indirect effect over product and service suppliers of the chain.	▪ According to the desired growth of the company	▪	▪
Agder Research - CN Partner	▪ Rising the env. research that Agder does increases the interest and investment of companies and institutions into green R&D.	▪ It is included in the CPN commitment and indirectly through the innovation activities with companies	▪ One big group in Agder Research is focusing on labor issues, so understanding the issues.	▪	▪ Indirectly, by preventing the impact of resource scarcity on the economy and poverty rise
DURAPART - CN Partner	▪ Not directly a target of the company; but embedded in new ventures as the carbon free kindergarten and green printing	▪ From CPN and new ventures on specific green economy services and activities; e.g.: green prints and carbon free kindergarten	▪ Mission of Durapart	▪ Indirectly as DURAPART runs education services	▪ Mission of Durapart
BGM Architects - CN Partner	▪ Contribution through its projects with INNOVA and the University. The green building sector is always keen to innovation.	▪ BGM directly involved in creating low emissions buildings	▪ Hopefully by the growth of the company BGM will contribute	▪	▪
FRAMEWORKS - CN Partner	▪ They contribute to development of systems, knowledge and innovation - as much as possible to get money	▪ Frameworks will contribute to all the targets. CPN is working great and they will continue, it is a carrot for customers.	▪ Not a focus on growth itself, but interested to recruit at least to double the organization.	▪ No direct link - without reach to schools	▪ No direct link - the Norwegian economy is hooked to oil. They'd rather reduce economic growth than continue this hook
Green Incubator - CN Partner	▪ In the Green Incubator research is co-located with the companies; "cup of coffee" points between researchers and businessmen; synergy-. They work very closely to the Kristiansan knowledge park	▪ Reducing CO2 is part of CPN. They promote that companies become members of CPN. The location of the building (downtown by the sea) will promote urban lifestyle. The land-planning model will help concentrate people and avoid cars (leaving them in the outside parking lots) and more sea transportation.	▪ Starting businesses. In Europe there are many unemployed 30-year-old angry men, yet they have a big responsibility to the environment. The focus on the green part maybe will attract even this kind of men for free, and start up projects, which may become businesses.	▪ Knowledge center, encouraging students on mathematics, physics and sustainability // they are searching for young engineers.	▪ Helping improve the economy in general. Also through the lifelong education center. Other companies could be part of the 4th or 5th floor to get engaged on sustainability as well.

Performance of Arendal in Climate and Energy Sectors*



COMMENTS about performance in climate and energy sectors

Energy Supply

- Need for more RE
- Brave in taking steps forwards and that makes a difference
- Not enough information (not pushed to find out)
- Water heating from the garbage disposal. Great system
- Most energy Renewable
- Local district heating with wood energy
- Climate strategy, reducing emissions, changing dirty furnaces for green fuels, green electricity
- Most of it is waterpower and they also export, as to heat buildings with seawater -heat exchange system-, biomass plant.

Energy Efficiency

- Huge potential to improve
- They are doing but a lot to do yet
- High stock of old inefficient houses
- Good but a long way to go
- Norway has not had the need; it is a starting issue
- There is a big job to do in their own buildings / in general the residential stock is energy inefficient
- Fairly compact and small city. There are plans and work on it
- Energy is too cheap and there is too much, so there is no culture on energy saving. People from other places that come here use much less energy.

Transports

- Small city, has no traffic jam, but a lot to do on eco car fleet, etc.
- Too easy to drive in and park
- Small place, this is a limit to public transport infrastructure. Local buses are running much more efficiently now (biofuels, rerouting, eco-driving…)
- Could be way much better in using the bus, cycling, walking…
- Not a big focus
- Komune is clever and bus company OK (6) ; not citizenship (2): 6+2
- Working on transport access
- A lot of transport by car and the buses are not full. They are preparing for electric cars. It is a mental problem.

Buildings

- Awareness is increasing, new buildings above general standards, but old stock needs renovation
- A lot done at the administration level
- Very little, except GRID and Komune
- Some low emissions buildings projects, but many old to refurbish
- NR/DK
- NR/DK
- NR/DK
- Moving up, new buildings are better, and focus on passive homes. Yet, a lot of old buildings very expensive to retrofit. Investment on sust. heating is still uncompetitive. Not much renting, many people in private homes and there is a rapid moving market.

COMMENTS about performance in climate and energy sectors	
Industry	**Waste and Water**
▪ Awareness through climate partners and other networks ▪ Knowledge ind. and oil business are greener than they would have been, because of the goals that the Gov. sets and CPN. ▪ NR/DK ▪ Part of the problem and solution as there is a lot of shipping heavy industry ▪ Quite good those here ▪ Something is happening ▪ Not sure of how much they are engaged, some in CP ▪ Not much ind. here any more. Power demanding ind. have been closed down and converted to engineering and offices. So, env. impact has improved; e.g.: 30% improvement in pollution after shutdown of a company that turned to solar.	▪ Waste treated and energy produced (8), water infrastructure is not suited for extreme weather (4) ▪ Very good ▪ Waste one of the best in Norway / Water would need a different qualifying ▪ NR/DK ▪ Water not a big focus because there is so much available ▪ NR/DK ▪ No restriction to water use ▪ Good recycling, very good drinking water
Green Areas and Nature	**Natural Hazards**
▪ Plenty of nature! ▪ Extremely good ▪ Very good, yet the bicycle paths network is very deficient ▪ NR/DK ▪ A lot around ▪ Good asset and it is in natural state ▪ Arendal is on a very attractive spot under a strong pressure from investors to build. There is a process of loss of green areas. ▪ A lot of green areas. There is a discussion inside the city.	▪ Floods and sea level rise are the main risks, there are plans to prevent risk (no homes below 2,7m above sea level) ▪ Sea level rise will become more important ▪ City badly prepared for sea level rise, snow storms, floods ▪ Lucky because there is no risk ▪ Good preparation ▪ There is prevention to level rise ▪ Not a lot done about it ▪ There aren't many natural hazards, as they are on a protected coast. Sea level is rising but the buildings are built higher. Record of problems with sewage getting into the streets when floods.
Food Products	**Retail and Services**
▪ Focus on organic food, goal 15% by the farmers in the region; 1/2 city employee dedicated to improve organic farming. Focus on local food in the green conferences. ▪ Quite high culture and availability. ▪ Difficult to find organic and local products. ▪ Local fresh products from the sea with high quality. Clients and customers are very happy. ▪ Starting focus on short travel food / a lot of import. ▪ NR/DK ▪ There have been initiatives to boost organic and local products, but they've failed. ▪ Norway doesn't have willingness to pay for ecological products; the local farmers deliver their products to the cooperative.	▪ High non sustainable consumption ▪ In the climate partners there is a company producing / Climate partners can be adopted by others and it is influenced ▪ Very low awareness ▪ NR/DK ▪ Interest growing with Klima Partners ▪ Some awareness, not much ▪ There is some awareness on SD, difficult to answer when inside the business ▪ Main driving force is little price, so there is little willingness. Customers aware but not much progress yet

Reflections about the 3E Crisis: Environmental, Energetic and Economic

EU's proposals and role in shaping the international agenda

- (Clim. Amb.) The EU's role has been very important in shaping the agenda. Not necessarily enough, but amongst the big players is the one taking the most progressive approach, despite EU only accounts for 10% of the emissions, and continues to be proactive. The 20-20-20 responds to the lack of activity of others even though it is not enough according to IPCC, who considers that rich countries should reduce between 25-40% by 2020 from 1990. The important goal is the mitigation of GHG, the complementary of 20% RES and 20% efficiency are good but probably easier and less crucial to the 20% GHG, target that includes become more efficient. 20% RES is a complementary goal as well, because the countries who are able to grow faster in RE will be the future economic winners. So, 20% mitigation is not enough, but the 20 RE and efficiency are tools to reach this other goal.
- (County) The international level is too indecisive. There is a great way to go until achieving international agreements, so the involvement of any small company is unlucky to happen but very necessary.
- (Nettbuss) It seems that EU is standing still or going backwards, and it feels like the crisis is really stopping the progress to a more sustainable society. China and Asia are jumping ahead of the developed economies in producing energy from the sun.
- (GRID-UNEP) EU is doing a very important role, providing milestones and a framework. It would have been interesting to go deeper on the systemic issues and discuss about natural capital. The value is to bring people together towards the issue. Tired of conclusions that do not go deep enough and processes that are not tangible. Sustainability is an interesting door opener, but once you start the next step is to see what it really means, to then see that it is not possible. It is the carrot to attract others.
- (Agder-Research) EU can play a very important role as the targets are seen and influencing other places as Norway. It is much more difficult to have a global GHG agreement, but locally it is possible to generate consensus.
- (BGM) The EU's role is important, it influences Norway for example. EU has decided that all new governmental buildings will be 0 near energy by 2019 and all other by 2021. This is really driving economy, technology, building standards, techniques. And gov. then must finance R&D, education, innovation, etc. for these new building schemes. This influences directly Norway's policy.
- (Frameworks) The EU is doing a great work on energy and environment. Normally EU is more foresighted than Norway. From the financial perspective if EU is able to keep it together it is a positive reference. EU has a strong influence on Norway's progress on env. policy. Looking top-down the environment is usually the looser. The EU contributes to upraise the env. and regulate it at all levels.

Where do you envisage your country and your city in tackling this crisis

- (Clim. Amb.) Norway should reduce 40% GHG by the application of the precautionary principle, although the Gov. is not following it. When it comes to energy efficiency there is a big challenge as in Norway there's been a lot of energy, and no culture about subsequently. Arendal has set goals more ambitious that EU for the emissions of the administration. Regarding the emissions of the city there's been a great reduction from the delocalization and bankruptcy of heavy industry and migration to cleaner tech. industries.
- (County) As CPN works locally and regionally it is very positive. The great mass media in Norway is even giving negative discourses, for example focusing on the new coal power plants in China and India, discouraging Norway's engagement. Luckily the national government has set some targets, although the actions do not seem to follow the claims for urgency. So, action from the local level is very necessary.
- (Nettbuss) Arendal is making very good efforts to communicate the need for a change, in setting goals, and setting and agenda. Norway is doing some good things, very good in hydroelectric power supply and testing a lot in other alternative energies (wind, geothermal) but very bad phasing out the oil and gas industries. Arendal better than Norway.
- (GRID-UNEP) Norway is quite sheltered from the problems that affect the world, even considering oil. The challenges to the natural capital are not so hard. There are a lot of good initiatives in Norway, but if the crisis affected, the country would probably not know how to react. There was a strong and fast reaction to last summer's terror crisis, but there seems to be a naïveness to the problems. The shelter pushes out change and innovation, this is always hard, but the conditions of comfort create strong resistance.
- (Agder-Research) Regions and cities have a great role because it is where people turn to when they have problems. It is much more difficult to have a global GHG agreement, but locally it is possible to generate consensus.
- (BGM) Regarding Norway, the Conservative Party in Norway is stepping forward on the climate change topic and putting into the top of the agenda.
- (BGM) Arendal is especially well positioned to tackle the threefold crisis as first climate neutral city in Norway. Arendal is in a county that will be also carbon neutral by 2014.
- (Frameworks) In Norway there is a very old oil producing industry, so even if they are saving the rain forest, actually they keep on relying on fossil fuels, oils, no energy efficiency measures... Yet it is a 50/50 case as also many leading positive things, but slow. Typical Norwegian is that the Gov. has been 3 years discussing the issue and no agreement yet. There are initiatives, but practically nothing: not walking the talk. Arendal is doing well, as it is focusing on very practical aspects like waste, recycling, climate neutrality

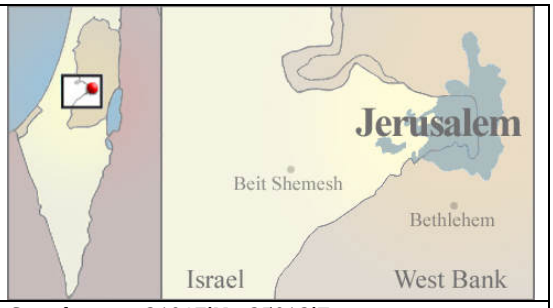
What else should be done to tackle it? Is "sustainable growth" the path to follow?

- (Clim. Amb.) The future of the economy is sustainable growth. CPN is one of the strategies, and it is included in a regional strategy on green economic development. This will generate political and economic winners. CPN has 35 members including two cities, the university, the region... it has a clear focus on green. If this is the best region in climate development the region will become winner in Norway. The solutions will be provided by private sector, so now R&D is very strategic.
- (County). The great mass media in Norway is even giving negative discourses, for example focusing on the new coal power plants in China and India, discouraging Norway's engagement. We have to be optimistic about these issues in order to engage other people. But there will be big challenges, no doubt about that.
- (Nettbuss) If restrictions / crisis do not happen we will continue BAU and comfortable. There is a need for stronger directions to a better development of a green industry: restriction, taxes, etc. There are big possibilities of improving the city infrastructures for promoting the transport systems. There is so much knowledge and possibilities and the tools available, when new restrictions come (even prices) there is a lot of optimism for the future as options are out there. And positive stimulus for green economy.
- (GRID-UNEP) It would have been interesting to go deeper on the systemic issues and discuss about natural capital. The value is to bring people together towards the issue. Tired of conclusions that do not go deep enough and processes that are not tangible. Sustainability is an interesting door opener, but once you start the next step is to see what it really means, to then see that it is not possible. It is the carrot to attract others.
- (GRID-UNEP) The big problem with these great processes is that people do not get involved enough, they do not appropriate it. The media are very smart to generate links to your personal interests. When trying to involve skepticals it is good to find out what are their interests and progressively go to the systemic picture and the connections.
- (Agder-Research) Sustainable Growth / Low-carbon economy --> It implies to redefine the value system, what do we consider growing and what valuable. It would be interesting to measure regularly the happiness index for example its stability even in a rich society; surprises might come out.
- (Agder-Research) We have to change the way we do business and the way we live. We may be even moving to a better world, so maybe the path should combine technological innovation plus lifestyle change. Only technology will not serve. It is also about solidarity in the World, we are building our welfare because someone else's misery and environmental lack of security. On a deeper level in the West we know; it is an elephant in the room.
- (Durapart) Durapart sees there are changes taking place and they want to adapt to these changes. So, even if they are market driven they want to be in the front line. As a publicly owned non-profit company (by the municipalities) the interest of the founders influences the development track. E.g.: One of the values of the company is that it must by socially responsible, and if this includes to work on green economy they will.
- (BGM) If the market is asking for something then the rest is coming. If the laws and government focus on green, the market will come after for survival. The market has to be guided. He believes in people, they take the right choices when they are well thought. Always optimistic about the future. The next step for Bengt is to introduce the green economy topic into the local agenda of his party.
- (BGM) The cities can be very concerned about climate but not every one of their citizens is involved; a little fake. At the beginning the crisis seemed to be a political message of fear. Now, more and more people are starting to think it is very serious and believe it must be taken care of. But when it comes to one's own action, yet many people think that the personal effort is too small and will be useless. So it is necessary to teach society the importance of individual action. And still people look for excuses but in general it is taken more seriously. How the issue is communicated is very important to bring the people on board of this challenge.
- (Frameworks) The financial crisis is not a very important issue in Norway. Financially, it is very well thanks to the oil industry. Yet, Norway will fail in its transition to a low-carbon green economy, as at the moment they are showing that they are not able to invest on the changes. So even if business continues for 10-20 more years, they may be too late. In general, the feeling is realistic pessimistic. It seems that humanity is very slow to make the changes. We may run into financial and ecological collapse.

Jerusalem - Israel

JERUSALEM - The Holy City

Jerusalem, the Capital of Israel, holds a population of 801 000 (2012). The city's importance goes far beyond the national borders as it concentrates holy land for the three major monotheistic religions in the World (Jewish, Christian and Muslim), an aspect that is clearly visible by the four ethnic-religious divisions of the walled city center. The Israeli-Palestinian conflict over the territories of eastern Jerusalem, at both sides of the West Bank barrier, is a crucial constraint to the progress of life quality. Despite it is the Capital, Jerusalem is the poorest city in the country; 55% of its workforce is unemployed for religious / cultural reasons (Jewish orthodox men and Muslim women in a 50-50 proportion approximately). Its economy is largely service based, mainly around pilgrim tourism and public administration; industry only ranges 2.2% of the zoned land. An urban sprawl trend of political and social nature has expanded the city much beyond the urban area. Sustainable development policies must challenge these realities, as well as a strongly centralized system.



Coordinates: 31º47'N - 35º13'E
Population 2012: 801,000
Surface: 125 km² (metro: 652 km²)
Mayor: Nir Barkat - Liberal-Independent
Vote turnout 2008: 42.7%
Municipal Budget 2008: 651,687,734 €
Per capita income 2009: 19,155€/inhab.
Unemployment 2011: 55 %
Website: jerusalem.muni.il
Study Visit: 2-15 Jan. 2012

Summary and Highlights of Green Economy in Jerusalem

Jerusalem's involvement in environmental issues and green economy is very much linked to the political changes happened in this last election (2008). The current Liberal-Independent Local Government includes as Deputy Mayor for Planning and Environment Ms. Naomi Tsur, former Director of the Society for the Protection of Nature of Israel (NSPI), a key person and organization in Jerusalem's protection of The Gazelle Valley and the forested western Jerusalem Hills. Before that, under the rule of Ultra-Orthodox majorities, *"some things had happened because it looked good, but not for real will; even now many people is still not convinced, just as in the USA where climate change doesn't exist for the conservative population"* (Tsur).

At the national level, the first Environmental Law in Israel is the Abatement of Nuisances Law of 1961. According to Tsur *"it is now dead in the books of legislation; because of it we are one generation behind"*. Only in the late 70s and 80s Israel started to think about environmental issues again. In fact, Israel's OECD membership process (2007-2010) represented to fulfill the interests and goals of the organization, being one of these environment and *"changes in policy are accelerating since then"* (Tsur). Both processes have helped the city of Jerusalem establish a broad agenda in environmental and green economy topics in the last political term, with participatory democracy and transparency a cross-cutting approach:

- Jerusalem City Master Plan and community planning
- The Gazelle Valley urban nature site declaration
- Renewable energy and Wastewater Recycling
- Solid waste recycling program and facilities
- Light Rail + BRT Transport System + Bicycle paths
- Community Gardens
- East-West Jer. Kidron River basin project (2010)
- ICLEI membership (2009) and Cities for Climate Protection campaign (2009)
- URBIS initiative (2010, int. network) and ICLEI's Local Action for Biodiversity (2011; 150 areas).
- The Jerusalem Green Map (international network)
- Healthy City Project (1980s, WHO network)
- Green Pilgrim Cities Network (2011, 1 of 7 pilot cities)

Low Carbon Economy in Israel

The development of a low-carbon economy in Israel will be a superior challenge for several reasons.

On one side, the specific geopolitical context of the country has driven it to become an energetic island. Israel has no international electric grid to connect with, yet maps of the Government show future lines to Syria, Jordan and Egypt. Ostensibly for national security, energy is still a largely centralized matter in Israel.

On the other side, renewable sources are limited, despite prospects estimate a potential capacity of 2 000 MW. Hydroelectric power, the main source of regular renewable energy, it is a very restricted option as the resource is scarce and vital to agriculture and domestic uses. Wind farming is neither possible on a large scale, because there aren't almost any offshore currents and mountain flows are irregular. So far, the only strong asset is the sun, thus CHP solar plants. Even so, the big extensions needed conflict with landscape and biodiversity conservation. Nevertheless, the Ministry for Energy and Water is setting several strategies to compensate the country's current circa 100% dependency on imports from Mexico (oil), Norway (oil), the United Kingdom (oil), Australia (coal), South Africa (coal), Colombia (coal) and Egypt (gas) -moreover after the gas pipeline from Egypt was cut off in 2012 after continued sabotage-. The country requires its own stable provision of energy. Fortunately, several offshore gas reserves have been found near the coast (<100km). Resource estimates ascertain self-supply for 20 years - including lower prices for water desalination and supply to electric transport fleets - and even the option of exporting to China and India.

In spite of the important limitations in the energy field, the country committed in 2009 to a 20% decrease in GHG intensity of the economy for 2020. Considering that in 2007 Israel's per capita GHG was 10,7 tCO_{2e} yr, any effort to cut down the rate is crucial, and a first step will be switching from oil to natural gas as main source of energy generation. A National Plan for GHG emissions mitigation was approved in 2011, acting in multiple other fields. Even so, the State Authorities assume that absolute and per capita GHG will continue to increase the current decade, according to the population and economic growth track the country is now going through.

- National Energy Efficiency Program for the electricity sector; in 2020 +20% eff. vs. BAU. By 2013 60% of electric generation from natural gas. USD 2 billion in 2010-2020 to adapt coal-fired units to European standards.
- 2020: 10% share of renewable electricity, with feed-in tariffs especially in the solar sector.
- 2025: -25% emissions from transport by biofuels and elec. veh. (replaceable batteries: Better Place)
- 242 M€ for scrapping of refrigerators and air conditioners in 2011 - 2020.
- 132M€ for GHG reduction investments in the industrial, commercial and public sectors.
- 7.8M€ for pioneer projects for new and existing green buildings, including public stock survey.
- 2011-2013: 9.3M€ in education and information programs
- 2011-2014: 8M€ to the integration if Israeli low-carbon technologies.
- Improved regulation on electric appliances, smart metering and GHG taxation especially in transport.
- Increased recycling rates. A landfill tax + 2011 packaging law mandating importers and producers to recycle a share and pay collection services. From the GE focus, recycling creates 30% more jobs per ton than landfilling.

In parallel to the emissions abatement policies, in 2008 the first phase of a climate change adaptation assessment described several impacts and the costs of inaction: 25% decrease in water availability by 2100 (USD 120 million per year); retreating coast line of 2-10 meters and 0.4-2 km^2 per decade for a 10 cm increase in sea level (USD 1.57 billion); bigger mosquito populations and their disease risks; more pests and 20% larger water demand in crops (0.78 billion/yr); migration of biodiversity northward with expansion of desert species; 3.2 % more energy demand per year for air conditioning.

More recently, a study by the Macro Center for Political Economics (Nathanson & Levy 2012) stated that fossil fuel dependent jobs are in danger in a globalized competitive market, mostly in the manufacturing industry. The best solution reported is to "invest in R&D to create a high quality, clean industry with high added value". Support measures such as training and exemptions should be implemented in the green transition phase. Actually, an increase in jobs is expected in transport, electricity and construction, recommending accelerating the shift to a green economy. The study concludes that diverting 15% Israeli private car drivers to public transportation could generate 7,942 - 9,182 new employees by 2025, and 2,678 new positions by 2020 from the national plan for the electric sector. Last but not least, a technological revolution is forecasted from the information intensive industries, in order to drive the process from heavy to clean-tech of many industries.

In regards to exports, in words of Dr. Yeshayahu BarOr, Chief Scientist of the Ministry of Environmental Protection (2009), *"in about 20 years, Europe will experience some of the conditions that Israel faces today. Therefore, Israel has a great deal to offer to the international community in terms of technologies for effluent irrigation, combating desertification, agriculture and forestation in desert conditions and salinity reduction"*.

Climate Change and Green Economy Framework						
		State (NUTS1)	Region (NUTS2)	Province (NUTS3)	County (LOCAL1)	Municipality (LOCAL2)
Climate Change	CC Responsibilities	Mitigation and Adaptation Planning, Energy, Transport.				Waste, Water, Buildings, Planning, Mobility, Green Areas
	CC Target	2020: -20% GHG vs. BAU + 10 % Ren. Elec.				2020: -20% GHG vs. 2007
	CC Action Role	Active: Public Transport and Energy Management				Active: ICLEI-CCP Member, upcoming Mitigation Plan
Green Economy	Assess. Report	Yes (2012)				No
	GE Legislation	Linked to sectoral plans and programs				No
	GE Strategy	Green Growth Plan 2013 & Round Table				Green Pilgrim City
EU 2020	3% GDP R&D	100% (>4.7%)				100%
	20-20-20	No				80%
	Work Age 20-65	100%				100%
	Education	100%				100%
	Lift 25% Poverty	No				No

Green Urban Economy Strategy of Jerusalem

Jerusalem's approach to the development of a Green Urban Economy is based on 5 main strategies:

1.- Strong leadership by the Municipality

2.- Promotion of a sustainable urban and natural environment

3.- Conditions for ecotourism linked to pilgrimage

4.- Israeli-Palestinian and multi-stakeholder cooperation

5.- National and international benchmarking

The city of Jerusalem doesn't have a specific green urban economy strategy. However, **the current administration has started a very intense agenda of plans, programs, policies and approaches,** which are indeed driving the city to this new philosophy. Most of the activity is flowing top-down from the Municipality to the rest of agents, besides transport and energy policies that lay a State competence. Several autonomous bodies (infrastructures agency and water utility) follow own agendas, yet under very close ties with the City Hall. A tradition in participatory democracy is feeding bottom-up processes as well.

Building on prior works for the City Master Plan and a new Public Transport System, **the Local Government wants to contain urban sprawl by densifying the areas nearby the recently inaugurated light rail and the BRT lines.** Consistently, the plan excludes the western Jerusalem Hills from developments for 20 000 housing units, side by side with traffic and parking restrictions in the city center. The reorganization and expansion of mass transit systems has also the mission to weave together Jerusalem east west (Arab low income communities - Jewish middle class).

Green planning tasks are being complemented by upcoming regulatory standards for green buildings and innovative programs, such as Local Action for Biodiversity (LAB), URBIS and the Kidron River Basin Restoration Plan. LAB and URBIS are international initiatives that seek to establish the natural infrastructure network of the city and the necessary planning tools for their management, in order to preserve biodiversity and ecosystem functions. With them, in a very innovative approach Jerusalem wants to determine the role of urban and metropolitan nature in providing environmental resilience; thus to enhance mitigation and adaptation against climate change impacts thru the conservation of open spaces and wildlife.

The goal of achieving a sustainable urban and natural environment for Jerusalem is continued by a very ambitious plan to requalify the Kidron river basin. This holy valley runs from Jerusalem through the Judean Desert to the Dead Sea along 25 km, including many of the Middle East's most famous cultural and historic sites for Jews, Christians and Muslims. But today it is a neglected area under two confronted governments (the Knesset and the Palestinian National Authority). Due to raw sewage, uncontrolled construction -even on the river bed-, pollution of the groundwater, poverty and abandonment of the farmland, this central corridor of the city has become a health hazard. Local Government from both sides are leading and lobbying the process to create the infrastructures (wastewater treatment plant, urban requalification programs, etc.) to restore the Kidron river basin. Actually, **the requalification of the Kidron river basin must turn it into the core asset of Jerusalem's Green Pilgrimage program.** The aim is to restore cultural heritage and deploy facilities and services all the way from the city to the Dead Sea, in order to promote a transboundary ecotouristic and religious pathway. The bottom-up approach through the cooperation of local governments and setting the environment and economic development as the common ground for collaboration, are producing Israeli-Palestinian understanding unprecedented in the last 60 years. The sewage plant location is the breakthrough factor in negotiation. The Kidron plan recommends its placement south of Bethlehem, where the inflow of water is maximized, after a one and half year multistakeholder (40 to 50 from both communities) discussion.

The practice of participatory democracy and stakeholder cooperation is indeed broad spread in Jerusalem. The LG has activated several thematic municipal councils related to environmental issues (sustainability, climate, biodiversit), in which stkaholders from all sectors (public, private, civil society and science-education) contribute to the city's planning and managment tasks. A very interesting experience is the **community planning program** the city implements through some of its 28 District Community Centers. By establishing a District planner and a facilitator in the Community Center small participatory workshops are initiated, in order to discuss and make local development proposals, after which they organize big presentations for the rest of the community. Thanks to this program, District "spatial plans" (there is no official name) covering local economic development, mobility, use of green spaces, etc. are being produced, and afterwards lifted to the Master planners. Other outputs of this process are the **Community Gardens**, by which the citizenship get involved in the management of parks and gardens (from planting and maintenance, to recreational and educational activities) and pilot programs for organic waste composting with a target of 1 000 families for 2012. The same approach is followed in the implementation of the **Healthy City Project**, which seeks community involvement in the development of healthy lifestyles and health resources adapted to the different boroughs of the city.

Another field of experience in participatory democracy is large-scale city planning of natural capital. It began with the protection of the Gazelle Valley, 20 ha of undeveloped land between roads and housing developments, but home to a little group of gazelles and other wildlife. Threatened by massive residential plans, SPNI advocated for its preservation with close-by dwellers producing a plan to turn it into an urban nature park, which indeed the Municipality finally adopted. Since 2009, the international program LAB -which covers 151 urban nature sites and a 43 km stretch of parkland around the city (1 500 ha)- is being developed by an extensive forum of stakeholders (ministries, park authorities, academics, NGOs...) after a catalogue from SPNI which studied

300 open spaces in Jerusalem's land.

In line with the prior, **41 organizations take part in Sustainable Jerusalem Coalition (SJC), a grassroots initiative born in 1998**. All kinds of citizenship (conservationists, universities, private companies, ethnic groups, neighbor associations, etc) participate in SJC, with the aim to influence long-range strategic planning of the city and its metropolitan area, combining economic, social and environmental development. The current Local Government interacts on a regular basis with this coalition for the discussion different sustainability processes in development (LAB, URBIS, CCP, etc.).

Additional environmental sustainability activities are progressively being assumed by the Municipal Infrastructure Agency Moriah, as well as by Hagihon -the Water utility-. On one hand, green+PV roofs in schools, recycled demolition materials for bicycle paths, reuse of water in ritual baths, efficient street lighting, road landscaping... On the other, electricity production from sewage biogas recovery and 1 million m^3 yr regenerated water for the irrigation of parks, creating on top extra savings in energy as most water in Jerusalem is pumped 60 km from the Mediterranean.

Another outstanding proposal from Israel's Capital is GREENMAP™. This map server based project provides an internet tool to locate all types of green infrastructure in the city; parks, streams, habitats, scenic vistas, community gardens, etc. GREENMAP™ is an international platform with over 100 members from all 5 continents, such as Greenies in Gambia, Barcelona in Spain, HoChiMihn in China, or Springfield (IL) in the USA. Options of the system allow widening the scope up to 170 different green assets, from farmer markets and repair shops, to renewable energies and environmental NGOs.

Last but not least, this whole green urban framework that Jerusalem is undertaking, is wrapped up by **national and international benchmarking**. As already said, the city is party in the **Green Growth Committee** created at national level. Moreover, the Capital has engaged in the Forum 15 - a lobby of the 15 wealthiest cities in Israel, plus 3 other invited, amongst which Jerusalem- that in 2008 signed the **Convention for Reducing Air Pollution and for Climate Protection**, committing to a 20% reduction in GHG emissions by 2020. In 2009 Jerusalem joined **ICLE's Cities for Climate Protection Campaign** as well. So far, the city has produced its emission inventory and it is in process of delivering a Local Action Plan.

For Valerie Brachya, Director of the Environmental Policy Center of the Jerusalem Institute for Israel Studies, despite "the Forum 15 process initiated programs, surveys, etc. about the action to undertake, the cities' pledge may be a *pipe dream*, as no assessment provided validity to whether this target is attainable". Moreover, in Israel the cities are very conditioned by the country. Israel only has 2 levels of administration: the State and the municipalities; there are no regions, or provinces to inter-phase between the national and local policies, even though in advantage this situation allows a closer relation between the Ministries and the cities. However, as Brachya points out "in other countries Local Governments have high levels of independence and decision making, but **Israel is still very centralized**. A lot of the major affairs are determined at a national level, such as energy and transport. The LG is able to install solar panels on roofs, but to change energy supply is out of reach of the municipality". **Even so, capital action is still at aim of the cities' for the buildings and mobility sectors.** Departing from the national energy conservation standards of 2005, some local authorities have approved own regulations to enforce all new buildings and retrofits to become green buildings. Yet, action should exceed construction: "if Jerusalem wants to act in energy efficiency it should regulate in planning and building; from new building areas to the design, in order to indirectly cope with energy and urban transportation" (Brachya); an approach already in the City Hall's vision.

For the particular case of Jerusalem Municipal laws dating back to 1918 (British colony period) require that all building facades must be of local white stone. This long-lasting aesthetic restriction shows that it is possible to establish strict regulations in the construction sector, an example that provides hope to the options of extending similar to environmental performance rules, despite increasing costs induced. On the other hand, the economic overburden already generated by the white stone criteria may be seen as an obstacle for the introduction of green building standards.

Nonetheless, it is noticeable that **Jerusalem starts its path to a green urban economy from a "climate friendly" profile.** The socioeconomic catch-up to propel in comparison to Tel Aviv or Haifa is at once the reason why Jerusalem's **per capita yearly GHG is 3.3 tCO_{2e}**, much lower than the average for western cities. It is to expect that this parameter will grow, but through the policies the city is implementing the aim should be to contain the rise as much as possible and avoid reaching current western levels.

Regardless of the singular obstacles that Jerusalem confronts, the truth is that **the "Holy City" is doing tremendous efforts to adopt a green profile and earn a position in the international clubs of green cities**. With programs such as Healthy Cities, CCP, LAB, URBIS or Green Pilgrimage, Jerusalem is no longer a city of religious tourism only, but a center of sustainable development and green economy discussion, planning, policies and innovation. The strong leadership exercised by Ms Naomi Tsur, Deputy Mayor for Planning and Environment is capital to understand the clarity of vision and fast progress of Jerusalem in catching-up on the Green Urban Economy trend. As Ms Tsur admits, "the important thing is how to communicate the topics: climate change, sustainability..., to get the message understood and the needed answers". Hopefully, the effervescent activity and the holistic approach (top-down, bottom-up, cross-boundary cooperation, multi-stakeholder engagement) she has set up, will spread and gain momentum to grow and continue beyond future political changes.

C/P Workshop of Development and Climate Change*

Climate Change

Conflicts; Challenges:		Opportunities; Capacities:	
▪ Social reluctance to cooperate ▪ To increase waste recycling ▪ Topography challenging for PT ▪ Biodiversity loss from climate impacts ▪ To encourage green buildings ▪ Underdeveloped natural areas ▪ Lack of sewage in East Jerusalem ▪ Unused methane from landfill ▪ To encourage use of Public Transport ▪ Switch to thermal-solar (CHP) electricity ▪ Zero emissions building code & house retrofit. ▪ Influence change of lifestyle ▪ Lobbying for environmental policy	▪ Urban sprawl and road density ▪ Lack of backing from National Government ▪ No legislation to support recycling ▪ No legislation to support green buildings ▪ No legislation to avoid sprawl by instead providing affordable housing in the city ▪ Pressure to build on Jerusalem Hills ▪ Economic sense on energy saving and RES ▪ Include all commitments into a Sust. Dev. St. ▪ Car use coupled to income rise ▪ Low environmental awareness ▪ Mainstream SD in all Education levels ▪ Turn roads to green corridors ▪ Enhance cycling and less meat	▪ Environmental Education Programs ▪ Natural Gas Net - 1st in Israel (now Mazut) ▪ Battery exchange station - 1st in Israel ▪ Transport Strategy: Light rail + BRT + Pedestrian areas ▪ Demolition materials recycled in the construction of roads and cycling paths ▪ High natural capital (>50%, 800 Ha in the city + residential private areas) ▪ Green Belt Master Plan ▪ Upcoming guidelines for green buildings ▪ Green Pilgrim City Project, including Kidron Valley Restoration Plan	▪ Sewage methane for hospital heating project (Hadasa) ▪ PV roofs program fast growth ▪ Supportive Deputy Mayor for the Environment ▪ Commitment to GHG targets ▪ Rainwater systems in schools ▪ LEDS in traffic lights ▪ Local Government a forerunner, producing green startups. ▪ Ecosystem and Biodiversity planning.: LAB - URBIS ▪ Community Gardens Program ▪ Membership to the Group of the 15 cities

Development

Conflicts; Challenges:		Opportunities; Capacities:	
▪ East-West social and economic Division ▪ Poorer city in Israel ▪ >50% adults dependent (orthodox men, Muslim women)	▪ Include all commitments into a Sustainable Development Strategy ▪ Care expenses rising ▪ Understanding of economic sense of energy saving and alternatives	▪ Promote action in other cities ▪ Political will to include community in dev. proc ▪ Compact city center, asset for quality of life ▪ Committed Decision Makers	▪ Profess. Committees of the LG working in SD ▪ Development opportunities from Kidron project on East Jerusalem ▪ Cooperation initiatives with LGs from East Jer. ▪ Group of the 15 cities

Brief highlights:

- Israel suffers an absence of an environmental legislation framework (to support green buildings, to avoid urban sprawl, to promote recycling, etc.) and no National Government backup to SD policies. In the current trend of economic growth, commodities like cars and detached homes in the periphery into icons of individual success. Within the reality of poverty in Jerusalem, social reluctance to cooperate grows together with pressure over natural areas as Jer. Hills. The public transport strategy, the Green Belt Master Plan, LAB, environmental education and participative programs (community gardens) as well as the compact city center contribute to counterbalance the prior challenges.
- Development of alternative and renewable energy sources is at a startup level: methane from landfill, CHP electricity, and natural gas network,... A higher economic sense over EE and RES must be developed to support the city's climate commitments. However, energy is an issue strongly under state control.
- Committed Decision Makers supported by cooperation strategies (Group of the 15, Kidron Project, Green Pilgrimage, promotion of action in neighbor cities...) turn Jerusalem into a forerunner in addressing different sustainability objectives (50% dependency, rising care expenses, GHG reduction and energy efficiency) in spite of the East-West social and economic division of the city.

<table>
<tr><th colspan="2">Interviews Jerusalem</th></tr>
<tr><th colspan="2">Public Sector</th></tr>
<tr><td>Municipality:
▪ (W: Woman) Deputy Mayor for Planning and Environment
▪ (M: Man) Head - Sustainable Planning Department
▪ (W) Head -Strategic Planning Department
▪ (M) Head - Sanitation Department
▪ (M) Air Quality Technical Expert
▪ (M) Head - Environment Department
▪ (W) City Planner**
▪ (W) Community Gardens Program Manager</td><td>▪ (M) URBIS Project Coordinator
▪ (M) Kidron Valley Project Coordinator
▪ (W) Local Action for Biodiversity Program Manager
▪ (M) "Ginot Ha-Ir" District Community Center (Director and Local Planner)
▪ (M) City Hall Environmental Lawyers
▪ (M) Healthy City Project Manager
Metropolitan (State + Municipality)
▪ (M) Jerusalem Transport Planning Authority</td></tr>
<tr><th>Civil Society</th><th>Private Sector- Corporations</th></tr>
<tr><td>▪ (W) NGO - Society for the Protection of Nature of Israel</td><td>▪ (M) Hagihon - Water Public Utility - Director General
▪ (M) "Moriah" - Municipal Infrastructure Agency - Sust. Expert</td></tr>
<tr><th>Education - Research</th><th>Cancelled</th></tr>
<tr><td>▪ (W) Jerusalem Institute for Israel Studies (JIIS) - Director of the Environmental Policy Center
▪ (W) Jerusalem Science Museum - Director</td><td>▪ Municipal Council Member - Environment Commission
▪ Municipal Botanist
▪ Deputy Mayor for the Traffic Department
▪ Municipal Education Department - Technical Responsible
▪ NGO: Responsible for the Bicycle Programs - SPNI</td></tr>
<tr><td colspan="2">Brief highlights:
▪ The interview program was clearly dominated by representatives of Departments, Programs and Corporations linked to the Municipality.
▪ The number of interviews (20) was high. This reduced the time length of the meetings and in occasions less detail in some answers, reason why not all interviews are included in the answer boxes further below.
▪ Representation from the private sector was especially low; moreover when considering that the 2 corporations visited were 100% publicly owned by the municipality.
▪ No interview was programmed with University representatives. Yet, the research field was covered by JIIS.
▪ Gender representation amongst the interviewees was considerably balanced: 8 women; 12 men.</td></tr>
</table>

Interviews: General Information and Socioeconomic Aspects

Interview	Year	Activity	Management	Jobs	2020 Jobs	Turnover	2020 Turnover	Prod/Service	Market	Performance
		% Green	PB/PR/J	#	#	€ /USD	€ /USD	Units	L/R/N/E/W	0 - 10 points
Env. Plan. Dep.	1979	.--	PB	9	.--	60 000 €	200 000 €		L	7,50
Sust. Planning Department	2011	.--	PB	1 + 1 (3-10 outsourced)	>2	200 113 €	.--	4 projects	L	8 (5 implementation)
Water Utility - HAGIHON	2000	.--	PB	250 (in 2000 -> 300)	less (more efficiency)	100 056 500 €	.--	100% supply (85% treatment)	L	8,50
Community Gardens	1999	.--	J	4 (+5-10 kids doing national service)	8	160 090 €	320 181 €	41 gardens	L->N (+ 5 municipalities)	8,00
Science Museum	1989	.--	PB	150	>300	3 602 034 €	7 204 068 €	.--	L-E	5,00
Local Action for Biodiversity	2009	100%	PB	1 (+ free of kind from SPNI)	3	38 818 €	116 454 €	management framework	L (W)	9,00
Participatory Planning		.--	J	0,50	1	.--	.--	4 000 inhabitants (interview scope)	L	.--
URBIS Initiative	2011	.--	J	.--	.--	.--	.--	Metropolitan Jer.	R (W)	.--
Kidron River Basin Restoration	2012	100%	J	10,00	.--	1 400 791 €	5 002 825 €	5 year plan; sewage plant for remaining 15% Jer	R	.--
Healthy City Prg	2011	.--	J	.--	.--	.--	.--	.--	L (W)	.--
JTMT (Jer. Transport Planning)	1968	100%	PB/J	28 (>1 000 including PT services)	>28 / 100 if turned to Tr. Authority	34 819 662 € planning (820 million € in investments)	investments rise to 4 billion € the next 5 years	Transport Planning	R	.--
Sanitation Dep.	.--	.--	PB	980 (waste)	<12% more	60 M €	53 M €	Waste	L	.--
SPNI	1953	100%	PR	40 (nationally)	>	600 339 €	>	Env. Advocacy 7000 members	L/N	6-8,5 (depending of the program)
Moriah	1991	10%	PB	1,00	25% (4-5)	31 M €	25% 77.6 M €	.--	L	8,00

Brief highlights:

- All organizations expect to grow in economic turnover and jobs, with the exception of Hagihon, which estimates declining workforce with higher efficiency.
- For many it is difficult to evaluate what percentage of the activity could be labeled as Green Economy.
- Most of the initiatives are Local, maximum Regional, in scope, despite some is linked to international networks.
- Performance self-evaluation is in general positive. The Sustainability Planning Department is critical about the implementation of their assessments and recommendations. The Science Museum shows some insatisfaction due "high awareness of workers, but inefficient building and not enough embedded attitudes in the operation of the center". SPNI also would like to improve [6 points] their activity in "platforms and support to grassroots".

Interviews: Activities, Constraints, Future			
Organization	**Activities**	**Constraints**	**Future**
Environmental Planning Department	▪ Waste, noise, air pollution, water pollution, planning, licenses for activities, partially on green areas, energy and climate, alternative energies, natural gas. ▪ Current key topic: waste. After landfill tax LG interest on recycling increased, more after local landfill was set for closure (end 2013) and waste will move 180 km far. ▪ What N. Tsur has done in Jerusalem is revolutionary, it has put the city on the worldwide map. The Env. Committee (E.C.) has met >30 times since her, before it was never even called. The E.C. can suggest to the Mayor and the city Council. The E.C. is a citizenship council participated by several organizations and public officers. It was asked to discuss the climate plan once produced, the waste in Kidron, the pollutant emissions... If this administration wins the next election many of the ideas that are being discussed will be done, one period is for learning and the second for action (2013 next election).	▪ Administrative paperwork for the Ministry (Funds): plans 3 years in advance; report every 6 months; 5 focus plans for each Department and yearly reporting. ▪ Not a priority for the Mayor: funds for env. topics; e.g. for enforcement of the bylaws. The Ministry won't allow more industry in the city due lack of env. protection enforcement by the Local Gov. ▪ Green Procurement difficult due lack of neither offer nor national labeling system / LG purchases in hands of Department not aware of issue. ▪ Lack of Env. Planning in general; promoters wait for the municipality to request env. measures in order to include them in projects. ▪ Society: In some neighborhoods people are very keen to do separation on the origin, but in general people do not cooperate	▪ New waste plant for 1000 tones/day; 55% of waste will be reused (15% dry waste for recycling; 35% as compost sent to Palestine) + 45% to the new landfill. ▪ Education for waste separation at origin, directed to schools, youth, welfare programs, by returning recycling income to them. ▪ Green Procurement and Environmental Planning, but it is necessary to find the mutual interest between many areas of the municipality. ▪ The Municipality Energy Conservation Plan (2012 - 5 year plans), which may bring savings, hence interest in contracting an ESCO. ▪ Support energy efficiency among low income citizenship with programs such as refrigerator renewals funds (lasted 1 week) ▪ Green Building Standards, yet it requires a strong national regulation.
Sustainability Planning Department	▪ The Department belongs to the City Head Engineer. It has a statutory role tin all stages of planning. ▪ It develops 4 big projects: 1) Survey about sustainability in Jerusalem; 2) Rehabilitating open spaces with antiquities; 3) Management Plan of the Gazelle Valley; 4) Urban Nature and Green Corridor Master Plan.	▪ The Department is nice to have but not a must; it has a consulting role but not binding. ▪ Budget: No security about continuity of resources to develop the projects. ▪ Implementation of sustainability considerations and measures emitted is not fully satisfactory. ▪ Political Management of the City Hall and position of the Head Engineer: now very good, but always conditioned to political changes.	▪ Integration of sustainability in all planning tasks in order to avoid needing a specific assessment Department. ▪ The city Env. Survey will provide information on where the weaknesses in SD are and strategic areas to work on, depending on the availability of resources and correspondent decisions. ▪ The Green Corridor project is a very important to the people of Jerusalem, not only for the env.; a network of leisure areas, in particular of those in worse situations. Most green areas already protected but budget and planning still pending.
Water Utility - HAGIHON	▪ Water supply (100 % population served); Development and maintenance of network; ▪ Sewage treatment (85% service, 2 plants: 1 for half city; 1 for 1/3 in SW). Old treatment plant in East (<20%) to be replaced soon. Upcoming nutrient extraction systems. ▪ SW plant includes Green Jerusalem Plan, to irrigate parks and gardens, to save pumping 1M m^3 yr from sea. ▪ Biogas production of 2 MWh elec. for plant and sale.	▪ Lack of cooperation or permission from the Palestinian Authorities for the new plant for East Jerusalem in their territory; also difficulties in the north. ▪ Technical difficulties to develop network in the city, and maintenance tasks in the East Jerusalem. Development needs a lot of coordination, in particular supervision from the archeology services which slows down pace of execution.	▪ Biogas project to supply energy to Hadasa Hospital - if the national authorizations arrive. ▪ Work with the solid waste services to install an anaerobic digestion plant for organic waste and produce energy. ▪ Build and manage the natural gas network of Jerusalem. ▪ Create a hydroelectric plant linked to the Jerusalem Dam. ▪ Fully expand the activity to the energy sector.
Community Gardens	▪ 40 gardens community co-managed. Born from the efforts of the SPNI, which started the first garden in 1999 ▪ Each one is decided by itself: mostly flowers, local fruit trees, olive trees, and bushes... Small plots are rented for vegetable garden. Everything is organic and indigenous / Mediterranean. ▪ The municipality as a partner provides gardening know-how, facilitation and tools. After 5 years, in 2011 the municipality provided funding. ▪ Also tasks of informal teaching about sustainability and community development: from contact to earth, to cultural and lifestyle aspects. ▪ Scope: W and S Jerusalem; mostly middle class, some lower. It is being promoted in all districts, also East and Orthodox.	▪ It is necessary to discuss how to finance manpower and water necessaries. ▪ A lot of deliberation by the people active of the gardens on how to regulate them. There is an interest to create a partnership with the municipality, but not everybody wants to be part of it. ▪ Resources: bureaucracy makes it very difficult to get funding, it is very time consuming… ▪ Involving the community in city planning and management is a new language in progress between planners and the citizenship. ▪ Policy: Water legislation is too strict, in the sense that there isn't enough enhancement and use of grey water. There is still a lot of water wasted, and much more grey water could be used. The municipality is very hesitant to allow use of clean water.	▪ Get other parts of JE to access this idea: for the sake of neighborhoods, the city and the environment. To this end it is necessary to create much more bibliography (explain success and unsuccessful stories). ▪ Link community gardens to recycling centers: they have started with putting them next to them. For example all the gardens are producing compost, so they want to create a continuous with the recycling centers to increase it. Not even 20 in the city yet and working too well (collection service often not frequent enough). ▪ More funding. In each neighborhood, which has 3+ gardens, they need to have a specific sustainable programming expert. Create network and stronger human resources. ▪ Green Learning Centre from the Community Gardens to teach sustainability, green economy, etc. Continue to enhance local leadership, not leave it up to formal settings of schools

Organization	Activities	Constraints	Future
Science Museum (ScM)	▪ Hands on interactive museum (1992) born from a Pilot project (1980) in the Hibru University Campus. Topics: Life Sciences, Physics, Chemistry, Earth Sciences... ▪ The Museum is like the open stage of the University. Professors (voluntary), PhD students and Post-Doc (paid) are engaged, while learning communication skills. Highschool students in summer do guidance on workshops, etc. Young Sciences Competition (winners go to EU/US events) ▪ Opening science to communities which are backwards to it: orthodox and Muslims. ▪ Special program "science for girls", as Israel has less participation of women in science. ▪ Members of EU "Excite" Network of ScM. Coordination of EU program "Engineer" to develop engineering units for schools. Partners in EU Prg. "Accent" about CC.	▪ The environmental studies at the Hibru University are not on sustainability of the economy. They are more focused on research on natural resources. Also on sustainable agriculture, water, less on energy. This limits the possibilities of green topics to work on. ▪ Energy for sure it is in the agenda. Difficult from the funding perspective, as it is important to be careful on the sponsors to avoid or treat well the issue of "green washing".	▪ In "Excite" there is a big discussion on the role of Science Museums and Natural History Museums. Each year they have a conference and a topic. In 2012 it will be "becoming green ourselves the Museums". They've started with a project on substitution of all lighting system, adding sensors for sunlight and presence/absence of people. Still to cope with: the building, the administrative work, the exhibits and activities. They are discussing what methodology to follow. ▪ A competition was just launched for the architectural project of the new building, under green architecture and local nature. ▪ As a Museum they try to embed green thinking into whatever topic they treat. They do not think that green issues should be alone, but integrated on other discussion topics.
Local Action for Biodiversity (LAB-ICLEI)	▪ LAB-ICLEI: program for awareness and decision making about local biodiversity. A multi-stakeholder forum supports the process through roundtables and recommendations.	▪	▪
Local Action for Biodiversity	▪ 3 year report on the ecology and management (policies, agents, etc.) of the urban nature system. J uses NSPI survey catalog (151 sites) including community use. 40 sites designated strictly for conservation (no building). ▪ Long term Biodiversity Strategy and Action Plan (LBSAP) including all related stakeholders (Env. Dep; Sanitation Dep. -responsible for public spaces-; JNF; National Park Authorities; Moriah (5 ring parks around the city), etc. It identifies spaces, authorities, manag. responsibilities, biod. conserv. strategies... and the necessary balance of interests with development, cultivated/planted areas, etc. ▪ Small group of sites for sust. manag. pilot projects with support of stakeholders. For instance the Gazelle Valley: it will be Israel's 1st Urban Nature Wildlife Park (including built wetland, as Israel is a very significant migration route). The local water company is restoring a natural stream, as a main pipe goes through that area. ▪ LAB will be extended to include URBIS. They will have to investigate a strategy to create partnerships with stakeholders beyond the city and the country.	▪ Budget, staff, facilities… ▪ There are some policymakers who are not completely in favor of preserving nature and this is observable on the resources.	▪ They are planning an international URBIS site. ▪ Selection of several other urban nature sites for pilot projects to promote. ▪ Branching out into the educational sector to raise awareness. ▪ Establish a resource center on biodiversity for the local planning community. ▪ Incorporate the adaptation of urban nature to climate change into the LAB program. ▪ Reach the necessary resources, commitment, and legislation on the part of the city for the program to develop.
Participatory Planning	▪ Other projects of the Comm. Center: community gardens and recycling (1000 homes producing compost in 2012). Separating organics was a comm. decision, lifted to the City Hall whom understood it must have a bottom-up approach. Economic savings of reducing waste will be shared with the district, to enhance comm. development. ▪ To reach sustainability one must create community. The other tenants in the buildings see their properties increase value. They get the Municipality to understand the need to change aspects of the Master Plan and to understand and integrate little by little the non-formal processes.	▪	▪ A new topic is "preservation of unbuilt land and trees". The idea that private land is part of public space. So, if more buildings are needed they will have to grow in height. They've suggested the Master Plan to regulate 20% access to green areas for the all the tenants.

Organization	Activities	Constraints	Future
Participatory Planning	▪ The Community Center is like a district council / comm. org. dealing with urban issues, social issues, culture... important for the community as well as for the City Hall. ▪ A comm. architect works for the Master Plan at district level, trying to integrate the citizenship's vision, through small workshops that are later discussed in big conferences. A vision workshop raised the idea to develop the community including sustainability concepts. To reach sustainability one must create community. In return, properties increase value, and the Municipality understands the interest in non-formal processes and of changing aspects of the Master Plan.	▪ Economy. There was a lot of pressure from investors to obtain properties in the district. The people reacted very strongly even on the courts and politically to prevent the transformation of the traditional structure and architecture of the district. ▪ Culture of the Planning Administration. The municipality Master Plan team doesn't help the community team to have directions on their job. They are on the back of the planning system of the city, yet they get to manage to deliver orientations at the district level. ▪ Values. The only way for the municipality to change the society's mind is to increase community feeling and values, even more in a complicated city as Jerusalem. The people pay to get the streets clean but they do not expect to receive values.	▪ Increase the number of Community Centers with participatory planning, as most of the city is covered by Master Plans for each district. Yet, it would be very positive if the Municipality gave goals to the local planner. ▪ Regulation in the Master Plan of renovation and better insulation of buildings. Still, a big issue now is: to provide more sust. homes or more affordable to young people? ▪ Another important question is parking space. Changes must come from creating the right environment, not from imposition. Now people start to say that they do not need parking as they will use PT. Receptivity by the Master Planners is necessary for urbanism changes leading to an environment in which the car is not needed. In this sense, a big concept is to generate urban economic streets, combined with safe walking routes. To promote small businesses and infrastructure for cycling.
URBIS Initiative	▪ URBIS initiative was born in Nagoya, Nov. 2011. Its scope is the whole metropolitan area to evaluate the ecosystems and the relationships. Yet, it works as an "inverted biosphere reserve": the core is the urban area, from which a buffer is defined and further beyond the ecosystems. The mission is to preserve ecosystem services. ▪ URBIS is going to develop a mechanism based on monitoring and research. New opportunities may emerge from natural resource management, such as turning sewage treatment into a water ecosystem. How sectoral policies must be modified to counterbalance climate change, for example how to reduce city temperature 1ºC.	▪ The multi-stakeholder cooperation framework is complex. The project must be developed on a cross-boundary basis in cooperation with Palestinian Authorities. Also, in Jerusalem there are different boroughs, different state agencies, sectoral authorities involved in the issues URBIS must work on.	▪ 2012 is the start up year (agreement amongst all the players and policy making framework in place). ▪ 2013: project operating, fund raising, supporting community programs, run through the policy making process. ▪ In process of setting up a 5 year contract. ▪ Objective: to create links between inter-phased actors on policy, by avoiding *"cooparalysis"*; by not generating a hierarchical process and instead search inter-phase management by agreements and network development.
Kidron River Basin Restoration Master Plan	▪ The Master Plan (not statutory) of the Kidron Valley covers from the top of Jerusalem to the Dead Sea. Its mission is to bring dignity to the area and progressively the Pilgrims Route. Tasks include: to treat the raw sewage, restore the Kidron River ecosystems, transport and urbanism guidelines at basin level, work in more detail in East J. to requalify the nearby settlements, create touristic infrastructure, environmental education... ▪ Some projects in development: Pilot projects going on in schools, such as Engineers without Frontiers building units of biogas plants production; green paths, such as Abraham path following the Kidron.	▪ The Valley has been neglected for 60 years. The conditions are awful (disgusting raw sewage). ▪ The most difficult action of the program is the Israeli-Palestinian cooperation for sewage treatment. The solution for the sewage in the Kidron is not in J because there is more sewage generated in Bethlehem and further down. The most economical and environmental efficient solution is to solve the problem on the deepest point. The Master Plan process has allowed many stakeholders (40 to 50 in 4 different meetings) to explore options and reach an agreement in one year and a half. However, some people see the Kidron project team as part of an occupying force and won't cooperate at all. ▪ The city of Jerusalem personnel does as in everywhere. When a new program comes in they get very scared.	▪ Implement an Action Plan, with a Steering Committee of only governmental institutions, whereas the Kidron MP is promoted by the Kidron Valley Committee: Ministry of the Environment, City of Jerusalem, Dead Sea Drainage Authority, Peres Center for Peace, the Milkin Association (California) . Three NGOs and 3 Gov. Authorities. ▪ Decision-making by the higher authorities about sewage plan placement. To do things in the Middle East it is necessary to avoid the geopolitical aspects. Environment allows having a common ground. ▪ Replicate project in the Yarqon Valley (to Mediterr. Sea) and cooperate with European Universities thru a EU Program to promote the concept of Basin management. It is key to environmental management as everything drains down to a bottom point.

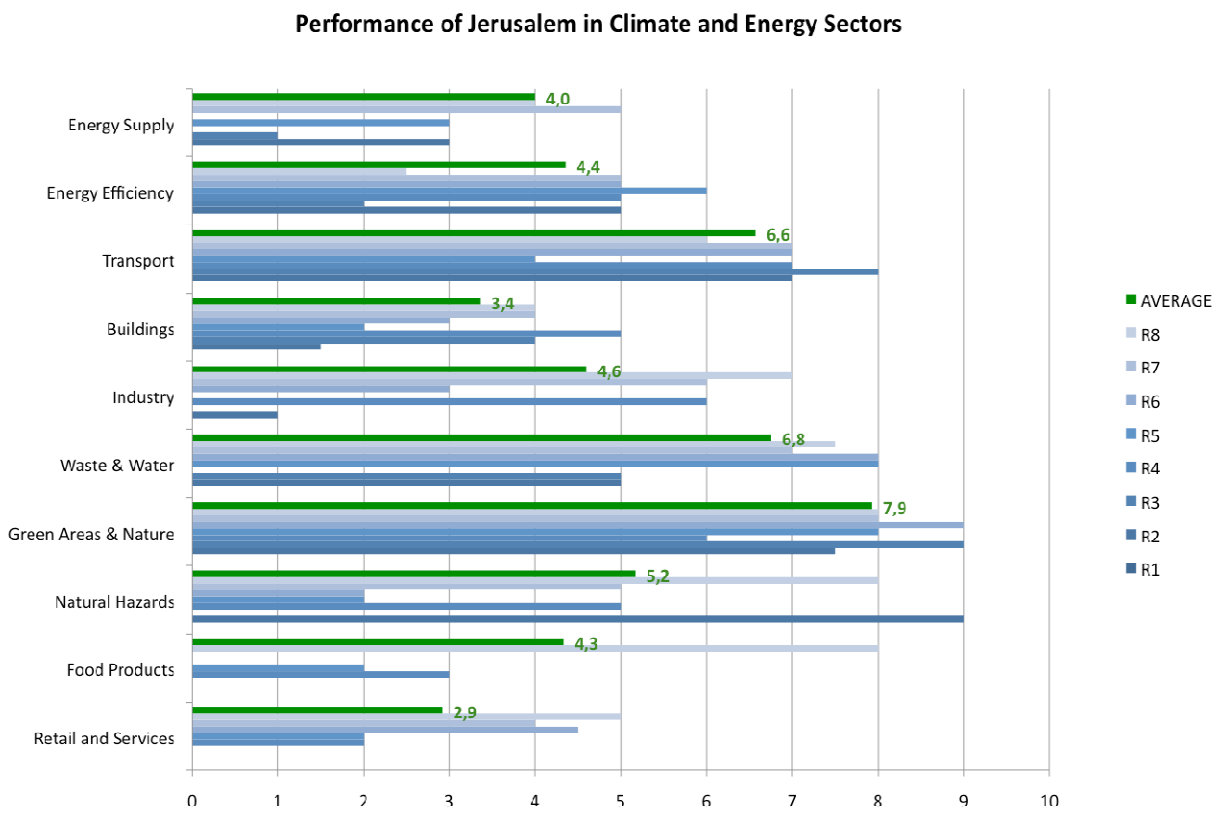
Organization	Activities	Constraints	Future
Healthy City Program	▪ The idea of the program is that health is an expression of wellbeing. Healthcare takes about individuals one by one, not about communities or sectors altogether, but Healthy City is not about medical care, but of the social aspects of health. The ultimate aim is to include health and health equity into all policies, as a resource to better life. How to integrate health in the non-health agencies and organizations. People with higher education and more income live longer. The program aims in increasing health among all communities by engaging others to take care of health in the aspects they can, and break the vicious circle "lack on knowledge-lack of health". ▪ They went to the community centers and asked the people what they needed to increase wellbeing. For example the long distance walking program between mothers and daughters (elder). The municipality provided clothes and shoes and an instructor to walk and discuss health issues. Eventually this program will extend as it was very successful. Vaccination programs (specific of J), health education since kindergarten, access to dental health until 14, community gardens, station for baby care. Every program has its own evaluation system.	▪ 75% of the health factors are out of the health care system. Non-health organizations have more influence on health and wellbeing than health institutions themselves. ▪ Vicious circle of lack of knowledge - lack of wellbeing and health. Equity is a very important factor, increase of equity! ▪ Identifying inter-phases of all policies with health and the benefits to the other policy of better health. ▪ Determining the social aspects of health. For example the needs of long distance walkers (mothers-daughters) to enhance the indirect positive effects of walking: discover beauty of nature and sense of belonging, ▪ On the eastern part of Jerusalem there is very little participation of the community. Only 5% of suggestions or calls to the community center came from the Arab sector. They decided to put more Arab speaking people and more instructors. The challenge now is to obtain their trust. It is the engaging phase. Once its starts to move it will bring a lot of work to the municipality. ▪ Being part of the network of healthy cities requires a fee of 6000 USD per year. Sustained funding for the Program.	▪ At level of Jerusalem they are doing a whole health profile survey, adapted from an international questionnaire, talking about education, work, etc… with which produce evidence based action plan. ▪ They are working with the State Health Authorities to start new programs like Jerusalem smokeless city, working with children to start with. ▪ Israel has good doctors and good facilities. There should be a change in focus to improve prevention policies than healing. ▪ Increase participation by the citizenship and cooperation from other sectors.
Jerusalem Transport Management Team (JTMT)	▪ Joint association: 8-9% percent of the budget from the municipality and 92% from the Central Government. Responsible for the planning of transport in Jerusalem Area. ▪ They have a Master Plan for Roads. Since the end of 90s they are also planning public transport systems. Also parking planning, road pricing schemes, cycling. ▪ Since 10-15 years there's been a strong shift into planning of PT and mass transit systems in Israel. Almost 50% of national budget goes to high-speed train and metropolitan transport of the 3 important cities (Tel Aviv, Jerusalem, Haifa). Yet, there hasn't been a 'No' for an answer for the last 5 years at least.	▪ It follows the trend of tensions between national and local government when they have to work together. ▪ Jerusalem is the poorest city as 2/3 adults not in the workforce. The need for PT services is very important and growing, but the municipality suffers of lack of resources. ▪ The strong participatory democratic system slows down processes; bringing the project into the various statutory committees. There are 4 statutory steps of approval: municipality, local committee, ministry of transport, regional committee (Ministry of Interior), and national committee. Above this there is a Special Committee to overrule projects and after that the Courts.	▪ So far they are initiators, advisers, coordinators. Even if they integrate in a Statutory Transport Authority, they would like to stay small and smart. ▪ New Unit of Transport Control within few months. ▪ Extend the Light Rail System: enlarge current line. BRT corridor will be LR too, connecting the 4 city centers (old city, modern, orthodox, Arab). 3 billion ILS for the second stage. (20 billion ILS the next 5 years) ▪ In a one year period change of the bus network. They have one BRT corridor with 6 lanes in project. New bus stops with GPS time control, and trip plan software in the buses. To explore: bus lane + fast HOV lane and toll road. New agreements with PT operators needed, as now more and more operators work in Israel (before only 2)
Jerusalem Transport Management Team (JTMT)	▪ So far they have a 13.8Km light rail operating (through concessionaire) N - SW with a cost of 4.1 billion ILS including 800 M for Jafa street renewal (before, the most crowded and polluted street in Jerusalem; they cleaned facades). They transformed the NW-SE corridor into BRT lines. ▪ 2/3 parking spots in the city demolished. Instead 3-4 P&R points by the LR; free ticket to park if they use the LR. They are studying new policies for more expensive parking in the city and dynamic tariffs.	▪ Eastern J: from the time of the Brits there are rights for 17 families with monopoly over bus services. JTMT hired 300 buses from these companies creating a Union providing them even Consulting to negotiate with the Israeli authorities (from the South Bethlehem to Ramalah in the North). Until 10 years there were many illegal companies.	▪ Green corridor (E-SW) to connect University campuses and the new Sports Area in the South. Small planning of cycling routes and feeding bikes into light rail. ▪ Integrated Smart Card system for Public Transport all over Israel. So far, family monthly passes so that it becomes more economic than taxi. Simple tariff system (3 or 4 tariffs in total with 90 minutes free transfer). ▪ Exploring redesign of city entrance to create intermodal hub with all buses and LR when high-speed train arrives. ▪ They are starting the Master Plan for bicycles

Organization	Activities	Constraints	Future
Air Pollution Unit	▪ Activities: Air quality, hazardous materials, polluted soils, GHG inventory, reduction of air pollution from transports. Municipal seat in the District Committee dealing water issues, despite water services outsourced to Hagihon. ▪ The policy on mobility control is to close streets and make them pedestrian. Despite transport only accounts for 18% of GHG (according to the GHG inventory based on 2007 data), it generates 90% of some air pollution factors. ▪ The Master Plan Agency is a platform in which bus companies take part in discussions, decisions and new agreements; e.g. a road where today 18 bus lanes pass, in a few months will be reduced to 5. This is a tremendous change for the people as they will have to transfer, yet much lower air pollution and transportation will result of it. ▪ Thanks to the light rail train was put in service NO_x in its street has decreased by 80% (before 200 buses in rush hours). They are also evaluating the effect of BRT, to extend the work in Jaffa Street to other places. They have 7 air pollution stations (NO_x, SO_2, CO, particles; each 5') ▪ Through CCP the city committed to -20% GHG from 2007 by 2020. Inventory is ready, Plan is prepared and revised but pending approval. No specific targets on energy demand (efficiency) and renewable energy. The inventory, the monitoring and the commitment are very strong tools to push actions in the government, but finance is the top-driving factor. For J not possible to buy offsets. So far, a new inventory for 2013 is the main goal.	▪ Citizenship response to PT changes (new transfers). ▪ Regarding the plan to reduce GHG by 2020 (target 3,4 tCO_{2e}/capita) in a business as usual development with increase of lifestyle and population, it is hard to think how to reduce emissions. ▪ For every sector the Plan sets the contribution to the total target of -GHG. Domestic electricity use behavior 15%; private sector 25% (insulation, behavior); 13% by steps in green buildings; 38% waste. However, the actions are just suggestion and the plan is pending approval. ▪ The Env. Dep. has almost no influence on the effective implementation of the Climate Plan, because it depends a lot in finance. Moreover, the Ministry of Environment is not much concerned about it. ▪ The elect. market is completely controlled by the central gov; it is not possible to contract certified ren. energy. ▪ The Ministry of Env. -owner of monitoring stations- wants to declare several cities as "polluted", including J. The city is concerned of the effect it may have on tourism and the ability to continue freely to measure.	▪ The Ministry of Environment wants the city to elaborate a plan for air pollution reduction from transport, including evaluation of different steps and assessment of others. ▪ Still be watch guard of the planning to keep development in the city instead of the surroundings as the pressure is there. ▪ So far, a new GHG inventory for 2013 is the main goal.
Sanitation Department	▪ Waste collection, recycling, and street cleaning. Also in care of the municipal fleet (services). ▪ Pilot program on organic waste on one neighborhood (1000 families, in 4 or 5 years reach >5000). Average of 1,3Kg/person, organic is 0,52Kg. ▪ Glass recycling in recycling center. No containers in the city, yet currently working on it. Paper: 1500 containers; 1800 for plastic. The objective is to increase separation and recycling. ▪ The Gov. is working on a regulation on waste targets.	▪ More cooperation and awareness from the citizenship to increase the efficiency of the work. ▪ Lack of solutions that can deal with the waste collected. There is not enough recycling industry in the country.	▪ Broader range in the future. So far only Jerusalem, but starting to study a metropolitan agency. ▪ Plan to build a methane plant in 5-6 years. ▪ There is no plan on how to increase sustainability of vehicle fleet. They are thinking about the idea of using biogas for the waste collection trucks. ▪ There is a plan to build a methane plant in 5-6 years. ▪ Recycling Objectives. ▪ There is also a discussion on incineration of inorganics.

Organization	Activities	Constraints	Future
SPNI	▪ SPNI has a good reputation in J. It is an independent organization working with the press, TV, etc... As NGO they must be aware of the government action, and sometimes they must even criticize the Nature Agency. They get a lot of collaboration of public and private institutions in the projects. ▪ They initiated the comm. gardens in J. Currently, project with the Min. of Env. and JJF in 5 cities, and self-expansion to other places (in 2012 the Min. of Agr. will also fund the program). ▪ They have programs on urban nature sites, from the planning level. They are a member by law of the planning system at all levels; local, regional and national. ▪ A lot of connection to urban planning in Jerusalem, concerning open spaces and nature areas in Jerusalem. Now they are doing a master plan for urban nature sites. The biggest campaign was to save the Jerusalem Hills from a 20,000 unit construction plan. The Gazelle Plan was also a great success; written by NSPI and approved by the city ▪ NSPI pioneers and after them the institutions follow.. Once it is done here other places start as well, e.g. Report of the environmental threats of Israel, especially on open spaces.	▪ Not performing very well in some of the programs: whereas 8.5 for open spaces and 7 for proactive sustainable planning and conservation of the city and education, the platforms and support to grassroots deserve a 6, recycling program a 4 and transportation a 3. ▪ It is easier to bring money to Jerusalem than to other places ▪ You need groups in every neighborhood on about everything in order to strengthen grassroots and advocacy capacity through the platforms and empowerment that SPNI can provide. ▪ A big obstacle is the need to raise money all the time ▪ They have obstacles in the Arab and Ultraorthodox Sectors. They are about to start a 5-year project on the Kidron Valley (Educational). This will help reduce distances (they have materials and guides in Arabs). There is certain connection with the orthodox with the community gardens, yet their children go to different schools, so they must develop a specific language to work with them.	▪ Working with Arabs and Ultraorthodox communities ▪ Once finished the Master Plan for Urban Nature Sites, they will have an opportunity to get involved in an Open Space Committee that the Municipality will run ▪ Still be watch guard of the planning system, to keep development in the city instead of the surroundings as the pressure is there.
Moriah	▪ Moriah was established to accelerate and facilitate infrastructure projects in Jerusalem: planning, management and contracting of projects, including the Calatraba bridge. ▪ All projects go through internal env. assessment, from plants and animals in road projects, reuse materials in projects --> cycling routes with demolition materials. Thanks to this, Moriah has made a very big mind change. It is an engineer institution so they didn't know about sust. issues at all. They are opening a lot to it now. ▪ A unique pilot project is the reuse water from ritual baths from Jewish ceremonies (mixed with rain). In Jerusalem there are 40 public baths, this uses a lot of water and by health regulations they must throw all this water. With a monitoring system they are reusing all this water, after purification so that it lasts for at least for one month (because Moriah builds the religious centers and baths).	▪ Economic resources: Moriah can make projects, but the budget is limited. ▪ Some activities depend on legislation that is on National Government hands. ▪ Effect of the green movements: they are very aware of plans and projects, and there is a strong process of lobbying ▪ Moriah has earned the attitude, yet it depends a lot from the municipality; so, if this is more or less open to these questions, it affects the projects.	▪ Even thinking on how to make money from green activity, such as energy projects that will generate income for the city. ▪ Solar-thermal in Olympic pools; rubber for roads; reach 10 or 20 MWh of PV roofs, changing street lighting (despite it is very much associated to security)... It all depends on National standards approved for rubber use, lighting, etc. ▪ Increase knowledge on materials and technology in Moriah and the municipality.

Interviews: Links to the EU 2020 Strategy Targets					
Interview	**T 1 - 3% GDP in Research & Development**	**T 2 - 20-20-20 Climate and Energy Package**	**T 3 - Age 20-65 75% in workforce**	**T 4 - <10% early sch. leavers + Tertiary Age 30-34 >40%**	**T 5 - Poverty Lift 25 %**
Env. Plan. Dep.	▪	▪ D: the city is committed to -20% GHG by 2020 vs. 2007 + Munic. Energy Conservation Plan.	▪	▪	▪ I: Support en. eff. among low income citizens + return savings from recycle to welfare programs
Sust. Planning Department	▪ D: R&D thru the Master Plan for urban nature	▪ D: the rules for green buildings and renovation are on track	▪ not enough done	▪ not enough done ▪	▪ I: (not doing enough) by wellbeing development and plan.
Water Utility - HAGIHON	▪ D: innovative prog.: irrigation with treated water; biogas plant, etc.	▪	▪	▪	▪ D: + wellbeing in East J. by new sewage plant and Kidron restor.
Community Gardens	▪	▪ D: vegetable garden plots for food production (small contrib.).	▪	▪	▪ I: Expand program to all districts and citizenship of J.
Science Museum	▪ I: It promotes interest in science and innov. among youth, etc. Participation in intern. projects	▪ D: Prg. to "green" the Mus: new building; eff. lighting, etc. // exhibits, etc. on energy and clim.	▪	▪ I: Benefits from fostering youth interest in education and science.	▪ I: program "Science for girls" due lower rate of women in science in Israel.
Local Action for Biodiversity	▪ D: R&D in biodiversity and urban nature planning and management	▪	▪	▪	▪
Participatory Planning	▪	▪	▪	▪	▪ Wellbeing and comm. dev. thru participatory and comm. planning
URBIS Initiative	▪ D: Innov. in biod. & ecosystem planning and management	▪ D: Ecosystem services planning for CC adaptation and mitigation.	▪	▪	▪
Kidron River Basin Restoration	▪ D: R&D in environtal planning and management.	▪	▪	▪	▪ D: + wellbeing in East J. by new sewage plant, Kidron River restoration, urban requalification
Healthy City Program	▪	▪ I: A healthy city calls for less pollution / inter-phasing policies	▪ I: As part of the social aspects of health / inter-phasing policies	▪ I: A healthy city depends on increased education en equity	▪ I: A healthy city depends on increased education en equity
JTMT (Jer. Transport Planning)	▪ D: new techn. GPS-timed stops, planned trip software, car-battery exchanging station	▪ D: by reducing private transport, promoting PT, less air pollution, etc.	▪	▪	▪ I: by providing affordable and quality public transport to all citizenship.
Air Pollution Unit	▪ D: Implementing tech. and policies for air pollution control	▪ D: Coordination of the GHG red. and Energy conservation Plans	▪	▪	▪ I: + wellbeing by thru less polluted cities.
Sanitation Dep.	▪ D: Innovative projects as biogas plant, biogas trucks, etc.	▪ D: Phase-out of landfill; recycling targets; Waste to energy proj.	▪ D: New jobs (3-5% yr) in waste collection and recycling act.	▪	▪ I: return of savings from recycling to welfare programs
SPNI	▪	▪ I: Through energy and waste prg.	▪	▪	▪
Moriah	▪ D: Money returning projects strong base for R&D activities	▪ D: Energy topic in many of their activities (lighting, PVs...)	▪	▪	▪

Performance of Jerusalem in Climate and Energy Sectors*



COMMENTS about performance in climate and energy sectors

Energy Supply

- It is in the beginning, but there is light. The Gov. committed itself to use alternative energies (10%) for Israel.
- the city only supplies about 1% green energy of total demand
- **Not aware enough**
- the city doesn't have responsibility on the issue.
- **NR/DK**
- The city needs to do a lot
- Old and dirty energy coming from the shore
- *Excellent supply, almost no blackouts. But no renewables*
- *Most of GHG is from electricity consumption, which is mostly produced by coal. Hagihon will also be involved in energy supply by spreading natural gas into the city.*

Energy Efficiency

- It is going hand in hand with reducing emissions. Very important, as most of the target must be done by energy efficiency
- low demand from the population due its poverty
- not explained enough, even the economic incentive
- it started to be an issue: the municipality is starting to follow up, gather the information. They monitor and promote but have not resources to support.
- **Not enough information**
- It is starting
- in the good direction, but not in a good point yet
- No green building at all, no requirements to build green. No rain collection unless you want to by yourself. Against the law to reuse grey water. No double piping.

Transports

- Much better thanks to the light rail
- light rail, bike lanes
- light rail, there are many plans and efforts
- Big change with the new PT system. It is a very big process
- A lot of effort and money put into it
- Some good steps being done, but still far away from what should be. We can do more.
- the light rail is making a big change, clean air in Jaffa street
- very poor, waiting much too time send the people to cars. Much population need buses in Jerusalem
- Transport contributes only to 18% of GHG but 90% of some air pollution factors.

Buildings

- Just starting to think about it
- more to do on insulation and photovoltaics. No public housing in the last 7 years and it is still stuck.
- No regulation, no recommendation
- some green buildings for businesses and the municipality; improving
- No green building at all, no requirements to build green. No rain collection unless you want to by yourself . Against the law to reuse grey water. No double piping.
- From the urbanistic perspective, thinking in a business as usual development with increase of detached home lifestyle and population it is hard to think how to reduce emissions.

COMMENTS about performance in climate and energy sectors	
Industry	**Waste and Water**
▪ There isn't much industry in Jerusalem; most people are public workers. There is some high tech industry ▪ **NR/DK** ▪ there could be more and clean industry ▪ Not relevant in Jerusalem ▪ **I do not know** ▪ not much industry, and not heavy ▪ there is not many industry in the city ▪ Very little industry, pretty good (high tech)	▪ Things are improving in both topics (new sewage plant, new waste plans) ▪ 50% of the water is very well reused and energy is produced / other 50% raw into the Kidron Valley / Solid waste is very bad, low recycling and most garbage ends up on landfill ▪ **Not aware enough**; water very expensive. ▪ Waste very high according to the current municipality, also on water important actions: use of wastewater for gardening… ▪ 8 for waste, a lot of effort to improve on water -7-, how to reduce demand for irrigation, recycle water at national level, now projects on recycling of private waters -they do not recommend-) ▪ Good thanks to Hagihon; the irrigation project... ▪ Water supply is good, but this doesn't depend on the city. Sewage (collection is OK) is another story, one half is treated fairly well. One third is not treated at all, and going down to the Kidron Valley. Trash collection is OK but recycling very weak. ▪ Water and sewage now dealt by companies apart from the municipality, because water bills and the money collected went to other topics; this made the administration outsource water. Hagihon is also going to be involved in solid waste treatment.
Green Areas and Nature	**Natural Hazards**
▪ The new adm. is taking care of the metropolitan gardens ▪ Doing quite well in the planning, in the development a 3 ▪ would like to see more prof input to save trees, and more adapted vegetation, and fight heat island effect and cold. Need more enhancement as a local treasure ▪ Something very much developed lately, community gardens. The problem is that there are not enough green areas in the city, but a lot around ▪ A lot of community gardens, big parks, the best in Israel ▪ Nice parks, but not on the top of green areas . Green belt good idea, Kidron Valley as well	▪ Good preparation of the city in emergency plans ▪ **NR/DK** ▪ City not prepared for earthquakes, although city in fault. There is law promoting to adapt buildings by rising height. Gentrification of population, because people are expelled from their home (by developers and the Ministry of Housing) and the land is rebuilt for foreigners who come twice a year. East Jerusalem, they do not get housing permits (the policy is frozen) and houses demolished. // Not aware if the city is prepared for forest fires, or who is responsible for them and enough forest management ▪ very low preparation ▪ Fire is a national issue, about earthquakes -there is a plan on how to strengthen houses in exchange of more floors and apartment, but it only works for the rich. This is very problematic here, because there are other policies about heritage preservation. They are fighting it now in Jerusalem. ▪ Animals, the gazelles could cause risk: but there are many parks and the people are aware (the URBIS project and integration of nature in planning; the green map). The city is prepared ▪ OK, due to security background. Earthquakes fairly well prepared
Food Products	**Retail and Services**
▪ Very different situation compared to Europe. The local governments do not have responsibilities on food; only on veterinarian ▪ **NR/DK** ▪ Something being done regarding proper eating habits (overweight, under-nourishing). Not strong conviction from the city regarding the issue. More happening on NGO level. Some awareness from the public, but a lot to do yet. ▪ nothing to mention ▪ There is no policy at all on this issue, no notion about it. ▪ Jerusalem doesn't have food production but there is a lot of good products in Israel ▪ Big offer of local produce (from Israel itself) but beef and other come Argentina. 50-70Km around there is a lot of agriculture ▪ Quite homegrown offer, fresh produce markets, farms are close	▪ Very few things thinking about it ▪ **NR/DK** ▪ No; some green wash, but that's it ▪ no action in this direction ▪ Business comes first, but things are happening bottom-up; the municipality is starting to build awareness; the same on social justice. ▪ few aware businesses ▪ A lot to change, very low awareness in this sector. Some shops out there, increasing but still little ▪ extremely weak, very little initiative on their part, they are pushed by business

Reflections about the 3E Crisis: Environmental, Energetic and Economic

EU's proposals and role in shaping the international agenda

- (Deputy Mayor Env.) It depends to what extent this agenda can take over the other agendas. Nowadays the news is about terrorism and conflicts, then economy, maybe climate change, then some crime and sports.

Where do you envisage your country and your city in tackling this crisis

- (Deputy Mayor Env.) A great challenge for Jerusalem is poverty and culturally unemployed people (55% of the population doesn't participate in the workforce: approximately 1/2 orthodox men and 1/2 Arabs women)
- (Deputy Mayor Env.) Israel: Green growth is a very new topic in Israel; a Work Team was just created by the Government. The fact that National level needs the local level's action to succeed has not been considered important until now. This will bring the sticks and carrots . The only year with environmental good records was 2008 with an economic crisis.
- (Transports) Jerusalem must focus on providing good, alternative services. In the case of transport, the only system for which people with ties will take is light rail. The goal is to change mode share. There is not a specific target but at least they do not want to see a degradation of the current figures. In the 70s 70% PT, now the opposite. But they expect to not lose that at least.
- (Air Pollution): About Jerusalem: if this administration wins the next election many of the ideas that are being discussed will be done, one period is for learning and the second for action (2013 next election).
- (Air Pollution): Regarding Israel: The electricity market is completely controlled by the government, it is not a free market so it is not possible to contract certified renewable energy. The Department of Environment has almost no influence on the effective implementation of Climate Plans, because it depends a lot in finance. Moreover, the Ministry of Environment is not much concerned about it.
- (Sust. Plann. Dep) Jerusalem: The global solutions to global problems are not at reach of a city. Not sure that the little things the city can do will change climate change, the global crisis... etc. Action focuses on wellbeing, with embedded benefits to the global crisis
- (Sust. Plann. Dep.) In Israel the problem is more lack of space than energy. It is not water anymore, Israel has found solutions to that.
- (Env. Dep.) Jerusalem was the first city in the World to have an Environmental Law on the early 60s (the Nuisance Law). It is now dead in the books of legislation. Only in the late 70s and 80s it started to think about environmental issues again; they are one generation behind.
- (Env. Dep.) Once incorporated to the OECD, Israel had to fulfill the interests and goals of the OECD, being one of these environments. Jerusalem is on track and it will be more and more obliged and Israel itself too
- (JIIS) An important question is how the county conditions the city (politics, economy, etc.). In other countries cities and LG have larger level of independence and decision-making. In Israel this is still very centralized. A lot of the major affairs are determined at a national level. Very strong dominance of the central government: energy, transport. The LG is able to install solar panels on roofs, but to change energy supply is out of reach of the municipality.
- (JIIS) Israel is very urbanized, it is even at larger rates than in Europe. Thus, cities should be able to do a lot, but they are restricted do to the centralized government.
- (JIIS) Attempt of the cities thru the Forum 15 to create a lobby for city empowerment, especially on environmental issues. They organized the signature of the ICLEI agreements. The group of cities recognizes the leading role they must assume in sustainable development. Jerusalem is not a member of the 15, but of the 18. Cities of Forum 15 are the wealthiest in Israel and do not receive subsidies from the Central Gov, as they already obtain income from rates and taxes according to floor space, property prices, industry and services. Those municipalities who do not have this own income need extra support from income taxes from the Central Gov; this is the case of Jerusalem. Jerusalem is not a wealthy authority, it has a large number of low value properties and non-paying population requiring a lot of services. What can be done in this context in relation to climate change.
- (JIIS) For example in energy efficiency European cities have EE authorities/agencies, programs, etc. Why is this not happening here? Because EE is not being sufficiently promoted at national level; hence, the cities can't do much more about it. A similar situation happens with ESCOs; it exists but in a very limited way. There is an institutional barrier, as the ministry for Energy and Water, which has the authority, has not been effective in promoting EE. It would not be fair to judge what Jerusalem or other Israeli municipalities have not done, or that they are not doing more.
- (JIIS) The commitment of Jerusalem and the Forum 15 (18) to 20% 2020 it is a "pipe dream" decision. It is setting targets without checking if they are realistic or feasible to achieve them; no assessment provided validity if this target is attainable. It was positive as all LG became aware about the issue. This initiated programs, surveys, etc. about the action that can be taken. But the target is completely out of context. No government has really the conviction to reach the target. Despite the good process it has triggered, why is this an unfeasible target? Europe has a static or decreasing population. Construction is by retrofitting old buildings or slow increase in new ones. Its GDP per capita is higher than Israel but not growing fast, but in a gentle rhythm. All these variables are completely different in Israel: fast population growth, speeded housing growth, and rapid GDP per capita increase and the economy is still strong, despite the crisis. Against these facts, the answer to reducing energy consumption is no. Hence, a 20% decrease in GHG is impossible as well.
- (JIIS) Israel itself has committed to a 20% reduction by 2020 of the increase expected in GHG. Israel cannot expect to take 1990 as baseline, as between 1990 and 2000 it grew from 4 to 5 million inhabitants (from ex-Soviet republics). It is impossible to assume absolute reduction vs. that time. So the target refers to a 20% decoupling from the expected increase in GDP.
- (JIIS) The fact that Jerusalem stats from lower GHG level due its poverty levels; the idea that emissions could be contained is not a good policy. In fact the GINI coefficient is already much too high and still growing. So, there is social unrest here, which is demanding a higher level of attention to the lower-middle income levels. This will drive to higher levels of energy consumption, and higher GHG.

- (JIIS) The situation on renewables Israel doesn't have enough alternatives sources, or in general alternatives to fossil fuels. Why? Israel has no nuclear and cannot risk having. Israel doesn't have offshore wind (no resource). The bit of wind there is, is on the mountains, but it is extremely intermittent. In addition Israel is an energetic island, in opposition to Europe where there is an interconnected grid, so energy can move from the production areas to the consumption. Intermittent sources are not useful in Israel. On solar technologies the only competitive is CHP, but it takes a lot of space, which is maybe more important for biodiversity, landscape or ecological functions; it is a big decision to allocate land to other uses. So PV panels are the only option thru feed in tariffs, but how much energy will be produced thru roofs... below 1%. Obviously no hydroelectric; very small and few and biomass and/or waste to energy.
- (JIIS) What could / should be leading? In the context of Israel, the major drivers of energy efficiency should be buildings and transport. In Israel there is no national mandatory regulation on energy efficiency in buildings. There is energy conservation standard, but not mandatory. Some local authorities have approved local regulations to enforce all new buildings to become green buildings. They have done it thru planning and building legislation, not through energy as it is not in their hands. This standard is still not good enough, it is just being improved. If Jerusalem wants to act in energy efficiency it should regulate in planning and building; from new building areas to the design. This is a crucial issue. It should also go for retrofit, at least to a certain cost-effective degree. The other topic is urban transportation, and the location of residence, jobs and services in regards to transportation needs. For this to be energy efficient it is necessary to create high density settlements with high presence of collective transport (public or alternative) and reduce as much as possible the need of cars (parking policies, location of developments, efficient development of public and collective transport); ergo reducing fuel and GHG. The investment in the light rail, very high and "locked in", could be combined with more flexible options in collaboration with the high employer organizations in the city (Hafa Hospital, Administrations, etc.) in order to provide alternatives to private transportation. This is what an Israeli city can do.

What else should be done to tackle it? Is "sustainable growth" the path to follow?

- (Deputy Mayor Env.) The only possible path is when the economic and ecological paths converge. So maybe when we admit that there's been no economic success the ecologic and social agendas will be given more importance.
- (Transports) The economical crisis has affected the USA and Europe, but not Israel although the OCDE shows Israel as one of the last. There have been responsible economical policies. On Green issues Israel is not very well situated, but awareness is increasing fast. You can see huge pressure of the Government to implement mass transport systems. It becomes more and more difficult to finance roads in cities, whereas it is becoming more important to finance IT projects. And as wealth is growing for the people they can afford new more green services and attitudes. Israel has always been a leader in fuel taxation. For very other reasons Israel has some green record. Now the schooling system is giving much more importance to green.
- (Comm. Gardens) It is the dream of environmentalists and socially aware activists to create equality for all. Striving it means that money must stop to be the bottom line, turn gold into basic commodities and spread them. The deep satisfaction behind environmentalism is the feeling of humanism, socialism, of doing the right things

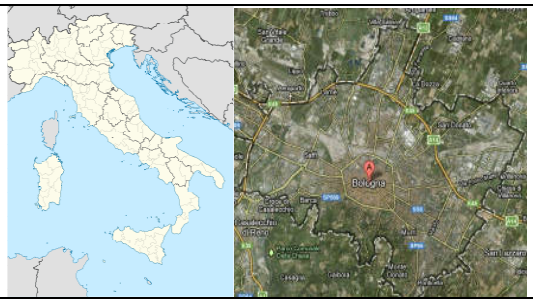
for the world and humanity. Young people are trying to be aware, responsible to their communities. We are in front of a change of age in which still some very old money ideas are being overrun by more caring and organic values and alternatives. There is an ongoing tension between materialism and advertising versus downshifting ideas. She is optimistic about the future.

- (Comm Gardens) It will take very brave politicians to undertake these actions, in a clash with reality as crisis turn people to the right.
- (Sust. Plann Dep.) A necessary approach tries to deal with wellbeing. It is local and daily issues that drive her to work everyday. Yet working on the global problems and their solutions it influences in a positive way the quality of life of the people. For example the heat island effect. Good planning is sustainable planning, so a good environment is better to live in and the global issues provide a framework to promote it.
- (Env. Dep) The whole world is thinking much more about sustainability. Quite optimistic about the future.
- (JIIS) We will not be able to stop climate change at the safe levels, at least the way we are going now. Even if everybody would abide to their commitments (which she doesn't believe) we are nowhere near the planetary boundaries of safety (Rocström 2009). It is a question of changing consumption, behavior and unsustainable lifestyles, which is what we are living. Talking about safe operating boundaries is not about changing production to make it unsustainable life styles more efficient, but to change unsustainable lifestyles; ex bioethanol for cars in America to continue operating completely unsustainable lifestyles, in expense of water and crops for food in Latin America. What is a sustainable lifestyle and once that is clear, how to promote it. This is the real issue, and there is no radical rethinking to it. Incremental improvement of the existing economic and social structures, in order to continue to do what we are doing today a little better is not going to take us anyway near a better the safe operating space that we need to be in.

Bologna - Italy

BOLOGNA - The City of Porticoes

At least 3,000 years of history lay under the grounds of current Bologna, with relevant milestones such as the oldest university in the world, created in 1088. Its historic district is also very famous for the 38 Km of porticoes. This UNESCO World Heritage Centre allows pedestrians to move around protected from uncomfortable weather: heat, rain, snow... A climate adaptation strategy started in the XI century. Bologna is also the capital and largest city of the Italian region Emilia Romagna. This region, at the crossroads of Italy hosts the major roads and trains hub. A large industrial economy has developed around it, embedding innovation and strong clusters in food, automotive, packaging and electronics. Overall, high added value contributing to Emilia Romagna's 3rd highest GDP in Italy, and one of the wealthiest regions in Europe according to the European Regional Economic Growth Index. Likewise, Bologna usually ranks in the top ten for quality of life in Italy (1st in 2011). Center-left coalitions are traditionally in power in both the region and the city, a heritage from anti-fascist resistance from WWII.



Coordinates: 44º30'27"N - 11º21'5"E
Population 2011: 382,460
Surface: 140.7 km²
Mayor: Virginio Merola - Democratic Party
Vote turnout 2011: -- %
Municipal Budget 2010: 541,349,000 €
Per capita income 2010: 21,122€/inhab.
Unemployment 2010: 5%
Website: www.comune.bologna.it
Study Visit: 30 Jan - Feb. 5 2012

Summary and Highlights of Green Economy in Bologna

Bologna analyzed for the first time its energy system in 1981; *"this was one of several pioneering studies to be carried out in Italy, to acquire the necessary tools for the rational management of energy within the municipal area"* (LGEM). Thereafter, municipal activity in the area of sustainability and green economy has been building up. As one of the founders of ICLEI, since 1991 the city is active in CCP. In 1995 initial strategies addressing GHG were approved with project *Urban CO_2 Reduction*. The following year the Local Energy Agency was created, and by 1999 a comprehensive LA21-Action Plan was adopted. More recently -2007- an updated Municipal Energy program was issued, currently being adapted to SEAP after the city subscribed CoM in 2008. Between 2009 and 2011 the city suffered a governance crisis, as criminal investigations over the Mayor drove to his resignation one year after elected and a technocratic Commissioner was appointed by Rome. The resulting lack of political unity effected some programs, for instance the delay in the CoM's SEAP. At present times, the city is launching the Metropolitan Strategic Plan, in which *"green economy is a holistic point of view to encompass many dimensions"* (Gabellini). The impulse of the city has an echo at different levels, from the private sector and the research community, to the regional authorities:

- 3,000 trees planted from PPP "carbon market".
- 2,300 dwellings heated by the waste incinerator and 1,800 through gas CHP and methane plants.
- 500-700 new homes/y with high env. standards (water, energy, materials) after regul. of 2009
- Public car sharing with +100 vehicles; extending the trolley-bus network; starting new urban train system; e-vehicles for freight in city center.
- Active in 5 international projects; 4 more in the 2006-2011 period; 4 planned in the SEA
- Region, 2012: Energy Plan, Green Economy Assessment, "Patto per la Crescita Sostenibile".
- Business and Industry: Sustainable industrial areas; Electric vehicle development; own devised CSR
- Integrated R&D in ASTER: Consortium of the Reg. Gov., the 5 Universities, Nat. Research Centers, the Reg. Union of Chambers of Commerce and the regional Entrepreneurial Associations.
- Green economy is 15-20% of the activity in the cooperative sector of the Region.

Low-Carbon Economy in Italy

National figures for energy in Italy state that ~85% is provided by fossil fuels (ENEA, 2012). Of the rest, 10% came from renewable sources in 2010 (EEA, 2012), still far from Italy's mandate of reaching 17% by 2020. Additionally, an important 15% share of its electricity supply depends on imports, mostly from French nuclear reactors (World Nuclear Association, 2012). In accordance, Italy recognizes the need to diversify its energy supply portfolio (OEDC/IEA, 2013) and in this challenge "negawatts" will play an important role (National Energy Efficiency Action Plan [NEEAP], 2011). As forecasted in a scenario of enhanced energy efficiency, Italy's gross final consumption in 2020 could remain within a maximum of 133 Mtoe. This contrasts with the current 185 Mtoe (NEEAP, 2011) and goes below the baseline scenario -145.6 Mtoe- of the European Commission (PRIMES model, 2009), which also takes into account the effects of the crisis (IMEC, 2010).

The track record of the "boot-shaped" country in energy efficiency is remarkable. Actually, it is one of the most energy efficient countries among the industrialized ones, with only 2.4 Mtoe/capita, compared to +3 and +4 for Germany and Finland respectively (ENEA, 2012). Between 1990 and 2009 EE in Italy has improved around 10%. In specific areas such as the residential sector efficiency boosted around 24%, whereas in the manufacturing industry a +10% gain was reached. In opposition, EE in mobility showed almost no change (+1.1%) due a very important increase in freight transports by road (ENEA, 2012). By 2020 EE is expected to grow another 14% compared to the 2001 - 2005 average consumption.

Lowering Italy's energy intensity has been a slightly continuous trend since 1990; -0.3% per annum (ENEA, 2012). However, this should not be disconnected from the recession currently hitting the Italian economy. In terms of GHG emissions there's been a sudden breakdown, with overall levels falling below those of 1990 since 2009 (EEA, 2012). In spite of a small increase of GHG in 2010 compared to 2009, gross variation in the 1990 - 2011 period was -4.9%. However, this doesn't complete the Kyoto Protocol threshold of -6.5%. According to the available info, the use of flexible mechanisms at government level, by "acquiring an amount of Kyoto units equivalent to 0.4 % of base-year emissions per year" (EEA, 2012), will not be able to cover the gap. Prospects for 2020 remain uncertain as well, as "additional measures" (EEA, 2012) to those currently operating are required for Italy to achieve its EU GHG binding objective.

Widespread use of renewable energy and supporting energy efficiency are the pillars of Italy's additional energy policy initiatives for fulfilling the EU's energy and climate mandates (NEEAP, 2011). Financial and regulatory instruments are being implemented in correspondence:

- Energy efficiency credits Scheme (since 2005)
- 55% tax relief for building refurbishment projects (2007-2010; extended to 2011)
- Obligation of energy certificate during building transactions (Decree 28/2011).
- New buildings and major renovations include minimum of 50% of hot water to be produced using renewable energy (June 2012 onwards).
- Minimum quota for electrical capacity installed using RES on newly constructed buildings or major refurbishments. (June 2012 onwards)
- Tax credit for district heating using geothermal or biomass energy (since 1999)
- Solar thermal feed-in tariff (2,000,000 m2 of panels by 2016; since 2008)
- Solar photovoltaic feed-in tariff (target 3000 MW for 2016 being updated; since 2005)
- Green Certificates for electricity from RE sources in the grid (in 2012, 7.55%) (since 1999)
- Energy Efficiency Titles (WCS; mainly for firms)
- Incentives for electric vehicles (end 2011)
- Minimum quota for transport biofuel into the network (4.5% in 2012; since January 2007)
- Support for the creation of district heating and district cooling networks (Manufacturing areas, Residential areas; 2010-2020)
- Support for the integration of biogas into the natural gas network (Agro-industrial system gas transmission and distribution network operator; planned for 2010-2020)

Notwithstanding the wide set of instruments just described, the Climate and Energy Policy Tracker (CPT) graded Italy with an 'E' for the two consecutive years (2010 and 2011) in which the project has been running so far. The absence of an overarching and ambitious strategy to promote a carbon free economy and for climate protection is one of the important reasons behind the latter mark. In addition, the National Energy Strategy intended to gradually substitute fossil fuels by returning to nuclear power, in order to reach a share of 25% with new facilities. For CPT (2010) this "could distract important resources from other low-carbon policies". However, a referendum held 3 months after the Fukushima disaster completely halted intentions on atomic energy, while waiting for a new National Energy Plan. Bottlenecks in the renewable energy sector, such as complex and long authorization procedures, need to be removed as well (CPT, 2011). And steadiness of the incentives must be guaranteed. For instance, PV is supported with a constant premium for 20 years, initially introduced in 2005. This feed-in tariff was first modified in 2007 and cuts of 18-20% for 2011 were applied. Further cuts of 6% in 2012 and 2013 were announced. Despite lower costs for PV installations are being reflected in these reductions, shortcomings and continuous changes in the PV incentive system inevitably produce reluctance to invest in the sector.

The public debt crisis and the strong market speculation derived generate relevant uncertainty for sustainable energy policies in Italy. New taxes on energy companies have been created, which will also apply to renewable energy production. Depending on the progress of the crisis energy incentives might be cancelled at some point, like it already happened in Spain. Indeed, "due to its high rate of public debt, priority is currently given to balancing the public accounts. Promoting the green economy is not yet prioritized widely enough" (CPT, 2011). Even so, as previously seen, Italian policymakers have approved an interesting range of instruments to

support the transition to a low-carbon society. Measures covering the most carbon intensive sectors of society are in place, together with others to foster carbon suppressive technologies: housing and buildings, private mobility, energy production -combined heat and power, solar-thermal, PV-.

Fondazione Impresa, a research institution, is issuing since 2010 annual reports about green economy in the Italian regions. The study is based on the development and analysis of a Green Economy Index (GEI), including: Energy, Organic Farming, Companies and Products, Transport, Construction, Refuse and Sustainable Tourism. The method uses and standardizes 21 variables, in topics such as energy efficiency, surface area of organic farming, the spread of ecolabel licenses, CO_2 emissions, differentiated refuse collection, cycle lanes... In 2011 Emilia Romagna fell within the 'Low'-performing performing group, together with 10 other regions. The 'High' and 'Medium' contained 1 and 3 regions respectively, being the Dolomites' Trentino Alto Adige the leader by then. In 2012, Emilia Romagna had jumped up to the 4th place (over 20) and entered the "High' performing division, despite not reaching the "Very High" (3) category introduced in this last edition of the GEI. According to the system's scale Italy as a whole is in the block of 'Low' developed green economies.

One important capital of Italy is civil society. For instance, cooperatives represent up to 15% of the total economy (EC, 2013). Following this participatory tradition, as a preparatory activity for Rio+20, the Ministry of the Environment and CURSA (University Consortium for Research on Socioeconomics and Environment) created the platform *Green economy: the experiences of the Italian Civil Society*. The aim of this initiative was collecting green economy practices from all over the country. 181 experiences were uploaded referring totally to 359 sectors of the green economy, as indicated by UNEP. Participants included businesses and industry; farmers, NGOs, scientific community; local governments; and others. This capacity to obtain a disseminated multistakeholder engagement in green economic activities is a very powerful tool for Italy's carbon-free development challenge.

In summary, Italian objectives for a low-carbon green economy should probably be more ambitious and focusing on the long-term, not just the next few years. Yet, taking into account the economic situation of the peninsula and comparing to other countries visited in this research, Italy seems to be putting some of the necessary stepping-stones for a smaller carbon footprint.

Climate Change and Green Economy Framework

		State (NUTS1)	Region (NUTS2)	Province (NUTS3)	County (LOCAL1)	Municipality (LOCAL2)
		Italy	Emilia Romagna	Bologna		Bologna
Climate Change	CC Responsibilities	Energy, ETS, EU mandates, Railways	Energy, Public Tr., Reg. Spatial Plan, Regulation of Industrial Areas	CoM supporting Structure		Energy, Public Tr., Waste, H_20, Buildings, Spatial Plan., Green Ar.
	CC Target	20-20-20	20-20-20	Upcoming		CoM SEAP: 20-20-20 --> -7%GHG vs. 1990
	CC Action Role	Main Actor: Reg., En. policy, taxing, adoption of EU mandates	Active: promotion of Env. Certificates // Support	Active // Support		Active
Green Economy	Assess. Report	GEI Report 2010-2012	2010 // 2012 in progress	No (integrated in the Regional report)		No
	GE Legislation	Sectoral for EE, RE...	Eco-friendly Ind. Areas	Eco-friendly Ind. Areas		Green Building Reg.
	GE Strategy	Strategic Planning process upcoming in 2012	"Patto per la Crescita"; Eco-friendly Ind. Areas	Regional "Patto per la Crescita" framework		Pedestrian-Slow Center (400Ha) // SEAP // Reg. GG Agr
EU 2020	3% GDP R&D	R: The leaders are not aware at all about the little R&D investments in place. When they talk about innovation is marketing, even in Bologna one of the top areas in the country.				70%
	20-20-20	R: The Covenant of Mayors is a facade, operationally speaking they are doing nothing. They measure meteorological data and generate a report, but otherwise it is useless.				50%
	Work Age 20-65	R: There is a large number of small companies. However, It may become provided that the Italy recovers growth; as long there are some safe-stands on GDP, employment and pensions.				80%
	Education	R: The citizenship of Bologna is quite concrete about these issues.				85%
	Lift 25% Poverty	R: The people tend to think that Bologna is a rich city, yet poverty is still an issue. The city should inform more about it. The provincial paper neglects this topic, talking instead of little things.				70%

Green Urban Economy Strategy of Bologna

Bologna's approach to green economy is encompassed with a strategy at regional level. Expertise and cooperation between stakeholders contribute to a widespread development.

1.- Regional leadership drains down to local authorities, industry and SMES.

2.- Green economy is monitored regionally: in 2010 >11% jobs, and ~23.5% turnover.

3.- Long-term steady work in the municipality is producing measurable positive results.

4.- Innovation thru international projects keeps Bologna in the leading loop of Green Cities.

5.- A strong public utility is regionally developing synergies on water, energy and waste.

6.- The cooperative economy is very receptive to green practices.

7.- Green R&D&I is coordinated in a cluster of public institutions and the private sector.

The Emilia Romagna Regional Authority is leading several programs to promote the green economy.

The Regional Development Agency Ervet - Emilia Romagna Valorizzazione Economica del Territorio- published in 2010 *Green economy in Emilia Romagna*. Findings of this report were so encouraging that its headline message was *"Green Economy, the green revolution has already started"* (Ervet, 2010). According to the results GE in the region represents 2,000 enterprises, 230,000 jobs and a turnover of € 61 billion. Other 2,800 farming and forestry properties, 3,400 professionals authorized in energy certification, and environmental labeling companies could be summed. GE activities covered departed from two larger groups: a) 'green production' oriented companies and 2) 'green product' businesses. The first one aggregates activities under green certifications, independently of the product and service; the second one is about activities supplying the market with green goods and services, in spite of the production process having or not an ecolabel. For instance, in "green production" one could find a car dealer with and EMAS distinction, and under "green product" a company selling aeolian energy regardless of the windmills' fabric. In conclusion, the GE in Emilia Romagna mounts up to a noteworthy +11% of the labor and ~23.5% of total turnover. The following table breaks down the percentage of green companies for some sectors:

SECTOR	Housing	Food	Mechanics	Fashion	Health
% Green	46.15%	37.65%	29.30%	18.4%	16%

Ervet's publication, with intentions of becoming biennial, produces a different view of green economy of that suggested by the *Green Economy Index* measured by Fondazione Impresa for all Italian regions -in which Emilia Romagna showed a 'Low' performance in 2011 (see section 'Low-carbon economy in Italy')-. This exemplifies the lack of consensus and standardized systems to assess this new and growing segment of the economy. Hopefully, continued research will bring to a certain convergence of methodologies in order to offer information about green economy that is more comparable in time and unalike places.

In other fields such as energy and waste green activity has rocketed (Ervet, 2010) after European and national regulations and incentives (20-20-20 Directive, Waste Directive, Packaging Waste Directive, etc.; Conto Energia Feed-in tariff, 55% Tax relief for refurbishing projects, green energy certificates, etc.), as well as regional law (Regional Law 23/12/2004, #24 on the Discipline of energy programming; 1st in Italy of its kind) and action plans (in energy: 2008-2010 and 2011-2013).

A budget of € 90 million was allocated to the 2008-2010 Regional Energy Plan (REP), with defined energy saving targets for the several demand sectors (residential 30%, transports 40% and industry 25% of the overall goal). Outcomes cannot be overemphasized: PV panels went from 15 to +6,000 between 2000 and 2010; yearly savings represent 1.7 MToe; installed RE power grew 400 MW since 2000 to reach 927 MW in 2009 (REP 2011-2013). Prior to this plan the Region had already gone through a transition from oil based to natural gas electric plants reducing 50% emissions from this energy production source.

For the second REP (2011-2013) € 140 million were previewed from the Region in order to support expected total investments of € 2.6 to 3.7 billion in renewables to achieve a 17-20% share of final consumption, and 471 additional KToe in energy efficiency. On the 2020 timeframe continued action in the energy field should deliver total use levels below those of 2007 (REP 2011-2013). Foreseen actions are very diverse, yet always with associated funds: € 5 M for R+D, 12 M to promoting industrial greening; € 3 M to the agrarian sector; 10 M for housing and urbanism; € 15 M for sustainable mobility; etc.

Moving on in Emilia Romagna's transition to a green economy **the Region launched in 2011 the *Patto per la crescita intelligente, sostenibile e inclusiva*.** This pact that literally reproduces the concepts of the EU 2020 Strategy gathers the most relevant social and economic stakeholders (province authorities, the Association of Municipalities, employer federations, workers unions, Italian Banking Association, third sector organizations) in pursuing, in line with the EU, a more efficient use of the resources within the 2020 and 2050 horizons. Citing the text: "the duration of the crisis imposes to continue emergency policies", such as guaranteeing credit and liquidity by the Government to businesses and entrepreneurs. A new social agreement is required, intensifying the fight against tax evasion and fraud, and reinforcing the value of full labor and work quality in fostering social cohesion. Training programs to adapt the workforce for the future needs of the economy will be implemented, and in this sense a key role to growth is given to the green economy, the local-regional assets (environment, heritage, culture, etc.) and the *Made in Italy*

trade mark. Research and Development, energy policies in concurrence with the European mandates at both the regional and local level, preservation of welfare services, and efficiency, transparency and effectiveness of the public administration, wrap up the Region's vision of a 'smart, sustainable and inclusive' development. The issue of debt is also approached in Emilia Romagna by passing a commitment to the Stability and Growth Pact of the EU.

The inspiring words of the 'Patto per la Crescita' were to be translated in 2012 into a common strategy relating to the programs of the EU Structural Funds 2014-2020 and the future Research Framework Horizon 2020. Obviously, results of this whole process are still not visible, but it is noticeable whatsoever as a start-up for bringing on board the topic of green economy the different agents in one same territory.

The municipality of Bologna spreads sustainability activities mostly in 3 of its 8 divisions, namely: urban quality; land quality and management; and community wellbeing. The latter take care of services such as energy and environment, sustainable mobility, housing, spatial planning and urbanism, and strategic planning. After initiating energy works in 1981 (see section "Summary and Highlights of Green Economy in Bologna") and intense adoption of sustainability policies in the last 2 decades (CCP, Local Energy Agency, LA21...) **the city has been able to curve down several per capita environmental indicators**: GHG emissions, residential electricity, motorization index, urban waste, residential water (see box below "Environmental Profile of Bologna"). And the other way around, positive trends in alternative fuel and electric buses, and separate collection rates have shown continuous growth. Just for renewable energy supply the figures remain low; 5% between 2006-2009.

By 2020 Bologna is committed to reduce GHG by 20% compared to 2005 (-7% vs. 1990). In 2007 a Local Enery Plan (LEP) was passed. This plan was recently migrated to a CoM-SEAP, in the 2008-2011 period, when Bologna led the European Life Project LAKS (Local Accountability for Kyoto Goals, in which GI -also in this research- took part as well) born in parallel to the CoM campaign. The project allowed the city to be a forerunner in joining CoM (2008), but -as earlier explained- the governance crisis it went through right after, stopped the LEP-SEAP merge until 2012. As the SEAP registers, 19% of the CO_2 depletion target has already been obtained with actions in the 2006-2011 lapse, such as: building retrofit with 55% tax relief, efficient appliances in housing, private vehicle renewal and conversion with financial aid for GLP and methane fuelled cars, massive expansion of solar panels, interventions in municipal buildings and equipments (street lighting, traffic lights, solar for HSW in sports facilities...), new planning instruments, etc. In a prior stage (1990-2000) other actions had been deployed in the area of energy production: 2 MW hydropower plant (1995); gas based co-generation and methane DH for 1,800 dwellings (1995); CHP waste incinerator heating 2,300 homes (1990); and wind farm in Monte Galletto (1999) despite out of the municipal boundaries. Considering all this previous work, for the 2010-2020 decade the focus for increased efficiency and GHG mitigation is on housing (27%), tertiary and industrial sector (27%) and mobility (20.5%).

The temporary (2009-2011) break in Bologna's energy planning process was used to include the principles and visions of the new Master Plan (MP) of 2008 into the SEAP. As the first observes, from the point of view of environmental sustainability the future development of the city should: a) protect climate and the atmosphere, reducing GHG emissions and pollutants rising from heating and traffic; b) reduce noise pollution through an adequate placement of housing and roads; c) protect and improve water resources; d) improve soil quality, by regenerating permeability and preventing urban sprawl; e) value and steward natural habitats, the landscape, green areas, parks and protected areas, through ecological networks, in special riparian systems. Thus, the new MP sets initial concepts for urban mitigation and adaptation of climate change in a wide sense of the issue; principles afterwards turned into measures in the Construction and Urbanism Regulations. In the same direction, the Urban Traffic Plan of 2007 established noticeable targets in public transport and cycling: increase of 40,000 (+17%) and 20,000 daily users respectively. The SEAP adopts all these mandates and prospects, yet part of this concurrence mission was already made by the LEP 2007. According to the MP 5,000 new homes will be needed in the next years; in a BAU scenario this would cause a +5% growth in GHG. The LEP tackles such rise with strict green building regulations passed in 2009.

The Sustainable Energy Action Plan (SEAP) of Bologna uses the 'SMART' approach: Specific, Measurable, Achievable, Relevant and Time Bound. To the 27 actions already in place from the 2006-2011 period, the SEAP adds other 61. Actions cover many aspects, like investments in efficient appliances, heat pumps, energy retrofitting, etc. in all kinds of buildings (government, residential, tertiary and industrial), with even some A class constructions. In mobility, operations will deal with a wide range of topics too (public transport, cycling, biofuels, restricted areas, etc.). Other actions refer to renewables, co-generation and CHP plants; planning instruments are envisaged, as well as international projects and citizenship engagement activities. Investments of € 4.2 billion are calculated. Obviously, the evolution of the economic and political crisis in Italy will influence the final outcome of Bologna's energy sustainability plans. The key challenge will be refurbishing thousands of buildings, as payback periods are long (10-15 years) and costs enormous.

Examples of sustainability measures in energy, transport and housing in Bologna:

- LEP 2007: study of heating [in]efficiency at unit level, creating a map of energy demand of all buildings in the city: 170kVh./m^2.
- Since 2009: 500-700 new/refurbished residential buildings, including 1 kVpic PV/person, in tertiary 0,5 kW/ 100m^2. For solar thermal 50% of HSW in resid., hotels and so on. More strict than Regional: solar instead of heat pump / co-
- Heating systems safety control: single systems, controlled yearly -communicated every two years-. This allows doing efficiency control through a sample every two years.
- Showroom of energy and environment, placed in a refurbished ancient municipal school: 2000m^2
- 350 public buildings with energy audits. 10 with simulations for turning them A Class.

geneneration. If refurbish. only for isolation, solar not needed. If they include heat systems then solar thermal is mandatory. PV only in integral refurb. Incentive: +10/20% construction capacity if B/A Class.

- Since May 2011 35% of all energy consumption in new/renovated buildings must be from RES.
- The City gives the right to 100 years of free housing in exchange for renovation. The program also has the option to self-construct. Green standards are mandatory. The city gives the building for 1/3 of the value; currently 42 flats.
- Renovation operations are constant. If necessary to demolish and rebuild high env. standards are implemented (funds from superior institutions). Light renovation works are foreseen every year such as skin insulation. A local mandate sends a part of the rentals for a maintenance fund.
- New social policies: collaborative housing and co-housing. 2 projects currently: 1st for under 35 years of age; 2nd for elderly. Buildings include common spaces in order to generate solidarity processes, internal economy, energy savings (e.g.: one place for washing). These projects are decided by the same potential dwellers through a social monitoring process. They must generate their own social chart of values to which they commit. The first project will include around 40 people. Strategic for the elderly, as Bologna is an aging city with many single elderly people.
- 2013: new contract with ESCO for +20% EE in LG buildings. Bring Housing Ag. in Energy Ag. to turn DH plant into CHP. Finance heat losses in public housing thru more sales and prevent en. poverty.
- >10% public dwellings (12 K). Rent from 0€ to 1/2 market. Private promotions supply % new stock.
- Incentives for car fuel substitution (CH_4 and LPG); 2012: 15% of all cars, from 4% in 2003.
- New efforts for substitution in freight, thru subsidy + incentives (e.g. cost of permits) and restrictions: city center access upon pollution levels.
- PT: all 500 buses hybrid or CH_4 (150 now; 2 gas points); in city center expand trolleybus.
- Elect. bikes (exploring replacement of fuel mopeds ; rate 14 : 100 inhab). 300,000€ to reach 1,000 e-bikes in 2012; so far, 10% with moped return. Broad E-charging points plan. Regulation of access to city center by scooters in the future.
- Plan to reach 30% PT; so far 96 M users/y. With year pass for civil servants, from 600 to 10,000.
- Participative traffic planning and management: workshops, forum online, sessions... 3,000 contacts in last plan. Participatory lab for cycle network, district mobility, <30km/h zones, etc. "Secure routes" to school: teachers and parents promote children using bicycle and by foot. They impulse the "pedibus" (bus on foot with tutor). Closure of areas on weekends: "T" days with shows and other activities to enjoy the street.

Bologna's green development teams are very active in international projects, such as: ICLEI's ecoBUDGET to generate annual environmental balance as part of the municipal yearly programming and budgeting; *GAIA* a EU Life+ project a local PPP promoting tree plantation in compensation of industrial GHG emissions; EU Life+ *Blue Ap* aiming at delivering a climate adaptation plan with experimental measures included; Urban Api financed by the EU R&D 7th Framework for the development of decision support systems for urban and environmental planning through modeling and data integration. Currently, a total of 5 international projects, 4 more in the 2006-2011 period, active participation in networks like ICLEI and the Sustainable Cities and Towns Campaign, and inclusion of 4 new projects at short-term in the SEAP.

Bologna is in process of producing a strategic plan looking forward to 2021. 'Environment, urban assets and mobility' in one of the 4 development axes. This domain includes a variety of topics in Bolognas progress towards a greener city: further pedestrianizing the old quarter; reinforcement of the green infrastructure; restructuring of the metropolitan and urban transport systems, including new railway services; [social] housing measures including energy retrofitting; metropolitan agriculture and a metropolitan pact on soil consumption and urban renewal; green economy...

Last but not least, **HERA corporation (born in Bologna 1990) is a 61% public multi-utility of 186 LGs in several Italian regions**. Hera supplies energy, water and waste services. Besides conventional technologies, HERA is continuously improving its environmental performance. Green economy projects and actions: R&D in anaerobic digestion acceleration (2 X 8-10 days) thru CO2 recirculation to increase the rate of methane production; 10 gas DH co-generation units in Bologna; 1 geothermal DH in Ferrara; PV, WTE, biogas from landfill, composting. They have trucks and vehicles running on methane. In two cities where they own the electric network they are building charging points (innovation: electricity is paid on the monthly electricity bill). They adopted an energy and resources optimization policy: end of 2012 closedown of offices spread out and concentration in two regional headquarters, in addition to full prepared mobile office-vans for operators. Working on the concept of creating an energy-&-waste recovery cluster in Emilia Romagna. So far, they are building a selection plant for the Bologna incinerator to reduce transport for non-recyclable waste; and they promote recycling industries to locate in the same area. Companies should receive incentives for relocating (like for APEAs). They stress data/analytics dissemination thru website.

With all this track record **Bologna stands out among the mid-sized cities as an example of sustainable development policies and institutions, and municipality led green innovation**.

Confcooperative is a confederation of cooperatives with 1,800 companies in the 9 provinces of Emilia Romagna. **About 15-20% of the cooperatives' turnover is in green economy, representing 10% of Emilia Romagna's GDP.** Green sectors include: co-generation and RE (PV on roofs, 2 agri-cooperatives produce CHP for energy crops, some with micro-Aeolian); freight services with e-vehicles, public transport in Bologna; global service in public spaces (street keep-up, lighting, green areas and parks, etc.), construction and housing rental cooperatives (>40 in Bologna) which are members of a EU network of sustainable building cooperatives (several A class dwellings); water treatment plants; waste collection and treatment; soil conservation; water efficiency; promotion short commercial circuits; sustainable forestry certification.

CNA, the Artisanat and SMEs national confederation, is running some programs to foster green economy among their associates (16,000). In GE, they have the Energy Excellency Club a quality label for companies providing energy services: saving, renewables etc. They are required to take training activities, prove solid economics, legality, etc. CNA also provides info and training (financial aid, tech. assistance...) about EE to the members and citizenship. So far, results of energy audits for SMES show that the cost of energy in overall operations is <5%; hence, few members are implementing EE measures for now. Instead, CNA manages corporate energy deals. CNA is also working on closed-loop economy thru a website to reunite and exchange materials and byproducts between companies in one same municipality. They also offer assistance for R&D in green products/processes through links to the universities and research centers.

UNINDUSTRIA, with around 2,000 enterprises from 10 to 500 workers, is involved in green economy by promoting eco-industrial parks (APEA; Area Produttiva Ecologicamente Attretazata) in response to a national regulation of 1998. They offer audits/assistance on energy, logistics and supply chain, water and waste, planning and communications. Some green concepts emerge: plan the areas near the highways and railway (for workers mainly) for efficiency and prevention of rural pollution; creation of a park management building with all the services (bank, restaurant) and centralized services on energy and products; design of the park structure (avoid the heat "canyon" effect by separating the buildings at least 5 m. from the streets and in between). The main obstacle of the program is that most parks are already built and the transition would require companies to relocate, which is very difficult, moreover with the ongoing crisis. A new project is a by-products database for sales, recycling... And they have created an industrial sustainability chart for the region, which might extend nationally. Unindustria participates also in project *GAIA* which pays for trees and grass in public parks in Bologna (also in an industrial park) in exchange for emission excess. Also innovative is their "PV community" in residential and industrial roofs to invest in other actions.

ASTER is an R&D&I Consortium among the Region, the 5 Universities, 2 National Research Centers, the Union of Chambers of Commerce and the regional Entrepreneurial Associations. ASTER sustains, coordinates and valorizes research and technology transfer throughout the territory. It supports the productive system through promotion of industrial research, technology development, high quality skilled professionals and, etc. Since 2005, ASTER is coordinating the Emilia-Romagna High Technology Network. This includes the **Energy and Environment Platform gathering 7 industrial research labs (staff 250)** engaged in env. quality control, natural resources management, development of renewable energy sources, analysis and reengineering of products, and others, pursuing to optimize the use and maximize the recovery of material and energy.

Other good examples of green economy in Bologna are Micro-Vett and Impronta Etica. Since 1986 Micro-vett is designing and manufacturing electric traction systems (for cars, small freights, 3 wheelers, etc.). They work for FIAT, IVECO and some Chinese manufacturers, selling 1,000 vehicles per year; 60% exports. The greatest challenge is distance autonomy, max 200 Km so far. Impronta Etica is an NGO working on CSR for all kinds of companies, from super-market chains to banks. They provide and disseminate applied research thru pilot projects (e.g. green events, sustainable transport); methodological topics (PPP on energy, waste, etc.); research on models and indicators; and green business assessment.

C/P Workshop of Development and Climate Change

Climate Change

Conflicts; Challenges:			Opportunities; Capacities:
▪ Reduction of floating particles and air pollut. ▪ Increase of Green Areas ▪ Change of lifestyle ▪ Zero emissions from public sector: buildings, transport, energy, etc. ▪ Less GHG in transport and buildings ▪ Urban requalification projects for citizen engagement	▪ To approve and implement an effective SEAP ▪ Mobility issues in general ▪ Microclimate adaptation strategies: green roofs, gardening, etc. ▪ Education and communication to increase citizenship involvement ▪ Increase of organizations working on degrowth-friendly ways ▪ Better waste separation	▪ Investment on Green Public Procurement ▪ New technologies on key climate sectors ▪ Economic mechanisms for climate action and development of the SEAP ▪ Public interventions to plan and develop green economy industrial clusters ▪ Increase of public-private partnerships ▪ Increase Inter-department coordination and cooperation.	▪ Political vision and interest on the issue ▪ Increasing citizen awareness ▪ Some green lifestyle changes are very fashionable today: organic markets, etc. ▪ Tradition on public participation --> trust and will to participate of the population ▪ EU Policies ▪ Very active LG on international networks

Development

Conflicts; Challenges:		Opportunities; Capacities:	
▪ Public and private investment in R&D ▪ Youth employment ▪ Aging population ▪ Economic Recession in general ▪ Increase of public-private partnerships	▪ Intergenerational and intercultural policies ▪ Attract investments ▪ Creation of new jobs ▪ Increase Inter-department coordination and cooperation. ▪ Many public brown fields to regenerate	▪ Universities and spin-offs ▪ Industrial interest on green economy ▪ Authorities' interest on new policies ▪ Strong economic structure: small-medium size companies, cooperatives, etc.	▪ Tradition on inclusion policies ▪ Important third sector network ▪ Multiculturalism - Co development opportunities ▪ Cluster in sectors as packaging and auto industry

Brief highlights:

- The approval and implementation of an effective SEAP must tackle in special emissions from the public sector (and aim to a zero carbon administration), less GHG from mobility and buildings in general, and abate air pollution in particular. Political vision and interest in climate change, increasing citizen awareness and widespread activity of the LG in international networks are the assets for a successful achievement of the prior objectives. EU policies in climate change and green economy provide the common ground for more and better cooperation between sectors and services. Nevertheless, inter-department cooperation, more PPPs and interventions to develop green economic industrial clusters are fields in which Bologna must intensify its activity.
- Urban requalification projects are challenge with strong potential to foster citizenship engagement. It opens the possibility of regenerating many public brown fields while increasing green areas and introducing green building strategies, such as green-roofs. Improving micro-climatic conditions the city is one of the key aspects of its adaptation to climate change. Bologna's tradition in public participation enables the necessary trust and will for constructive cooperation. Some green lifestyle practices are very fashionable today (e.g. farmers' and organic markets; recycling...). These activities will help coping with needs of education and communication to increase citizenship involvement, and pave the way for the ultimate goal of producing a change towards degrowth-friendly lifestyles.
- Green and social economy (cooperatives, third sectors, inclusion policies, etc.), mature clusters like packaging, and the economic structure of SMEs are economic strengths of Bologna. The Universities and their spin-offs deliver innovation and new opportunities. All of the prior must become sources of jobs to tackle youth unemployment and processes like aging population, despite public and private investment in R&D is in conflict due the recession.

Interviews Bologna

Public Sector

Municipality:

- (W) Advisor on Spatial Planning and Environment.
- (M) Energy Officer - Spatial Planning and Env. Department
- (M) Transport Officer - City Quality and Urbanism Department
- (M) Land Planning and Housing Officer - Welfare Department

Other public authorities:

- (M) Consultant Environmental Policies - Ervet - Reg. Dev. Agency

Private Sector- Corporations

- (W) CNA - Resp. Environmental Programs
- (M) Multiutility Hera Corporation - Manager
- (W) Impronta Etica Corporation - Secretary
- (M) Unindustria - Respons. Land, Environment and Transport
- (M) Micro-vett.it Corporation - Sales Manager
- (M) Confcooperative - Technical Expert

Civil Society

- Cancelled

Education - Research

- (M) University of Bologna - Green Economy Expert
- (M+W) Aster Research - Director and Expert

Not interviewed

- (M) Regional Adviser Energy Policy - Completed survey online
- (W) Head of Environment Quality Unit - attended workshop
- (W) Equal Opportunities Officer - attended workshop
- (W) Head of International Relations Office - attended workshop
- (W) Culture and Tourism Promotion Unit Office - att. workshop
- (M) NGO: Legambiente-Reg. President - Cancelled

Brief highlights:

- The interview program was initially large in number and varied in organizations, yet several meetings were cancelled. Finally, 13 interviews were conducted plus one survey completed digitally.
- In contrast to other cities the number of interviews of private sector organizations was larger. Many of the latter were sector federations (cooperatives, SMEs, Industry, etc.) providing an overarching view of their affiliates' engagement in environmentally friendly activities.
- As in other cities it wasn't possible to interview a representative of the civil society.
- The diversity and number of organizations programmed by the Municipality suggests a broad knowledge and interaction of the latter and the stakeholders involved in green economy.
- Only 4 out 15 interviewees were women, despite the initial program was more balanced with 8 W and 13 M.

Interviews: General Information and Social Economic Aspects										
Interview	**Year**	**Activity**	**Management**	**Jobs**	**2020 Jobs**	**Turnover**	**2020 Turnover**	**Prod/Service**	**Market**	**Performance**
		% Green	**PB/PR/J**	**#**	**#**	**€ /USD**	**€ /USD**	**Units**	**L/R/N/E/W**	**0 - 10 points**
Sust. Mobility - Urbanism Dep.	1980s		PB	70 (from 1000)	less	Last 4 years: 20 M€	Reduction	Trolley-bus, Bus, mobility planning	L/R	6
ASTER: High Tech. Network	1985	~25%	PB	5	--	750,000 €	--	Tech. transfer, support to R&D	E	
CNA: National Conf. of Crafts	1970s	11%	PR	2 + 1,800 over 700 + 16,000	3 (CNA Staff)	50,000 €	100,000 €	Green programs in CNA	L	7
Multi-Utility HERA	2002		J (61% PB)	6,656		3,668 M€		Waste, gas, DH, H20, elec.; 80 plants	N	8
Unindustria	2007	5%	PR	4 + indirect by free EE audits	Growth in the member	Low	--	100 ind.; Sust. Ind. Parks; EE Audits	R	8
Micro-Vett	1986	100%	PR	55		19M€		Electric traction systems	W	8
Confcooperative	1980s	15-20%	PR	15-20%	>50%	~2,350 M€ (1.8% of reg. GDP)	(~4.5% of regional GDP)	Services and Lobby for Coop.	R-W	6

Brief highlights:

- The number of answers to this survey is low in relation to other cities and compared to the total number of interviews made; 7 out of 15.
- Most of the responses obtained correspond to the private sector, which is interesting in order to collect their feelings about progress of green markets more in general.
- Just a few of the interviewees suggested forecasts in terms of jobs and turnover for their activity, but when not (Multi-Utility Hera, Unindustria and Micro-Vett) self-evaluation of performance was quite positive (8). The cooperative sector shows important ties to the green economy (current 15-20% and € 2.3 billion turnover) and sees strong potential for growth by 2020 (over 50% of their total activity).
- The Mobility Department of the Municipality considers that jobs and budgets in their field will reduce over time as important investments have been done throughout the last years.
- The High Technology network ASTER measures at a remarkable ~25% the share of their activity in the field of green economy.
- In general performance results are not very high (no 9s or 10s)

Interviews: Activities, Constraints, Future			
Organization	**Activities**	**Constraints**	**Future**
Energy Office - Spatial Plann & Env. Department	▪ Energy assessment of buildings. The local reg. obliges PV (1kVpic/person) in new residential. In tertiary they mandate 0,5kW/100m². For solar thermal 50% of HSW in residential and in hotels, etc. Since May 35% of all energy consumption of the building must be from RES according to regional leg. Bologna raises restrictions, instead of heat pump and co-generation, only solar for new and relevant refurbished buildings. If the refurbishment includes only isolation they do not have to put solar; only if they include heat systems. PV only in integral refurbishment. ▪ Safety of housing heating systems: control once a year for single systems, communicated every two years. This allows EE control every two years. ▪ Energy planning activities. The last plan (2007) was designed for the Kyoto goals (-7% vs. 1990). They found that between 1990 and 2004 +18% GHG. The Master Plan forecasts 5,000 new dwellings --> +5% GHG. To reach Kyoto the plan aims at -28% by 2012. Currently, updating the plan to CoM-SEAP. The 2007 Plan developed at very precise level; gas consumption for every building (~170 kWh/m²). Analyzing the results of actions conducted between 2004 and now, already 20% achievement of the 2020 target. On one side thanks to changing the base to 2005 and -20%, yet similar to Kyoto. ▪ Control of street lighting, traffic lights... ▪ They have an audit of municipal buildings (350). One audit is from the company that provides the energy services (300). Another (50) including simulation of actions from 10 to turn them into class A. They found out that is costs a lot. ▪ Very close relation to the social housing office, which owns 50 central heating plants and 200 housing buildings with 14.500 housing units. 2,000 homes on DH and 500 more on the central heating. They are talking to the company on how audit and retrofit this buildings.	▪ The possibilities of implementing the SEAP will be very much dependent on funding, stakeholder involvement and political engagement. SEAP costs are measured on 669M€. ▪ Involvement of citizens is crucial: a resource in place is the showroom of energy and environment, placed in a very ancient municipal school. 2000m² with an exhibit, panels, efficient appliances, etc. It is a school for craft workers, so they also learn about efficient construction ▪ Costs of implementing the SEAP. They will try to include the ESCO in the SEAP. The end of the Actual energy service is 2013, the new one will include a energy performance contract with 20% efficiency increase. ▪	▪ First objective of the SEAP will be to conduct the refurbishment of thousands of buildings, as this has a very long payback period (10-15 years) and the costs are enormous. ▪ The larger actions are on transport, either for air pollution and mobility issues in general (so not only related to SEAP targets). ▪ ESCO in the new energy service contract. The end of the Actual energy service is 2013, the new one will include an energy performance contract with 20% efficiency increase. ▪ For social housing they discuss with ACER (social housing company of the Province) to include them in the new Energy Agency, so that they participate in the issues of energy saving, insulation... ▪ They add another aim, which is to reduce energy price, to solve energy poverty problems. ACER manages a very big DH plant. If they change the current one to co-generation it would be possible to finance heat loss intervention as they would earn much more money from the plant. ▪ Opinion: Despite Bologna's energy efficiency regulation for buildings is quite strong, it could be improved affecting all reconstruction works.

	Activities	**Constraints**
Sust. Mobility - City Quality and Urbanism Dep.	▪ Mobility planning, through: traffic plan, other more specific or sectoral like parking, cycling plan, air quality program... ▪ In 2007 while elaborating the Master Plan, there was an integration process of development plans and transport plans on a long term. Not only organizing the current services and infrastructures, but also future projects and infrastructures (tram, air-rail). ▪ They provide the Office of public works with preliminary projects and guidelines. ▪ Also: coordination of actions and stakeholder interests (TGV, highway network, metropolitan railway plan citizenship). Undergrounding of the TGH station will free a large amount of lanes for the metropolitan railway system. ▪ Manag. of construction works in streets, streetlights, underground parking, transp. tech. (cameras, fines, etc...). ▪ Mobility management and innovative mobility: car sharing, incentives for car fuel substitution (funds from the Region) -there are 800 CH_4 companies and 1,200 on GPL-. They promote tech. change or car change: today 15% degree of substitution -from 4% in 2003-. Lately, new efforts into subst. for commercial sector, through partial subsidy of the change + regulation (incentives, e.g.: cost of permits; restrictions: city center access (hours and total time) depending on the pollution levels. Incentives for change are not enough, but help to increase stability of change. Public transport. Target: all 500 buses hybrid or methane (150 now; 2 distribution points); in city center trolleybus. Electric vehicles: bikes (Region studying if e-bikes can replace mopeds in Bologna; 14 scooters per 100 inhab). New program with 300,000€ to achieve 1,000 e-bikes by summer 2012; until now there's been 380 bikes sold with around 10% with moped return; also open to electric scooter -2 were sold-). They have planned a very large number of electric car charging points with *Enel*. The city will regulate in the future the access to the city center for scooters. Conventional cycling is less promoted than in other cities of the Region. The last account on cycling shows a 10% increase. ▪ They monitor the plan objectives, but no necessarily on a yearly follow up basis. They wanted to get to 30% PT but it wasn't possible. So far, they reached 96,000,000 users/year. They created incentives, such as yearly cards for workers: from 600 to 10,000 civil servant users. ▪ The emissions of the transport sector are measured by the Env. Dep. They do not conduct quantitative monitoring per year; they care more about actions themselves. They provide a lot of data to other areas but it's not their mission. ▪ In order to create a positive opinion on sustainable mobility the city promoted the closure of areas of the city for weekend: "T" days with show and other activities to appreciate the street. ▪ Regarding participation they use different instruments. For the last traffic plan there was a strong process of involvement of the citizenship with workshops, forum online, sessions... 3,000 contacts done. There are co-involvement actions for specific programs -for example participation laboratory for cycling network, district mobility -30km/h zones, etc.-. They are experimenting now with the "secure routes" to school, in which with teachers and parents they try to promote children using bicycle and by foot. They impulse the "pedibus" (bus on foot with tutor).	▪ Lack of funding, personnel, it generates frustration not being able to satisfy citizenship requests ▪ At the legal level often there is no correspondence between the law and technological innovation: control systems for small particles for example... ▪ Rules in practice in other cities in Europe. Regarding organizing streets there is no legislation in Italy. For example occupied points for car sharing, is it possible to protect them another way? The law doesn't observe it **Future** ▪ Fulfillment of the Plans and sustainable mobility targets on Public Transport (30% share of total mobility); 100% eco-friendly buses; electric vehicles program, etc. Even studying e-vehicles for commercial delivery services in the city center.
Organization	**Activities**	**Constraints**
Housing Office - Welfare Dep.	▪ Public and Social Housing. A yearly amount of dwellings are rented to families according to income and characteristics (young people, immigrants, single parents, etc...); prices from 0 to half the market rate. In 2011 800 homes, new or returned by families no longer requiring housing. In some cases the renters shall buy the homes, but few. There are also some transition apartments for people who have achieved some income and do not need as much support anymore. The social cost of the worst cases is 120€/day as besides housing they receive social care. ▪ The stock keeps growing as private interventions deliver new public housing according to the reg. laws. Currently 12,000 public dwellings out of a total stock of >100,000. ▪ The Comune gives the right to 100 years of free housing for apartments in exchange for renovating the building. Within this program there is also the option to self-construct buildings. In this case they must observe the national and regional environmental standards. The city gives the building for 1/3 of the value. There are currently buildings in this program, around 42 apartments. ▪ Every year there are operations of building renovation. When necessary to demolish and rebuild the new buildings include energy, water, material, and RE performance (if available funds of superior institutions). Some light renovation works are foreseen every year such as skin insulation or similar. A local agreement mandates that a part of the rentals go to fund maintenance actions. ▪ District Projects is a program that provides important co-financing from the nat. gov. to invest on very high quality energy and env. performance, covering the extra costs. Bologna had 2 District Pr. in 2001 and 2009. The last one retrofitted 2 buildings and demolished-rebuilt 2 more. ▪ Interventions on public housing achieve the nat. and region energy standards: 50% of water for HSW; > 1kW PV per dwelling, RE and efficiency of the	▪

	heating system. Also regional water saving standards, such as underground cisterns for watering; outcome is class C-D. The local regulation is even stronger, much more than the other cities: rain recovery is mandatory for new buildings, and a cap in water use per capita. Unique in Bologna (in public and private) incentives (10/20% more construction capacity) if B/A Class reached): very high standards for H_20, En., reuse of demolition mat., unsealed green land. ▪ For renovation, new heat plants must introduce RE. For other actions it is only mandatory to respect the national law. ▪ The second task of the housing department is to experiment new social policies: collaborative housing and co-housing, for instance; 2 projects currently. One cohousing project that will be developed soon is for under 35-yearold people. Another project in process will be for elderly. The buildings are designed to include common spaces in order to generate solidarity processes, internal economy, energy savings (e.g.: one place for washing). These projects are decided by the same potential dwellers through a social monitoring process. They must generate their own social chart of values to which they commit. The first project will include around 40 people. They are searching funding for the second project (2012 is the year of the active elderly people). For elderly it is very important because it is an aging city with many single elderly people.	**Future** ▪ In the future an Agency will be responsible of the assignation process (ACER); a task currently done by the Department responsible for management and maintenance of the building stock. ▪ On cohousing they plan to study and discuss some future intergenerational project.
Organization	**Activities**	**Constraints**
Ervet - Regional Dev. Agency	▪ Ervet is the Emilia Romagna Dev. Agency (9 provinces, 360 LGs, 10 regional capitals). Born in the 70s around the regional ind. sectors and research centers: textile, shoes, metal-mechanic, ceramics... The activity of Ervet was to support the environmental, research and analysis activities of these sectors. At the beginning of the 90s with the appearance of the voluntary environmental instruments, the Environment Unit was created. Together with other local agencies, and sector associations they gathered to promote the SD policies. In the 2000s they became an in-house society of the Region (>90% shares) after Prodi law. The Region establishes 3-year programs. About 20% of the budget is from EU. In general ERVET does support, analysis and coordination in order to integrate actions, at regional level they also support to write policies and plans. Ervet Emilia Romagna Valorizzazione Economica del Territorio ▪ Following the concept of industrial symbiosis Ervet promoted the environmental requalification of ind. areas, which has become a regional regulation. All the new areas planned under APEA (Aree Produttive Ecologicamente Attrezzate). Environmental services provided: common wastewater plant, closed waste treatment service. The Region promoted Network Cartesio, with 6 member regions that confront periodically about APEA in Italy. Currently, 42M€ from Emilia Romagna have been allocated from POR-FES (Development Funds) to APEA. ▪ Support to the Sustainable Consumption and Production: env. labels and certification; promoting demand increase; Green Public Procurement (GPP). 2012 review: In Emilia Romagna at least 45% of authorities have made some type of GPP regulation. Promotion and application of cleaner tech.: website unifying resources and techn.; info on regional providers. ▪ CC method. support: guidelines to the Province for CO_2 reduction plans - yet, not CoM support structure. Now looking to integrate the work of municipalities in their act. ▪ The Green Economy Report: it started because the Region could not measure the scope and dimension of the green economy, particularly because of the strong traditional sectors in the Region; thus, to see the green evolution of these sectors. According to the Activity codes it is difficult to determine which activities are green or not. They have generated their own methodology starting from "green business" (economic classification helps) and "green production" (ecolabels and certifications): 2010 is the first report, because the Region wanted to promote green economic policies, as for example the POR-FES funds to green drivers: APEA, support to GPP ...	▪ The challenge is how to attract companies to move from current locations to APEA areas or to manage the establishment of new companies in APEAs under the framework of industrial symbiosis. **Future** ▪

Organization	Activities	Constraints	Future
Regione Emilia Romagna	▪ Emilia-Romagna's Region (RER) promotes green economy in every sector in which is competent. In particular, RER works to develop the regional research system, to support the industrial sector to realize energy efficiency measures, to see that new buildings are made with energy efficiency techniques and using renewables energy sources (RES), to help the agricultural sector to introduce RES in its supply, to develop sustainable mobility, to lead all the regional actors and stakeholders in one clear and stable way in direction of green economy	▪ The principal difficulties met by RER to achieve its targets are the following: ▪ 1) economic difficulties, both for the private side and the Administration one; ▪ 2) social acceptability of the energy projects, in particular; ▪ 3) cultural divide about green economy and energy system.	▪ This critical economic moment could be capitalized by working on those sectors that could promote investments on sustainable mobility, in agree with the reduction of the atmospheric pollution. ▪ It could be a priority also working to spread RE and the energy efficiency measures in buildings and industries. ▪ To achieve the prior, the important factors will be involvement of all the stakeholders, decision capacity and renewed financial capacity for the investments.
Organization	**Activities**	**Constraints**	**Future**
ASTER: High Tech. Network	▪ ASTER is a Consortium between Emilia-Romagna Regional Government, 5 Universities and the Nat. Research Centers in the region -CNR and ENEA- the Regional Union of Chambers of Commerce and the reg. Entrepr. Ass. It has the aim to sustain, coordinate and valorize research and technology transfer throughout the territory. It supports the promotion of industrial research, tech. dev. and the improvement of high quality skilled professionals and career development in technology transfer field. Since 2005, the main activity is dev. and coord. of Emilia-Romagna High Technology Network: industrial research laboratories and innovation and technology transfer centers organized in 6 Thematic Platforms. ▪ Among these, the Energy and Environment Platform gathers 7 industrial research laboratories engaged in developing and transferring innovative technologies and methods regarding: environmental quality control, natural resources management, development of renewable energy sources, analysis and reengineering of products, systems, production processes and anthropic activities in general, with the purpose to optimize the use and maximize the recovery of material and energy. The 7 laboratories mobilize a total number of about 250 researchers. ▪ Based on its role, in over twenty years of activity ASTER has developed a number of initiatives at national, European and international level in order to develop new opportunities of collaboration and to ensure the presence of the regional system within relevant international networks. ▪ Aster mission and activities are based on the Regional research and innovation Law nr. 7/2002 (which represents the first Regional law for innovation set up in Italy) and its implementing Program for Industrial Research, Innovation and Technology Transfer.	▪ An immaterial constraint that ASTER faces in its activity is represented by the difficulty to set up a dialogue between Industry and Research, due to the tendency of enterprises to stay in the status quo situation, as "it has worked well so far", to the "natural" resistance to changes, to the budget-driven choices that do not encourage investment in innovation with high pay-back time and high risk... ▪ Furthermore, a limit to success of TT is the different working "modes" of the two spheres (Ind. and research). One of the most important objectives of the Regional High Tech Network is in fact to lead the Research Laboratories to adopt a "enterprise-friendly" way of working, with set contract models, reliable timing, the allocation of the necessary resources, etc. ▪ Scarcity of economic resources is a great challenge to produce the best possible projects. ▪ On the energy field it is easier to find funding, as it is has an economic saving as well, while for the environment it is more related to will ▪ There is a big problem about regulation, the most important boost for green tech could come from the regulatory field (transport, building, machinery…) but not all the public bodies which are able to do this are up to date on this visions and options. ▪ Public Procurement in Italy is only devoted to administrative processes and money saving. It is very difficult in this way to foster green innovation. ▪ In public transport and buildings there is a very strong shortage on investment. And even more on green performance technologies. ▪ Very low reform capacity and flexibility of the Universities.	▪ The energy sector is now experiencing a bloom of projects and collaborations due to the objectives set at local to EU level and also to the strong correlation within energy saving and money saving. Indeed the set of laws currently in force in Italy allows investments in RE plants with reasonable payback time. This new interest has brought along the development of activities aimed at developing new and innovative solutions and prompted a number of private-public collaboration on R&D. ▪ Green Chemistry ▪ Common infrastructure between univ. and R&D Centers ▪ Improving efforts around smart cities: mobility, intelligent infrastructure ▪ Retrofitting - a lot of historical centers in Emilia Romagna. It is very important for energy efficiency and to create technologies and enterprises in this sector to compete internationally. ▪ The average energy class in Italy of the built env is G, while mostly protected as well, so difficult to work on ▪ Big project on electric vehicles: trying to create a new pipeline from batteries to all the infrastructure in Emilia Romagna ▪ Develop the competences in the Universities - adapt their structure and contents to the new knowledge needed ▪ Create the synergies to build critical mass ▪ They are trying to bring competences to the policy makers in order to influence the upcoming regulations on the fields they work ▪ Improve investment on green economy sector - it is not only a priority to international competitiveness of their economic system, but also for their internal growth and demand. Both in human capital and ▪ Just last November all the actors in the region signed the so called the Pact for the EU green growth strategy: one point is to create an industrial and research policy for green development. ASTER is responsible for this strategy, it is the technical support.

Organization	Activities	Constraints
CNA: National Conf. of Crafts - Env. Programs	▪ The organization at provincial levels has the role of relationship and services to the member companies. At national and regional level, CNA doesn't have direct contact to the companies but it acts more as lobby in front of Government. CNA in Bologna is the biggest in Italy about 16,000 members: from single professionals, to those with 2-3, and even a few with some hundred workers. ▪ Regarding climate change and energy saving CNA created the end of 2008 the Energy Excellency Club (EEC) to generate a label for those companies that provide services on energy saving, renewables etc. They must fulfill some requirements such as: participation in permanent learning activities, be economically solid, legally correct, some experience on the field. The technical experts that belong to the EEC have created an Energy Audit service . They participated in the Green Social Festival and those who attended were offered a free audit, for around 20 people. So far 25 companies have subscribed to the EEC and they have created 4 energy efficiency websites. Companies have not necessarily channeled their audit by the CNA service maybe directly with one of the EEC companies. ▪ CNA also provides information to those companies interested in improving their energy performance and they also generate campaigns in the province of Bologna to raise awareness. They also inform their members about financial aid and information about technical assistance for energy efficiency, information about tax advantages. They have a website about energy efficiency. They also organize seminars for the members and/or open to the citizenship about different energy issues. For those companies that work on this field they organize courses (by their external instruction service) and updating activities. ▪ In another program called "micro-Kyoto emprese" around 20 companies of CNA and Unindustria have received energy audits for free. The second step, application of the audit have been done by very few due the crisis. An analysis done by CNA showed that the cost of energy in the overall operational costs is minimal (<5%), therefore they do not prioritize it unless they already preview a change for some other reason. For small and medium enterprises the costs of a unified management of energy services would not compensate. Instead they have promoted some agreements with specific providers of energy, such as HERA that also supplies green certified energy. ▪ On waste the aim is to favor use and recycling of waste. They also promote the creation of new companies that will use these products as sources. It is difficult because these companies require large amounts of waste, and only one province as source is too small. They could also have companies on the sector of technologies. They have created a website to reunite same types of waste from different companies in a same municipality: building companies, car workshops, hairdressers, metal, plastics.... no commerce. Some of their waste is assimilated to urban and collected by the city, but the rest must be taken care of by themselves. They have the platform (cnambiente) but it is not operative but they need time to formalize the contracts between collectors and producers and economic terms. Once done they will go to the cities and sell it. In 2012 they believe to have a first experience in place. ▪ They also offer assistance for R&D in green products/processes through links to the universities and research centers. ▪ Another instrument they developed is an environmental check-up system that assesses the economic costs of environmental services required by the company, after which they can see where are the main needs for alternatives and saving. First they check situation in accordance to the law and potential fines. This project has been experimented by 4 companies, but none have done posterior investments.	▪ The current crisis really constraints the financial capacities of the companies towards green investments ▪ Other companies consider that the final customer will prize the greener companies, if it is only for their own benefit. No added value. ▪ They would promote more green products if there was green public procurement open to small businesses, so not necessarily for large tenders. ▪ When there is financial aid from the region, the trend is that those who are benefited the most as very few big projects. It would be necessary to inverse, so to finance many small actions with small targets instead of very large ones. ▪ Bureaucracy is very large and discouraging. ▪ If the market had a large demand on the green aspects all these questions would become secondary. **Future** ▪ Economic incentives - and penalizing; this is what shows to work. ▪ Correct informational activity about sustainability - Education at all levels. To be regularly aware about these issues. ▪ Continue the capacity building activities to provide stable green and efficient quality products and services.
Organization	**Activities**	**Constraints**
Multi-Utility HERA	▪ Multi-Utility HERA runs services and facilities on waste, water, gas, District Heating. It is a PPP structure: Public 61% and 186 LGs, 9% from bank foundations and 30% small shareholders (21,000). Group Hera acts in 2/3 of Emilia Romagna, and in a bit of the Marche (Pesaro). ▪ In its birth (until 1990) there were 2 municipal companies (AMIU - waste and waste water; ACOSER - water and gas supply). In 1995 they merged (SEABO, SPA as municipal company from 49 mun.). Then there is a process of liberalization of the public services, it goes from a culture of administration to a business culture. In 2002 HERA SPA (Holding Energy, Riffiuti Acqua) is born from SEABO and 11 other societies from Romagna (sea side region, 3 provinces). Then the society went into the stock market (June 2003) and it started to operate integrally. In 2004 and 2006 two more provinces come in (Ferrara and Modena) and small local companies until current dimension. Now they want to grow into the Marche were there are many small competing companies. ▪ Confronting HERA with other Italian companies with this mission they are the best multi-utility in Italy. They are comparable to the best in Europe: the economic and environmental facts confirm; but they can still improve. ▪ On innovation they do a lot of activity as the field of waste is always on evolution.	▪ Improve separate collection, production of renewable energy, in energy saving, in waste consumption. ▪ Lack of legal stability is a great problem. In the last years there's been great uncertainty about legal conditions. Also the economic crisis has caused instability. **Future** ▪ More work on commercial capacity; there will be a large free market in the future, so they must have a vision on its regards and about competition. ▪ In 2013 waste collection in Bologna there will be tender call, this is for gas distribution as well. ▪ Improve organization and management aspects, to reduce costs and become more competitive.

Organization	Activities	Constraints	Future
Confcooperative Emilia Rom.	▪ Union of coop. companies (1,800) in 9 provinces. Active in agriculture, services, productive activities, transport, ind., banking, fishing, welfare (health, care, social inclusion), culture, construction, tourism and sport. They mostly act as lobby in front of the region and the provinces and municipalities. Also provision of services. They have a Nat. organization as well (and provincial at smaller level). In the region all cooperatives account for 10% of GDP. ▪ Cooperative companies are inspired in the principles of sharing and the aim to share benefits among associates. A part of the social capital that is individually provided in becoming member, the rest of the capital is not divisible. In governance all members count for the same vote. ▪ In green sectors they have many different activities, from consulting to waste transport. Coop. has always had an attention to the env.. Grape production has been long time involved on integrated production. On packaging, before everything was use and throw, currently, all coop. share plastic boxes that can be folded after use and reused. Agricultural waste is valorized energetically; several biogas production projects from agric. waste. Only complementarily they include energetic crops. ▪ They've never published a report on their green sector.	▪ The great challenge is how to have sustainable businesses environmentally and economically. ▪ There is a need for more integrated policies on the rural environment. ▪ There is a cooperative that provides energy and gas to all the members, providing green en. if demanded (growing). The bigger agricultural cooperatives use a part of green energy. ▪ Cultural approach and mentality from members and citizenship as well. We make part of a certain model of consumption that takes to the super-use of resources. It is time to think about this; the economic crisis is somehow helping on this. ▪ The costs of industrial research (economic, political, bureaucratic...) are very high. There is no public engagement on research. Only by very big companies that have own resources. ▪ There is too much jealousy on the research field as well, this causes a lot of inefficiency: duplication, uselessness, etc. It is necessary to promote research systems... how to build excellence networks related to the desired research results.	▪ Mountain areas green economy: analysis situation and potentialities, and instruments to promote labor and activity there. ▪ Energy supply-service: growth and dissemination. And ESCOs --> they are working with the banking cooperatives. ▪ Production of renewable energies: PV on the roofs not on the floor; biogas from waste, only exceptionally from crops; ▪ Green requalification of urban ground; retrofitting of buildings. The building stock in Italy is very old and inefficient, but better to improve it that build new and not sell. ▪ To engage in all these futures activities it public incentives are necessary: strong tax reduction, and fix/stable incentives, make them structural, not eventual.

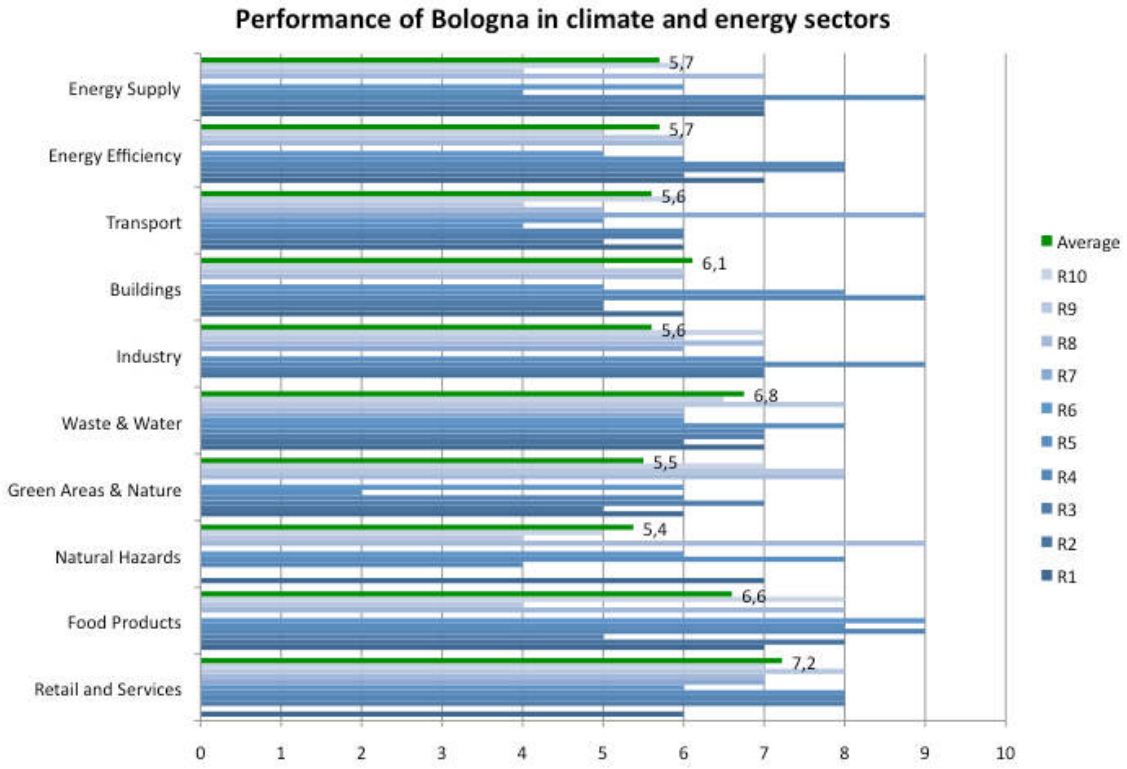
Organization	Activities	Constraints
Impronta Etica	▪ Network of companies working on R&D on sustainability and CSR. 25 members from different sectors and size (HERA, CONAD coopearive supermarkets...). IE born from a group of cooperative companies wanting to compete internationally at the end of the 90s when env. issues became so important and mainstream. It is part of a cultural change process. No international act. but participation in networks as in CSR Europe; no need as the companies have their own strategies. ▪ Applied research - interest topics from their member, support instruments as for example the guide to green events... they analyze a question and develop solutions - the green aspects ; the sustainable transport in the company. They analyze the case of the available solutions, which afterwards are offered to the rest; ▪ Research on method. questions as for example PPPs -they started on the social topic and now on energy, also waste recycling- Ten years ago they worked on labor of elderly of gentrified people; recovery of disadvantaged people. ▪ Research on models and indicators - connections between business performance: territorial capital; social cap., nat. capital; ▪ Support on innovation processes. Support to the birth of ideas -> for example how to create a new green shop -advising-. They also help companies identify their benchmark regarding the best practices. They work on basis of peer-to-peer action, they interlink the companies so they cooperate on specific activities. ▪ There are yearly ordinary activities: info. to members, information pills, participation in networks as in CSR Europe. The research activities have more variability and may enter as opportunity or last for two years. Also external communication. ▪ Success cases: CONAD supermarkets cooperative -> they made a great change introducing green retail, and reducing the through away of unsold produce. Also a lot of actions on transport. / when HERA entered they didn't have even a CSR department / Building responsible construction: include in their process the material providers: LEED Gold for CMB Offices.	▪ Biannual planning when so many projects take longer. ▪ Hard conditions to be members of Impronta Etica: 1) there must be a historical track of env. activities, there will be an audit of the controversial issues -through research and interview; after this the Managers of IE evaluate the new membership. 2) They are completely against the philosophy of certificates/labels. Members with statutory CSR philosophy; quite a unique approach on the excellence field. They'd rather not grow in number but in Excellency. 3) If a member is not active on the innovation and dev. activities in a couple years they are kicked out. 4) The office is hosted by a member of the NGO. ▪ IE is effective, or it would not exist. They only go after funds linked to development lines they have. It is not only to have a green performing building, but the embedded process; Manutencop: GHG verification global service. ▪ There are not enough incentives and many legal barriers; for example in innovation, many legal limits. ▪ All these process are not acknowledged as innovation that provide added value. **Future** ▪ Development of effective public private partnerships in all green sectors ▪ More strategic cooperation between public and private agents on green economy ▪ There is a need of a cultural change from the political and administrative class. They tend to see the private agents as sources of funds and taxes, but not active transformation actors.

Organization	Activities	Constraints	Future
Unindustria Resp. Land, Env. and Transport	▪ Around 2,000 enterprises from 10 to 500 workers (smaller than 10 workers belong to CNA). Unindustria gives services to enterprises, as contract assistance in front of the unions, labor legislation specialists to defend the owners in front of the unions (core activity). Currently the activity has grown to give other and most modern services, as economic assistance in front of banks, financial assistance to write tax declarations, etc., assistance for internationalization -different to delocalization-. ▪ The Land, Env. and Transport service is giving assistance on environmental, urban and regional planning, as well as in transportation and communications (physical and technological). ▪ An important focus is sustainable industrial parks. Unindustria wants to transform old industrial parks into sustainable ones APEA: Area Produttiva Ecologicamente Attretazata. It is necessary to go from eco-industrial park (includes only environmental aspects and some urban) to sustainable industrial parks (which includes social and political aspects, inclusive policies). In the new industrial parks it is necessary to work at the level of planning, then it is easier to integrate eco-activities, for example exchange of by-products -materials and heat-. Unindustria has developed a APEA planning concept to be implemented in different levels of detail: Level 1) put the area near the highways for efficiency and to avoid pollution of rural areas, and if possible next to a railway (for workers, as commercial transport on railway is little -5%- because it is always late and less efficient); Level 2) Creation of a central office with all the necessary services of the industrial area (bank, restaurant)...; Level 3) design of the structure --> they try to avoid heat "canyon" effect by separating at least 5 m the companies from streets and in between buildings; Level 4) The level of the building, as TEBO did (Active and passive efficiency saving up to 80% energy, as well as productive efficiency and domotics). ▪ The province of Bologna has established that all new industrial sites will be AEPAs. The great challenge is how to convert the existent areas, instead of new ones because the crisis has stopped new construction. It is not possible to act on first or second level, it is all done. They concentrate on the 3rd level, including a feasibility assessment determining actions that are high effective in energy, water-waste, transport. For example coat the building with a ventilated wall. ▪ At the European level EMAS only certifies Clusters, it doesn't observe industrial areas (EMAS easy for companies up to 10 workers for 1,000€). It is possible to certify an area with ISO 14001, now it is a necessary step to obtain an EMAS and it implies to publish results over established objectives. This promotes to generate unified management of the areas, for example in energy. Currently, there are 2 energy agencies that buy a lot of energy to sell at lower prices to all the companies. They have also created a "PV community" in residential and industrial roofs to invest on other actions. No experience in ESCOs whatsoever. ▪ Unindustria is linked to Confindustria Italia. They have created a national sustainability chart for Confindustria. This chart will be explained next month to all provincial Confindustrias. When the chart is signed many actions will develop in each province. ▪ Unindustria believes in green economy. Many people think that green economy is more expansive to conventional economy, but it is not. It is also a means to improve knowledge of the companies (by their own owners) and run them in a cost reductive way, save money through ISO 14001 application. Unindustria offers to provide an audit on energy, another on logistics and supply chain, and an audit on water and waste. These aspects are studied from the inner (the company) and outside perspective (public authorities). ▪ Unindustria participates also in GAIA carbon emissions compensation program, which pays for trees and grass in public parks in Bologna (also in an industrial park) in exchange for emission excess.	▪ Today in Italy there is not a sustainable park working. The great challenge is how to convert the existent areas into APEAs, instead of new ones because the crisis has stopped new construction. It is not possible to act on first or second level, it is all done. ▪ Another great challenge is to promote unified management in which costs are lower than environmental advantages	▪ In the future industrial areas should be much more integrated into cities, in order to avoid urban sprawl. The good urban form and dimension has been studied, half a million compact cities, 800.000 the limit. MITO: Milano-Torino Conurbation. ▪ They want to organize a "products market", every company will introduce to an information system the waste and optimize costs and logistics for sale/recycling ▪ Get to work symbiosis between companies, in order to reduce 80% of waste disposal. ▪ Creation of Unified management systems to link all companies ▪ To plan the type of companies to locate on a park (kalodberg in Denmark)
Organization	**Activities**	**Constraints**	**Future**
Micro-Vett	▪ Since 1986 Micro-Vett is designing and manufacturing electric traction systems, either for cars (or road vehicles) or other types of vehicles --> electric vehicles and truck-commercial vehicles. They work on FIAT vehicles, IVECO and some Chinese manufacturer. They started cooperating with Piaggio, because only Lead batteries were available. Since 2004 they work with Fiat and IVECO as Lithium batteries can allow larger and heavier vehicles. They assembly different components from several supplier -not batteries-. They are members of a F7 Program. ▪ They are developing a prototype of 3-wheel vehicle. ▪ They sell about 1,000 vehicles per year. They sell about 60% of their vehicles outside Italy.	▪ The politics in Italy are not supporting electric vehicles - Legislation-. There are some cities that have closed city center for standard vehicles and allow electric. Btu very few. The subsidies are small and few. ▪ In terms of technology the challenge is mainly related to the batteries. This is the main constraint but it is not on their hand but on the battery industry. Some big research institutes state that from 5 to 20% of EU and USA vehicle fleet will be electric, but so far the autonomy can vary from 70 to 200km. The day they reach 600 Km range, that will be a turnover point. ▪ *Better Place* project is something special - If every country has a different kind of electric plug, imagine what will happen with batteries. The business model may work for a small company, but not for a global market. It is complicated and expensive. ▪ Fuel cell vehicles (developed a model in 2002). The lifetime for a car is very low and there is no hydrogen network. The only way will be if someone finds a way to produce the hydrogen from bacteria that will work. ▪ Chicken-egg situation regarding charging stations. They sold many vehicles to energy companies who can create their own charging stations.	▪ Suppliers: In the future an improvement will be the charging time, from 30' to 5' there will be no difference to a petrol car. ▪ Energy density: 5 years --> how much energy in 1kg/batt: now 160Wh/K and must reach 500. ▪ Different components and controllers, and performances ▪ In order to make R&D activities support from EU, Italian and local support is appreciated. ▪ The market increase will of course allow increasing investment.

Interviews: Links to the EU 2020 Strategy Targets					
Interview	**T 1 - 3% GDP in Research & Development**	**T 2 - 20-20-20 Climate and Energy Package**	**T 3 - Age 20-65 75% in workforce**	**T 4 - <10% early sch. leavers + Tertiary Age 30-34 >40%**	**T 5 - Poverty Lift 25 %**
Housing Office - Welfare Dep.	▪ R&D is an objective, by searching for new technologies and building methods for future public constructions. Experience shows that traditional building methods are too expensive and new energy and static requirements push to an inn. able to reduce the cost of the intervention to keep the social target possible; e.g.: wood technology and other inn. systems. To do this some EU projects and research programs are going to be launched.	▪ Goal is also achieved improving the energy efficiency of existing buildings, reason why many energy retrofit interventions are foreseen	▪ Target not affected by the activities and projects of this department	▪ Target not affected by the activities and projects of this department	▪ Social improvement is the main task of this department, which works together with the social services department to give an answer to the needs of people, considering also the new forms of poverty. The home is one essential aspect of this process.
Regione Emilia Romagna (RER)	▪ Within "Patto per la crescita intelligente, sostenibile e inclusiva", RER stimulates the development of the regional research system, through the "Rete Alta Tecnologia" (ASTER), and promotes formative actions all around the region.	▪ Within "Patto per la crescita..." RER targets about the RE are greater of those nationally involved for RER. In particular, RER targets are about 17-20% of RES on final energy demand of 2020, while national targets for the Region are about 9%.	▪ Within "Patto per la crescita..." RER works to stimulate the creation of new work opportunities, especially on green economy (new industries, new activities, new agricultural opportunities, etc.)	▪	▪
ASTER: High Tech. Network	▪ ASTER boosts a number of initiatives to promote the "reciprocal acquaintance" and direct connection of Enterprises and Research / Academia: company missions, workshops, BtoB events, etc. Aiming at financing R&D activity with private funding.	▪ Besides the research activity of the Energy & Env. Platform and projects at regional level, ASTER staff itself is engaged in EU projects aiming at GHG emission reduction: MHYBUS (use of hydrogen and methane blend in bus), ENERCITEE (dissemination of energy efficiency best practices among Public Adm.), EURESP (support SMEs in receiving env. Services). Recently ended: RENEWED (bio-based energy districts), ASTECH (Promotion of RES-based HVAC), EnercyRegio (dissemination of energy eff. best practice among Public Adm.)	▪ ASTER supports the Regional Government in coordinating programs that promote the placement of young researchers in the R&D areas of companies	▪ ASTER promotes the dissemination and knowledge of Research at any level, up to common citizens: e.g. the initiative "The Researchers' Night", coordinated by ASTER and involving all regional universities and research centers, has been going on for 3 years now and targets the local population and common citizens' awareness. The event is in the framework of a EU initiative. http://www.nottericercatori.it/	▪ Triggering the innovation of the regional economic system (i.e. ASTER's mandate) has the direct effect to keep it more competitive and less fragile to economic crisis. So obtaining the side effect to maintain a highest as possible employment rate.
CNA: National Conf. of Crafts - Env. Programs	▪ Direct link through the reconversion and updating of companies.	▪ Direct link, through all the described programs.	▪ Another colleague that follows labor and education policies, assists programs for the re-insertion of people who lost their jobs or had to close their companies. Green jobs are probably a new niche for these people	▪ Indirectly	▪ Indirectly
Multi-Utility HERA	▪ They work a lot on it, own initiative (RE lab for example) or Universities for example. Two researchers in Bologna affirm to have found cold fusion.	▪ They participate in many actions: they have plans with energy production, saving. They must observe conditions for green and white certificates, if not they must buy them.	▪ They keep high levels of occupation.	▪ They are not directly linked. They have scholarships, internships, they have a project called "young bachelors". Those under 30 can ask for jobs in the company for two years, after a selection process. It could be an idea to develop an academic cluster linked to the industrial one.	▪ They are not directly linked to it. A company such as theirs, that provides basic services, if it is efficient and well performing, it favors economic sustainment and wellbeing. It is competence of the LG to take care of poverty, but they can increase competitiveness of local comp. with robustness and quality.

Interview	T 1 - 3% GDP in Research & Development	T 2 - 20-20-20 Climate and Energy Package	T 3 - Age 20-65 75% in workforce	T 4 - <10% early sch. leavers + Tertiary Age 30-34 >40%	T 5 - Poverty Lift 25 %
Unindustria	▪ The program promotes attention to R&D env. impact reduction. They impulse networks of comp. -even SMEs- in order to research and innovate together, while isolated they can't. Doing innov. they favor the inter-phase between University and ind., this can happen in the unified office.	▪ R&D in env. impact reduction, improves energy efficiency and generates new sector of occupation.	▪ R&D in env. impact reduction, improves energy efficiency and generates new sector of occupation.	▪	▪
Micro-Vett	▪ They invest more than 10%	▪ Direct mission of the company	▪	▪	▪
Confcooperative	▪ They have signed "Patto per la crescita..." An agreement RER outlining this overall objective. RER has activated with the social actors social welfare agreements to close down small companies, which do not enjoy the 80% salary return.	▪ Within "Patto per la crescita..." ▪ The Reg. Energy Plan in principle is very good, but many of the regulations / limitations push back many of the potentially interested actors. Different interpretations, bureaucracy, many rules, contradictory, etc...	▪ Within "Patto per la crescita..."	▪	▪

Performance of the Bologna in Climate and Energy Sectors*



Notes: Anonymous section

COMMENTS about performance in climate and energy sectors

Energy Supply

- HERA is very efficient and usually does never have supply problems. And energy is fairly low in price.
- Natural gas represents the higher share of primary energy source in the region (58%). The wide gas network and the will for biomass production (agro industry residues and energy crops) will allow to prompt the production, distribution and use of biomethane - The Regional En. Plan has set ambitious targets. Regarding RES the share must be higher than the EU regional burden share allocated RES; PV installation doubled the last year reaching 820MW (serving ~350.000 families)
- Bologna has a good network of DH, managed by HERA. This makes production more EE, but in turn HERA has no interest promote RES, as it must sell the gas. The LG is partly involved, as it owns many shares of Hera. Thus, process difficult to change.
- See above: (T1 EU2020: Regional targets on RES are greater of the same national targets that involve the Region: in particular, regional targets are about 17-20% of RES on final energy demand of 2020, while national targets for the Region are about 9%).
- There was a hydroelectric central in the area and it was closed - this is not cause of the city, but the supplier. Not as much investment in photovoltaic plants as in other cities. This is related to politics made by all players in the city.
- Still a monopoly by the 2-3 big companies.
- The LG is promoting interventions for RES and so on.
- Hera manages it, and it works a bit as a monopoly so it could be more efficient and less costly, yet they are brave.
- There's been a good response from the citizenship and business to renewable energy production, the installation of CHP and DH plants... Bologna is on the good path

Energy Efficiency

- NC
- New financial measures for Energy Efficiency are provided by the Regional Energy Plan issued in 2011
- National and regional regulations require now very good performances, and the municipality has even increased them introducing some incentives in its urban – building regul. (RUE)
- The Region promotes energy efficiency in all sectors: in Emilia-Romagna is possible to build only in Energy Class "A" and "B", and since 1st January 2014 only in Class "A"
- In process of replacement of light systems: traffic, street, etc.
- NC
- Buildings are very old and inefficient, also social housing...
- The city is very aware of promoting energy efficiency from everybody
- NC
- They could do more. For example the management of public lighting, also the appliances and building techniques, a lot to do there.

Transports

- Compared to South of Rome it is pretty good. When the weather is not good the services tend to not work.
- 23% of local transport buses and 13% of vehicles circulating in the region are NG fuelled. PT quite wide spread in town (Bologna) but can be further improved. An effort is being made to homogenize the offer of public transport offering regional train-bus integrated seasonal ticket and decreasing the number of public transport agencies active in the territory (from 9 to 3)
- Being Bologna the most important commuting hub of the Region, the interconnections train/local bus can be further improved. Single-driven private vehicles are still one of the most used commuting modes. It is

Buildings

- The medieval center is very old, so buildings not adapted.
- The local building heritage is old and highly en. demanding (most building scores class G). Also, new buildings of the last decades did not respond to specific energy efficiency constraints. An energy labeling for building has been into force only since 2005. RER developed its own certification system since 2009.
- The building stock is quite inefficient, since the average consumption is more than 180 Kwh/sq.m.year. The intervention of the existing city is quite difficult. Good interventions have been done with some public buildings (energy renovation) but funds are too low. Maybe the future en. commission will help.

necessary to attract citizens towards alternative means. Yet, mobility management is applied only in few organizations. Local air quality is poor; mostly due to local vehicle traffic according to a recent AQ Reg. Report: 47% of CO; 60% of NOx; 30% of PM10.)" ▪ The mobility system doesn't go in the right direction. On the paper there are many innov. new transportation systems, but the strategies show reduced feasibility and bad integration of the whole system. The cars are still the main mean of transport in Bologna, and despite the total length of cycle ways is increased there is still not a good connection of them. A good sign is the increase of pedestrian zones within the city centre. ▪ RER promotes sust. mobility, local public transport, trains, etc. ▪ The public fleet has been renewed but not with electric, only standard. In Bologna there is another company producing electric buses, but not sold in Bologna, only some hybrid. ▪ Critical. Mobility is very negative. The country has been too strongly oriented on individual transport, and urbanism policies of the 70s were thought from urban sprawl; so, the people have lost the concept of using PT. PT only used when no other options are available. There is no renewal of the PT vehicle stock, etc. ▪ There is good public transport service. ▪ Bologna wanted to do a subway but stopped it, also a magnetic train now stopped. There is no metropolitan system. ▪ NC ▪ More could be done to reduce private transport and increase PT.	▪ See "Energy Efficiency": (RER promotes energy efficiency in all sectors: in Emilia-Romagna is possible to build only in Energy Class "A" and "B", and since 1st January 2014 only in Class "A") ▪ Some national new laws are introducing ecolabels on the new buildings ▪ Buildings very old and inefficient, also social housing... ▪ The new ones must fulfill the energy saving rules. Is it possible to change the old buildings? ▪ They are starting to do good buildings. ▪ NC ▪ The need is to retrofit and make existing buildings efficient, because there is no need for new buildings now.
Industry	**Waste and Water**
▪ They have some of the biggest CSR companies in the country. ▪ The interest of the agro-food industry for energy production is increasing - driven by the economic advantage and saving in waste management - with particular reference to the exploitation of its residues for biogas production. The Province of Bologna issued a number of voluntary measures (namely energy audit) for enterprises (manufacturing, retails and services) in order to decrease their energy demand: around 200 applied. The identification and reporting of 'green' ind. activities in the region is undertaken by ERVET, signposting the products, processes and reporting the number of companies active in this sector. More must be done to increase an "environmental awareness" in companies. The environmental compliance of companies is averagely quite high. Emiliga-Romagna is one of the top regions in Italy for number of Companies adopting an EMS and for number of eco labeled products. Emilia-Romagna also issued the first Italian law (regional law 20/2000) for the development of Ecologically Equipped Productive Areas. Aree produittive ecologiamente attrezzate (APEA)". ▪ The industry has a relatively low presence in Bologna, and there is not a specific positive contribute to the reduction of GHG emissions. But there are 2 positive projects going on: GAIA, for a GHG compensation of industries within the Municipality borders, with the new plantation of trees, and the Industrial areas called APEA (ecologically equipped areas) at the provincial level. ▪ The Region promotes energy efficiency, the development of green economy, green districts, birth of new experiences, etc. ▪ In regards to env. activities there is a lot of support and help of the city and authorities in respecting the env. standards. ▪ It is improving a lot the last years; there is a big difference between SMES and large companies. Large ones cannot continue to be inefficient to continue competing, and the legislation has become much more strict and it must be observed. Particularly in cooperative companies, as the responsibility is shared, not individual (from 5 to 7). Certificates are becoming extended. ▪ One big area and there is an interest to change into APEA. ▪ A lot of interest of the city for the APEAs. ▪ NC ▪ It is working on energy saving, as it is very expensive in Italy.	▪ They have separate collection of everything unless in the center. ▪ 50.4% of waste is collected separately in the Region. The Province of Bologna can improve (40% in the Province of Bologna, the lowest of all 9 provinces). The share of waste sent to incineration is still high (50% of the mixed waste, while 37% goes to landfill). Water treatment and depuration is widely applied. However, natural watercourses of the plain do not score high quality index values (dir 60/2000). ▪ Bologna has a good percentage of waste segregation and it is starting pilot door-to-door collection in one district, to increase this efficiency. The trend is positive. On water, the daily personal consumption is still high, but there is has improved the last year: http://www.provincia.bologna.it/ambiente/Engine/RAServePG.php/P/358511030300/M/364411030606/T/Consumi-idrici-civili ▪ Urban waste per capita 698 Kg/yr (+2,4% from 2009 to 2010 / Waste separated collection 50,4% (+3,1% from 2009 to 2010) Water consumption: 2.100 Mm^3/year. Waterworks leakage: 26% ▪ They have a high level of separate waste collection for recycling. ▪ Much more could be done; the policies are focused on separate collection -by words-, but actually there is a lot of incineration, many new factories built the last years. They are afraid of doing door by door and the message of consuming less and producing less is necessary. Also on sector of eco-packaging, etc. The water of the tap is perfectly drinkable, there is no garbage in the streets, etc. Small garbage bins would help awareness. ▪ No problems on water. On waste for companies the problem is cost of collection. There isn't a system that really links cost to production, it is still dependent on surface. ▪ NC ▪ NC ▪ 7 for Water: good situation, main target to reduce losses, yet theory are quite eff. Also it is necessary to keep investing in use reduction. On waste it can improve: increase separate collection, more effort on education about sustainable attitudes, make understand that waste can become resources depending on the way they are collected, and even reduce costs: 6
Green Areas and Nature	**Natural Hazards**
▪ The green areas could be much larger than they are. ▪ The region is extensively built, the trend is an increasing one (in 15 years 22% of the agricultural land has become built land, by means of public plans) and intensively populated (200 inhab/km^2 with peaks of 500/km^2 on the coastal areas) - The latest economic reg. law allows marginal woods to become built areas. ▪ The total amount of green areas is pretty high in percentage, but it is bad distributed. There are many areas in the city fabric without green, and the hills are not easily accessible by the most of people. The new master plan improves this in the next decade. ▪ Natural protected areas (natural parks, Siti di Importanza Comunitaria (SIC) and Zone di Protezione Speciale (ZPS)): 13% del territorio regionale. ▪ Because of the crisis many open spaces have been turned into residential in order to increase revenues of the city. ▪ NC ▪ There are few green areas in the city center. ▪ NC ▪ NC ▪ No problems, good offer and policy on parks. It is costly to manage though.	▪ Usually they have floods in the close hinterlands but without many problems. ▪ ▪ I do not know ▪ Regional surface involved by landslide: 11.4% ▪ There are no big hazards in Bologna ▪ ▪ There are no risks in this city, yet more to do on biodiversity management ▪ This happens when there is no land management; it is not the case ▪ ▪ Landslides. There is little investment on soil defense and water regime

COMMENTS about performance in climate and energy sectors	
Food Products	**Retail and Services**
▪ They have a proximity system, in which local producers bring to neighborhood markets. ▪ The agro-food industry is the second important industrial sector: in 2008 it counted 9,513 working enterprises equal to 16% of the whole regional manufacturing sector. RER has been carrying out for years a policy to foster the production of high quality product in the agro-food sector: the regional label "Controlled Quality" for fruit and vegetables; territorial labels such as PDO, PGI, CDO, DOCG, TGI; organic or integrated farming systems. The region is the Italian most represented one in EU as far as designations of origin. Furthermore, the regional Government has funded (through Regional Laws 16/95 and 43/96) a heritage of more then 60 wines labeled CGDO, CDO and TGI and 200 more products are in the ministerial list of quality labeled products. 2,722 farms apply organic farming and 1,071 food processing companies working exclusively with organic raw material prepare organic food products. (2009 data) ▪ I guess the performance is low because there is a big food industry, and most of transportation is made on trucks. ▪ Agro-industry is 1st sector in reg. green economy. RER promotes biological and "integrated production" in agricultural sector ▪ The city is into the culture of Slow Food, the society is concerned about food quality. ▪ There is a good offer and the customers are aware, and food security is granted. ▪ Growing offer of KM0 products, local, organic, etc. ▪ NC ▪ NC ▪ There is a growing attention of food organoleptic quality -8- present in all levels of society. There are many organic farms, slow food circles, markets... tradition on good cuisine. Of course there products from outside; confidence is given to the sellers.	▪ Not so sure, but not so positive. They are transforming the sector, so they lose in tradition but win in standards ▪ NC ▪ Retail and services in Bologna are at the highest level in Italy, despite the economic crisis has brought a cut also in the social services, and may be a problem in the near future because the social demand is increasing. ▪ The Region promotes the CSR strategy to sustain environmental labels, management systems and Green public Procurement through initiative aimed to retailers and consumers. ▪ There is awareness on sustainability. ▪ It is necessary to separate large and small distribution: large distribution has grown very much the last years, too many now and getting stronger: 7, because they are requalifying energetically. Little shops are mostly in hands of immigrants who are not so aware at these issues. Historical shops are closing down (5). Small do not associate to work together. ▪ Most of the companies depend on the big distribution chains for their provision. Moreover, the share of green products and consumers is still small. Yet, the offer of green services is still quite important. Big distribution is already creating a green line for most products. ▪ NC ▪ NC ▪ The city has a great commercial sector. The superficial impression is that more attention should be given to neighborhood business due their direct link to the citizenship. Supermarkets, instead, pay attention to prize not so much on quality. Local distribution should be associated to quality and this will reinforce virtuous circles of production-consumption. For sectors non-food a rationalization process can still be done.

Reflections about the 3E Crisis: Environmental, Energetic and Economic

EU's proposals and role in shaping the international agenda

- (Univ-Bologna): Europe is going the right way, but not all at the same speed. The basis of the problem is the cultural stereotypes that turn into political obstacles, exploited by any government who is not willing to do the job. Hopefully EU regulations will force Italy to act on climate issues, as in the economic crisis. After Monti, hopefully the EU will keep an eye over all issues in Italy in order to continue to progress. Regarding the Covenant of Mayors, it is a facade, operationally speaking they [in Italy] are doing nothing. They measure meteorological data and generate a report, but it is ridiculous.
- (ASTER): At EU level, the problem is to create common regulations not only on economic issues, but also on the social and env. topics. The society is in general too slow in doing the necessary changes, in particular in compelling the international community around a model of development closer to that of the EU. It is not possible to have a free market in front of many different instruments, EU is a dwarf in regards to building international policy. The value basis is good, but it is not competitive in the international market.
- (Micro-Vett): Thinking about other countries, a big effort in Europe is nothing in the rest of the Word. It is key to engage China, developing countries, and USA. If by 2020 we achieve 1M e-cars in Europe, in China they will have 100M new conventional cars.
- (Confcooperative): The role of the EU is fundamental. If the EU didn't do anything, nothing would be done. And still Europe is too small to overcome the crisis, but it is absolutely necessary. It is still more necessary to reinforce the role of Europe in order build critical mass in favor of green economy. A necessary step is to have a more political EU than economical. Stronger political power of the EU Parliament.
- (CNA): CNA as association agrees with the EU strategies.

Where do you envisage your country and your city in tackling this crisis

- (Univ-Bologna): Climate Change and the 3E crisis are not at the top of the agenda, as they now have the problem of increasing the GDP. Actually, not too many years ago the Minister of Environment said that following the Kyoto agreement would sink the Italian economy. In any case, the ability of Italy to cope with the energy crisis is extremely limited. There is no specific program -for example investment of Renewable energies- to tackle this situation. ENEA: Energia Alternativa Research Center is not working anymore on RE. Italy is actually starting to use the stockpile and more imports from Libya and Saudi Arabia, as Russia has reduced its supply. The State level is the main level to rely on. If Mario Monti finds the time to get a hold on the issue of CC, he's the right person. In Italy people are evading taxes like crazy, and those who pay are very tight (46-48%), so it is not possible to ask for more. They would need a technical gov. for at least 12 years to deal with all the issues, even climate change. So far, there are written programs and documents, potentially positive, but operationally they are left to the good will of the future generation. At the regional level, maybe they measure things and give recommendations but do not do anything really. In Italy env. awareness is pretty low, and very often those who are aware are perceived as very strange people. The average Italian is very suspicious about environmentalists. Also, there are strong NIMBY protests against RE initiatives. This way it is very difficult to progress.
- (Univ-Bologna) The question is: Is it a wise idea on the long term to rely on tourism instead of building a carbon free economy? Are we a country or a museum? The country needs to take a stand in order to change minds quickly, explaining with clarity what the situation is. The aggregate demand of computer electronics is much larger than demand for monuments that require traveling. They must look at Finland, Denmark, Sweden, Germany, etc. as models. If not there will always be some new thing blocking the initiatives.
- (Univ-Bologna) The EU 2020 strategy may become a target, provided that the Italian economy recovers growth in the next few months. As long there are some safe-stands on GDP, employment and pensions. The expected duration of this gov is 2013, the time slot retained after Berlusconi. The problem is that there could be a crisis in Parliament, yet PD and PDL declared to not undermine the stability of this Gov. The reaction of hedge funds and international investors if Mario Monti is fired, they will react as in the past. At the local level there is a CC Plan, but if you expect local authorities to work on their own initiative, you'll wait forever.
- (ASTER): In Emilia Romagna they are anticipating the EU 2020 agenda; these are the pillars of their policy for the last 10 years. The region is convinced that this is the way to go. This region is a little Germany: manufacturing, exporting, very high level of technology and knowledge embedded in their products. They need to play a role, but too small in the context of the Union, but EU policy must be supported. They preview a loss of 30% of the manufacturing capacity in the next years, so they really need to create new activities in new emerging sectors in the field of green economy, and health science ad technology.
- (ASTER): The State of Italy was not able to adapt their policies and regulations to the EU strategies in the last years. In Italy in the last 15 years the rate of inequality has doubled. In Italy the 10% of families own the 50% of wealth, and 50% poorer only 10%. In Emilia Romagna inequality is also growing but not as fast and strongly as in Italy in general. The economic structure of small companies, and manufacturing sectors helps distribution of economy and the domestic demand. It grows much better in a framework of distributed economy. The EU should support more the model of the Emilia Romagna, but it is seems that it is not possible.
- (Micro-Vett): In Italy and Bologna, the crisis is putting the environmental issues on a second stage. This will be dangerous, as this is a structural crisis. It will not be overcome in the next few years. What we leave behind will be there for many years.
- (Confcooperative): Bologna and Emilia Romagna have always felt as a part of the EU, so they've always have considered themselves as part of the richest and most fortunate Europeans. For the last 20 years Bologna has become too conservative, not being capable of being innovative and challenge oriented. Everybody (citizenship, politicians, entrepreneurs...) has become more conservative and guilty of less action, more individualism and less sociality. Even the social capital, they are poor on strategic ideas, to re-launch the territory, they are on a progressive decadence from everyone, even the University. It is necessary to promote participation at all levels around a Strategic Development Plan. Everybody must think out the box to participate more on the vision of the city and the region. It is necessary that people obtain responsibility over the progress of the city. The politicians alone do not have a magical formula.
- (CNA): They are very critical that Italy stayed very much behind in these issues compared to other EU countries. The mentality of the country is still so linked to the economic discourse that this new [green] economy doesn't find its place. Italy has not been in line with the EU. Bologna as a city has always been much more in tune with this EU strategies, but the local governments cannot go all the way without the support of the national authorities. Emilia Romagna has been a bit an island in Italy regarding green economy and SD topics. There's been a lot of work on cultural aspects, education... so the future is optimistic in the sense of a well-prepared society. Even if it is difficult it is necessary to insist. In CNA even if results are not fast as expected, they must keep on working and not abandon.

What else should be done to tackle it? Is "sustainable growth" the path to follow?

- (Univ-Bologna) For all these issues to progress, public policy should be very different. In Denmark they pay 200% VAT for cars , but Public Transportation is really very efficient. In Italy PT doesn't work very well. Added to the different taxing system, this encourages people to use cars. The problem of the EU is not about the different speeds of the member states, but the different minds of the people. In Italy env. awareness is pretty low, and very often those who are aware are perceived as very strange people. The average Italian is very suspicious about environmentalists. Also, there are strong NIMBY protests against RE initiatives. This way it is very difficult to progress.
- (Univ-Bologna) As humanity we must understand that there is no alternative than a green carbon free economy, together with the economic growth that we want to leave for our descendents. One thing is to have "off-the-track" areas where to escape to, but we cannot revert our way of life to the old times. We cannot get into more wars for oil without looking into green development and technologies, because we'll go into an important economic crunch. For a long time we've had a trip of innovations for which the initial costs were economically inefficient at the early stages. But the firms saw the mid term big profits. With green alternatives companies keep on saying that innovations are uneconomic. So the question is, is it profitable for next generations? Should we grant patent protection to any huge green public innovation? Any innovation patented gives a lot of power. Probably, public sectors should have a say in at least joint ventures in order to have some property rights over the innovations. The same would apply for brown innovations.
- (Univ-Bologna): There is another idea about Pigouvian taxation, to turn brown companies into green through investment. They can be convinced to do and explained in order to understand it as an incentive, in order to explore possibilities you previously left aside. In some sense the higher the oil prices, the higher the incentives for green development. It really depends because the estimates of known and exploitable sources have always overlapped. We should run out of the stock today, but more recent estimations say 30-50 years, because the price change brings into stock more reserves uneconomical before. This is a countervailing incentive to go green.
- (Univ-Bologna): If a drastic green innovation comes across the oil price will crash. This is the strategy of the EU, this would free it from Russia, Saudi Arabia, the USA, etc. Yet, this would be a disaster to oil producers. A natural consequence is that if the EU comes across this innovation, everybody else in the Word will suffer from the consequences of a no-longer economically profitable oil based industry. There should be a disclosing technology in order to cross the river all at once. A non-excludable product but with the right incentives to develop it; otherwise, why sink a lot of money into a new techn. and never get a payback. We need rules before the innov. comes out. Without this, a lot of suffering would become. E.g.: a system of royalties in order to acquire the technology and repay the investment.
- (Micro-Vett): The 3E crisis is a structural crisis. It will not be overcome in the next few years. What we leave behind will be there for many years. Sustainable growth is the only path possible to take. Not only in the EU but also in the rest of the World. Thinking about other countries, a big effort in Europe is nothing in the rest of the

Word. It is key to engage China, developing countries, and USA. If by 2020 we achieve 1M e-cars in Europe in China they will have 100M new conventional cars. For the Chinese the most important is to grow 10% regardless of the environment. Here we should act different, but the crisis is devaluating these values. What EU, the country and the city can do is increase pollution taxes. In Italy there is a property tax over cars. This is still not linked to the GHG emissions, but to the power of the car. Even if in another country the tax is based on GHG the difference between high and low emissions is too low. It is not necessary to give incentives to low emission activities, or good. It is more necessary to disincentive polluters, lets make pay more who pollutes more.

- (Confcooperative): The crisis has not touched its bottom yet, yet it may drive to requalify alternatives: social, economic, productive... After 20 years of building wealth from debt we've lost the measure of what are the right needs and amounts. It is necessary to leave the idea of progress measured by GDP but by dev. or happiness. The young ones must have an open mentality and overcome the elderly.
- (HERA): **Personal opinion** about the crisis, published in "Il Pianeta in Riserva". It is needed to consume less; the society is starting to understand it. It will inevitable but difficult, because the paradigm of growth is still too strong. It belongs to 2 centuries of modern culture (1800 and 1900). We need different reference values, less goods more relations, but we seem to be late for them.

Girona - Spain

GIRONA - 3 times immortal

Girona, a settlement since the times of the Iberians, was founded by the Romans almost 21 centuries back. It is popularly named "Three times immortal" after repelling attacks from Napoleon's troops. The city's medieval quarter is outstanding and its Jewish remains are famous internationally within this tradition. The colored houses by the river are must see as well. The mid-size city of Girona is also the capital of the Province of Girona, on the northeast of the Iberian Peninsula. Bordering with France, the region holds the main international infrastructure corridor from/to Europe. The province is also home to the Costa Brava, a major touristic destination for Europeans and Barcelona residents (just 100 Km south). All these location and landscape features have made of Girona -province and city- a wealthy Spanish region with high quality of life. Tourism, the University, commerce and the administrative capital role feed the economy. Still, recession since 2008 is striking hard, as prior activity was highly dependent on real estate and its related services.

Coordinates: 41º58'59''N-2º49'30''E
Population (2012): 97,198
Surface: 39 km²
Mayor: Carles Puigdemont - Liberal-Conservative
Vote turnout 2011: 48.3%
Municipal Budget 2012: 97,397,655€
Per capita income 2009: 20,300€/inhab.
Unemployment 2011: 13.8%
Website: www2.girona.cat
Study Visit: April 23-27 2012

Summary and Highlights of Green Economy in Girona

It could be said that Girona's engagement in GUE started in the mid 1980s when the waste incinerator was operated after closure of a landfill in a natural area (1983) and separate collection of glass began (1985). In the decade of the 1990s recycling and selective treatment reached most all materials in waste and new policies started after signing the Aalborg Charter (1996), such as the first bicycle paths, sewage treatment, air pollution control, and biodiversity conservation actions. In the 2000-2010 period green policies spread to other LG responsibilities, like energy, parks and urbanism. In this phase the city approved its Local Agenda 21 (2004), created the Local Sustainability Council (LSC) and established a system of sustainability indicators. The latter were monitored yearly and evaluated by the LSC in order to determine and disseminate the sustainability status and progress of the city. Within this time span an Energy Action Plan was passed in 2007, followed by many investments, including: 2 schools run on woodchip heating and one on geothermy; 12 schools and sports facilities with thermal solar panels for SHW; around 800 MWh yr of PV electricity; a public bike-sharing service; 41% of traffic lights with LEDs, and efficient street lighting delivering a 24% reduction energy use compared to 2007. The crisis (2008) drove to a change of power in the LG (2011) and austerity policies slowing down the expansion of low-carbon development, as for instance the revisions of the CoM-SEAP. Nevertheless, the current authorities are enthusiastic about the smart cities approach and promoting green economic activity together with several initiatives in the private and research sectors:

- Agenda 21 2004 and Sustainability Indicators
- Domeny Eco-District Plan
- Suburban orchards and organic catering
- Green Belt and the "Green Ways"
- Biodiversity friendly green infrast. management
- Energy Action Plan 2008-2011 and SEAP 2011
- Walking-friendly home-school itineraries
- Girocleta bike-sharing and E-dit car-pooling
- Euro-Mediterranean Tourism and Water Campus (e-MTA)
- Catalan Institute for Water Research (ICRA)
- Inclusive organic production and consumer groups
- RESPIR Ecotourism development program
- Renewable energy cooperative
- Local currency systems

Low Carbon Economy in Spain and Catalonia

Spain's coupling between economic activity and carbon emissions is still very strong. The sudden abatement -19% in 4 years (AvanzaCO2 and EEA, 2012)- in GHG registered since the maximum of 2007 is a direct consequence of the collapse of the Spanish economy occurred in the same period. Hence, Spain is close to reaching its Kyoto target of +15% compared to 1990; 332 $MtCO_{2e}$ vs. 356 $MtCO_{2e}$ in 2011. However, before the recession, the rocketed economic growth experienced with the construction sector bubble had taken national emissions around 50% above the levels of the baseline year. It is a pity that the current positive results in cutting global warming emissions are not the outcome of a "low-carbon, efficient and inclusive" development. On the contrary, the lower CO_{2e} is taking place together with important suffering, in form of more poverty (+8% 2008-2011; IVIE, 2013), unemployment (>27% in 2013), and moreover, with the dismantling of the energy policies to support the migration towards a renewable based mix, including retroactive cuts in solar PV feed-in tariffs.

Nevertheless, the crisis has been a useful driver for efficiency increase in the energy market. The favorable incentives for wind, solar and other alternative technologies prior to the crisis, fostered their rapid penetration in the market. The amount of feed-in tariffs on renewable sources between 2004 and 2011 went from some € 1 Billion to € 6 Billion ("La Caixa", 2012). Moreover, the last years renewable have gained tremendous cost-efficiency thanks to their global propagation and R&D&I improvements, as for instance much cheaper PV panels since China started to produce them. In parallel, conventional and finite sources such as oil, coal and gas have become much more expensive and price-inelastic due diminishing reserves in a growing market. Therefore, despite Spain's Central Government has reduced RES stimulus and even cancelled some, sources such as wind are cheaper to produce and hence more profitable than coal and gas, reason why renewable keep increasing their share in the daily energy auctions. According to EEA (2012) stats, renewable sources in Spain reached close to 30% of final electricity and 15% of gross final consumption in 2009. Data from the RE sector indicate that in March 2013 clean energies represented >51% of the electricity mix (REVE, 2013). Even more recently (23 May 2013 in press) 45% of the nuclear capacity in Spain was inoperative (4 out of 8 plants) due unprogrammed stops of 2 facilities, the refueling of a third one and an ended life span of a 4th. Even so, the power grid suffered no cuts or incidences, with most of the energy deficit supplied by RES. This shows how every day RES become more and more reliable, even at a large scale. Taking the last reflection into the field of public policies, the Renewable Energy Plan 2011-2020 sets a target of 38% green electricity in gross generation by 2020. Leaving aside possible changes in consumption trends in case of an important economic recovery, it appears as quite feasible for Spain to cope with its RES aims, at least for electricity.

In spite of the remarkable progress in renewable based electricity, the 2010 and 2011 version of the Climate Policy Tracker (CPT) gave Spain a rating of E. Even if already a low grade, a negative trend was marked between both years, as counteracting developments took place "partly due to budget cuts" (CPT, 2011). The already mentioned reductions in feed-in tariffs for new and existing installations are among the latter. Yet, actions contrary to a clean energy system may be found as well. For instance, maintaining strong subsidies to national coal mining. Also, extended time spans for nuclear powers, including as of May 2013 a demand to reverse the Ministerial Order IET/1453/2012 for the closure of facility Garoña, and add 1 to 6 more years to the power plant; the oldest in Spain and a technological twin to Fukushima. Last but no least, there are continued tax payments to gas-thermal plants when not operating, in compensation for the higher competitiveness and thus larger share of business of Aeolian energy.

On the other hand, in order to accelerate a green economic recovery, Spain has implemented different laws and programs that aim to increase energy efficiency and energy savings in transport and the building sector, although some of the measures introduced are only temporary (e.g. speed limit reduced during March – June 2011). Overarching this set of instruments there is the Law of the Sustainable Economy (SEL) enforced on May 4 of 2011. In a strict adoption of the EU2020 Strategy vision and aims, the SEL focuses on:

- boosting competitiveness and the economic environment for business (removing bureaucratic and economic obstacles for entrepreneurship; easing of the commercial use of patents; increased support to exporting firms; increasing R&D&I expenditure up to 3%)
- reducing early school leavers to 10% (from the 32% of 2011) and improving vocational training
- supporting green sectors, such as renewable energy, sustainable transport, electric vehicles, etc.
- financing sustainable economy projects from local authorities and private organizations
- Standardization of the housing sector and gradual shift of resources towards more productive sectors (elimination of the income tax deduction for housing purchases; urban rehabilitation...)

According to simulations conducted by the Ministry of Finance in 2011, thanks to the application of this law on the long term "there is a positive and significant impact on activity, mainly through a productivity growth channel, which turns out to be consistent with employment gains" (Kessler and Cuerpo, 2011). Visible benefits from the SEL should be expected by 2020, but indeed the ongoing crisis is so structural and cross-cutting that negative effects are still worsening; prospects of >28% unemployment in 2014 (OECD, 2013 in press) and steady recession throughout the 2010-2013 period. However, the European Commission foresees an inflection in the latter fall by 2014, bringing hope to the Spanish scenario of social and economic devastation.

The prior explanation of the economic context is important to understand the effective possibilities of green economy policies, as well as the prolonged deployment of contrary measures, such as incentives for the purchase of conventional cars; 150 M€ for cars and 38 M€ for light freights, in front of 10 M€ for e-vehicles, yet with important abatements of GHGs expected, through the renovation of the vehicle stock and therefore more efficient engines (97,400 t CO_{2e} yr for cars and 35,000 t CO_{2e} yr for commercial vehicles).

In this crisis response political scenario it is necessary to explain that Spain's draft national climate strategy intends to lower the RES target of the previously published National Renewable Energy Action Plan, from 22.7% to 20.8%. Following the EC's suggestions (May 29 2013, from press), instead of these steps back in low-carbon development, "Spain should adopt additional measures in the environmental taxes, specially in transport fuels". According the EEA (2012) "in Spain 10 years ago the share of environmental taxes to GDP amounted to 2.3% and declined to 1.6% in 2010... the country ranks 26th in EU27 in revenues generated from energy taxes and 18th when considering vehicle taxation". The share of pollution and resource taxation in Spain is one of the lowest in the EU; as CPT (2011) reminds, "more coherence in energy policies is needed".

The report "Green Jobs in a Sustainable Economy" published by the Observatory of Sustainability in Spain (OSE, 2010) determines that the green sectors (from water and waste, to biodiversity and clean technologies) hosted about 531,000 workers in 2009, an increase of 235% since a first scope of 1998. Spanish green jobs reach 2.62% of the total workforce, "putting Spain on the European average" (OSE, 2010). From a qualitative perspective, ecoindustries have experienced the biggest growth; RES by more than 30 times, water and waste almost 4 times. The crisis has negatively affected some of these activities (less waste generation, ergo less treatment; impact on some of the RES sectors -biomass, biogas- from reduced and suppressed feed-in tariffs), yet others like organic production continue to progress and strengthen: from 2009 to 2011 +15% and +27% in surface and producers respectively (MAGRAMA, 2012).

In the reality of the Spanish Green Economy, Catalonia represents the leading community in terms of jobs with more than 93,000 people (17,6% of the total; OSE, 2010). It bears the strongest green economy in ecoindustries, environmental services, environmental education and green jobs in the mainstream industry. Actually, already more than 1,000 products and 400 firms and institutions from Catalonia have the Catalan Environmental Quality Label (TES, 2011). In consonance to the latter, the Catalan Government recently passed its Strategy 2020 aiming at the adoption of the EU2020 targets at its subnational level. Simultaneously, more than 300 Catalan LGs have signed CoM (about 1/3 of all) creating the base to bridge the top-down 2020 Strategy and the private sectors for an effective deployment of green growth for the decade.

Climate Change and Green Economy Framework

		State (NUTS1)	Region (NUTS2)	Province (NUTS3)	County (LOCAL1)	Municipality (LOCAL2)
		Spain	Catalonia	Girona	Gironès	Girona
Climate Change	CC Responsibilities	Energy Planning, ETS, EU mandates, Railways	Energy and Clim. Plan., Pub. Transport, Regional Spatial Plans, Regul. of Ind. Areas, Waste and Water Treatment.	CoM Supporting Structure	No	Clim. & En. Planning and management; PT; Water, Waste, Building permits, Green Infrastructure
	CC Target	-10%GHG +20.8%RE +20%EE	-25GHG +20%RE +20%EE	No	No	(SEAP under review)
	CC Action Role	Planning & Reg. of CC, En., Buildings... Active in Mobility Infr. Adoption of EU mandates	CC and Energy Planning and Assessment. Active in PT and Mob., Building regulations. Active LG Support Str. & Funds	Technical and financial support	waste management, when delegated by municipalities	Active in management of Energy, Waste, Water, Green Infrast., PT, Building regulat.
Green Economy	Assess. Report	2009	yearly: 2003-2010	No	No	No
	GE Legislation	Sust. Economy Act (not enforced)	No	No	No	No
	GE Strategy	2009 (not implemented)	2012: "Strategy Catalonia 2020"	No	No	Ecotourism / CoM-SEAP (review) // Pilot Smart City (upcomming 2012)
EU 2020	3% GDP R&D[1]	No				50%
	20-20-20	No				25%
	Work Age 20-65	No				75%
	Education	Yes				100%
	Lift 25% Poverty	No				-25%

Green Urban Economy Strategy of Girona

Girona is reinventing itself in a context of strong crisis. A Zero Emissions Administration and the concepts and practices of "smart cities" shape the city's green urban economy approach. Urban planning for city attractiveness aim creating a friendly climate for residence, business and tourism. Bottom-up initiatives also feed-into Girona's green profile. Europe, the University and its Science & Technology Park are the drivers for locally adapted green innovation. Metropolitan and inter-regional mobility are major challenges to face, while international connectivity contributes to pinpoint Girona in the maps.

1.- Zero Emissions Administration and Smart City Project

2.- Urban planning for attractiveness

3.- Bottom-up grass roots green initiatives

4.- Green innovation from the University and the S&T Park

5.- Urban, Metropolitan and International mobility

The municipality of Girona goes for the Smart City concept and a Zero Emissions Administration, in spite of the crisis. Between the 1980s and 2011 the green development trend of Girona has evolved in parallel to most other western European cities. Environmental management was progressively introduced in areas such as waste, waters, parks and green areas. The last decade (2000-2010) in a climate of rapid economic growth, sustainable planning (LA21), compact urban areas, biodiversity management, some elements of sustainable mobility and sustainable energy systems have become the new focus activity. The first steps towards eco-urbanism (ecodistrict planning) were also made. The Sustainable Energy Action Plan (SEAP) of 2011 including a light-rail network and a new waste treatment complex established the vision for a mature green city model. But the crisis hitting on the Spanish and Catalan economies, drove to changes in power in many public administrations and a new set of priorities, on top of which rationality in public expenditure. Girona is amongst the latter, therefore a review of the SEAP was started (2013) with a Zero Emissions Administration and the Smart City concept as the current aims to pursue.

- Zero Emissions Administration (ZEA) and the SEAP: The plan for a Zero Emissions Administration, as a basic step of Girona's commitment to the CoM targets, is still under preparation for its inclusion in the revised SEAP. A mutlistakeholder participatory process has been initiated (2013) through the reconversion of the former Municipal Sustainability Council into the Municipal Table for Climate Change. This body includes representatives from all political groups, environmentalist NGOs, the University, distinguished experts and certain economic sectors. Its mission is to suggest, discuss and assess the energy and climate planning tasks of the municipal staff aiming to a new SEAP by 2014. As part of the ZEA objective the Municipality is continuing the actions initiated with the 2008-2011 Energy Action Plan: renewal of public lighting and brightness reduction; remote control of lighting and heating in buildings (including management tools for the building operators, such performance-expenditure charts); LED traffic lights; and rationalization of power contracts. In 2013 a tender for the Municipality's electricity supply required 100% green certificates. Reoperation of 2 small hydroelectric centrals will also be possible after substitution of their obsolete turbines. Stronger investments such as biomass heaters, PV or geothermal are on standby until savings generated from the prior actions provide reasonable funding.
- Girona Smart City Project: In an attempt to become a frontrunner in urban development and its related technologies the city of Girona has joined the "Catalan Chapter" of the international Smart Cities Protocol. According to the headline statements *Girona Smartcity* is the connection of ICT will wellbeing, sustainability and competitiveness -very much in line with the EU 2020 Strategy-, through the implementation of smart-economy; -mobility; -sustainability; -citizenship; -coexistence; and -governance. So far, the practical outputs of Girona's strategy have been an expert commission to discuss and follow the institutional process and a University Chair, which will run a Master Degree in the topic of Smart Cities in the 2013-2014 school year. Besides, as specific lines of action Girona has defined: *Barri Vell 30*, to enhance tourism and business in the Old City center; *Sustainable Urban Management* focusing on public and private spaces, mobility, energy efficiency, etc.; and *University District* to promote the R&D&I engines of the city, such as the cluster ICT Media and the S&T Park.

The city of Girona is aesthetically very charming. For 30 years the city has used this asset to promote urban quality, including environmental sustainability as one of its dimensions. The city of Girona is currently celebrating the 30th anniversary of a local plan enabling the restoration and renovation of the Old City, which includes the second largest Jewish quarter in Europe. The location of this Old Part on a steep hill is an outstanding landscape feature of the city, as well as the houses hanging by the river that divides the medieval district from the modern developments. The Old City Special Plan sets the rules and incentives, such as the colors allowed for the "hanging houses", to requalify the whole area from an a degraded city center -a common situation in many European cities- to a dynamic pedestrian commercial district. Year-round influx of tourism, a University compound nested in some of the most emblematic ancient buildings, and intense housing activity for the students and local dwellers now desiring to reside there, make of the Old City the true heart of Girona, the place where everything happens.

The small size in extension and population of both the city and the center contribute to its charm, as Girona becomes rapidly walkable and cyclable, and the key landmarks are very easy to find and close to each other. In fact, Girona is in the top 50 of Spanish cities over 10,000 inhab. in terms of quality of life (González, Cárcavo, Ventura and García, 2011) .

Girona has experienced a remarkable growth since its 65,586 inhabitants of 1983 (IDESCAT, 2013). Nowadays the city is close to reaching 100,000 registered residents, yet serving around 120,000 people when the student community and daily commuters are

included. In order to keep up quality of life, the last 3 decades have prioritized urban compacity and mixticity of uses in the expansion processes -the Mediterranean city model- generating a total built up area of 13 Km^2 (a density of 7,461 inhab./Km^2), in about 1/3 of the municipal territory. In parallel, several "green lungs" in both the urban environment and the suburbs have been created and/or protected, amongst which the Santa Eugènia Hortes, a natural riparian area of 42 Ha with 3.3 Ha dedicated to food production plots. Added up, non-urbanizable land represents around 65% of the whole municipality. The last step in this urban and spatial model was an ecodistrict for 1,200 housing units planned in one of the few remaining developable areas (about 2%). This 27 Ha new sector is currently frozen due the real estate crisis. Even so, it is worth mentioning that building regulations for the ecodistrict established +15% EE in winter and +30% in cooling, as well as RES requirements. Also measures and recommendations regarding orientation, openings, crossed ventilation, materials and glassed galleries, must be observed. The whole plan allows fulfilling the LEED parameters. Other aspects included were: separate waste/rain water collection; infiltration of street drainage, drainage to the river and gardening criteria.

In order to progress in the development of its attractiveness Girona is currently implementing the European project RESPIR to promote active tourism and eco-tourism. On behalf of this project new products are being created, as for instance the cross-border cycle-touristic route *Pirinexus* that goes through Girona from France, to the Costa Brava and then the Pyrenees. Also, nature tours in different languages in the city parks.

Bottom-up initiatives are feeding-into the city's sustainable development strategies. Maybe because of Girona's reduced scale, the interaction between the LG, the citizenship and local NGOs is very common and often cooperative. Several innovative experiences have become a reality thanks to this:

• Regulation of commercial mailing: Since 1996, after a campaign from a local environmentalist NGO (Nature Association of Girona; ANG), the city by-laws regulate the right to not receive commercial materials in the mailbox. Nowadays, some 6,000 mailboxes (15-20% of total) exhibit the sticker linked to the regulation, producing a remarkable prevention of waste.

• Urban-Cycling infrastructure: Also in 1996 ANG promoted a local platform involving more than 20 organizations from all sectors to support biking in the city. 17 years of continued activity of this movement, through rallies, press releases, transport competitions, school activities, etc. generated the critical mass to convince the City Hall to design and approve the first Plan of Cycling Paths, create a network of bicycle parking stations and more recently (2011) deploy a public bike-sharing system.

• Organic Catering in Schools: Pressure from parental organizations from several school boards initiated a movement to introduce certified organic products in different educational facilities. In 2006 one first school adopted this catering model. So far, despite the crisis, at least 5 centers participate.

• E-Routes: This project from 2012 concentrates in a map based website all the LG actions in energy sustainability. It is an award based educational resource for schools designed by ANG, thanks to which it is possible to check and learn through tours and exercises about PV, solar-thermal, LEDs, etc.

• Transition Towns: A grass-roots political organization (CUP) has been the driver to the approval of a motion to engage in the Transition Towns movement and start participatory process for the development of related actions (2013).

• Inclusive Alternatives: The desperate situation of families with all their members unemployed (and often evicted or in risk of) brought together neighbor movements and the local Greens to promote alternatives (2013). In first place, a motion to use abandoned sites in the city to the production of food (by willing citizenship). Secondly, a food and clothes-repair organization formed by workless citizens has been created to generate job and income options, even through exchange. The birth in parallel of organic consumer groups may close the circle of community-supported agriculture.

The University and its S&T park lead green innovation, focusing on water, tourism and energy. The University of Girona (UdG) is a community of 15,000 academics, students and administrative staff. Against the crisis and responding the international trends for University development, UdG is betting on quality as the driver for successful progress. Departing from its research strengths and opportunities UdG is searching its individualization through the Excellence Campus on Tourism and Water. Moreover, the Science and Technology Park has facilitated the ground for new ventures in the field of energy sustainability.

• The Euro-Mediterranean Campus of International Excellence on Tourism and Water (e-MTA): e-MTA is the backbone for synergic cooperation among the different faculties and researchers of UdG. The aim is to deliver high quality education and science, attractive for both national and foreign students, as well as opportunities for international networking and business for UdG teams and spin-offs. Tourism and Water are essential issues for the socioeconomic and environmental sustainability of Girona's Province. Long-term collaboration of the University and the local authorities in the region has driven to a lot of activity in the latter topics. Water represents abut 20% UdG R&D&I activity: from treatments for drinking and ecosystem conservation, to water economics, law, land use, flood risks... In accordance, the Regional Government of Catalonia created and located in UdG's S&T Park the Catalan Research Institute for Water Research (ICRA) in 2006, with already 90 jobs and a yearly turnover of € 3 M; and plans to reach 200 staff and € 6 M by 2020. Other relevant water and tourism research related bodies are: the Laboratory of Chemical and Environmental Engineering, the Institute of Aquatic Ecology, the Institute of the Environment, the Underwater Robotics Research Centre, the Higher Institute for Tourism Studies, the Landscape Observatory and the Water, Territory and Sust. Group.

• The S&T Park and energy sustainability: UdG's Science and Technology Park is facilitating the ground for public-private partnerships in R&D&I. On one side, part of the activity of the prior research institutions is moving into this Park, as well as their spin-offs. On the other side, local companies are strategically relocating in the Park as a means to relate and collaborate with UdG. As a result several energy sustainability projects are emerging. One example is the RES production and distribution cooperative SOM

Energia, created by several University professors. This alternative organization has reached 10,000 members in 3 years, who are switching to a 100% green supply of electricity, and it is already building its own renewable power plants (biogas and PV mainly). Another case is the platform e-Dit, a car sharing experience brought by the UdG spin-off Centre Easy. This initiative is base on creating an online UdG community of people sharing rides to/from home the University, in which people from all over the region have joined. The most innovative element is that it has a social currency "finger" associated. "Fingers" are necessary for passengers and they are obtainable through purchases in local shops and stores. Drivers earn "fingers" from passengers and can spend them in car related businesses (repair shops) in form of discounts and special offers. Last but no least, the energy efficiency company QNorm has recently installed its headquarters in the S&T Park, outstanding in certification of forest management for biomass generation and biogas plants.

Urban, Metropolitan, Regional and International Mobility; strategies and challenges. Sustainable mobility in Girona is a true challenge, due cultural and political factors. The size of Girona is big enough to require a vehicle for certain journeys and collapse in the city is sufficiently low -ergo, travel plus parking time- to not divert locals and commuters from using the car. Moreover, every day 160,000 vehicles enter or leave Girona every day by car (MCrit, 2013), to/from its Metropolitan Area of around 150,000 and beyond; mostly cities and villages in a 45 Km radius and Barcelona (100 Km). In total, the city generates 427,000 journeys per day (PTOP, 2006) of which 54% are in private vehicle, 8% in public transport and 38% by foot or bicycle. Nonetheless, several strategies and instruments are in place, and a Mobility Plan is also on the way (2013):

• Dissuasive Parking Network: Girona's city center is surrounded by a network of 20 free dissuasive parking lots with about 3,400 places in the North and 750 in the South, at between 5 and 15 minutes walking from the main commercial, business and administrative areas. This infrastructure a great resource to avoid over-driving inside the city. In addition, some 4,150 enclosed paying spots and many streets with fee demanding blue zones offer closer locations for those willing to pay.

• The Metropolitan Transport Authority (ATM): the intense connectivity of Girona with many of villages in the Province took to the creation of the ATM in 2006. This governmental body financed and managed by a consortium including the Regional Government of Catalonia, County Authorities, and Municipalities including Girona, is responsible for planning and coordinating bus services between the 47 member localities. As a result a system of 7 zones, a common set of tariffs and unified negotiation with public transport operators have been implemented. Benefits of the ATM are evident; its 2011 Memorandum shows an increase from 4 to 6.7 million passengers between 2006 and 2011.

• The network of playgrounds: This is a program that follows the philosophy of the "Safe Routes" movement, which promotes safely walkable itineraries from home to school. The aim is to reduce the number of parents driving to schools every morning and afternoon. Through the European project MMOVE Girona partially adopts the concept of "Safe Routes" by creating a network of playgrounds at less than 200 m from all the schools in the city. This means to add some new playgrounds to the 107 of 2008 through the adaptation of squares and little open public spaces in the urban thread. These areas follow a set of safety criteria regarding playground surface, fencing, games, etc. Widening sidewalks and installing benches also improve the itinerary from schools to playgrounds.

• The Mobility Plan: Besides the actions and initiatives already Girona is currently producing a Mobility Plan. The philosophy behind the plan is to decrease pollution and emissions by preventing traffic jams and over-driving in search for parking. More parking offer is hence a target, together with reduction of traffic light phases to reduce stop and move, and Green Zones under a yearly fee for locals and residents to promote permanent parking. Also, a range of 63 Km instead of the current 18.6. Progressive implementation of charging stations for e-Vehicles is in the Plan's agenda as well.

• Long-Distance Connectivity and International Hubs: Connectivity of Girona is well covered. The recently inaugurated higs-speed train station right in the city center is facilitating connectivty to Barcelona for commuters and tourists, as well as to the rest of the Peninsula to the south and Europe to the north. In addition, the local airport with low-cost services is powerful hub for international tourisim aiming to visit the Costa Brava and for the locals for traveling abroad, which in turn expands the city and the region's trade potential, already strong thanks to the AP7 highway corridor crossing the territory.

C/P Workshop of Development and Climate Change*

Climate Change

Conflicts: Challenges:		Opportunities: Capacities:	
▪ High use of private transport ▪ Public Transport not competitive against car ▪ Old and inefficient housing stock ▪ Increase of temperature, increase of energy demand for cooling. ▪ Commercial sector not aware ▪ Impact of climate in water cycle ▪ Climate topic not mainstream in public action ▪ Skepticism and conservative society ▪ Increased risk of forest fires ▪ Waste incinerator obsolete	▪ Confusion on ESCO business offers to the LG ▪ Districts with worse housing where most vulnerable people live ▪ Lack of climate impacts assessment and climate adaptation plan ▪ Important share of commuters coming into the city every day, mostly by car. ▪ Very limited public transport at metropolitan and interurban level. ▪ Lack of gov. support to local climate action ▪ NIMBY movements against RES facilities ▪ A lot of new housing stock without EE meas.	▪ Good information system ▪ New developments planned with higher standards in energy use. ▪ Positive results of experiences developed by the Local Government (solar roofs, biomass heating systems in schools...) ▪ City committed to carbon neutrality	▪ Close university and Science-Technology Park ▪ Many local energy companies ▪ Little problem with heat island effect so far ▪ Energy advisor ▪ Small city, walking distances most everywhere. ▪ Energy cooperative very successful

Development

Conflicts: Challenges:		Opportunities: Capacities:	
▪ Strong crisis, very high unemployment and increasing population under the poverty levels ▪ Large stock of empty housing	▪ Investments from superior administrations frozen ▪ Impossibility to create debt from LG ▪ City very based on commerce and tourism	▪ Strong role as regional capital ▪ University and Science-Technology Park ▪ Beautiful historical center and tourism ▪ Benefits from being close to Barcelona	▪ Dynamic commercial center ▪ Student community living and often establishing residence in the city ▪ Location in the 1st corridor in the country; TGV, Low-cost Airport, Highway...

Brief highlights:

- Two main sectors require most attention regarding climate change: buildings and transport. For the first, inefficiency is common to both old and new buildings, as most housing built before the crisis was prior to the enforcement of nationwide EE measures. Even so, new developments have been planned with higher standards, awaiting a recovery of the real estate market. For transport, competitiveness of the private vehicle is still high in front of public transport. The short distances across the city and actions to include in the Mobility Plan must contribute to revert excessive use of cars, also from daily commuters.
- There is too much offer and hence confusion regarding costs and benefits of working with ESCOs. The track record of experiences already developed by the Municipality, a good information system and the city's energy advisor are assets for a satisfactory management. Moreover, the energy field is very dynamic in the city, with very successful local companies. The latter, together with a close University and the Science and Technology Park should help progress in the right direction.
- Climate is still not a mainstream issue, and skepticism is yet strong. Climate impacts assessment and adaptation planning are absent, with risks over water and forest fires potentially increasing. The commitment to carbon neutrality of the LG and operating experiences must be disseminators for the citizenship.
- The economic climate is bad (growing unemployment and poverty levels, public investments frozen, empty housing stock). This requires the city to further develop its potentials and strengths: commerce and tourism, capital-role, University, vicinity to Barcelona, etc. for the city's prosperity.

<table>
<tr><th colspan="2">Interviews Girona</th></tr>
<tr><th colspan="2">Public Sector</th></tr>
<tr><td>Municipality:
▪ (M) Mayor
▪ (W+M) Sustainability Dep. Chief and Technical Expert
▪ (W) Energy Advisor
▪ (M) Spatial Planning - Buildings Technical Expert
▪ (M) Green Areas - Nature Technical Expert</td><td>Municipality:
▪ (M) Economic Development and Tourism Dep. Chief
▪ (M) Waste Management Technical Expert
▪ (M) Waste & Water Treatment Utility CEO
▪ (M) Water Supply Utility
Other:
▪ (M) Province Authority - Environment Department</td></tr>
<tr><th>Civil Society</th><th>Private Sector- Corporations</th></tr>
<tr><td>▪ (M) Energy Cooperative SOM ENERGIA
▪ (M) Onyar Foundation
▪ (M) Ser.Gi Foundation</td><td>▪ (M+W) QNOrm
▪ (M) Solventa6
▪ (W) Centre Easy</td></tr>
<tr><th>Education - Research</th><th>Cancelled</th></tr>
<tr><td>▪ (M) Vice-President of Research and Transference - Univ. of Girona
▪ (M) Lab. of Chemical and Env. Engineering - Univ. of Girona
▪ (M) Water Research Institute - Univ. of Girona</td><td>▪ (W) Transport Technical Expert</td></tr>
<tr><td colspan="2">Brief highlights:
▪ In total 22 interviews were conducted; more than in any of the other cities visited. Being Girona the hometown of the researcher it was possible to expand the agenda beyond 5 days.
▪ Less than 50% of the sessions were with members of the LG Departments and Services, a situation not common in the other cities, yet also explained by the calendar flexibility of this case.
▪ 3 meetings with civil society organizations where arranged; an important contrast with the remainder cases, where none or just one were successfully programmed.
▪ Meetings with University and research related representatives were also noticeable; a sector under-represented in some of the cities.
▪ All the prior differences respond to the researcher's knowledge about the local stakeholders. This gave the option to create an agenda with independence of the meetings suggested by the LG.
▪ The public sector was mostly linked to the Municipality, as in the other cities.
▪ The gender ratio of the interviews was very unbalanced, only 3 Women for 19 men.</td></tr>
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Interviews: General Information and Social Economic Aspects

Interview	Year	Activity	Management	Jobs	2020 Jobs	Turnover	2020 Turnover	Prod/Service	Market	Performance
		% Green	PB/PR/J	#	#	€ /USD	€ /USD	Units	L/R/N/E/W	0 - 10 points
Environment D. Municipality		100%	J	72 + indirect from partners	= (manag. at metro scale)	20 M€	=	Waste, green areas, activities...	L	3 (no mid-term strategic planning)
Energy Area Municipality	2008	30%	J (3 partner companies)	2 + indirect from partners	+30% (yet, should grow)		+50% (as savings feed to more actions)	RE & EE, street and traffic lighting	L	8.5
Waste Area Municipality		--	25% P + 75% PR	145 (streets + waste)	?	11,2M€: 50% waste collec. - 50% streets	11,2 + Inflation	Waste collect. and street cleaning	L	
Green Areas Municipality		--	J (13 partner companies)	38 + indirect from partners	some more	4 M€	4,5M€ (+50% room for biological control)	parks, forests, open spaces, etc.	L	6
Water Supply Utility	1992	--	J (80% PR + 20% PB)	67 (5-7 in efficiency)	? Very ucertain	6 M€ (350,000 eff. and maintenance)	Golden Age ended; ergo rational growth	67,000 clients (490 km network)	L	6.5
Waste Treatm. Utility	2000	~60% (valorization)	PB	59	double	4,850,000 (no vat)	? Linked to energy price change	Waste & sewage treat. + Recycling	L	6
Env. Dep. Province Auth.	1990s	100%	PB	11	? Prov. Auth. may cease	2,8M (+450.000)	? Prov. Auth. may disappear	Nature, CoM, A21 Plans, old forests	L	7
Solventa 6 - Girocleta	2001	100%	PR	24	Growth	1M€	no targets defined	Bike sharing, biomass, CRS, EE	N (yet products targeting export)	6.5 (crisis is withholding business)
Cooperative Som Energia	2010	100%	PR (>4,000 members 2012)	3	Growth	--	Growth	Prod. & Supply of RE	N	8.5
SER.GI Foundation	1987	100%	PR	35-45 (not full time)	reduction, yet too uncertain	1M€	reduced 200,000 € in 2011	educ., support to youth, social hous.	L-R	7.5 (quality process, workers commitm.)
ONYAR Foundation	2005	100%	PR	100	uncertain	<2M€	uncertain	special work center; organic products	R	8
Water Research Institute	2006	90%	PB	90	200 (2014 plan for 150)	3 M€ (65% Gov + 35% Calls)	6 M€	Eff.; Pollut.; biodiv.; sewage; clean tech	E	5
Univ. of Girona VP Research	1992	--	Most is PB	80 researchers + 40-50 scholars	+10%	2,5 M€	+30%	Water, climate, tourism, ecology...	R-E (Strong Medit. Campus)	7
LEQUIA - UdG	1992	100%	PB	40 (6 research. + 35 scholars)	too uncertain, growing so far	1M€	Too uncertain, ups and downs coming	improvement of water treatment	R-N	8.5
Centre EASY	2001	25-30%	J	3+2*1/2	4+10	?	?	Car Sharing & Local Currency Tech.	L-R	7
QNorm - GETMA - BIOMCAT	1997	100%	PR	10	40-50	2M€	Str. Plan 50 M€ / now partnering	RES and EE	R-E	2

Brief highlights:

- Organizations/services from the public sector and the University tend to go far back (late 1980s or early 1990s), whereas in most cases private companies and civil society organizations are of more recent creation (2000-2010)
- Expectations of growth in jobs are present in most of the cases but in one. Uncertainty is also common, but not generalized even though the crisis.
- The prospects of economic evolution are also more positive than expected, when considering the situation going on for the last 6 years in Spain. Nevertheless, several messages ("the 'Golden Age' is ended"; "ups and downs coming"; "too uncertain") expose pragmatism when looking ahead.
- Most organizations self-evaluate their performance between 6 and 8.5, showing that satisfaction is present but not fully as a consequence of a "crisis withholding business" (Solventa6). Actually, two organizations are very disappointed with how things are going. The Environment Department Manager claims lack of direction and strategic vision in the Municipality. The company QNorm working in EE and RES is suffering with all the policy changes introduced by the Spanish Central Government (e.g. cancelling feed-in tariffs), driving a full stop of projects in development with large investments behind.

Interviews: Activities, Constraints, Future			
Organization	**Activities**	**Constraints**	**Future**
Environment D. Municipality	▪ It takes care of the municipal environmental services and activities: waste, water, energy, green areas, env. education. One of the newest topic is climate change, by engaging in CoM. Some env. topics are run by other Departments, such as transports and land planning.	▪ There is no strategic planning at mid term (e.g. waste & water). There's not a framework for the debate and strategic planning at local and metropolitan levels. ▪ Due the crisis and gov. change the LG is changing / eliminating services as environmental education. ▪ In the current context, there is no direction of the policies and responsibilities; set targets and objectives.	▪ Energy topics: renewables and efficiency. ▪ Waste, energy and water are crucial as they affect directly the quality of life. These have the largest costs of managment, so cuts will have to address these topics ▪ Yet, citizenship has the responsibility to define priorities with their vote, clear mandates at local and regional level. ▪ Management must become regional/metropolitan in order to increase eff. and scale economy of the public adm.
Energy Area Municipality	▪ In EE this last 4 years have been the strongest, in public lighting since 2005, by renewal and brightness reduction. Actions in biomass, solar-thermal, PV, geoth. So far, from 20 schools, 2 biomass and 3 gas. ▪ Management of energy use: e.g. remote control in school buildings (18; work hours, rooms)... The newer buildings have lighting and heating control systems (Marfà Civic Center, and Day Care Center). Adapt the existing buildings progressively. ▪ Currently developing low investment actions to generate savings (accountability systems and so on, excessive power contracts, reactive energy over-cost). They are mainly obtaining economic savings today, more difficult to control consumption. They have the idea to create charts of each building for the center managers.	▪ Economic resources. The substitution of heat pumps is currently stopped due lack of investment capacity. The same for solar thermal, etc. ▪ Moreover, the cancellation at Spanish level of feed-in tariffs has stopped a large PV project for the sports arena. ▪ Organization of the municipal budget. It should be more unified and planned prior to its approval and posterior destination to the different divisions. ▪ ESCOS: Difficult to determine the savings with a set of measures. So far, the city has been investing in actions with clear savings such as public lighting. In buildings and facilities it is more difficult because management is also very important: working hours, activities developed... Not easy to calculate and verify in regards to ESCO services. This is a great obstacle to go down the road of ESCOs. So far contracts are a bit blind: the adm. accepts a fee for a certain period, not necessarily the lowest.	▪ Energy efficiency in the municipal buildings ▪ More awareness and cooperation of the citizenship ▪ Diversification of energy sources as much as economically possible ▪ Re-operate the hydroelectric plant El Molí ▪ Increase investments with a return period, and prioritize this type of mechanisms in order to allocate investments
Green Areas Municipality	▪ They particularly work on water saving, which is the larger resource used in the city. They are currently installing a network of meteorological stations that will automatically control irrigation (if rain, no water). Savings may not be strong but image a lot. They have a policy on Mediterranean vegetation. There is not a calculation, but before they'd have to water 5 days a week and now 3 in some places. ▪ In 2014 there will be a new Directive transposed of the use of chemical products in sports areas, parks, schools, hospitals, etc. To which they acting in advance. ▪ They dedicate important efforts in retrieving traditional works. In the brigade some say OK due several cases of cancers, but they also do not like physical activity. Age is not a big issue though. ▪ Biological control. The last two years they have acted much less on plagues thanks to biological control. They are funding reproduction of the pest controlling insects. ▪ They are starting to discuss about varieties of plants for the Flower Festival of the city; also fixing public spaces for the fair with a perspective of permanence.	▪ Lack of time: time lost in administrative processes and lack of time for upgrading knowledge. Need of continuous updating as it is a very dynamic topic. ▪ Social perception about sustainable gardening: the people want Versailles type garden, and this is not affordable both economically and environmentally ▪ Political interest ▪ Lack of transversality between areas: particularly with urbanism. Parks & gardens should be a cross-cutting area, independent to others as it affects many aspects of the city (from urban development to schools or public space) ▪ In the brigade some say OK to the new practices due several cases of cancers, but they also do not like physical activity.	▪ Biocides: organic plant-care products. ▪ Unit of parks and gardens, as in Barcelona, in order to integrate not only daily activity, but also some research and education, pilot tests, dissemination. ▪ Improve smart gardening: introduce CIT in gardening (e.g.: sensors for data collection for plague control) ▪ There is no perspective related to climate change mitigation and adaptation (e.g. Some trees are increasing diseases due to the last heat waves). It is necessary to search trees adapted to the new conditions. They should also be relocated in better places -not is tight streets were they bother and need more maintenance; or not in both sidewalks, etc...

Organization	Activities	Constraints	Future
Waste Treatm. Utility	▪ Utility taking care of solid waste treatment (incineration with energy recovery) and waste waters treatment. They also derivate all solid waste types to the several recycling facilities (glass, paper-cardboard, plastic and light containers, organic waste, sludge).	▪ Economy; lack of autonomy to develop the desirable projects as the political context doesn't permit. ▪ The legal framework is completely futile, overloaded and unreal. e.g.: according to the license they have yearly costs of 120.000€ for mercury whereas the measures obtained are 100 times below the legal levels. This is a demand only existent in Catalonia; also for Fluoride Acid, they emit 0. ▪ Norms that no one can accomplish: In waters they had to define sensitive areas next to rivers. Almost everywhere, therefore all treatment plants had to introduce nutrient extraction creating an economic collapse of the system, when many of the rivers didn't need it.	▪ Update incinerator (1983): refurbishment or new and larger plant. Currently, about 50% of the load is bypassed to landfills to technological obsolescence of the plant. ▪ Improve the energy efficiency of both plants, especially in heat. In electricity they are working a lot on optimization, but in heat there is no use of the energy.
Waste Area Municipality	▪ Girona follows the waste manag. program of Catalonia based in 5 containers in one same area when possible. ▪ The city is reducing waste since 2004; the first years thru improved separate collection services, since 2008 due the crisis. Since 2002 the city has reduced its final waste 30%. The first 4months of 2012 have had 1,5% reduction compared to passed year. However the city doesn't seem to lose population.	▪ The citizen is always not happy with the issue of waste. In part because they mix street keep-up with waste management. Activity not approved. ▪ They try to do the work as best as possible with the available resources. However, politicians often listen more to the population than the technicians ▪ They have to adapt to the legal framework no matter if it is good or not.	▪ The new contract plans to rationalize the system and increased the service to the whole city. So far the city has different truck systems (back, lateral, top). According to the new system is planning to reduce the volume and integrate all collection to the same system wherever possible. ▪ The city will complete separate collection to the old part. ▪ Another perspective is to introduce biodiesel in new machines and some small electric vehicles.
Water Supply Utility	▪ The water utility can't do much in sustainability. Between 1992 and today there's been a growth of energy demand related to the water demand increase, yet per capita there's a reduction thanks to all these measures. ▪ Drinking Water needs 2 MWh/y -> 8 years ago they put PV panels for 35 kWh/y. Energy is supply is from the net, yet they can be autonomous (with gasoil) if necessary (with regulations to avoid emission peaks when turning on). ▪ In the city there are also some water pumping stations (at night) linked to deposits: about 10-11% of the water is over elevated to the high-located neighborhoods. There is an energy control system of the water pump stations in order to monitor their efficiency yet control has a limit. ▪ Another area is awareness rising in order to reduce demand. In 2007 a campaign with ACA distributed 70,000 water saving appliances for WCs in Girona-Salt-Sarrià. This generated 350.000m^3/y savings in water treatment. ▪ Savings in the network. They control night minimal flows from 2 to 4 creating a register; also acoustic detectors and electronic control systems. When they started in 1992 uncontrolled ratios where ob 30%. Today is 15% (the year with lower level was 2010 13%).	▪ The economic situation is dramatic, in particular the financial opportunities. A good project on the table with a lot of financial demand will probably not develop. ▪ The administration is suffering the same as the industry but double. There is a disappointing trend. Very anxious situation. Much more conservative today than 5 years ago. ▪ Girona doesn't have a policy or network for regenerated water. There is an issue about investment and energy costs. They have never discussed the issue, as the treatment plant is far away and downwards in altitude, so very energy intensive to pump the water back up. ▪ The new building code (2007; 2010 100% application) includes reuse of grey waters; it is having some effect on residential homes. It is a pity it didn't arrive 10 years ago -before the crisis- as many rain water could have been collected in order to gather water for parks.	▪ They are in touch with a company generating micro-energy with little waterfalls (25 KW). The continuity it could have depends on the regularity of water entrance to the plant. ▪ They are also studying the incorporation of small electric vehicles for short transports: maintenance. Hybrid vehicle are doubtful due their double engine and mechanics -double costs in case of problems-. ▪ District heating not being considered. Really difficult to plan this new activities in a general context of recession; very hard financial conditions. If growth recovers, why not? ▪ The next years, the key areas are alternative energies, EE, and energy optimization (vehicles) and control. ▪

Organization	Activities	Constraints	Future
City Promotion Municipality	▪ Four areas: business, labor, tourism and commerce. ▪ Not working specifically env. topics, yet they consider that RE is an issue to work on. ▪ They manage the "Farm of the Plots". 2 projects for job creation: building a windmill for water pumping; gardening school with interns and youngsters. ▪ Commerce: campaign for EE on local commerce after the city's commitment to 20-20-20. searching ways to save costs and energy on the business sector. ▪ Markets: PV roof of retrofitted market building. ▪ In tourism the European Project Respi'r is launching the natural areas as a touristic asset of the city. The target of the project is to promote excellence within the eco-tourism companies, through capacity-building. etc. The project also includes investments for this sector.	▪ Intellectual reluctance from those who must make decisions ▪ Lack of funds ▪ From the companies it is seen as a regulation rather than a support to competitiveness. Whenever it becomes interesting to the private sector it will be more for the city ▪ There has been a trivialization process of the sustainability ideas, today the concept is weak for many politicians	▪ Energy, is the key to economic development in the future. ▪ Also a model of sustainable city, both for quality of life and environmental purposes. ▪ These topics must become marketable, they must have economic interest. Also, it is necessary to have a change in perception of environmental issues
Spatial Planning Municipality	▪ The Urbanism Dep. deals with planning, building licenses, public spaces and services. For the latter, they work to improve EE and energy contracts. In licenses, they do not impulse specific actions but verify expected measures. ▪ In planning the city has very little land to build: the North access, Mas Masó (20K m^2 roof). Residential sector of Domeny (2006); 27 Ha (1,200 homes and 113K m^2 roof). This sector had env. planning of buildings: +15% EE in winter and +30% in cooling. Also measures and recommendations regarding orientation, opening, crossed ventilation, materials, glassed galleries. They did not forbid materials (PVC or aluminum) just recommended. This whole plan allows to fulfill/prove the LEED parameters. Other: separate waste/rain water collection: filtration of street drainage and drainage to river, gardening criteria. ▪ The city had its own green label for buildings -not mandatory-; the highest standards were applied to Domeny Plan. They discussed if adopting building energy labeling which also includes energy sources. Therefore, biomass in an inefficient building can increase label quality. ▪ The national code (2007) has adapted and regulated many of the requirements of Domeny. They haven't changed their reg. in order to ensure building criteria; ergo, there isn't control system of the Code's execution. The technical code is mandatory over new buildings and under certain criteria in retrofit. Yet, many licenses are from before 2007, and there is almost no new building stock. Yet, the interesting issue is to retrofit the existing stock. They are now implementing a plan to install lifts outside buildings to improve life quality: (1,000 homes need). Accessibility links to obsolescence of many buildings, so an excuse to act and introduce retrofit measures. ▪ Another topic is to do energy retrofit of the urban landscape. Deficit of services (electricity supply, public lightning), mixed uses (reserve for commercial activities 3K-4K m^2). For public buildings and facilities they try to rationalize the localization in order to provide social and administrative coherence: civic center with library e.g.	▪ In Domeny they had the plan stopped for one year in order to install a heat and cooling cogeneration plant for a district system. The potential companies were against it. Promoters didn't want it either. Climate is very negative for this concept here. Not everybody needs/wants energy in the same way: thus the system may be working just for one. They could not ensure how to legally bond the residents to the district system. There is a lack of community culture in our country. ▪ The city cannot promote cohousing buildings, but for example in Domeny there is space for a cooperative project option for 50-75 years. ▪ Very complicated and superposed legislation	▪ It is necessary to do good practices in the sustainability dimension, as well as gender aspects, services, mobility… ▪ More systematic procedures: for example a environmentalist as part of the plan teams ▪ Discussion on adaptation to climate change; so far, none. ▪ It is not a question of regulation. It is a cultural affair. Many things that were considered secondary are now more normalized and internalized. There are lines not crossed. ▪ It is a question of program and priorities: for example the agenda of a plan should be reviewed every 6 years. This would have helped, also including more private. The different stakeholders act separately. ▪ The new sector of Barcelona Street (is smaller in land but similar in dwellings) will include some of the parameters of Domeny, but not all. ▪ There is a technical commission for a new strategic plan of the city --> Jordi Xirgu.

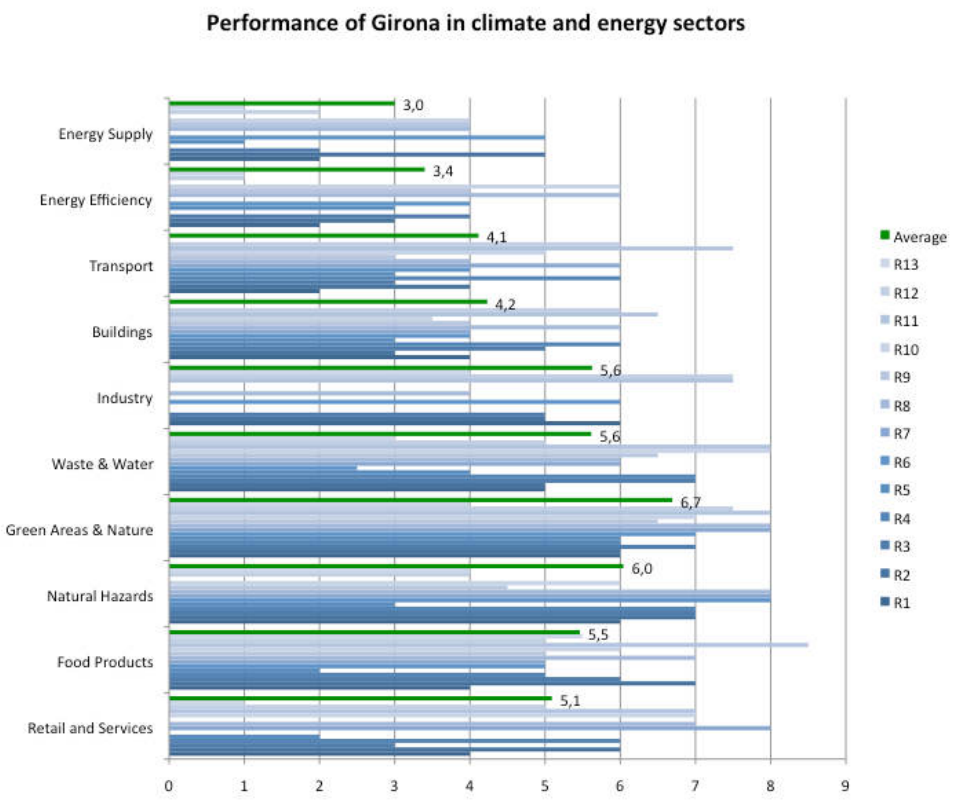
Organization	Activities	Constraints	Future
Env. Dep. Province Auth.	▪ Support Structure for the Development of SEAP / ▪ Program Pla a l'Acció to implement actions form LA21. ▪ Environmental Education ▪ Conservation (Montseny Park, yet they plan to create a Consortium with all the involved authorities including the Catalan Gov.). Due the crisis, they had to cut back many funds to other protected areas. ▪ CILMA: platform of local governments for sustainability	▪ The crisis. ▪ Organization: lack of permeability between administrations, between neighbor departments... In areas where there is link to other areas they try to communicate and cooperate. They still lack more communication with the Land and Environment Department of Catalonia for common objectives... ▪ The political will of the Province Authority. ▪ Lack of responsibilities in the climate and energy topics; yet they have the mission to serve LGs and this is not sufficiently developed. ▪ The idea that Province Authorities should disappear.	▪ Support structure: assessment in channeling external funding. Fund programs and technical support (if economic cuts trend continues, this must be rethought) ▪ CILMA: turn into a platform to exch. experiences between tech. exp. of different mun. and county councils. ▪ CILMA: a new issue emerging is planning micro-wind farms ▪ Integrate in the Network of Sust. Mun. of Barcelona in order to have a Catalan Network (Generalitat already in) ▪ Energy: in order to reduce emissions and costs. ▪ Biodiversity (fire risk control and management, protected areas and so on) ▪ Environmental Education as a support to the prior two
Solventa 6 - Girocleta	▪ Engineering company with different business sectors: biomass, CRS, infrastructure management (big buildings with large operation costs, including energy). ▪ They run Girona's public bike-sharing service. Quite an important success: 300 (bikes); 2,000 users and 1,200 uses/day. Hard effort on logistics to redistribute the bikes; a lot of trips are one way. The service is an important yearly investment from the LG, targeted to the citizenship (not oriented to tourism). The yearly fee for user is 30€/year. A service like this would be very difficult to self-cover with fees. Its value is not quantifiable in money. ▪ They are part of an incubator with other companies: e.g. 4Sfera is a neighbor company that is specialized in carbon footprints. They are little by little introducing this in their other projects, not only on the bike service.	▪ The crisis ▪ Lack of credibility of the sector. They mostly need to rephrase their work without spoiled terms and concepts, such as sustainability. Strong reluctance from the potential clients.	▪ ESCO is an energy manager type of service that they work on but without that name. ▪ They study even investments and articulate the process in order to manage the correct progress of the investment.
Univ. of Girona VP Research	▪ The University has opted to individualize and excel in water: Excellence Campus in Tourism and Water. Very linked to sustainability: from treatment for drinking to ecosystem conservation there is a many activity going on. About 20% of the University's research is around water (economy, law, land use, risks...). Water will be the backbone for many other new research: law, ▪ There is a group on sustainable architecture, some research on renewable energy, a group on soil conservation... scattered activity.	▪ Limited participation in European projects and networks. ▪ Improve transference, because many groups are not used to work with companies. ▪ How to reach further markets, not only as investigation expertise. Many researchers are at the top level, but it is necessary to visualize more this value.	▪ Clean techs, resource use: most technical and scientific faculty and researchers are oriented to this: resource use. ▪ Climate impacts: trend topic that will become mainstream. ▪ EE in buildings. ▪ Biotechnology (well understood) in the field of health. ▪ RE: progress, yet Girona is a satellite to cluster in BCN. ▪ Research responds to economic resources. The new research program of the EU includes 4-5 headline topics related to sust. This will be a very strong driver for R&D.
Water Research Institute	▪ Part of Cerca, a network of research centers of Catalonia. They are a private foundation funded by public administration: ACA, UdG and Government of Catalonia. ▪ The idea of this research center is very crosscutting. From rainfall to all human use of water and return to the ecosystems. Pollution control; biodiversity; sewage control; clean technologies; water efficiency. ▪ Energy: the better the water treatment is, the less is the energy demand. ▪ Effect of climate change in water cycle	▪ The crisis is a very strong constraint; the budget of research will decrease >30% this year. However the situation in Catalonia is different than in the rest of Spain. There is a will to continue with research in Cat. Despite the crisis, they are still doing a lot, yet, they are very conditioned by the facts. ▪ In Spain the political consideration of research is very low. This drives to a low acknowledgment of the society (politicians, media, managers...) towards the scientists. The paper and weight of science is very low in everything... very much behind other countries in this sense.	▪ Already working on the top topics. It is just question to continue like this: treatment, ecosystems, sustainable / compatible use of water for both human and natural uses; better tech.; ecosystem processes and limits. ▪ Researchers often relate much more from a personal approach than just institutional. Their Mediterranean and European vocation is therefore turned into searching partners and projects at this scale. ▪ Resources to attract the best researchers. ▪ Insist in improving the reception of their work by society ▪ Integration of work branches of ICRA

Organization	Activities	Constraints	Future
Cooperative Som Energia	▪ <1,000 members they didn't start with specific services. 1st create the social mass for an RE demand, by turning the cooperative into an energy distributor. In energy distribution they started the activity in October 2011 with 33 MWh but the growth is expected for 4,000 MWh in 2012. They are growing about 40-50 members a week. Local groups are developing in different regions of Spain, promoting the expansion of the project and local initiatives. 1st coop. with this vision and aims in Spain. Inspired in initiatives in other countries in Europe; similar in Belgium have reached 40,000 members in 20 years. When they develop a project as much as possible they try to link to the public authorities, searching public roofs. Some LGs become members of the cooperatives, but this is still little. In distribution, LGs are not accepted as clients, due current risks of local authorities in regards to payment. ▪ They also provide investment funds to the members for the implementation of renewable energies with the aim of producing the energy demand of all members. ▪ They just installed their 1st PV roof, and they plan to increase up to 430 KWP PV this year. And they are promoting a biogas central of 500 KW. ▪ Born thanks to a resettled Dutch man who wanted to invest and participate in RE projects, and together with students in the University they promoted the cooperative.	▪ There are constraints from the administrative aspect. Paperwork is often not as fast as desired. ▪ The volume and areas of work they could have could be much larger: education, assessment, etc. They can't reach all. ▪ The extinction of the feed-in tariffs to RE has been a big hit on their activity, as they expected to invest in projects with certain return periods. This has slowed down some projects, however all the projects they work with still include feed-in. In the future they hope to work on self-production, but they guess policies may change again. ▪ The crisis is perhaps the driver for such a project. The current situation asks for alternatives as this.	▪ Education ▪ Assessment ▪ Self-production ▪ All projects are on electricity now, in the future they'll open to heat. ▪ They will need to grow on work capacity in order to cover all these topics. They are very busy in this a investment allocation
SER.GI Foundation	▪ Support for teenagers that are at risk of dropping out education. ▪ In 5 highshools, conflict management and intercultural livelihood. Facilitation of relationship school-families ▪ Capacity building for professionals in the fields of education and social works. ▪ Social housing with flats from little private owners. They facilitate the process to offer them at low rates for families at risk. Prog. adopted by the Catalan Gov for the whole region and managed by SER-GI in Girona (in 3 cities, about 220 flats). ▪ Community building: Local Plans for Citizenship and Hosting: welcome sessions to newcomers, awareness rising for the management of newcomers.	▪ They could be doing much more; on one hand the cuts due the crisis have prevented them involving in certain projects, others are at risk of disappearing. ▪ In their projects sometimes they have social response, sometimes not. One never knows. ▪ Not enough knowledge of their activity (housing services). ▪ Political obstacles, especially after conservative turn in last local election; not interested in these issues. ▪ They often work with LG services with a certain ideology behind. This sometimes generates friction yet it is beneficial and brings positive changes (in high schools and LGs).	▪ CSR. They have created a partnership commission with members and non-members including businessmen, people from the University, Chamber of Commerce. More structure and support for the Foundation in certain issues. ▪ In the economic field they will have to work to reach European Funds, sell paid services to other public than population at risk; open to corporate sponsoring. ▪ Housing ▪ Youth: what happens to teenagers who drop out? ▪ Partnerships with other org. with common aims (in Barcelona, Tarragona, etc...) and the 4th sector (coop. between Adm, private company, University and them.
Centre EASY	▪ "Fes E-dit" is a car-sharing service, which includes commercial and parking advantages for the users. Born in 2009 after a brainstorm to search new products. First a pilot test with people from the PCiT and UdG. In Sept 2011 it was launched to the whole UdG, and the cities of Girona and Barcelona. There are 806 and most of them do shared trips every 2 weeks. Most of them centered in UdG in cooperation with the Green Office. The evaluation is positive so far. They started with 60 routes in a whole school year; today they offer 800 options. So far the stats are about 6-7 shared trips per week. They about to start a program in the Regional Gov. in Girona. They include a big number of incentives and advantages. ▪ Alternative currencies: RES. It is complementary coin with the same value as 1 €. They are currently reaching out to shops, which will accept this currency and offer discounts to users. Every user will put Euros into their RES wallet, which will be increased by 10% or more through the system. It is an idea started in Belgium in the 1930s	▪ Culture of individualism. It is hard to find people who want to share their car: fear. ▪ The introduction of an alternative coin is complex for many people, and there is a mental attitude of prevention to new experiences. ▪ There is need to work on awareness in sustainability, in sharing and opening minds... The prior statements are results from surveys done with the university community. Imagine with the rest of the society. ▪ Potential public is a minority.	▪ Car sharing communities ▪ Awareness ▪ Access to fingers: they will improve access to fingers (car sharing exchange unit) with the chance to buy them. ▪ Optimize the application (for Iphone for example)

Organization	Activities	Constraints	Future
ONYAR Foundation	▪ They work in env. not only for awareness but also for business opportunity. For many years working in forest tasks, cleaning and burning shrubs. Now they thresh, but they would like to work in energy production. The price of fuel is determining a lot of changes and they work on them. They also have a garden for autochthonous species (heura, trees). This sector dropped after the construction crisis and they turned to organic production. They are also impulse new sectors as organics seedlings. ▪ As a special work center, for handicapped people, they must adapt innovation sectors to this social segment. Not large scale, not large investment. Clients of organic produce mostly local (<100 km). ▪ The recycle bales of sawdust into a heat pump for the seedlings and shitake tunnels. There's been an important growth of both products. ▪ Members of the Agro-social Network (fom Caixa Catalunya), which adds up to 1,500 jobs. They exchange knowledge, they finance studies for entrepreneurship projects, assessment.	▪ They are falling into a contradiction nowadays, because the people most needed of help are most probably going to lose their job. People with disabilities lose capacities faster than ordinary population. Simple tasks are disappearing, and activities that would bring benefit have lost it as the crisis has lowered wages, and there are no more subsidies to new workers. Exploring how to provide some economic aid to this population, but it is not only a question of income but also of life structure and assistance. ▪ The crisis. ▪ Marketing. So far they have been working for few big clients. They didn't care about marketing too much and they do not have the expertise. Currently they are opening to many little clients, so communication becomes key.	▪ Production of fresh pasta ▪ biomass. ▪ As long as they can start new activities the feeling is positive. But of course all new initiatives are at mid term, so it is necessary to hold on and wait for results, and the current crisis brings a lot of uncertainty.
LEQUIA - UdG	▪ LEQUIA focuses on the improvement of water treatment. Objectives: improvement of knowledge and applied science; contracts with administrations and organizations. ▪ A strategic step in UdG is the Euro-Mediterranean on Tourism and Water campus, established in its 2020 strategy as core areas of activity with UIB and CSIC. Anamox: project that treats nitrogen with less energy. Energy is now a key word. / Other: microbial for fuel cells; how to obtain electricity for organic matter and nitrogen. Strong incidence on energy and recovery of materials. ▪ Another important activity decision-making support syst. ▪ LEQUIA works mainly with regional administrations (ACA, CCB...). Other research projects with European funds and also projects with international companies. ▪ They are working with the concept of innovative ecosystems together with the administrations and companies of the sector (cluster). This will help improve financial resources. For example education projects together with related research.	▪ Economic crisis is an important restrictive factor in this moment. There is a lot of uncertainty in the future. ▪ They perceive that they work on a field of environmental sustainability, positive perception.	▪ Produce technologies for water treatment in order to have auto-sustainable plants ▪ There is a new paradigm in this sector, which is "resource recovery" instead of water treatment. So recovery of water for a further use, also recovery of the materials embedded (metals, N, P) and energy. ▪ New: in water treatment there is a generation of GHG. Currently they have found that there are also little amounts of NOx that has 300 times the power of CO2 on the greenhouse effect. (ICRA). A lot of effort to reduce these gases.
QNorm - GETMA - BIOMCAT	▪ In the beginning working on ISO and quality. Now they work on energy efficiency, renewable energies, and R&D in the area of energy and environment. Very focused on European Projects.	▪ RE and EE Policy in Spain. Perhaps better to shut down and restart a new business as the context is against these sectors in Spain. Another option is to open market out of the country. ▪ RE and EE was an emergent market but it was destroyed by the Gov. after the crisis (political change) and, in particular, the stop of the feed in tariffs. There's been a 90% cut in IDAE's budget -the national institute for EE- (also ICAEN). There is no support at all from the authorities (the Region can't, the State stopped it). The market has shrunken too fast and they haven't been able to gain expertise to go abroad. ▪ The sector will recover in the future, but there is a focus in protecting the big energy lobbies and destroying the small companies. The big corporations have used the little ones to generate knowledge, create market and awareness and now they'll enter and eat up all the market.	▪ Heat energy ▪ Energy Efficiency at all levels: industrial, administration, etc. ▪ Self production and consumption of energy ▪ Climate change mitigation ▪ Renewable energy ▪ Their strategy is to generate projects in order to implement them or sell them and recover the investment. ▪ Also, to enter in the management of the local administration in order to introduce their technologies into planning activities. ▪ An important challenge will be to obtain the necessary resources to access knowledge and innovation, and funds for the projects..

Interviews: Links to the EU 2020 Strategy Targets					
Interview	**T 1 - 3% GDP in Research & Development**	**T 2 - 20-20-20 Climate and Energy Package**	**T 3 - Age 20-65 75% in workforce**	**T 4 - <10% early sch. leavers + Tertiary Age 30-34 >40%**	**T 5 - Poverty Lift 25 %**
Environment D. Municipality	▪ No	▪ En. manag. and leading the topic in the LG, however it is cross-cutting so other areas are involved	▪ No	▪ No	▪ No
Green Spaces Municipality	▪ Directly not much, but they facilitate info to researchers. They experiment bio-plague control systems, new tech. for watering, SIG, etc.	▪ EE little and emissions from old vehicles; introduction of electric vehicles would be good. It is a challenge to adapt and mitigate through manag. of Green Areas.	▪ There's been a reduction of the employees since 1976 of 20% ▪	▪ They have agreements with high schools and professional schools for internships	▪ There is a non formal policy to employ people under risk of exclusion, from people who are doing community works
Water Supply Utility	▪ Yes. Microbiological research with ICRA and CSIC --> a lot done / undergraduate research, with results and improvements	▪ Yes	▪ Not directly	▪ Not directly	▪ Limited action. There is a reduced fee policy for single parent and large families. There's been a growth of disconnections..
Waste Treatm. Utility	▪ OK	▪ OK --> the SEAP gives waste to energy key role in the targets	▪ OK	▪ No	▪ No
City Promotion Municipality	▪ They can give institutional support. The city wants to be a referent in Smart Cities new tech. under the current Mayor.	▪ Campaign in the commerce sector, yet a long way to go in energy production.	▪ Main focus, yet the city has lost many jobs form the brick sector collapse. The challenge is huge. There are no easy means to transform this situation. So far, developing training and active labor policies, but few benefit.	▪ Program SUMA't links training in companies for students dropping out; 40-50% jobs consolidated. A lot of profess. training and work with high schools, and Prof. Cert. valuing whole profes. experience of people (EU system).	▪ Indirect thru labor promotion: improving economic activity and professionalism
Env. Dep. Province Auth.	▪ indirect in new technologies included is SEAP	▪ Yes, as supporting structure of CoM and SEAPs	▪ As part of SEAP development, educational services, transport...	▪	▪ Conservation programs working with sectors in risk of exclusion.
Cooperative Som Energia	▪ Their will to support RE bringing citizenship into this challenge can help grow R&D companies in the energy field	▪ Yes	▪ Yes, as much as they have a continued interest to RE, despite political changes, international investments, etc.	▪ No	▪ No. Energy poverty has not been a topic of discussion yet. It may be an issue in the future when it becomes more important.
SER.GI Foundation	▪ No	▪ indirect through family economy training, yet the organization doesn't have a specific en. policy.	▪ Preventive work through capacity building for youngsters in the worse situations	▪ UEC, link family-school	▪ social housing at low rates (even now housing costs are ~40%, but legal assistance only under 30%)
ONYAR Foundation	▪	▪ If biomass project works out	▪ Yes: main focus of activity	▪	▪ Yes: main focus of activity
Water Research Institute	▪ Yes, primary field of activity	▪ Yes, more and more embedded in R&D	▪ Yes, according to strategic plan ICRA will grow in jobs	▪ ICRA is a product and stimulus for youngsters to study	▪ Their research must contribute to more wellbeing
LEQUIA - UdG	▪ Yes	▪ Yes	▪ generating jobs to students and afterwards in the sector	▪	▪
Univ. of Girona VP Research	▪ Yes	▪ Thru research, and management: Green Office and Sust. Plan under review, with actions in many fields.	▪ Producing qualified graduates will facilitate access to jobs. The city is now promoting very strongly self-employment and entrepr. PCiT plays an important role by providing spaces for new comp., co-working, access to funds...	▪ UdG researches on education specialized on inclusive programs for schools with high percentage of immigrants	▪ UdG office to support to int. development projects. Some research in this area, but less. In theory a country with strong R&D, and added value economy, on the long term should drain wealth to all levels of the society.
Centre EASY	▪ Yes	▪ Yes --> they calculate reduced emissions from car sharing	▪ Yes	▪ No	▪ No
QNorm - GETMA - BIOMCAT	▪ Yes	▪ Yes	▪ Yes	▪	▪ Maybe in consequence of T3, but the current idea about energy is speculative. An alternative model can fight energy poverty because it can allow independency

Performance of Girona in Climate and Energy Sectors*



Notes: Anonymous Section

COMMENTS about performance in climate and energy sectors

Energy Supply

- There is cogeneration, some hydro and the incinerator, but very far from waht could be done
- NC
- Very low RE in mix
- Strong fragility and no network redundancy
- Catalonia in general is below the needs of sust; not very clear that RES is the priority option for the Adm.
- A high percentage of Catalan energy is nuclear or fossil
- The technologies for alternative and renewable energies are there but we still continue under nuclear and fossil.
- There is little RE; symbolic

Energy Efficiency

- Housing stock and transport are very inefficient
- NC
- Very low
- Very poor background from the last decades
- Just as energy supply. There must be regulations for buildings, materials and so on. We are at the beginning.
- There are things happening in schools, etc.
- Similar to the previous. Some days the traffic lights are working during the day. And some useless solutions operating
- Nothing has been done; it is starting

Transports

- Very little PT and the existing very inefficient and pollutant
- Big effort lately, but still too many cars. Almost collapse. Important near the university
- NC
- This territory with low density and high dispersion it is very difficult to generate useful infrastructures
- Girona has a big problem in this topic. PT is very badly designed and very badly communicated with Barcelona and the Coast
- A lot to improve on PT and leaving the car at home
- There is an offer of PT but timetables are terrible, connections as well. It can take 2h in connections to move around the city. If the bus is full it won't stop. Often it runs late. Frequencies vary too much between winter and summer.
- NC

Buildings

- There is improvement and culture of saving
- A lot to do and improve. Some projects there but no systematic plans and programs; lately a lot of projects for solar-thermal (2/week or so)
- NC
- The stock of 70/90 null
- Energy efficiency has a lot to do with buildings
- Excessive building stock, very badly planned sector
- Even new buildings are badly built. Only what is mandatory or subsidized. Old buildings with humidity, etc.
- NC

COMMENTS about performance in climate and energy sector	
Industry	**Waste and Water**
▪ The industry is active as it is a cost related issue // little industry ▪ NC ▪ NC ▪ Active because it is cost efficient to implement EE measures ▪ NC ▪ Residual ▪ Perhaps more concerned than others thanks to their open mentality to R+D, to CSR, etc. ▪ NC	▪ There are infrastructures however obsolete, and there is recycling but on a model which is also ended. For progress there should be change on system ▪ A lot to do in water, it is much beyond the city responsibility (the sewage network is much larger). A lot of separate network but not operating. A lot of spilling points for the excess of sewage; problem, + 2 storm deposits for the 1st minute waters ▪ Better waste than water, a bit ▪ Losses >50% but we have water ▪ Waste treatment in Catalonia is something quite well developed. We fulfill European targets ▪ NC ▪ There is not enough awareness on these issues by the society. We act only when there are problems. If it is too costly wastewater is drained to the rivers (perhaps) ▪ Industrial some recycled, in agrarian waste nothing, some urban
Green Areas and Nature	**Natural Hazards**
▪ There are green areas but with not enough connectivity with the naturals areas and systems surrounding. ▪ The Master Plan was written as a response to the Liberalization Law of 1998. There is a strong component of soil protection, with several plans for different natural areas and the Allotments and the Green Ring. The green urban areas would need more structure (corridors between the big parks for example). ▪ Good ▪ Good nature not so much green areas. ▪ This is a great asset of this city. IT has been quite well exploited. There was a project to condition the river Ter next to Salt but had to stop due lack of resources. But OK ▪ In the city green areas are limited, but the surroundings have a lot of nature ▪ They take good care of parks and green areas, yet image is the main driver ▪ NC	▪ Floods and fires, quite controlled ▪ Floods: it is recurrent problem. The city has created several infrastructures to prevent the risk and there is a River Spaces Plan (PEF). No geological risks. Chemical not very well. There is a conflictive point (CLH deposits) as the necessary distances are not there. Soil pollution not much to worry about. ▪ Depends on the risk, fire is very aware (7-8). No awareness on seismic, marine water pollution, floods (<5): knowledge of risk but not on hands of who is responsible for it, about some of them. ▪ well prevented systems ▪ Floods. It hasn't been well managed. The protection against floods has been done only through hard engineering (reservoirs and channels). In the future we will regret this. Other risk is droughts, on top of which there is the transfer to Barcelona cutting down potentialities of the city against drought. ▪ not to exposed to risks ▪ If there is prevention is so internal that the society doesn't know. The city wasn't prepared to last snow storm. When the ice cold came they were receiving info from the city with advisements. ▪ Forest fires are an important risk; floods quite well prevented
Food Products	**Retail and Services**
▪ There is a distribution network, production is very little and 0KM is very rare still ▪ Little experiences: but little land as well. Most nature is forest ▪ several reasons: not working on food security (dependency is growing due cheap transport, cheap production elsewhere), local productions are more inefficient every day; this brings a lot of unsustainability here and there in the agrarian sector; environmental unsust., and a lot of inputs. ▪ There is a recovery , because the sector was abandoned. Productivity bad ▪ Not in track on this topic; more of a fashion than anything else: expensive and difficult to find. Food security is high although. ▪ In general we eat very strangely: not local products, not from the season. A lot to improve in this sense ▪ Not much awareness. Most people buy in shopping malls and the cheapest possible. O Km and organic are better but usually more expensive, so this cuts back potential clients. Fresh fruit and vegetables not very popular among young people. ▪ NC	▪ Similar to industry but less; costs are seen more indirectly ▪ There is no big shopping mall, model of mixed used in the city ▪ The same but services perhaps around 5 and for commerce as in agriculture 1; delocalized, turn Europe in consumers without producing ▪ NC ▪ NC ▪ There is a lot of local commerce, which is the first principle of sustainable business ▪ Fair trade: many products that are leveled are not even 100% fair trade. In general we are very little concerned on fair trade; only the northern countries are very much into it, even when not 100%. Most people do not even know what this is ▪ NC

Reflections about the 3E Crisis: Environmental, Energetic and Economic

EU's proposals and role in shaping the international agenda

- (Mayor): Europe is broken down in order to continue fighting this crisis. There is not a common project today. Either Europe reunites and decides to do the efforts and aids to overcome the crisis, or it will end into a dual Europe.
- (Province Auth.): If Europe continues in the trend of creating a consumerist society without producing, for sure this system will end up collapsing. If you destroy the industrial tissue, regenerating it is not a question of 5 or 10 years, much more...
- (Som Energia): Fortunately we have the EU that is pushing for these questions. Does it have enough force to apply or not? For example the Province of Barcelona was supposed to obtain 500M€ from the EIB through local financial entities. But these entities request such degree of guarantees that it is impossible to have cash flow.
- (Water R. I.): The key point is how to get this message to the city. The EU tends to create very great frameworks and policies, but it is necessary to bring the down to the common society. If we want to reach a green economy, sustainability and a balance with the other forms of life on Earth it is necessary to link with the people. In Europe we tend to stay at a bureaucratically stage, it doesn't reach the people. Currently even the concept of Europe is questioned. Priorities for development should be: people, economy and the army (from the geostrategic perspective). What can we do and what not?
- (VP Research): Perhaps the new map of wellbeing will not include Europe, or not this part of Europe. Therefore, we must all change. This economic crisis is the mechanism to change BAU to something new, but is it for this or for relocating wealth and no more. The feeling is more that we are in battle without weapons in which we are little by little being excluded. Hopefully it is the other way around.
- (LEQUIA): It is clear that Europe is leading this fight.

Where do you envisage your country and your city in tackling this crisis

- (Mayor): In Catalonia we have a victim's position by which we'll never be able to brake through. On the short term it is not probable to abandon this position, but at some point we'll have to accept that progress depends on action. In the background there is a challenge to values. The culture of effort has been lost and this happened in a very short time, spreading a culture of speculation and easy money (credit). Girona is asleep, the city ended a model of commercial activity and old city center without a renewal, alternatives, etc. As the city once overcame the limits of the city wall, today it should reflect on its real dimension according to the activity of the community, the services, etc. The city should also decide what economic personality wants to have, and the industry should have an important role in it, for example R&D in primary sector for quality produce, CIT, water technologies.
- (Green Areas): This society (Catalonia and Spain) is not very prepared for this change. We are too egocentric and individualists. For example, private green areas between buildings could be used for vegetable gardens. Instead they are abandoned and destroyed with garbage and dog excrements, etc.
- (Water Utility): This perverse cycle will be finished or about to, at least reasonably. The golden times are finished; growth has to be rational, not like until now.
- (City Promotion): It is key to develop energy production, as a system to provide economic survival and resilience to the city. The impression is that we are still at the kickoff stage of this challenge. We are very much behind other countries in this question. However it must be very well evaluated in order to avoid sinking key sectors as tourism and assets as landscape.
- (Province Authority): If you destroy the industrial tissue, regenerating it is not a question of 5 or 10 years, much more... We must regain producing activity: energy, food, and goods in general. Relocalize the economy is basic for a sustainable future.
- (Som Energia): The impression in Spain is that we talk a lot but walk very slow, even backwards; for example, the cancellation of RE feed-in tariffs in Spain. It is urgent to react, for climatic reasons but also for economic interests (switching the economy and the industry to the green energy technologies).
- (Water R.I.): The key point is to get this message to the city. The EU tends to create great frameworks and policies, but it is necessary to bring them down to the common society. If we want to reach a green economy, sustainability and a balance with the other forms of life on Earth it is necessary to link with the people. In Europe we tend to stay at a bureaucratically stage, it doesn't reach the people.
- (VP Research): Here there is not enough awareness about this possible change. There is a lot of people who just do not understand, others who do not want to understand and others who do understand but do not do anything. It is a quite generic trend in our political leaders, which are trapped on solving daily issues, the elections and so on, instead of looking at the larger picture. How to confront this problem is something not reachable at local scale. There is little to do at city scale. Instead, action must be at national or even continental level.
- (LEQUIA): Girona is a city where these issues are a concern, with steps going on, yet more could be done of course. The city is in track to sustainable progress. The analysis is correct and the city is on the right direction.
- (QNorm): Spain and Catalonia are the last in Europe in energy issues, even behind Cyprus. Even being one of the top powers in knowledge, technology, etc. But we are behind everybody else. Income per KWh installed of biogas were 11,000€ in Spain and in Germany 35,000€. Without the tariffs the business will be even smaller.

What else should be done to tackle it? Is "sustainable growth" the path to follow?

- (Mayor): The economy or it is sustainable or it is not economy. Green economy is a redundancy. If by green economy it is meant those sectors that can create jobs, we'll be inflating a new bubble and this is a new danger. So what we must do is make the economy more sustainable, not create a new green economy. Green economy is not to buy and sell eco-labeled produce from Taiwan, and increase the social gap between those few that can afford this quality and the rest excluded. Instead, we should be promoting much more season and local produce and exchange knowledge so that all produce and goods can be done everywhere. As there is a crisis, this is always an opportunity. As the core cause of the crisis is unsustainability of the current economy, increase in competitiveness is necessary but of course not the only ending. China is starting to slow down its growth. Are we seeing the beginning of the end of the Chinese bubble? They only have a 60 million high consumers market.
- (Green Areas): Green growth could be the way to overcome the crisis and transform the current society. We'd win a lot with a local economy. But it seems that this has been left to a second term. It also seems that environmentally friendly products and services are options for snobs and rich people. Now due the crisis everyone is back to the shopping malls, for cheaper products.
- (Water Utility): This perverse cycle will be finished or about to, at least reasonably. The golden times are finished; growth has to be rational, not like until now. How to grow with respect to the environment? with sense enough to understand what it is necessary and what not. If we reach this, the crisis will have been useful.
- (City Promotion): Energy is the key to the development in the future. It is key to develop energy production, as a system to provide economic survival and resilience to the city[ies].
- (Province Authority): Green economy is the only option, despite it will become or not. In 50 years we have either developed a green economy or we'll be suffering a lot. However, it will be very difficult to apply. Just as Rio 1992 launched a series of great announcements and many have not been developed, green economy will have the same track. In particular if we expect to have an economy based on non-producing sectors, only commerce and services. We must regain producing activity: energy, food, and goods in general. Relocalize the economy is basic for a sustainable future.
- (Solventa 6): It is difficult to change mentalities even though the crisis is bringing new realities. It would be an opportunity to rethink our relation with the world, ethics, and ecological responsibility as a fact not a tag. If we are able to understand it has to do with us and our wellbeing, whatever the name, we will care more. The challenge is to make green growth real and not a fashion.
- (Som Energia): The Green Economy should be a way to approach and solve many of the current challenges, from oil dependence to energy oligopolies. They do not expect the administration to transform the current block to a new energy model. It will be a grassroots movement that will make the changes emerge.
- (Ser.Gi Found.): They haven't made a rigorous reflection on this topic. They see that there is a clear meeting point in energy, sustainability, and creation of work. Also many social enterprises can deal with environmentally friendly economic actives. There is also a line of activity in agroecology. In 2050 this could be more important, localization of agricultural production will be a growing trend. Also sustainable tourism and cycle-tourism, and so on. The feeling is that we are walking slowly in this direction [green economy], but there will be a tipping point after which all this will grow exponentially. It will be a survival issue, if not... It won't be simple awareness, more a need, as switching to train from car because of gas prices increase (with collateral advantages: security, possibility to work, etc.)
- (Onyar Found.): The impression is that everyone speaks of normality, but water leaks are already in the engines. People as him who grew with the Meadows Report have been expecting this crisis since then. The realization of limits was obvious but not happening. And it is finally happening even in the decades as expected. The question is: are we going to a new form of social organization, or towards chaos? It is a fascinating moment, but probably very painful as it seems that we go towards chaos.
- (Water R.I.): The situation is not sustainable, we must rethink. The crisis is a driver for rethinking, even due economic effects are the only perceivable measure. If this crisis continues going on, we'll have to change dramatically. This will be good for the planet, yet perhaps not for us. We are too used to living very well. If we want to reach a green economy, sustainability and a balance with the other forms of life on Earth it is necessary to link with the people.
- (VP Research): Honestly, the situation looks bad. Most trends take to the conclusion that it is necessary a very transcendental change. It is not possible to extend the level of resource use of westerners (1/5) to the many more (1/3). We will either continue will a system of some privileged; will we be there? Therefore, we must all change. This economic crisis is the mechanism to change BAU to something new, but is it for this or for relocating wealth and no more. The feeling is more that we are in battle without weapons in which we are little by little being excluded. Hopefully it is the other way around.
- (LEQUIA): We must go towards green economy because we must have a more efficient use of resources. Optimistic about the future.

Almada - Portugal

Almada - cradle of Republic and Democracy

Twice in Portuguese history (1910, 1974) this city with 5,000-year-old remains has been the raising and spreading point for the Republic and democracy. This revolutionary character perhaps explains why Almada is the largest municipality in the country with a Communist government, steady since the recovery of local elections. The economy of the city is very much in line with other metropolitan red belts; heavy industry - fishing, maritime and shipyards as it is located in the estuary of River Tagus- under a reconversion process in the last 2 decades. Tourism and urban related services are the growing market of a city with very low unemployment despite the crisis. 30 years of continued policies combined with strict budgetary control make of Almada the city with best economic health in Portugal. Nevertheless, the strong centralization of the country and austerity measures deployed after bailout funds injected by the EU, are putting at stake the progress of green development strategies promoted in Almada.

Coordinates: 38º40'50''N - 9º9'30''W
Population (2011): 174,030
Surface: 70 km^2
Mayor: M. E. Neto de Sousa - Communist
Vote turnout 2009: 48.3%
Municipal Budget 2012: 83,578,294 €
Per capita income 2009: 19,055€/inhab.
Unemployment 2009: 5.5%
Website: www.m-almada.pt/
Study Visit: April 16-20 2012

Summary and Highlights of Green Economy in Almada

Almada's involvement in sustainable development and green economy has been a long-term process of 4 revolving 10-year cycles. The decade of 1980-1990 was for the implementation of basic urban infrastructures (water, waste, land use structure, etc.) and social activism (associations, civil movements...). The decade of 1990-2000 aimed at an integrated development, providing the citizenship those amenities that enhance urban life: sports, arts, culture, green areas... together with new environmental activities, such as sewage treatment, recycling and LA21. From 2000 to 2010 the strategy was Sustainable and Solidary Development of Almada. Throughout this period key actions towards a green city were undertaken: ICLEI membership, the Children's A21, creation of the Local Energy Agency (AGENEAL). And in parallel, knowledge infrastructures were founded –local development agencies, the science and technology Madan Park, universities- to reverse the destruction of thousands of jobs in the maritime industries. Today, Almada is engaged in its 4th progress cycle (2010-2020) focusing on "Sustainable, Inclusive and Eco-efficient Development". Leading the overall process is Lady Mayor M. E. Neto de Sousa, in power for 4 consecutive terms and former Deputy Mayor for the Environment (1982). The following list highlights some of Almada's green milestones:

- Integrated Almada 21 & Annual Corp. Plan ('07)
- Sustainable environmental management and planning Department (2005)
- Local Energy Ag. (AGENEAL, '99) & SEAP (2011)
- Agenda 21 of the Children (2004)
- Sustainable Urban Mobility Plan -Light rail, cycling network, the Flexibus-; "House of Mobility" Project; the European Mobility Week Award (2010)
- Local Platforms for the Green Economy: a) Sustainable Tourism; b) Energy; c) Social Inclusion; d) Climate change (including voluntary committ.)
- Green public procurement policies: hybrid and electric fleet; green electricity purchase; etc.
- "Less Carbon" Local Climate Fund (2012)
- Master Plan with new S.D. instruments (2012):
  - Energy Ability of Urbanization Assess. Tool
  - Food Security Ass. and Urban Agricultural Plan
  - Green Infrastructure Plan (similar to LAB-ICLEI)
  - Adaptation framework for the water network
- "Finicia" Municipal Fund for the creation of new companies.
- Madan Park incubator for green and tech. innov.

Low-Carbon Economy in Portugal

When talking about Low-carbon economy in Portugal it is unavoidable to speak about the financial crisis and its impact. In contrast to the most EU member countries, Portugal has a very centralized administration, with only 2 levels: the central government and the municipalities -just Israel shares this same structure in the present study-. No regional administration articulates the relationship between the national and the local authorities, despite "over the paper, the country is organized in regional units in order to access European funds" (Freitas, 2012). In return for the EU's economic bailout, these regions will gain administrative and political structure and power, "but not under democratically elected processes; instead, by direct designation of the central government" (Freitas, 2013). Furthermore, local governments will be reduced in number, yet the current 308 municipalities is already a small amount (e.g.: compared to France, Italy or Spain). The number and size of civil parishes, as well as the political structure of the LGs' or "concelhos" and the public administration are expected to decrease too. This set of reforms is bringing uncertainty to the local authorities; also regarding green economy challenges. Centralized ruling of topics such as energy production and market, and public transport are critical areas for cities engaging in CoM and low-carbon development. The scope of potential local action remains unclear in the current and unfolding political and economic climate.

Recession, on the other hand, has induced a sudden retreat in energy demand, ergo in GHG; a 10% cut from 2008 to 2011 (EEA, 2012). Portugal registered in 2011 +21.7% over 1990, well below the 27.1% Kyoto target, yet non-ETS sectors exceeded 2.6%. The 20-20-20 EU Package allows Portugal a surplus of 1% GHG compared to 1990. If the trend continues, emissions rights may become an income opportunity.

Notwithstanding the crisis, relevant efforts in clean energy and efficiency are ongoing since 2002 when gross emissions reached their high. In the first decade of the 2000s energy intensity of the economy has been following a down slope path, with ultimate values for Portugal slightly below those of the EU27: 152 e 155 toe/M€ GDP respectively (Environment Agency of Portugal [APA], 2012). Carbon intensity of the economy is also on decline; more than 30% since 2000, and 45 points less than the EU27 (340 vs. 385 t Co_2e/M€ GDP). Efficiency in the energy supply and transport sectors explains most of this positive evolution. Despite a growing economy (in the first half of the period) and increasing motorization, total energy use and GHG emissions were stabilized in 2002-2005 and reducing thereafter, more since the financial crisis (2007).

Progress in RES is noticeable, representing more than 40% of the electricity and near to 25% of final energy consumption at the end of 2011 (EEA, 2012). Actually, the 2010 Climate Policy Tracker (CPT) highlighted "Portugal's well-designed feed-in tariff for renewable energy sources, which means it is about to reach the ambitious target of having 45% of consumed electricity powered by renewable energies". For instance, according to the EEA (2012), only in the 2009-2010 gap thermal power production declined by 24%, whereas hydro power production increased by more than 80% with an associated decline of 5.1% in GHG.

The prior stats show that the country is on track for its National Energy Strategy approved in April 2010, by which in 2020 60% of the electricity must be supplied by RE. Also according to this policy exterior energy dependence should decline to 74% in 2020, rising the overall share of RES to 31% and increasing energy efficiency in order to obtain a 20% decrease in final energy demand. As a consequence of this, Portugal is undertaking a comprehensive policy planning process (CPT, 2011):

- Low-Carbon National Roadmap 2050 (is to be ready by 31 December 2011);
- Sectoral low-carbon plans, such as the Program for Electric Mobility (2009) aiming to develop a network of an estimated 180,000 electric vehicles and 25,000 by 2020.
- National Strategy for Climate Change Adaptation (Approved November 2011).

The Roadmap 2050 is still not a reality, but an exploratory study produced by Fortes, Dias, Seixas and Gouveia, (2012) prospects "cost-effective opportunities for Portugal to achieve an 80% GHG abatement target by 2050". The investigation departs from an arguable economic growth scenario of 2.9% yr after 2020. That said, after modeling 6 different 'policy, technology and energy price' tracks, the study concludes that even in the worse scenario -Frozen/Conservative technological development- "it is feasible to achieve 80% reduction of GHG emissions in 2050 comparing with 1990" (Fortes et al., 2012). For the authors, adopting the roadmap could save more than 54 bn$€_{2011}$ if following the 'New energy technologies development' scenario, and RES in 2050 may grow to 77%-82% depending of the chosen model. Additionally, the study finds that Portugal's 2050 Roadmap may present some differences compared to other countries:

- Electric mobility option may become cost-efficient earlier (2015).
- CCS technology can develop in industry and have a small contribution in CHP.
- Forecasts indicate lower final energy consumption and electricity production.
- Wave technologies are cost-effective and with more importance than wind offshore.

In spite of all CPT gave Portugal a rating of E for both 2010 and 2011, despite the country is showing "a slightly positive development in its comprehensive approach to creating a low-carbon and green economy" (CPT, 2011). Support and promotion to RES and EE is present all levels -energy supply, industry, buildings, transport, agriculture- "to some extent" (CPT, 2011), but limited due the difficult financial situation.

In terms of improvement CPT (2011) recommends introducing an "environmentally-sound taxation system, that favors renewables

over fossil fuel based electricity generation". The platform stresses that there is a political discussion in order to eliminate indirect incentives for fossil fuels, but without decisions taken so far. Instead, criticisms about the expenditures on RES subsidies have risen like in many other countries (e.g.: Spain and Italy). Yet, the fact is that for RES -even with a reduced VAT (13%)- market competition is still hard against fossil, as the latter receives "grandfathered permits in the ETS and is not taxed (for some time)" (CPT, 2011).

According to the State of the Environment 2012 (APA, 2012) Portugal invests 1.59% of the GDP in R&D, still far from the EU27's 2% and the 2020 target of 3%. In the specific area of eco-innovation, the Eco-Innovation Observatory ([EIO], 2013) -a 3-year project financed by DG Environment of the EU- affirms (for Portugal) that "although eco-innovation is still perceived as key for an economic reboot, the strategies and action plans needed to encourage its development are somewhat lagging". EIO 2012 statistics leave Portugal some 16.5 points under the EU27 average, despite the country's ranking has improved from 18th to 16th in the last year (2011-2012). The EIO index assesses 5 areas of eco-innovation performance. In the area of socio-economic outputs (based on exports of products from eco-industries, employment in eco-industries —0.82% of total workforce- and turnover —1.96% GDP-) Portugal marks 63.8 compared to the 100 EU27 average.

A Strategic Program for Entrepreneurship and Innovation (+E+I Program) was launched at the end of 2012, including training programs, public venture capital restructuring, economic incentives, etc. In certain sectors such as photovoltaics, electric mobility, cork industry, smart grids, e-governance and decentralized energy production, Portugal is accountable for encouraging projects and policies (EIO, 2013). However, access to financing, through banking or public R&D funding has become very limited. Moreover, "most policy drivers like the Action Plan for Energy Efficiency, Action Plan for Water Efficiency, National Roadmap for a Low Carbon Economy, Green Public Procurement Strategy are currently being reassessed" (EIO, 2013)

Last but not least, Portugal's efforts in sectoral policies and reporting is remarkable: eco-industries and eco-innovation (Department of Foresight and Planning [DPP], 2010); the environmental impacts of economic activities (DPP, 2009); Tourism and Climate Change (DPP, 2009); Action Plan for the National Program for Climate Change - measures the responsibility of MOPTC (2006, Ministry of Public Works, Transport and Communications [MOPTC]); etc. However, besides the analysis on eco-innovation, no specific document has been found regarding the scope, impact and potential of the green economy in Portugal.

In order to improve Portugal's adoption of a low-carbon economy it would be interesting if economic and labor assessments were published, at national and sub-national level, such as those found in Italy, Spain and Israel. Lack of prospection in this topic may withhold options of economic activity to overcome the current crisis.

Climate Change and Green Economy Framework

		State (NUTS1)	Region (NUTS2)	Province (NUTS3)	County (LOCAL1)	Municipality (LOCAL2)
		Portugal	Lisbon	Setubal Peninsula	Setubal	Almada
Climate Change	CC Responsibilities	Energy, ETS, EU mandates, Railways, Public Transport				Energy, Waste, Waters, Buildings, Spatial Planning, Green Areas, Private Mobility
	CC Target	+1-20-31				CoM SEAP: 20-20-20 -22% GHG vs. 2006
	CC Action Role	Main Actor: Planning & Reg. of CC and Energy. Active in Mobility Infr. & Services (roads and railways). Adoption of EU mandates				Active
Green Economy	Assess. Report	Eco-Innovation 2010 Country Report from the EIO 2010-2012				
	GE Legislation	Sectoral				
	GE Strategy	Nat. Energy St. 2010 Upcoming: Low-Carbon National Roadmap 2050				Energy Agency // Urban requalification with tram // CC planning in Master Plan
EU 2020	3% GDP R&D	Investment in R&D tends to decrease due the crisis				20%
	20-20-20	Energy demand is decreasing a lot because of the crisis (in transport, at home...) this will affect GDP in the sense of investment possibilities of the city and its society.				40%
	Work Age 20-65	Portugal is currently increasing unemployment				20%
	Education	Public school offer (low cost) is large and with enough quality. Hopefully economic situation will not condition negatively the education capacity of the system. At university level there may be effects due higher fees for poorer families				60%
	Lift 25% Poverty	The political agenda of the nation and the EU is to reduce social support policies and resources from the State; therefore, it is expectable to have an increase of poverty levels				0%

Green Urban Economy Strategy of Almada

Almada's track record in Sustainable Development is strongly tied to its political history, characterized by the continuity of a progressive government since the recovery of Democracy. "Sustainable, Inclusive and Eco-efficient Development" throughout the decade of 2010-2020 is Almada's Strategy towards a GUE. The pillars of Almada's green profile are:

1.- Strong leadership by the Municipality and Green Governance.

2.- Research-wise strategic and integrated environmental and spatial planning.

3.- Sustainable mobility and urban-life quality and attractors.

4.- Resources for green innovation and green economic activity.

5.- National and international benchmarking.

The Municipality of Almada is the main driver of green economy in the city. Strong leadership and green governance foster the continuity of this process.

As it has already been expressed, Almada is an anomaly in the Portuguese context of local governments. It has been steadily run by the Communist Party since 1976, when municipalities were reestablished after the dictatorship. The long-term positive feedback between the authorities and the citizenship cannot be avoided in order to understand the 'hows' and 'whys' of Almada's 'red-to-green' city process, somehow parallel to that of the European Green Party. As exposed by the Lady Mayor de Sousa (2012) "for more than 30 years Almada has been working in phases under a humanistic project, concerned with social and solidary issues". Since the 1990s this project incorporated the challenges of sustainable development. In the current decade green economy is the emerging aim under the spotlight.

Several features outstand in Almada's green leadership & governance model:

• High rank of environmental planning in the local administration: The Sustainable Environmental Planning and Management Department (DEGAS) is a strategic department under direct accountability to the Lady Mayor. This Department works in decade-long development strategies, after experience showed that 4-year mandates was not enough to solve the problems of the city. DEGAS leads most of the following programs and initiatives.

• Integration of Almada LA21 and the Annual Corporate Plan: In 2007, under DEGAS coordination Almada developed a process to integrate LA21 and the Annual Corporate Plan. 1500 people from all the municipal areas and services worked in this challenge. Organized in strategic objectives and areas of activity, each Department was offered to propose orientation lines and actions. This management model is continued until today through biannual reporting and integrated planning tasks.

• AGENEAL and green multi-stakeholder platforms: Almada has created several platforms to promote the engagement of a variety of stakeholders in the city's sustainability. AGENEAL, the local energy agency was founded in 1999, including the Local Energy Forum with the participation of energy supply companies, waste management services, the water utility, the university, national authorities transport companies, etc. This meeting point facilitates cooperative planning and management of energy sustainability activities and projects in Almada. In the context of strong centralization of power of Portugal, this type of body helps multi-level governance over complex issues like ESCO services for public lighting, implementation of RES, information to the citizenship, etc. In order to expand this model to other topics, Almada is running similar platforms for: Sustainable Tourism; Social Inclusion; and Climate Change fight. In this last case the Forum includes citizenship, local companies, the chamber of commerce, and a system of voluntary commitments. Environmental planning & management is developed with the support of a citizenship survey ranking problems and interests.

• Local Agenda 21 of the Children: Since 2004 Almada is implementing this very innovative experience to involve the children in environmentally friendly planning and action in the city. Throughout 6 months children (8-12) are involved in workshops and visits dealing with environmental issues of the city and the planet. In parallel they produce education resources created with the kids (movies, manuals...). At the end of the program each group has its own list of proposals and actions, which they end up presenting in a Forum. 2-3 children from each school together with the President of the Municipal Assembly present the Forum in front of the executive body of the Municipality. 400 people including the district parishes, etc... attend the Forum After the presentations, there is a political discussion by the executive body, and later on an open discussion with the public. They talk about all topics from poverty to land use, from environment to school repairs, etc... After this, there is a session to evaluate the experience by the children. In general they feel very proud and want to participate in the next edition. Every Forum is begun by a presentation of the Head of DEGAS assessing the actions developed the last year. Last but not least, municipal staff bindingly evaluates the proposals of the children, in order to see how to introduce them in the Year Plan. The Municipality does its best to integrate the children's demands in actions already planned.

• Vision *Almada+*: Sustainable, Inclusive and Eco-efficient Development of Almada 2010-2020: In 2010 Almada started its 4th decade development strategy. This instrument, generated through participatory forums and integrated work of the municipal staff, defines 7 development axis for the period: 1) urban requalification and socio-economic dev.; 1) Environment, biodiversity and energy; 3) Urban mobility, accessibility and public spaces; 4) Education, training, knowledge and youth; 5) Culture, sport, solidarity and safety; 6) Information, participation and governance; 7) Modernization and valorization of the public services. Vision *Almada+* is clearly in tune with the green economy paradigm, ergo the EU 2020 Strategy, and the EU SDS framework. Every year, action plans are set up for the Council's discussion and approval, including objectives, budgets and policies to implement, and establishing the

Annual Corporate Plan of the city. The level of rigor in Almada's green governance is a role model for any local government aiming to a sustainable development. Specific actions in order to promote green economic activities will be described further ahead.

DEGAS acts as municipal research unit delivering strategic and integrated environmental and spatial planning.

The fact that DEGAS is not responsible for downright management services (waste, water, green areas, etc.) allows this unit the necessary freedom to work with a research-wise and cross-cutting approach towards all environmental sustainability related topics. In the last years DEGAS has contributed to shape Almada's green city profile with innovative and applied-research technical resources, such as:

• The Energy Ability of Urbanization tool: Technical assessment tool to evaluate the suitability of land development programs from the perspective of energy sustainability (passive energy, efficiency, RES, transport demand, energy infrastructures and services, access to public and urban services, etc.). Now the city is able to decide the evolution of the urban structure by EE criteria.

• The Food Security Assessment and the Urban Agricultural Plan: In order to assess the city's food security potential DEGAS produced a report on the quality of natural and agricultural soils, crop / farming suitability and yields. After analyzing the food deficit resulting from this study (food security area needed 12,300 Ha and total municipal surface 7,000 Ha including built up) the Council agreed upon the necessity of an Urban Agricultural Plan (for vegetables a necessity of 418 Ha, currently 380 available; increase by crossing abandoned land and high quality soils), and included it in Almada's new Master Plan [MP] of 2012. The following years programs to promote local agriculture will be undertaken.

• The Green Infrastructure Plan: The Base studies for the new MP have included a strategic analysis of biodiversity: species under threat (16%; 37% for fish), main threats, priorities, etc. These studies included an applied-research assessment in cooperation with landscape ecologists from the University of Lisbon; it determined ecosystem area correlations to presence of key bioindicator species. A bioindicator methodology has also been created to monitor the ecological quality of Almada's estuarine waters. After all, the MP established the Green Infrastructure Plan of Almada, with the basics for a Local Action for Biodiversity Plan. This ecological structure of the municipality is a binding map/element of the MP, in form of an articulated system of urban and natural areas, and corridors. It is also a long-term resource to cope with potential heat island effect on the urban settlements.

• Adaptation Plan for the Rainwater Network: the first modern engineers designed Almada's rainwater network, and it included infrastructures for flood prevention and groundwater recharge (keen action considering the location of Almada at the estuary of the Tagus River). The great expansion of the 70s (after 74) included separate pluvial and sewage networks. The new MP will re-strengthen this system and it includes precipitation regime forecasts in order to plan the adaptation to climate change.

Urban-life quality, attractors and sustainable mobility are shifting Almada from an industrial hub and Lisbon dormitory-town to a green and prosperous city to live in.

One of the great challenges of Almada is its own reinvention after 30 years of intense shipyard activity (1967-1998), the extinction of which left 10,000 unemployed. Ill-functioning spatial planning inherited from the pre-democratic period is a burden as well. Efforts are still important in order to rearrange irregular settlements in the west coast beaches (Costa Caparica). Actually, the city is still paying the non-development of a patch of land for 30,000 new dwellings in this area. Moreover, in the 'golden' period the city grew as a commuting node for Lisboners searching for cheaper housing. After a decade of economic diversification and adaptation to the new reality, the city is recovering its attractiveness. Nowadays 60% of working residents do it in Almada. Several economic development and urban sustainability policies are refloating the city since the mid 1990s:

• The knowledge and economic development infrastructures: The University and the S&T Madan Park have brought talent, research, innovation, and of course jobs; both in the training institution and in spin-offs and newly born knowledge based companies. Some 10% of the activities and workers in Madan Park deal with green economy, with an exports approach. Growth is guaranteed (～20% by 2020) as environmental engineering "is very strong in the Faculty" (Park Director). Furthermore, between 2002-06 Madan cooperated in an international project to create a tool on environmental management of industrial parks. In addition, the city has created two Development Agencies to support local entrepreneurship. One of the latter is aiming specifically to the regeneration of business and labor in the old city center, where investment and renovation are urgent, in parallel to new public equipments. These agencies provide free office space for startups, access to meeting rooms -even for non-resident companies-, and even funds (the local "Finicia" tool).

• Sustainable mobility is playing a major role in Almada's attractiveness strategy: After 20 years of negotiations the national government assumed the creation of a light-rail network for Almada and its metropolitan area, inaugurated in 2007. Besides the redesign of mobility in the main avenue of the city -restrictions for cars, restructuring of the bus network, new pedestrian areas- the works have included renovation tasks (from sidewalks and pavements, to facades and lighting) turning the most polluted, crowded (40,000 vehicles/day) and noisy street of the city into a long relaxed public space in which to walk, shop and socialize. The area is in consequence gaining interest as focus of investments and livelihood. The plan is to extend this new service to neighbor municipalities and establish the 'metro' of the south shore of the Tagus River.

Although public transport (PT) is not a municipal responsibility, in view of the arrival of the tram the city drafted and approved a plan for sustainable mobility in 2003 (under review); based on 4 pillars: modal change towards PT and soft/active systems; better infrastructures for the latter; new and more efficient technologies; involvement and awareness of citizenship. Many explicit actions have been planned and executed thereafter: creation of an electric-bus service for the historical centre (Flexibus); electric vehicles

for gardening activities; hybrid cars for the public authorities (2006); 100 buses on 20% biodiesel; enhanced reality app for soft transport itineraries; planning of an urban and peri-urban cycling network, including pedestrian-cycling connection to Almada's central park; etc. Not surprisingly, Almada won the 1st prize of the European Mobility Week in 2010. The main challenges for the future include reaching agreements in order to carry bicycles on ferries, as Costa Caparica -a seashore resort of Almada- is one of the most important touristic hotspots in Portugal. This would allow Lisbon visitors to go from the harbor to the beach by bike, and enjoy cycling infrastructures there without using the car (there is already a tourist-train connection from the harbor). The other critical issue is diverting 35,000 cars/day crossing the city to the Lisbon bridge due bad communications with the highway; through the tram, street directions, traffic lights, etc...

Almada's economic diversification includes specific levers for green innovation & business.

The previous point highlighted Almada's S&T Madan Park, the University and the city's economic development agencies. It is worth to treat separately specific measures to support green economic activity and the progressive relevance that green innovation is earning:

• "Almada Less Carbon" Climate Fund: created in 2009, this financial tool collects yearly the economic savings produced by energy efficiency measures and reinvests them into new energy sustainability actions. With the unfolding CoM-SEAP the fund helps visualize the benefits of taking action.

• The "Mobility House" Project: a new green building will stand out on one of the major crossroads in Almada's main avenue. This headquarters of the mobility services will also be an environmental education facility and a live-lab for RES and green architecture.

• Pull & Push for energy efficiency and RES: The increase from 16% to 21% (2011-2012) in the VAT of energy has prompted stakeholder interest on energy saving. Moreover, Almada's passed an EE and RES code for the construction sector stronger than the National adoption of the European Directive. This combined with tax-reductions and other support programs is expected to help accelerate the low-carbon transition in the buildings sector, as 13,000 (38% of total) need retrofitting by 2020 according to the SEAP. On the other hand, the LG is accountable for multiple actions in municipal buildings since an Energy Audit Program of 2003 (AGENEAL): remote-management for street lighting; solar HSW in all sports facilities; energy efficient lighting and HVAC systems in municipal buildings and historical monuments; energy certification of municipal buildings; etc. In addition, the city takes part in ICLEI's Procura+ program with different green procurement criteria in mobility (see above) now extended to the LG's energy supply tenders by positive discrimination of green energy.

National and international benchmarking for a city "off the beaten track" .

Almada is making its way in the broader arena of cities through consistent green policies and awards. This is helping to benchmark the city abroad, but also at the national level, where -as explained by the Lady Mayor (2012)- "Almada's singular political history and reality is not appreciated by the dominant parties and powers". From the 1990s onward, Almada has engaged into the major international green activities and dynamics: ICLEI; CCP; Agenda+; Procura+; Energy-Cities; CEMR; Worldwide Educative Cities Network; etc. Good practices have been distinguished with two international awards: 1st Prize of the European Mobility Week in 2010; 3rd prize of a competition on business incubators in 2011 (for Madan Park). DEGAS is currently contributing to many international projects: 3 Interreg, 4 IEE, 1 FP7, 1 BestEnergy (with a staff of 10 people). AGENEAL receives yearly visits to learn and invitations to teach. Despite Portuguese centralism, Almada's initiatives are being transferred to Lisbon and elsewhere, but never recognized because of the Communist background. Yet, +30 years of strict economic agenda drove Almada to be the only major public authority without debts in Portugal, and topping the list of paying authorities. Almada's model is now trustworthy.

C/P Workshop of Development and Climate Change - EXTRACTS from Interviews and Documents

Climate Change

Conflicts; Challenges:		Opportunities; Capacities:	
▪ Large stock of inefficient housing from the 60s and 70s. ▪ Very high commuting with Lisbon by car and not enough alternative systems. ▪ 100% of public transport in Almada is private and directly under Central Gov. control. ▪ High locked-in costs of light rail system. The public contest for the light rail was made under planning-construction-operation. ▪ Hydrological risks from CC. Extreme rain + reduced permeability require redesign of drainage network. Floodable settlement in River Tejo. Sea level rise and beach erosion. ▪ Almada located in one of the areas of higher seismic risk + large flooding areas for tsunamis	▪ Different disconnected districts of the city. ▪ Risk of political turnover, as the current term is legally the last one for Mayor M.E. Sousa. ▪ Combined env.-climatic-tech. risks due heavy industries in coast. ▪ Increase of droughts and heat waves. Increase of saline intrusion in groundwater ▪ Stress on aquatic biodiv. and ecosystems ▪ Cardio-respiratory illnesses from heat waves ▪ Forest fires ▪ Contagious diseases rising from lower latitudes ▪ Decrease in water availability ▪ Impact on tourism potential ▪ Lower agrarian productivity	▪ Positive evolution of the city since the 70s confirms validity of Almada's development and institutional model. ▪ 3 ten year cycles of SD Strategic Planning: 2010-2020 Vision Almada + "Sust., Solidary and Eco-Efficient" setting clear paths. Since 2007 action plan and A21 merged. ▪ Experience and capacity of the Municipal structure and staff on Sustainable Planning. ▪ Strong leadership with long term vision ▪ Local Strategy for Climate Change (ELAC) ▪ Great urban requalification of the city center after building the light rail. Increasing quality of life: less noise and pollution ▪ Plans to extend light rail at metropolitan level	▪ Innovative mentality and instruments integrated into the new Master Plan, such as: Energy Suitability of Planning Tool; Food Sovereignty Assessment; Local Biodiv. Plan. ▪ Planning ahead climate adaptation, for instance in the drainage network, and heat island effect by green infrastructure system. ▪ Estrutura Ecológica Urbana: planned network of urban green infr. for connectivity, hydrologic and climatic regulation, etc. ▪ A21 of the Children produces active, participative and aware youth for the future. ▪ Wide set of planning instruments to assess risks and vulnerabilities. ▪ Planning adaptation of water ▪ Plans to promote soil permeability

Development

Conflicts; Challenges:		Opportunities; Capacities:	
▪ Strong centralism of the central Government, increasing with the crisis and EU bailout. ▪ Great anxiety over the recentralization of powers in progress. ▪ Economic reconversion still in progress after naval and fishing industries closed down. ▪ The great problem of this country is the lack of regional authorities.	▪ Evolution of Municipal structure and investment capacity because of crisis: reforms want to cut down staff by law. ▪ Risk of political turnover after 4 terms in office of the Lady Mayor. ▪ Only important city in Portugal with the Communist Party ruling. Majority parties and institutions ignore its success on purpose.	▪ Within the context of crisis and recession of the country and Europe, Almada is holding up ▪ Positive evolution of the city since the 70s confirms validity of Almada's model ▪ Integration and alignment of A21 with local planning: efficient and effective. ▪ A21 of the Children produces active, participative and aware youth for the future.	▪ Great urban requalification of the city center ▪ Strong leadership with long term vision ▪ Vision Almada + "Sustainable, Solidary and Eco-Efficient" setting a clear path by 2020 ▪ Strong economic assets: nature (fossil beach of Caparica) and tourism. ▪ Local development institutions: Madan Park and Almada Velha-Almada Nova Agency ▪ Agriculture Parks as development strategy

Brief highlights:

- Hydrological risks from climate change are important and spread in Almada. Planning adaptation, even with resettlement measures in irregular coastal districts, will be basic for resilience. A wide set of planning tools generated within the new Master Plan (2012) are setting the foundations for a resilience planning approach (energy suitability of planning, green infrastructure plan, food sovereignty assessment, etc.)
- Potential institutional changes caused by local elections, structural reforms required after the EU bailout and Portugal's centralist tradition may produce an abandonment green commitments. The city's positive track since the 1970s and a good situation despite the nation's crisis, will hopefully help compensate the latter factors and give continuity to the "Sustainable, Solidary and Eco-Efficient" dev. strategy of Almada for the 2010-2020 decade.
- Sectors such as energy and transports are not in control of the LG. Expertise in governance and innovative policies must help reach cooperation.

<table>
<tr><th colspan="2">Interviews Almada</th></tr>
<tr><th colspan="2">Public Sector</th></tr>
<tr><td>Municipality:
▪ (W) Mayor
▪ (W) Sustainability Department Manager
▪ (M) Environment Department Technical Expert
▪ (M) Energy Agency Technical Expert
▪ (M) Fleet and Waste Management Services</td><td>Municipality:
▪ (M) Water Supply and Treatment Services
▪ (W) Environmental Education Technical Expert
▪ (W) Green Spaces - Technical Expert
Other:
▪ (M) Director of Local Energy Agency (AGENEAL; private non profit consortium between Municipality and local stakeholders)
▪ (W) Economic Development Agency (Almada Velha)</td></tr>
<tr><th>Civil Society</th><th>Private Sector- Corporations</th></tr>
<tr><td>▪ (W) Fair Trade Cooperative</td><td>▪ (W) Bio+3</td></tr>
<tr><th>Education - Research</th><th>Cancelled</th></tr>
<tr><td>▪ (W) Ecology Researcher - University of Lisbon
▪ (M) Madan Park - Science and Technology Park</td><td>▪ (W) Land Use Technical Expert</td></tr>
<tr><td colspan="2">Brief highlights:
▪ A total of 14 interviews were conducted and just one cancelled. Within 5 days of study visit this is an optimal number for sessions with time flexibility.
▪ Only 4 meetings took place with non-municipal organizations / bodies.
▪ 8 of the 14 meetings were with women. Besides Turku, this is the only other case with men outnumbered.
▪ In contrast to the other cities, support in the execution of the agenda was more intense, in the sense that a member of the technical staff in Casa do Ambiente drove the researcher to all the meetings, and took care of a complete tour around the city as previously requested.</td></tr>
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Interviews: General Information and Socioeconomic Aspects										
Interview	**Year**	**Activity**	**Management**	**Jobs**	**2020 Jobs**	**Turnover**	**2020 Turnover**	**Prod/Service**	**Market**	**Performance**
		% Green	**PB/PR/J**	**#**	**#**	**€ /USD**	**€ /USD**	**Units**	**L/R/N/E/W**	**0 - 10 points**
Environment D. Municipality	1999	100%	PB	10	15			Str. Planning, Env. Assess., Educ, Mob.	L	10
Mobility Area Municipality	2000 / '03 Strat.		PB (Pub. Transp PR)	39 technical					L-R	8 (1st or 2nd in Portuguese ranking)
Fleet & Waste Municipality			PB	600	reduction (retiring staff not replaced)	14M €	Partly subsidized; if private uncertain if cheaper or not		L	4.5 (low qualif. of staff + complaints of the citizenship)
Green Areas Municipality	1997		PB	25	25 (problem: aging staff)	250,000 €	250,000, yet maybe reduction of costs		L	
Water Supply Utility	1951		PB	495	less (crisis driven restrict)	31M € (19M€ ordinary)	similar (for service level + more costs)		L-R	8
Env. Education Services	2003	100%	PB	5		100,000 €			L	8
Local Energy Agency	1999	100%	J	6	8 to 10	500,000-1M€	It should grow		L	8
Economic Dev. Agency	2002		J	0 Green (3 + Dir. total)	0 (Green not target)				L	8
Fair Trade Cooperative	2002		PR	2 (+1-2 volunteers)				70 members	L (linked W)	8
Madanpark	1995	10%	J	20 (10% of total)	20%	6M € (1.75M in R&D); 10% Green			W (34% international)	7
Bio+3	2005	100%	PR	26	50 (from outsourcing)	1M€	3-4M€		N (by 2020 E/W)	9

Brief highlights:

- Public services intensive in workforce (waste management, water supply, gardening) forecast a reduction in jobs by 2020 due requirements of more cost-efficiency. This will cause unreplaced retiring workers and in the case of green areas a problem of aging staff, perhaps not the best scenario for this task. In terms of turnover, the same services consider that yearly amounts will stay stable despite services may increase, thus become more efficient. A potential process of privatization after structural reforms in the country may also contribute to this evolution.
- In contrast, private companies and knowledge intensive organizations (Environment Department, AGENEAL, MADANPARK, Bio+3) expect to grow both in jobs and turnover.
- Both prior points express an idea that Green Economy will continue to develop in spite of the current crisis, yet with an efficiency and added value base.
- All but 2 organizations grade their performance at +8 points, with the Env. Dep. marking 10. Only the Waste services show a low value, after public opinion.

Interviews: Activities, Constraints, Future

Organization	Activities	Constraints	Future
Dep of Strategy and Sust. Env. Management	▪ The Dep. directly accounts to the Lady Mayor. They work in development strategies for decades, after the experience showed that 4-year mandates was not enough to solve the problems of the city. In 2000 they stated the decade of Sust. and Solidary Dev. The tipping point in this decade was "it is not what you do, but how you do it". Hence, A21 turned from a Plan to a Process; then, waht was the best methodology in order to adopt this agenda on a for efficient, effective and resilient way? They agreed to merge Almada 21 and the Annual Corporate Plan. In 2007 they were able to merge both instruments. Result: 1500 people working under the same 2 Strategic Objectives, subdivided in different Strategic Areas (including one on qualification of municipal workers). Each Department is then offered to propose orientation lines and actions. ▪ The second decade of 2000 they will focus on More Sustainable, Solidary and Eco-efficient Development. Accountability is still under progress due lack of resources (human, economic and time). In Governance they have a participation chart and the list of formal and informal participation forms. They generate public sessions of the Council, but also for different topics, projects... ▪ The Base studies for the new Master Plan (PDM) have included a strategic analysis of the biodiversity: species under threat, main threats, etc. After the studies in biodiversity they established main threats, priorities, etc.; the basic infor for a LAB Plan. The output is a proposal for a Basic Nature Conservation Network: the Ecological Structure of the Mun., a binding map/element of the PDM. ▪ Partnerships with scientists and researchers to develop instruments such as the noise map, the GHG inventory (first in Portugal), etc. needed for the development of the strategies of the city. ▪ Diversifying the local econ.: Dev. Agencies, Madan Park, Tourism (yet state ownership of the sea side areas limits action). The city is improving dramatically in 2000-2006. Today 60% of working Almadians do it in town.	▪ The crisis. Before the crisis happened, the Department had enough resources to do its job. Thanks to the European funds the Department has been able to approach certain areas that would not have been possible otherwise. ▪ Very centralized Gov impedes reaching results in SD plans. Only 2 adm: State and Municipalities. The central gov. is very strong and it intervenes on many LG matters: transport, education, health, nature management, water resources... The municipality really suffers to generate changes in any competence of the central gov on its territory. Just for the metro it took 20 years and talks to tens of ministers and general directors, etc. ▪ A great problem of this country is the lack of regional authorities. Portugal has 5 regions on the plan but not real; only for applying for European funds, with chiefs elected by the central gov. Behind this policy there are calculations from the dominating parties, calculating they would lose power in favor of smaller regional coalitions. They launched a referendum for the regions stressing the lack of efficiency, more costs, more corruption... But in fact the whole structure already exists regardless of the creation of the regions. There are Metropolitan authorities for Oporto and Lisbon, but without competences, administrative autonomy... ▪ The current reforms, induced by the crisis and the bailout funds, are changing the concept of municipality itself: 1 director every 20,000 inhab; 1 dep. director for every 40,000. A reduction of 50% of public representatives. ▪ Almada has a great way ahead to become a green city. One big issue to fight is monofunctionality linked to fishing, naval industry, etc. which employed 20,000 directly and more indirectly... Dismantling this had a tremendous impact. ▪ One issue in Almada is the terrestrial-maritime land that is property of the State and with shared authority on land use. The State thus outsources land management to private companies for the establishment of campsites.	▪ It is a priority to increase cooperation and penetration of knowledge with the land use department, in order to make the biophysical matrix an information basis of land planning. Consensus political and technical around environmental topics and land planning, in order to generate a common language about planning -not urban against environmental- therefore to reach a common platform ▪ Also improve the concept of resilience in the land planning instruments ▪ Achieve the participation of the media on the consecution of measures and programs for SD. it is necessary to have media developing independent analysis of phenomena ▪ Involve the citizenship in a participation culture more globally focused and environmentally based. Better information in order to build independent information and opinions ▪ Make of energy efficiency a national target, while this has a much larger potential of results than renewable energies. Create conditions for the national authorities

Organization	Activities	Constraints
Env. Education Services	▪ Coordination of the environmental education strategy of the city, by developing regular activities throughout the year. 1) Children's Agenda 21: from Nov-to June, 2) Eco-tech service, which works a lot online through demands by email, or on their website, 3) Support to projects from other organizations in the city (schools and others...), 4) Articles for the local bulletin, 5) They created the CMIA in Caparica Coast and the Virtual Aquarium: for public from 3 years old to adults, 6) They work directly with education projects of schools and institutions that work on social solidarity (religious comm., comm. centers in welfare districts, disabled org.: 20-30 projects/y.). And European projects on education on energy. ▪ Agenda 21 of children: Throughout 6 months children (8-12) are involved in workshops and visits on env. issues of the city and the planet. In parallel they produce education resources created with the kids (movies, manuals...). At the end of the program each group has its own list of proposals, which they end up presenting on a Forum together with actions to develop. 2-3 children from each school together with the President of the Municipal Assembly present the Forum in front of the executive body of the Municipality. 400 people including freguesias, etc... attend the Forum They present their proposals, afterwards there is a discussion and executive body, and later on open discussion by the public. They talk about all topics from poverty to land use, from environment to school repairs, etc... After this there is a session to evaluate the experience by the children. In general they feel very proud and want to participate in the next edition. Every Forum is begun by a presentation of the Head of the Department assessing the actions developed the last year. They want them to perceive complexity. The technical experts of the Env bindingly evaluate the proposals of the children. Dep. in order to see how to introduce them in the Year Plan. SINCE 2004. They try to link actions in plans with demands from children in the European Car Free Days.	▪ A city with the same gov. for 30 years is able of providing long run programs. ▪ Working with schools is very much conditioned by the education politics of the country. The citizenship education is being reduced to 1-2 hours/week, therefore teachers do not have time to participate enough. ▪ Human resources. ▪ They are not able to reach (with their events and actions) all population. Their influence is over those nearby, present, those who read the paper... It is very slow to change the adults' mentality. They would not support punitive measures.
		Future
		▪

Organization	Activities	Constraints	Future
Fleet & Waste Services Municipality	▪ with 600 people which takes care of waste collection, streets cleaning, and municipal fleet. ▪ Waste is treated by the inter-municipal company AMARSUL: 2 landfills, a compost plant, a unit for mechanical biological treatment, also collection of plastic, glass, paper, animals, green areas (60% public vs. 40% private management). ▪ It also manages del municipal fleet: 200 units including flexibus and buses for school services, but no police cars. They introduced electric vehicles for street tasks but not very successful. ▪ Main fuel use comes from the waste collection trucks: 10-12% of the energy use, and demand of truck from is 60 to 100 L/truck; 1M€/y in gasoil. They try to see how to spend less through circuit optimization. This way, theoretically they will reduce 1 route per day + 1 night:. Also, they are going to work one day less as landfill will close on Sundays. They are also providing eco-conduction training for the truck drivers; experience showed a decline afterwards, which needs regular updating in order to have continued results; +-10% of expense depends on the driver. ▪ The economic and financial aspects are starting to have an important role in environmental matters, as energy prices are rising a lot. For example natural gas is starting to be very interesting.	▪ Waste has very heavy routines behind, which are difficult to change and require constant remessaging, renovation of action. ▪ Optimization of daily trips of the workers in order to reunite people in the same trip. Next step to introduce GPS technology in all vehicles. ▪ They have observed a reduction of waste generation due the crisis. Recycling is also reducing due less consumption. ▪ Increase in informal recyclers: people taking paper and cardboard from the containers and sell them. ▪ According to surveys, they obtain a better qualification and offer in green areas, whereas in waste they are very much exposed to disturbances and negative perceptions. ▪ In fleet the client is internal and there is quite a lot of insatisfaction because machines are more and more specialized and mechanics can't handle as well as the whole conservation division (cost of pieces, electronic equipments, etc...)	▪ Oil collection: future project. They had a contest for the service, but must be relaunched this year as the only company who applied did no accomplish the requirements. ▪ They are studying the introduction of biofuels as part of their renovation plan for the fleet (to renovate every 10 years). It is currently delayed due the crisis. However they are aware that biofuel has not enough quality and generate mechanical problems in the injection system. ▪ However, for every action they must always measure cost/benefit of innovation vs. operational outputs.
Mobility Area Municipality	▪ Mobility Plan of 2003 (under review): created in part because they wanted to build a tram, which supposed a radical change on the mobility structure (and other networks underground, as energy, sewage. Before 40,000 vehicles/day in the main street. Despite the lack of competences the city is promoting sustainable mobility based on 4 pillars: modal change (to PT and soft/active systems); better infrastructures for PT and soft systems; New and more efficient technologies; involvement and awareness of citizenship. ▪ They are introducing modal split in the master plan (tram, cycle network, slow down). Strategic aspects of PT: intermodal PT-PT and PT-Bike. They were going to put a public biking service but due the crisis had to be dropped. Possibly a similar system will be created for boat-bike to the beaches. Great challenge: to detour 35,000 cars/day only crossing the city to the Lisbon bridge due bad communications with the highway. Through the tram, street direction, traffic lights, etc.... they planned (2003) new transit system, for both cars and pedestrians, also cycle network in new plan. Also tourist train running next to the beaches. One only company runs all the regional buses south of the Tajo (Transportes Sul do Teijo). ▪ Green procurement and alternative fueled vehicles. Ex: electric vehicles for gardening act. No infrastructure for natural gas cars though. Hybrid cars for (2006) for the public authorities. Flexibus electric for the old quarter. 100 buses on 20% biodiesel. Flexibus is Italian tech, so when repair is needed an Italian engineer must come if it is complicated, and a conventional is put to substitute. ▪ Involvement of citizenship: Throughout the year they celebrate not only the mobility week but also eventual activities. New program on enhanced reality for soft transport itineraries. The city won the 1st prize of the European Mobility Week in 2010. ▪ As part of the plan they created the first municipal company of Almada dedicated to parking and traffic management.	▪ Domain over the issue: There is a lack of metropolitan/regional transport system and there are no regional authorities. It is a national competence, thus transport operators work on an individual basis without cooperation. Even so, the municipalities are claiming for a regional system called the South River Basis Ring. ▪ There is an integration process of transport titles, but not complete. For example train does not participate. ▪ They went from 23% to 49% car share between 1991 and 2006. Next survey in 2012 for new Plan; if they are able to stabilize is already positive. However 35% of tram users come from car. ▪ The boat Company is a state navy service, very reluctant to modern management modes; e.g. Bicycles in the boats. ▪ Mobility investments conditioned to the development of Spanish and Portuguese economy in general. A new airport is planned (yet currently cancelled) at the South of Tajo. Together with other infrastructures as a 3rd bridge which should allow the tram to ring at metropolitan scale. ▪ Great challenge: to detour 35,000 cars/day only crossing the city to the Lisbon bridge due bad communications with the highway.	▪ Extension of metro to Caparica ▪ Optimize integration of intermodal services ▪ Complete cycle network plan ▪ Increase devolution of public space to people ▪ Increase restriction to private car ▪ Incorporate the transport measures in the Spatial Planning Instruments ▪ The next year competences on bus transport will become municipal, which will enhance a lot their options ▪ For all these future prospects, political uncertainty on the next term may bring unexpected changes, as the current Mayor cannot run again and opposition is strongly against mobility measures in place. Political consensus is key, as the already existing consensus for them tram. Another challenge will be investment capacity. Technical capacities for the projects must be developed as well.

Organization	Activities	Constraints
Green Spaces Municipality	▪ Central Park of Almada: The Park has 50-60 Ha. It didn't have any control some years back; it was going to be built. The city created a panel to promote a park in this area in exchange of the land for the shopping mall. They are currently in the phase of conservation. The park doesn't have drainage network, instead it has recharging ponds and through valves and doors they delay its transport to river Tajo. Plant species planted in this area are only autochthonous. They also have fields. All the organic rests are recycled as compost. They combat pest with biological, physical and manual treatments. Where they can't reach with these treatments they apply *Bacillus thuringensis*. They apply mulching with shredding machines; hence, they do not need to pick up leaves and so on. They have separate waste containers that are collected by an electric vehicle. The Park has a "league of friends" that uses the park for sport. As it is so central to the citizen interests, the sports divisions deliver personnel for sport coaching. They are about to build a pedestrian-cycling bridge in order to prevent car travel to the park from the city center or the University. They will also build an organic orchard very close. The soccer field has synthetic grass. ▪ They are currently building a new urban park with 8 Ha more.	▪ The park is very much loved, but this would increase with option of taking action in caring for it. **Future** ▪ More interaction with schools and nearby dwellers ▪ The park is integrating into a more general green corridor North-South of the city
Organization	**Activities**	**Constraints**
SMAS Water Supply Utility	▪ It started as the water supply service. Sewage treatment was incorporated in 1957, by then it was only sewage collection. The first treatment plant began in 1984. ▪ In the water domain they have a very important role regarding sustainability since all resources in Almada are underground. The water comes from very deep and it must be distributed to a relatively high altitude due the relief; this generates a very large energy bill. In the North margin of Tajo they use superficial water from a reservoir, but is the south margin it is underground. Use of underground water is historical because in the ancient times wells had water at 1m. Nowadays this aquifer is the largest strategic aquifer of the country, with one of higher quality waters of the country. ▪ A second topic of concern is the pipe losses in order to avoid use of natural reserve. ▪ Large investment on a monitoring system of physical-chemical parameters of the aquifer in their extraction points. ▪ SMAS is also responsible for the rainwater drainage system. The first engineers designed their rainwater network, including infrastructures for flood prevention and groundwater recharge. The great expansion of the 70s (after 74) included separate pluvial and sewage networks. The new PDM will re-strengthen this and the adaptation to climate change. ▪ The treatment capacity of the city is already 100% and the first plant is actually under retrofit. Three of the 4 plants have digestion of activated sludge and the first one is having it introduced. Even so in winter they must add heat to the process. In 2010 they reached from 25% to 60% of energy demand depending of the plant. ▪ The supply system is 50 years old, so the strategy is to audit and renew machines but also remote control. They complementarily install PV panels in their centrals...	▪ They are feeling the reduction of activity in the renovation of infrastructure by their own personnel. ▪ Maintenance is an aspect that in all sectors of Portugal where there is a lack of culture; it shouldn't be culture of repair, but that of daily care (from the painter to the industrial). They give more importance to repair than to prevention, and the results can be seen. **Future** ▪ A new field of action will be to use regenerated water ▪ Maintenance of the system, efficiency ▪ Determine feasibility of use and potential users (new plan for the naval sector, tourism...) introduce the necessary treatments (disinfection) for regeneration in plant retrofit. ▪ Another potential action is bus wash, also for street cleaning machines (in particular disinfection stability).
Organization	**Activities**	**Constraints**
Bio +3	▪ Bio3 works in environmental assessment, information tech. and applied research in the area of biodiversity. They have a network of partners on different areas in order to tackle larger types of projects. Environmental assessment, monitoring, scientific assessment on biodiversity of projects such as wind farms. The also develop biodiversity planning and land management linked to biodiversity. They also work on compensatory measures involving local communities from electric lines and wind farms, reservoirs (connectivity, management of habitats, nesting conditions...). ▪ As a company in their own operation they try to develop good practices . For example in their field trip work they put an effort in planning not only economically but also environmentally. ▪ The company works specifically in CC adaptation from the perspective of habitat and biodiversity management. They are studying the adaptation and protection of environmental services, including economic assessment of ecological services. It is necessary to generate an economic value of ecosystem services in order to contribute to land planning. So, they produce on one side action plans, but also economic values in order to facilitate decision-making. They are participating in a European group called "no net loss initiative" of ecosystem services in order to explore financial mechanisms to apply compensation funds. This should be very well regulated. Else, speculation and fraud may occur. Good training needed.	▪ Investment capacity is a great constraint in order to execute projects with the desired quality; response time of the public authorities is very delayed due lack of resources **Future** ▪ Biodiversity (from the 26 workers 22 are biologists and 1 forestry engineer) management in all sectors --> conservation, planning, habitat management, land use, ecosystem services...

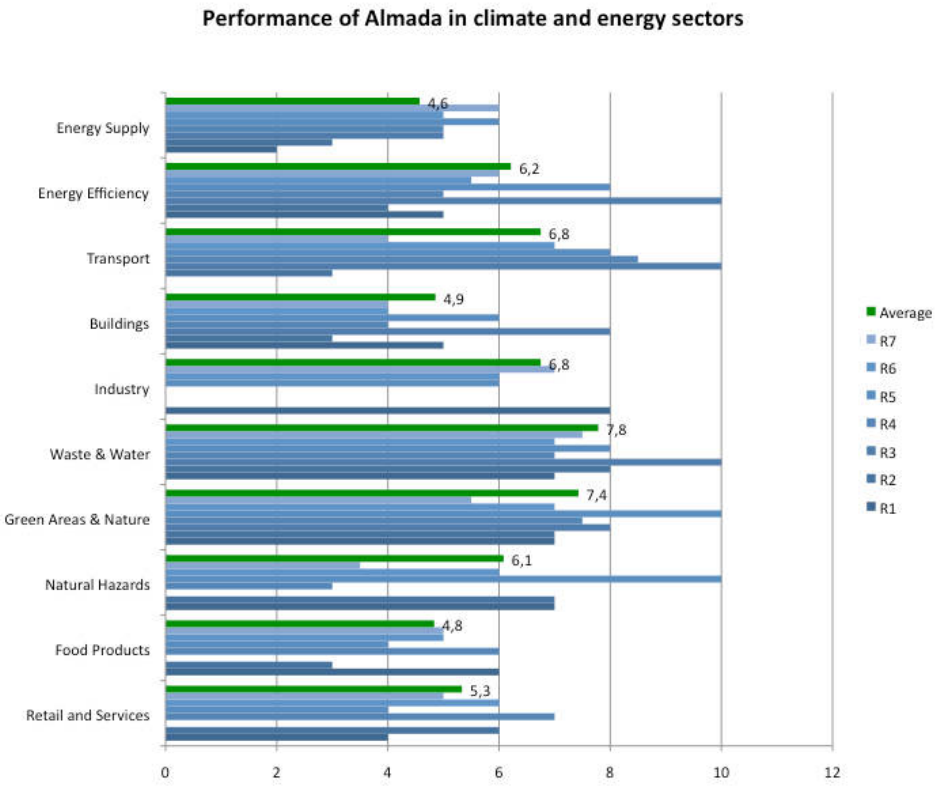
Organization	Activities	Constraints
(Nova Almada Velha) Economic Dev. Agency	▪ Municipalities do not have specific competences on development. Currently economic development at local level is linked to land use. In the beginning of the 90s the cities were very concerned on sanitary issues, thus regulated economic activities from the dimension of land use. They even created land for economic act. at low prices and other advantages. ▪ In contrast, Almada linked to the Fac. of Sciences to build a Science Park for business nursery (1996) for R&D. At the end of the 80s the city suffered a very strong hit, dropping its historical heavy industry (naval) with 10.000 jobs lost. There was a great need for economic transformation, and define the economic identity/profile in the Metropolitan Area of Lisbon. Some experiences and economic poles were created in the 90s with the participation of the Municipality, such as the Park to fix companies and initiatives. First it was only for services of the University, but then it grew. ▪ One further step was the Local Agency in the Old Center together with a renovation project of the quarter, after its progressive abandonment. They wanted to relocate services and activities (commerce, tourism, etc.) in this city center. The Agency is created in this context, with the creation of other public interventions (museums, etc.) to requalify the district. The Agency hosts new companies for 3-4 years and after that they spread in the available buildings in the quarter. After 10 years they evaluate positively the results. Currently there are no free spaces and they plan to start new programs for support on management aspects. Since 2002 23 companies went to the center, 70% of people graduates and 47% women. Production of shows, jewelry, layout builders, marketing, architecture, tourism.... Usually 2 pax/company. ▪ As asset of the city is pilgrim tourism, as Almada hosts an important Corcovado statue. ▪ They are building a third incubator for cultural and artistic industries. In 2013 they will have 3 vocational areas on which the city is more competitive. ▪ In 2012 they started "virtual" incubation; this means they only use the meeting rooms and some internet services, but have their office elsewhere. They are starting now counseling initiatives until they have a good enterprise plan.	▪ Today it is difficult to innovate as conditions for autonomous activity of municipalities is cutting down due the crisis. It is even difficult to maintain the activity of the agency itself. For example impossibility of generating any debt even though the city has no debts. Crisis is even affecting cities with paradigmatically good conditions. ▪ Activity very justified from the public policy perspective, but economic and institutional context makes it difficult to forecast. **Future** ▪ Green Pilgrimage? They are now cooperating with some local operators for tourism development of Almada, such as a company specialized on pilgrim tourism.
Organization	**Activities**	**Constraints**
Fair Trade Cooperative	▪ They are consumption cooperative, centered mainly on fair trade and sustainable and solidary tourism in their beginning. They work mainly with products from Africa, Asia and Latin America. They work as a store . They try to approach the concept of solidary economy and integrate fair trade into it. In 2002 fair trade was a South-North phenomena, but then they realized (after working with schools) about responsible consumption local and global. In fair trade there are many ambiguities and aspects to improve. After that they found other organizations sharing this preoccupation and they created the Iberian network: Espacio de Comercio Justo, not only N-S but also N-N, E-W, S-S, etc... This created a wave that led to open about 10 shops across Portugal. Currently most of them have closed down. They work with Xarxa de Consum Solidari, LiberoMondo and Hispania (Nicaragua). ▪ Many organizations (the bigger in terms of fair trade) end up having products in the shopping malls. They propose an alternative model that introduces fair trade conditions in all levels of the chain, there and here. ▪ For organic products the certifying organizations are private, this can introduce perversion into the system. In consequence they do themselves verification and avoid large-scale products. ▪ They also have educative activities that let them work with about 2000 students. // ▪ Their building is owned by Pluricup, which reunites different consumer cups in Portugal, with whom they signed a cooperation protocol in order to introduce fair trade topics into the organization (together with the more conventional cooperative). Pluricup is now broke because it tried to compete with the larger shopping chains.	▪ There is uncertainty about the office and there are contacts with the municipality in order to promote some center in which they could move into. ▪ Space not very visible; they need to do a lot of action outside to raise awareness ▪ Find producers and enough members for long term bonds ▪ The mentality is an obstacle, now even more with the economic situation ▪ Good relationship with the municipality **Future** ▪ They are developing a group of solidary economy and they are going to launch the S.E. fair. ▪ Creation of workgroup researching produce and producers in the Peninsula of Setubal. ▪ They develop short circuits and time banks: exchange systems will have to develop by necessity

Organization	Activities	Constraints	Future
Local Energy Agency	▪ Due the limitations in responsibilities of LGs in Portugal they put a lot of effort and attention in the Master Plan, as this is one of the specific sovereign competences they have in order to transform the local reality, orient the economy, etc. An innovative instrument in this sense is the Energy Suitability Assessment of Development Plans. ▪ Almada was the first city with a GHG inventory in Portugal (2002) and the first strategy in 2003. The country did not until 2006. In 2006 - 2007 they did a review and tackled climate action by mitigation and adaptation according to CoM, considering the different methodology of inventory calculation (waste not included). ▪ The main aim is to promote energy saving in the territory of Almada. They develop a strategy of engagement of different stakeholders. The agency was created not as a municipal service but open to the whole city, through a European project by DGE. They created a Local Energy Forum with the members of the Local Energy Agency with: energy supply companies, waste management services, water utility, university, state auth., transport companies, etc. They want to create a new and larger platform to include the citizenship, local companies, the chamber of commerce, once they have reached agreements/commitments by the members of the Forum. They already an similar example operating which is the Local Tourism Platform, with a regular framework, a system of agreements... ▪ The city created in 2009 the local climate fund. 62% of government emissions come from public lightning. Economic saving produced by energy efficiency measures are reintroduced to the fund for new investments. ▪ The first activity they developed was to build the energy matrix of the LG and the city. With this diagnose they developed a limited strategy, first rising awareness amongst the local services and the partners. They continued to promote awareness in the city, and certain projects with some partners and in particular energy efficiency in the government sector. Nonetheless, they lost competence over the street lightning from 2002 to 2022 because the municipalities of Portugal outsourced the low-tension network to a holding of the national energy company. Even so, they started to press for energy saving measures. They also started to work with schools through an energy characterization and determined interventions for those with higher than average demand. In one case they expect to retrofit the whole building. They finally were able to get the City Hall concerned with the energy issues. They continued to audit the rest of municipal dependencies and assess the adoption of labels of the European Directive of Energy Efficiency, but the lack of enforcement and resources is an obstacle to continue with this. Still, they obtained sets of actions to undertake on lightning and awareness. E.g. this year they will start a project to monitor energy use from computers. ▪ So far the energy demand has continued to increase because there are more schools and with better comfort furnaces. So, absolute energy must have grown but in relative terms they must have stabilized. In 2012 the city will complete the installation of solar-thermal on all sport facilities. Through the example of the municipality they want to show other stakeholders and citizens the advantage of actions ▪ The EE and RE code for construction of the city is stronger than the Nat. adoption of the Directive. ▪ In 2011 they measured the share of car users shifted to tram and forecasted for 2020 some 20,000 cars/day; also projections for car to bike, etc. The crisis is being a strong driver to change of transport mode. ▪ In this last trimester (Oct 2011 and Dec 2012) energy cost has increased 21% because VAT rose from 16 to 23% and the cost of energy itself. Now stakeholders have much more interest in EE than before. The City Hall created an information service on this, on the new (2012) liberalized market (from technical to general -municip. bulletin-).	▪ Spain is 25% of Portuguese exports; if Spain sinks Portugal follows even deeper. The WTO is formed by 1% of companies that move 90% of the financial activity. A worldwide market is dehumanizing because we'll never be capable of competing with China: 50h/week, no holidays. Only worth is price and it is only possible if life and resources are devalued. A deregulated market. ▪ One of the big problems of 20-20-20 is that the municipality is only 5% of energy demand. It is extremely urgent to engage the citizenship, if not it won't be possible to reach the targets. From the point of view of the Agency potential savings are very small; how to engage other stakeholders is the challenge. ▪ Because of the crisis, lack of enforcement and resources is an obstacle to continue with the energy labeling. ▪ The Agency is dependant on the political will; they hope to be a consensus project, but uncertainty is there ▪ Limitations in responsibilities of LGs in Portugal ▪ Loss of competence over street lightning from 2002-22	▪ To reach the general public, and get them to adopt the proper energy options, in particular from the sense of investment possibilities for energy efficiency ▪ Retrofit of the housing stock. There is a law to regulate the creation of ESCOs in Portugal. In Almada there hasn't been special interest on ESCOs; instead investment of the Municipality. The city wants to candidate to Elena in order to promote investments in private dwellings. At municipal level it could be interesting on the lightning sector. ▪ The city would like to invest on a remote control system of public lightning with LED tech., but this would cost about 25M€. No ESCOs interested on such a business. Yearly expenditure is 1,5M€ aprox. in 29,000 light points. ▪ They need to generate interest from the private owners, this will require some sort of funding as investments are high and return periods long.
Organization	**Activities**	**Constraints**	**Future**
Madan Park	▪ Unninova, Faculty of Sciences and Municipality created the park in 1995 among others. The Park's aim is to attract technology based enterprises. The park is multisectorial, dominant 75% is CIT, the rest other sectors. 200 persons in total. The municipality provides maintenance of green areas and so. The municipality and the park search cooperation projects (e.g. Ideas Lab for last year engineering students to provide ideas for municipal facilities and services; public space). There is more space to develop. About 100 companies since the creation of the park (40m€) ▪ Between 2002-06 there was a project to create a tool on environmental management of industrial parks leaded by a Vasc Park, Tamperee: ECPADEV. ▪ A second project was Super. Collection of results from projects as ECOPADEV and their presentation to scientists (dissemination). ▪ The park has about 50 companies (including virtual partners). ▪ Madam Park obtained the 3rd prize of an international competition on incubators in 2011, thus today it is a quality label to be part of it. ▪ Env. engineering is very strong in the Faculty, so growth is guaranteed.	▪ The current constraint is basically the crisis. The Municipality would donate new land (a total of 15Ha only developed 2,5) but there is no capacity of investment on developing the land. ▪ The conditions of the national government to local authorities due the crisis are stopping options for Almada, such as impossibility of indebting. Structural Funds of EU to the region have finished. Only private investment can attract new funding.	▪ Enhance international business as the crisis is cutting down national market ▪ Continue CIT and increase other technologies linked to the Faculty. ▪ Reach new sectors not represented (materials, chemical, physical...) ▪ They need to motivate the entrepreneurship of the research departments and students to research on new sectors. ▪ Financial mechanisms: there is money but often there is no investment on risk ventures (business angels).

Organization	Activities	Constraints	Future
Researcher	▪ Main interest on finding indicators on early warning of climate alteration, nitrogen concentrations in the air (loss of orchids e.g. NOX and NH3 it basifies the air) and biodiversity loss. Searching ecological patterns: in Portugal, Spain, Brazil and places in Africa. They have found critical levels of Nitrogen for biodiversity in meadow ecosystems. They have discussed findings in UN and produced a review of regulation in the EU, about range transport of atmospheric pollution. This will change animal farming. ▪ In Almada they are working on identification of key species and state (plants, animals...). They are also studying the effect of fragmentation on butterflies, lichens, insects, birds, micromamifers, reptiles, and amphibians. Very much top science in urban ecology. They defend functional diversity, not only species diversity (many species can do the same function, but depends if the function is present/absent). With some degree of perturbation it is possible to have more species . Birds and lichens are the stronger signals in the sense that they have two big groups (cosmopolites vs. specialists). They have even found forest sizes under which species presence is negative. This is the basis to provide the land use plans of Almada with the necessary information to preserve ecosystem functionality. ▪ They have been able to determine which are the potential areas for higher biodiversity and functionality in order to determine connectivity actions necessary and correspondent measures. Lichens and birds will be able to monitor, as well as model effect of actions.	▪ This research is very much oriented to biodiversity management through the connection of forests biomass and water connections. Temperature alteration is already about 6ºC in urban areas, so they act as labs of climate change. Carbon sequestration will depend more on minimal temperature of the ground in winter. 2 ºC more in winter will generate respiration of organic matter under decomposition, which slows down in winter. There is an acceleration of soil respiration. It is more urgent to increase biophysical matrix in order to prevent temperature rise; regaining shielded land is for example a positive measure. ▪ Challenges are mainly urbanization (although this is stopped by economy). Also connectivity. There has to be a shift in structural patterns of the urban areas (the squares, types of pavements, architecture models and techniques, etc.) ▪ Environmental education is an asset of Almada. Every week scholars receive lessons on environmental issues from a deep sustainability perspective. Children has now a profound knowledge // ▪ There are 4 principles in ecology to follow: no waste in nature ; the more diversity the better ; all comes from the sun; population dynamics stable.	▪

Interviews: Links to the EU 2020 Strategy Targets					
Interview	**T 1 - 3% GDP in Research & Development**	**T 2 - 20-20-20 Climate and Energy Package**	**T 3 - Age 20-65 75% in workforce**	**T 4 - <10% early sch. leavers + Tertiary Age 30-34 >40%**	**T 5 - Poverty Lift 25 %**
Mobility Area Municipality	▪ A pillar of the mobility strategy is new technologies and alternative vehicles, even through specific projects developed with universities and research centers. Strong link to the University on transport topics.	▪ Obvious - they have some calculations on the benefits of the mobility strategies	▪ They created a transport company, all new services and facilities generate new jobs (cycle network, house of mobility...)	▪ Not very linked, there doesn't seem to be school abandonment due lack of transport. Yet, effic. and economic PT prevents lack of conditions to access school. Due the crisis student titles have been abolished, potentially increasing abandonment	▪ Through job generation on one hand. Also a good cycling network reduces transport cost to a lot of people against 300-400€/month that a car costs.
Green Spaces Municipality	▪ New applications or organic treatments, and so. The park is used for biological studies, etc.	▪ The park will be equipped with LED lightning with deeming after certain hours; they have an electrical vehicle; also eff. measures applied to their buildings and facilities: wood fire, etc. Catarina's Department has measures of the CO2 fixed by the park's vegetation. They optimize energy and materials recycling, reduce need of external supply. The park has a role for heat island effect mitigation.	▪ Indirect through the education activities	▪ They have a professional school very close on gardening activities, doing even a stage with the park authority; learning to use the machines, etc... The kids really love it any it helps prevent abandonment, in fact increase their grades. The University also conducts a program on "live science" about geology in the Park.	▪ There is an illegal settlement very near to the Park. At the beginning they thought this would damage the park; on the contrary these neighbors really love and take care of the park.
Env. Education Services	▪ The ecological footprint project was developed with the Wackernagel team in "Redefining Progress" (presented to many congresses) and the virtual aquarium in partnership with a Y-dreams a local technology and design company very well known in Portugal and internationally.	▪ Information and awareness. Prom. of sust. transport means. They show that it is possible to use PT effectively, fast and comf. Planting trees: 1000/y for citizens in certain admitted areas, including info on GHG capture. Campaign Almada better without car: one day/week provided advantages in public services and shops. The climate Fund: Act. of the LG measure CO2 at this must be compensated through environmental actions. For example the substitution of lightning systems.	▪ They incentivize work with local partners, particularly with solidarity institutions: wood, clothes.	▪ They work with schools directly	▪ They incentivize work with local partners, particularly with solidarity institutions.
Economic Dev. Agency	▪ Not directly	▪ Not specifically. Yet, their activities are in general without Env. Impact	▪ Directly linked	▪ Not directly	▪ They facilitate options to prevent poverty. One project starting is a community dinning room, optimization of public facilities (laundry, dinners, etc...)
Local Energy Agency	▪ Indirectly through the partners. The Univ. promotes ventures with companies on energy efficiency and renewables. The University is very strong on materials, so they could research on isolation materials, super-conductors... but developments are being applied in Brazil, USA, but not here.	▪ Directly involved	▪ In the statute of the Agency, they affirm the will to promote labor. They consider that the energy sector can generate a lot of jobs	▪ Not very related	▪ Indirectly by the promotion of labor. The issue of fuel poverty is starting to emerge in Portugal, yet not in Almada so far.
Fair Trade Coop.	▪ No	▪ No	▪ Indirect contributions	▪ Indirect, also European volunteers	▪ Indirect
Madan Park	▪ Main goal of the park. There is currently an incentive measure so that inter-phase entities as Madam Park cooperate with SMES on R&D.	▪ They are working with one of the incubating companies to improve env. efficiency of the park. It already has some measures implemented.	▪ Promote occupation of the local engineers.	▪ It is a national priority but not part of their activity.	▪ The trend doesn't seem to go on the right way; hopefully sacrifices will help.
Bio+3	▪ Directly linked	▪ Indirectly in the sense of support to the correct implementation of RE	▪ Directly linked	▪ They take in interns from different levels of study including secondary school	▪

Performance of Almada in Climate and Energy Sectors*



Notes: Anonymous section

COMMENTS about performance in climate and energy sectors

Energy Supply

- The city is fully supplied on electricity and gas. The level of sust. of this energy is not competence of the city. Currently 50% of electricity is from RE (elec. is 20% of total energy demand), but 100% dependence on fossil fuels for transport and heating
- There are no alternatives, the only local production is cogeneration from the sewage plants. Full dependency and no initiatives in the city, despite the awareness actions.
- not enough info
- It doesn't depend on Almada. The Energy Agency is doing a lot of dissemination and awareness rising.
- NA
- limited knowledge
- the distribution network and facilities will be improved in order to reduce energy loss. The energy locally produced is very little, the mix is out of the reach of the city

Energy Efficiency

- A lot done already, but yet a lot of energy loss to reduce
- NA
- very good job
- There are
- NA
- there's a lot to do yet, although action is in place
- a lot to be done in LG buildings, lightning

Transports

- NA
- NA
- a lot of resources and services
- Almada is promoting several alternatives as flexibus, bikes, tram, municipal fleet, etc…
- NA
- Many transport systems, both in and out of the city (towards Lisbon). They should have built more cycle paths along the metro
- 49% of transport is still by car; foot 19%; PT the rest; no results of effect of tram yet. However, the crisis is having an impact on mobility in general, less movement in all types of transports.

Buildings

- They have a problem on the housing stock built between 60s and 80s. Very inefficient. New regulation much better, but effects in the future. Economic conditions for central heating and other energy sust. Measures are bad. Yet, still today consumption here is lower than in Norway due the weather
- NA
- there are actions on energy audits, efficiency of buildings…
- New projects under certification
- NA
- old buildings in general, yet abandonment not a particular issue.
- NA

COMMENTS about performance in climate and energy sectors	
Industry	**Waste and Water**
▪ It is OK, it has progressed the most on energy efficiency despite it must have been by cost advantages and legislation ▪ The industry of Almada is production of vegetable oil, grain warehouse and oil storage ▪ there is no industry almost, the economy is based on knowledge and services. There is no industrial park ▪ There is no industry ▪ NA ▪ the large and heavy industry is gone ▪ pretty good. The main industry produces oil and use a lot of heat, making a good use of energy. They do part of ETS	▪ Only city in Metro area of Lisbon with 100% wastewater treatment. Quite efficient water supply. In waste they have acceptable levels of separate collection, but must improve ▪ NA ▪ very good water quality and treatment. No more done because there is not enough support ▪ 8 water / 6 waste ▪ NA ▪ more advanced than in most cities of Portugal, and there is regularly info about it ▪ 2 sewage treatment plants, with cogeneration. A third and 4th under retrofit
Green Areas and Nature	**Natural Hazards**
▪ Its gone from a periphery of Lisbon to a very livable place with the largest natural areas classified and a lot of investment ▪ the city has its green lungs and natural assets ▪ NA ▪ Center of Almada is very much concrete, except Park de Pass which preserves some very interesting species. There are two other reserves next to the fossil beach which maintain the ecological structure ▪ NA ▪ high value for natural environment in the municipality, but lower in the urban environment ▪ What is left is protected, but a lot has been destroyed	▪ There is an adaptation plan with measures implemented in what refers to the river and sea fronts, because they are vulnerable to water level rise ▪ they have some plans and resources ▪ NA ▪ NA ▪ NA ▪ not enough info ▪ the Atlantic Coast is very vulnerable to rise of sea level (in fact waterfront below sea level). Every year a lot of money to rebuild the beaches as no new sediment arrives… an important sector occupied
Food Products	**Retail and Services**
▪ They are investing on urban vegetable gardens and good production area in the coastal lands, despite being a typically urban land, so not comparable to more rural places ▪ little security ▪ NA ▪ food security in vegetable, some integrated production ▪ NA ▪ NA ▪ High level of food security, but most produce not local	▪ They have a large mall and try to promote local commerce, but not very aware in SD issues ▪ With doubts ▪ NA ▪ EMAS in shopping mall ▪ NA ▪ NA ▪ not very interested on the origin of produce, fair trade, etc…

Reflections about the 3E Crisis: Environmental, Energetic and Economic

EU's proposals and role in shaping the international agenda

- (Water Utility): The European project is on the edge of the cliff.
- (Madan Park): The EU is working on the right direction as the resources are scarce and depleting in the near future.

Where do you envisage your country and your city in tackling this crisis

- (Env. Dep.): In Portugal it is difficult to reach results in SD plans. The central gov. is very strong. The other authorities are municipalities and no other level, although the constitution observes the creation of region. The central gov. intervenes on local gov. matters in many fields: transport, education, health, nature management, water resources... Thus the municipality really suffers to generate changes in any competence of the central gov. on its territory. Just for the metro it took 20 years and talks to tens of ministers and general directors, heads of office, etc. The great problem of this country is the lack of regional authorities. Portugal has 5 regions on the plan but not real; only in order to apply for European funds, with chiefs elected by the central gov. Behind this there are calculations of political results from the dominating parties, who would lose power in favor of smaller regional coalitions. They launched a referendum for the regions stressing the lack of efficiency, more costs, more corruption... But in fact the whole structure already exists regardless of the creation of the regions. There are Metropolitan authorities for Oporto and Lisbon, but without competences, administrative autonomy...The current reforms of the country are redesigning the concept of municipality itself: from 1 municipal director every 20,000 inahb to 1 department director for every 40,000. A reduction of 50% of public representatives. The state is going to disappear if this goes on. The solution is to turn around Europe, not to leave it. The power of the media in shaping the people's mind in Portugal has been very clear, for example against the public workers before the salary cut downs.
- (Env. Dep.): Even so, the management model of Almada is trusted and has become trustworthy by the local citizenship. Effect can be seen on the track record of results from local elections. The municipality has been able to stay outside of the general trend of bipartisanism, whereas for the National Gov the same coalition is third on the results. There's been a great preoccupation on economic accountability --> thanks to this Almada is the only public authority without debts. They are topping the list of paying authorities. Yet, they haven't been able to turnover negative participation into proactive movements. Almada is on eye of the hurricane of political interests of the country.
- (Env. Dep.): A21 was started in 1998. They engaged then into the mainstream activities and dynamics: ICLEI; CCP; Agenda+, Procura+...; they are members of Energy Cities, CEMR, Worldwide Educative Cities Network, etc. It is basic for them to engage internationally. The Env. Planning Dep. has 3 Interreg, 4 IEE, 1 FP7, 1 BestEnergy ... for 10 people working in the Dep. // The Municipal Energy Agency is a model not only at national level, but also international. Other Portuguese come to Almada to learn, or they are invited elsewhere to show what they do.... The centralism of Portugal avoids to adopt Almada's initiatives in general, but indeed specific solutions (bikes, bioindicators for water...) have been transferred to Lisbon, or even at national level, but never recognized.
- (Env. Dep.): Paying attention to the history of local gov in Portugal and Almada, they agreed that 4 year mandates was not enough to solve the problems of the city. Thus, they generated 10 years strategies of development. The decade of the 2000 they stated the decade of Sustainable and Solidary Development. There was a tipping point in this decade when they landed on the idea that "it is not what you do, but how you do it" --> the A21 turned from a Plan to a Process. Then, what was the best methodology in order to adopt this agenda on a for efficient, effective and resilient way? They agreed to merge Almada 21 and the Annual Corporate Plan. In 2007 they were able to merge both instruments. Result: 1,500 people working under the same 2 Strategic Objectives; subdivided in different Strategic Areas (including one on qualification of municipal workers). Each Department is then offered to propose orientation lines and actions. The second decade of 2000 they will focus on More Sustainable, Solidary and Eco-efficient Development. Accountability is still under progress due lack of resources (human, economic and time). In Governance they have a participation chart and the list of formal and informal participation forms. They generate public sessions of the Council, but also for different topics, projects...
- (Econ. Dev. Agency): The intervention of the city against the threefold crisis is identifying and promoting plans to face the environmental challenges, but also economic opportunities; for example the river front, which is a great environmental asset. But also operational instruments as the development agencies, with the mission of setting economic activity as the means to enhance potential investments that the city may need. The requalification of the historical center is also a core aim in order to attract activities and potential synergies here. Capacity building and working in nets.
- (Madan Park): The city is very aware and active of what is being developed at European level. In fact the city has been acknowledged, which gives a lot of pride. At national level the situation is really bad in many aspects: environmental but also heritage, misuse of European funds. He has a pessimistic view. A clear example is the investment on roads and demolition of railways. Today many people can't pay gasoline any more, and there are no alternatives transports. All connections to Spain were cut.
- (AGENEAL): The crisis is even causing a progressive loss of autonomy of the local authorities, also in the case of Almada which is the most efficient economically, without debt, etc. The city of Almada would like to become even more active in international commitments, whereas the central gov. wants to reduce local competences and privatize public services, turning them into a benefit aiming activity. Portugal is under the force of Germany and France. When these countries start to change perhaps Portugal will start to move as well. It is possible that this system collapses in order to let a new way to develop emerge.

What else should be done to tackle it? Is "sustainable growth" the path to follow?

- (Env. Dep.): The sector of sustainability speaks ahead of time from the rest of society, generating a feeling of "aliens"
- (Water Utility): In the end we are on the eternal fight for the control over resources, nonetheless the language is economic. It is a fight between the long term and the short term. The short-term benefits will turn into long-term damages. If the borders were closed, there could be sectoral actions to achieve sustainable economies, but as the market is global and competitive the results are absolutely the opposite. The neoliberal systems know that the only way to continue growing is redistributing the available resources to the emerging customers of societies as India, Brazil and China. Today in Africa it is easier to have a cell phone and internet than water. If we were intelligent we'd be able to share wellbeing for all, but with fed ignorance it is possible to drive humanity to the worse. There is no room for thinkers; those who reach out are under the threads of the great media powers. After the financial crisis it seems that the European social model of the last decades has been completely absurd and worthless. Climate skeptics are now on full rise, without growth there won't be wellbeing and it is dooming to preserve the environment. The European project is on the verge of the cliff.
- (Madan Park): He hopes that society will be able to improve. The lobby of oil won't be there forever, so alternatives will have to grow. If there were incentives to work at home, there would be much less demand on energy and mobility.
- (AGENEAL): Present is in fact not very good observing the economic crisis. It is difficult to look at the future without thinking in the present and what it will be necessary to do. The neo-liberal model of development (speculative, based on the power banks) is having a very strong negative influence in the model of development of Almada, which is based on sustainability, solidarity and ecoefficiency. For example, the concept of smart city is not only a great supply of technologies, but on how to increase human capital, which is at last what will let us reach the CoM targets or others, but also this message doesn't really break through.

ANNEX 2 - QUESTIONNAIRES

- Interview 'General Framework of SD in the city' (1/2). Expert Response by SLDM, LGEM, and/or RE.

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GENERAL INFORMATION

Please complete the following data:

Municipality:			
Region:		Country:	
Website:			
Area:		Km2	
Cont. Person:			
Position:			
email:		Phone #:	

	1996*	2001*	2006*	2011*	
Population:					Inhabitants
Budget:					€
Income/Capita:					€ / Inhabitant
Unemployment:					% active pop.

*: please change these dates if you have data for other years. It would be good have data 5/10 years apart.

	1996*	2001*	2006*	2011*	
Local Gov. elections:					Year
Vote turnout:					
Party in power:					%

*: please change these dates as appropiate

Please describe the city's historical process of involvement in CC action and GE development:

Please complete the following information on Local CC Governance:

	Yes/No	Year Created	Budget	Staff/ Composition Description
CC Office				
CC Council				
Support Structure				

Please describe your city's experience regarding supporting structures for CC action development:

- Interview 'General Framework of SD in the city' (2/2). Expert Response by SLDM, LGEM, and/or RE.

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GENERAL FRAMEWORK AND CONSIDERATIONS
1.- Please describe the reality of your city, its development priorities and the relevance of climate change for your city's prosperity
2.- Please describe the city's historical and political process of involvement in sustainble development
3.- Please describe the city's strategy to promote sustainable development: policies and instruments, organigram, integration processes, accountability and governance mechanisms, etc.
4.- Please describe the roles and relationship of national to local level public institutions dealing with climate cange mitigation and adaptation. Please discuss the European policies and instruments to promote sustainability and their links with local government action.
5.- Please describe the positive and negative effect(s)of the city's involvement in sustainble development from the governance perspective. Is the Municipality involved in Sustainability Networks and/or Innovative-Demonstrative Projects? What is the impact of the city's policy on neighbouring towns and cities, on the region, elsewhere? Is the city leading improvements in national policies, legislation, etc. regarding sustainable development, climate change, green economy?
6.- Please describe the positive and negative effect(s)of the city's involvement in sustainble development from the economic perspective. Is the Municipality attracting new businesses and industries? Are new economic sectors emerging and/or green R&D? Is it having an effect on the Academic/University field? and from the torusim point of view?

- Interview 'The city and the EU2020 Strategy'. Expert Response by SLDM, LGEM, and/or RE.

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EU 2020 STRATEGY

The EU 2020 Strategy aims at "smart, sustainable, inclusive growth". Its 5 headline targets are:

1) "To achieve an investing of 3% of GDP in R&D"

2) "To reduce greenhouse gas emissions by at least 20% compared to 1990 levels or by 30% if the conditions are right, increase the share of renewable energy in final energy consumption to 20%, and achieve a 20% increase in energy efficiency.

3) "To raise the employment rate of the population aged 20–64 from the current 69% to at least 75%"

4) "To reduce the share of early school leavers to 10% from the current 15% and increase the share of the population aged 30–34 having completed tertiary from 31% to at least 40%",

5) "To reduce population below national poverty lines by 25%, lifting 20 million people out of poverty"

Please evaluate your city's performance in regards to the 5 headline targets of the EU 2020 Strategy:

Target	Perform.	0%	20%	40%	60%	80%	100%	Why?
3 % of GDP on R&D								
20-20-20 Package								
20-64 Employment								
Education levels								
Poverty reduction								

Please fill in specific targets and qualify the present situation and feasibility of achieving targets 1 - 5 in your country and city:

	T1	Year	T2	Year	T3	Year	T4	Year	T5	Year
City										
Region										
Country										

- Conflicts and Potentials regarding Development and Climate Change in the city (C/P workshop). Workshop with LGEM and LGTE (except in Almada; results extracted from documents and interviews).

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DEVELOPMENT AND CLIMATE CHANGE CONTEXT

Please describe the main challenges and capacities of your city in relation to development and climate change . Please connect through arrows and mark with + or - the relevant positive and negative relationships among the latter. Please define the time horizon of the topics (short term, mid term, long term) Please include regional aspects if needed for a better analysis.

CLIMATE CHANGE	DEVELOPMENT
Challenges: 1 2 3 4 5 6	Challenges: 1 2 3 4 5 6
Capacities / Strengths: 1 2 3 4 5 6	Capacities / Strengths: 1 2 3 4 5 6

- Policy and Instruments. Expert Response by LGEM

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CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT (SD) POLICY AND INSTRUMENTS

Please complete the political and institutional framework for CC in your countr according to the NUTS division system:

	NUTS 1	NUTS 2	NUTS 3	LOCAL 1	LOCAL 2
Administrative Body:	State	Region	Province	County	Municipality
Name:	name of country	name of region			
CC competences Y/N					
CC Legislation					
CC Plan/Strategy					
CC Action Role	Active, passive, finance, legislation, support...				

Please complete the following SD and CC policy and instruments framework for your city:

	Yes / No	Year Created // Review	Qualify (0 worst - 5 best)	Department	Links to other Dep. / Str.
LA21/SD Action Plan		//			
Aalborg Commitments		//			
SD Indicators/Reports		//			
SD Council		//			
GHG inventory		//			
Climate Plan		//			
Covenant of Mayors		//			
Vulnerability Analysis		//			
Adaptation Plan		//			
Building Energy Efficiency Map		//			
Public Buildings En. Eff. Plan		//			
Solar Ordinance		//			
Electric Vehicle Plan		//			
Carbon Footprint		//			
EU2020 Strategy		//			
Env.Man. System		//			
Other 3		//			
Other 4		//			
Other 5		//			
Other 6		//			

- SD Indicators and Greenhouse Gas Emission Inventory (GHG emissions inventories were received by email under the format that every city had developed it). Expert Response by LGEM, LGTE.

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SUSTAINABLE DEVELOPMENT INDICATORS

Please fill in the available data of your municipality regarding the following sustainable development indicators / topics.).

	1996	2001	2006	2011	
GHG emissions / Capita:					tCO2eq / inhabitant
Total Energy / Capita:					MWh / inhabitant
Renewable Energy:					% Total Energy
Total Electricity / Capita:					% Total Electricity
Residential Electricity / Capita:					MWh / inhabitant
Renewable Electricity:					% Total Electricity
Ren. Elect. Installed Capacity:					MW
District Heating Range:					% Households
Bicycle Rental Public Service:					# Bicycles
Car Sharing Public Service:					# Vehicles
Elec. Vehicle Pub. Rental Serv.:					# Vehicles
Electric Public Transport:					Type (tram, bus, etc.)
Electric Car Charging Points:					#
Total water / capita:					Liters / inhabitant.day
Residential water / capita:					Liters / inhabitant.day
Tertiary Sewage System:					Yes / No
Bio Index River Water Quality:					Excellent -> Defficient
Rain Water/Sewage Separation:					% Collector Km
Total Urban Waste:					Tones
Urban Waste / capita:					Kg / Inhabitant.day
Separate Collection:					% Total Urban Waste
Total Waste:					Tones (Urban + Other)
Organic Shopping:					# Number Shops
Organic Public Catering:					% Public Dining Serv.
Motorization Index:					Vehicles / 1.000 inhab.
Public Transport Users / Day:					Urban PT users / day
Public Transport Use:					% Total Transport
Km Private Vehicle Year:					Km
Transport CO2eq Emissions:					% Total CO2eq Emiss.
Built Up Land:					Hectares
Developable Land:					Hectares
Specially Protected Land:					Heactares
Land for orchard and vegtable gardens					Hectares
Protected Coast Line:					% Total Coast Line Km
Public / Social Housing:					% Total households
Organic Vegetable Production:					% Agriculture Land
Other key local SD indicator 1					*Unit*
Other key local SD indicator 2					*Unit*
Other key local SD indicator 3					*Unit*

- Green Economy Activity. Expert Response by LGEM, LGTE, CO, SO and/or RE.

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GREEN ECONOMIC ACTIVITY AND EU 2020 STRATEGY

Please identify and describe your sector and fields of activity from the annex list.

Activity	Manag.	Jobs	2020 Jobs	Revenue	2020 Rev	Prod/Servicc	Market	Qualifiy the activity's performance in the present					
#	PB/PR/J	#	#	€/USD	€/USD	?	L/R/N/E/W	0	2	4	6	6	10

Legend: PB Public, PR Private, J Joint Venture // L Local, R Regional, N National, E European, W Worldwide

Are there any constraints (Policy and Legislation, Economy and Funding, Society, Knowledge, etc.) to a full development of your sector/activity? Please describe

Text

Please Identify/define potential activities you consider prioritary / plan to work on: What are the development conditions necessary?

Text	*Text*

- Green Economy Annex. Expert Response by LGEM, LGTE, CO, SO and/or RE

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CLIMATE CHANGE ACTION AND GREEN ECONOMY DEVELOPMENT

Please complete the following information on Green Economy (GE) development:

	NUTS 1	NUTS 2	NUTS 3	LOCAL 1	LOCAL 2
Green Economy Report	Y/N				
Year of last GE Report					
Policy Framework for GE	Y/N				
GE policy link/reference					

Please describe the following CC and GE actions in relation to your city:

	PRESENT	FUTURE	MANAG.	CONSTRAINTS	VOLUME	JOBS	REVENUE
ENERGY SUPPLY	Y/N	S/M/L	PB/PR/J	1/2/3/4/5	Units	#	€/USD
Gasification/carbon sequestration							
Co-generation (CHP)							
Renewables							
TRANSPORT							
More fuel-efficient vehicles							
Hybrid, electric and fuel-cell vehicles							
Car sharing							
Public transport							
Non-motorized transport							
MAUNFACTURING							
Pollution control							
Energy and materials efficiency							
Clean production techniques							
Cradle-to-cradle							
BUILDINGS & FACILITIES							
Lightning, efficient appl and off. equip.							
Solar heating/cooling, solar panels							
Retrofitting							
Green bluidings /insulation, materials…)							
Passive-solar houses, zero-GHG buildings							
Water and sewasge systems							
MATERIALS AND WASTE							
Digestion							
Waste to energy plants							
Landfills							
Recycling							
Extended producer responsibility							
De-materialization							
Durability and repairability of products							
RETAIL							
Efficient products/Eco-labels							
Distance store-residence							
Minimization of product transport							
New service economy							
AGRICULTURE							
Soil conservation							
Water efficiency							
Organic production							
Reducing farm-market distance							
FORESTRY							
Reforestation/Aforestation							
Agroforestry							
Sustainable Forestry Certification							
Halting Deforestation							

Legend: Y Yes, N No, S Short term, M Mid term, L Long term, PB Public, PR Private, J Joint Venture, 1 Funding, 2 Legislation or policy, 3 Society, 4 Knowledge, 5 Other

- Performance in Climate and Energy Sectors. Expert ANONYMOUS Response by SLDM, LGEM, CO, SO and/or RE

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PERFORMANCE IN CLIMATE AND ENERGY SECTORS

Your city is engaged in climate change mitigation and adaptation. Please qualify the city's performance on the sectors below and explain why

	Performance (0 2 4 6 8 10)	Why?
Energy Supply		
Energy Efficiency		
Transport		
Buildings		
Industry		
Waste & Water		
Green Areas & Nature		
Natural Hazards		
Food Products		
Retail and Services		

- Links to the EU 2020 Strategy Targets. Expert Response by SLDM, LGEM, CO, SO and/or RE

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LINKS TO THE EU 2020 STRATEGY

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5) "To reduce population below national poverty lines by 25%, lifting 20 million people out of poverty"

Please describe how does your company/organisation/activity link to the latter targets. Do you think your company contribute to the EU2020 Strategy?

T1

T2

T3

T4

T5

- Discussion of Green Growth and the 3 E Crisis. Expert Response by SLDM, LGEM, CO, SO, and/or RE

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7.- Please give us your feedback about the following reflection:

Threefold environmental, economic and energy crisis:

- In 1988 the Bruntdland Report defined sustainable development: "one that meets the needs of the present without compromising the ability of future generations to meet their own needs".
- International development and environmental governance is not proving effective since the 1992 Earth Summit in Rio de Janeiro.
- A deep economic crisis has recently emerged.
- Peak Oil is no longer a theory.
- The continuity of quality of life, welfare and access to commodities to which industrialized societies are used is at threat.

EU Action:

- In 2009 the 20-20-20 climate and energy package was launched.
- 3.000 Local Governments are currently engaged in energy sustainability planning through the Covenant of Mayors.
- The EU 2020 Strategy (2010) aims at "smart, sustainable and inclusive" growth of the Union.
  - EU 2020 is considered as a Green Economy strategy.
  - It sets simultaneous targets on sustainability, innovation, education, labor and poverty.
- EU Roadmap 2050 aims for 80% decrease in GHG without compromising Europe's economic growth.

Strategic Role of Local Governments:

- The UNFCCC COP acknowledges the strategic role of local governments against this threefold -environmental, economic and energetic- crisis:
  - 50% of the World's population live in urban environments and this is expected to achieve 70% by 2050.
  - 80% of GHG are originated in cities today.
  - Local Governments are seen to have higher autonomy and action options than higher ranking institutions, specially in comparison with National authorities, who sign treaties and commitments but often have little capacity to execute them

An open discussion:

My perception is that most radical social and environmental clusters don't believe that a social welfare scenario will be delivered by the current economic system. These groups advocate for degrowth and "transition towns", and "the faster the better" migration to a relocalized and decarbonized green economy.

Based on the prior analysis, please comment on:

- EU's proposals and role in shaping the international agenda:
- Where do you envisage your country and your city in the tackling of this threefold crisis? (environmental, economic and energetic)
- What else should be done to tacke it? Is sustainable growth the path to take?

Text: