Worban Resilience and (un)sustainability

Exploring the nexus between resilience and urban systems

A Doctoral Thesis by
Lorenzo Chelleri

Directed by

Françoise Breton Renard
David Saurí Pujol
Thorsten Schuetze

Universitat Autònoma de Barcelona (UAB)
Bellaterra, June, 2012

The present Doctoral Thesis titled “Worban Resilience and (un)sustainability. Exploring the nexus between resilience and urban systems” has been carried out at the Geography department at the Autonomous University of Barcelona (UAB) Spain, under the supervision of Professors Françoise Breton Renard, David Saurí Pujol (both from the UAB geography department) and Thorsten Schuetze (Sungkyunkwan University, Suwon, Seul, South Corea).

Bellaterra, June 2012

The directors

Françoise Breton Renard

David Saurí Pujol

Thorsten Schuetze

The Phd Candidate

Lorenzo Chelleri

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Preface

This Doctoral Thesis represents a first explorative research work over the generic and specific possible interpretations and meanings referred to the relationships between resilience and urban systems.

Because of the complex cross scales dimensions of cities and the existing variety of resilience multidisciplinary perspectives we decided to navigate different possible examples of urban resiliency, from developing countries urban growth to urban planning processes in OCSE. Notwithstanding the potential fuzziness of such too broad framework, a specific conceptual common thread develops along the three case studies the evolution of (urban) resilience perspectives relating it to (urban) vulnerability, (urban) growth and (urban) renewal capacities.

A strong literature review is proposed in the first part of the thesis in order to explore the state of the art on resilience and urban resilience emerging paradigms.

In the second part, as if it was about a learning process from the easier to the more complex urban resilience perspective, the case studies explain respectively:

a) The urban resiliency and timeline: relating resilience to vulnerability and Climate Change threats. The Netherland example builds strong evidences over the short term links with recovery and (system) protection resilient strategies, underlining the usefulness and necessity of framing urban long term resilience toward system structural and functional changes (transitions).

b) The urban resiliency and sustainability: relating resilience to fast urbanization processes in developing countries due to global economy and its cross scale effects. The Moroccan case study underline the “resilience for whom” emergent critical perspective, because of the cross scale

consequences of the new urban resiliency (and transition) based on global commodity chains better than be sustained from local and regional resources. Deep unsustainable and inequitable transformations emerges from such urban metabolism shift, related to social justice because of a cultural and behavioural induced changes and essential ecosystem services access and benefits re-distribution.

c) The urban resiliency behind urban renewal in global cities: relating resilience to power issues in shaping new forms and functions in emerging global cities. Barcelona case study wants to put at the forefront of urban resilience discussion the gap between generic urban resilience (maintain the global network strategic position benefitting markets chains tradeoffs) versus local citizen resilience and needs.

From both theoretic reviews and case studies insights we can definitely consider urban resilience as “a multidisciplinary framework to explore the reactive, recovery, adaptive and transformability capacities of (and in) urban systems”. In so doing the application of this framework has underlined the need of recognize the benefits of self-sufficiency, redundancy (less efficiency), learning capacities and innovations as core principles for sustainable urban resiliency and transitions. Last but not at least, the fundamental research question (and urban resilience focus) must always critically arise the issue of ”resilience of what to what”, and “resilience for whom” that we try to address.

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PART I

MOTIVATION AND STATE OF THE ART

MOTIVATION

WHY WORBAN RESILIENCE AND (UN)SUSTAINABILITY ?

"Resilience encourages us to look at problems from a lens that is systemic, is integrated and is multidisciplinary (-) acting to be prepared and respond to the phenomenon of CC, financial crises, unpredictability of food shortages, increasing fuel prices... (-) phenomenon emphasized by our increasing global interconnectedness, our economic systems, our food system, which makes the goal of building resilience even more essential and urgent"

Dr. Judith Rodin,
President of the Rockefeller Foundation

Previous page photo from the Author: Los Angeles Downtown

Why Worban resilience?

The title of this Doctoral Thesis, "Worban Resilience and (Un)sustainability", merges and it's built over the relationship between two emerging binomial: a) World-Urban, representing the global urbanization process and the consolidation of global commodity chains (GCC) and cities global networks (GCN) b) Resilience-Sustainability, as one of the most discussed binomial because the necessary sustainability focus of resilience (resilience *per se* is not a sustainable nor a normatively positive concept, see for example autonomous unsustainable adaptations to Climate Change stresses or the fact that increase resilience at one scale or of one group can erode the resilience at another scale or of another group).

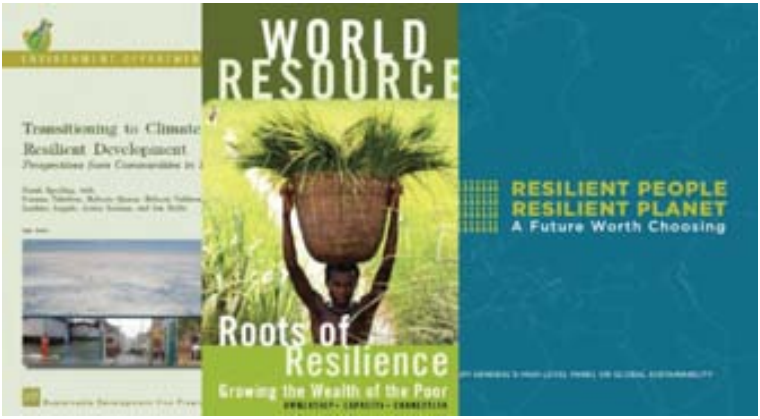
Exploring the different dimensions of resilience applied to urban systems, and referring those dimensions to geographical, political, planning and management concerns, I try to get some feedback from an equity and sustainability point of view along both theory and case studies insights and findings. In this first motivation section I propose the justifications of why we should focus on, and relate, the concepts of "global – urban" and "resilience – sustainability".

The Sprawl of Resilience: a step beyond sustainability

Since the World Summit on Sustainable Development in Johannesburg (2002) resilience appeared for the first time as a key concept also in the policy arena, leading and bringing the ambition of sustainability in to more practical terms. In fact as Niel Adger would say after, "Both sustainability and resilience recognise the need for precautionary action on resource use and on emerging risks, the avoidance of vulnerability, and the promotion of ecological integrity into the future" (Adger, 2003:2).

After the Brundtland era, in which ecological well-being was the key issue to address (Costanza et all, 1992) due to the emerging consensus on the unsustainability of urban (industrial) sprawl (Club di Roma, 1972), resilience starts to appear as a necessarily step in building sustainability (Levin, 1993).

Fig 0.1: The sprawl of Resilience in Policy International Reports.



Source: Author from the Web

Since Holling first ecological definition and measurement of what now we referred to as "engineering resilience[1]", the capacity of a system of withstand crises maintaining the same structure, function and identity (Holling, 1973), the concept sprawled into other disciplines like sociology (Adger, 2000; Allendby and Fink, 2005), system theory (Fiksel, 2003), economy (Arthur, 1999; Perrings and Stern, 2000; Brock et al. 2002), psychology (Bonanno, 2004), engineer (Avallone, 2007) and social-ecological systems (SESs from now) theory (Berkes et all 1994, Folke et all, 1998) where its links with sustainability patterns became more and more evident (Perrings, 2001; Folke et all, 2002, and others).

As reported in Fig 1, nowadays we find resilience as the main message also in the United Nation Report of the High-level Panel on Global Sustainability (2012), titled "*Resilient People, Resilient Planet: A future worth choosing"*. The message cannot be clearer. As Brand and Jax states "the message of resilience is more radical for policy-makers than that of sustainability (-) promoting resilience means changing, in particular the nature of decision-

[1]For engineering resilience we mean the speed (and capacity) of a system to recover from external pressures (or abrupt changes) and return to its previous state.

making to recognise the benefits of autonomy and new forms of governance in promoting social goals, self-organisation, and the capacity to adapt". (Brand and Jax, 2007:1).

But why and how is that enormous success and sprawl of resilience possible?

To give, and understand, the answer to this question we have to briefly go through the resilience concept evolution and notice at least two important and related conceptual moves along its development (a deep analysis of that evolution and perspectives will be developed in the next thesis chapter). From the definitions of ecological resilience, standing around a stability domain and systems equilibrium point of view[2] (Holling, 1973), the concept moves toward multi-equilibrium (complex) systems patterns (from Holling 1976). Such evolution is explained along two main corollaries. The first one is the cross-scale dynamic and continuous systems interactions. Something that Holling named "Panarchy" (Holling, 2002) and that represents the nested cross-scales interactions between different systems at different spatial and temporal levels, fitting and interacting one in the lifecycle of the others. Such added complexity introduced the elements for a second necessary move. Systems can transform and evolve themselves, which imply some subsystem could even collapse due to the upper system reconfiguration and survival (Folke and all, 2010). So, while since the beginning of the ecological resilience the maintaining a specific regime or equilibrium (identity, functions and structure) was a key factor for resilience, recently[3] within more complex social-ecological frameworks resilience is determined by the magnitude of the perturbations that systems can absorb and still retain their overall function; the degree to which the system is capable of self-organize; and the degree to which capacity can be built for learning and adaptation for the middle and long terms survival.

[2]In its first conception resilience was considered like the property of a system (ecological) to maintain its equilibrium (within a so called "stability domain" or "regime") toward different perturbations.

[3]For whom may be interested in a deeper understanding of the evolution and different perspectives (and definitions) of resilience we suggest the reading of respectively Folke (2006) and Brand and Jax (2007).

Considering transformative and learning principles (something links to long term evolutionary views) in systems' resilience means to open it, from being just a recovery principle (use in ecology, psychology and engineering), to innovation and socio-technical system (STS, from now) study domains[4] (Trist, 1981). This aperture provides a conceptual multi-level perspective to analyze long term socio-economic dynamics, using insights from sociology, institutional theory, economy and innovation studies (Geels, 2004). That actually should justify why resilience sprawled worldwide in most political agendas, because it deals with the practical dimension of change (toward sustainability), pushing for transitions of STSs, economies and all kind of SESs.

The consequences of such sprawl of resilience between different disciplines, from one side create a shared vocabulary and concepts, although from the other side this provokes a blurring of the exact meaning of resilience (and its coherent, methodological and scientific applicability). There were being in fact measurement of resilience (Cumming et all, 2005) trying to put the theory into practice, while at the same time Carpenter and Walker have clearly put forward the clarifying statement that since one system's resilience can lead other systems ones, it seems mandatory to always define the "resilience of what to what", better known as the "Specific Resilience" (Carpenter et all, 2001; Walker and Salt, 2006, Walker 2011).

Notwithstanding such possible fuzziness detachments, and coming back to our main introduction chapter porpoise (why urban resilience?), we agree with Brand and Jax that the concept of "resilience is one of the most important research topics in the context of achieving sustainability (-) promoting research efforts across disciplines and between science and policy" (Brand and Jax, 2007:1). **This is why resilience matters**.

[4] After the first thesis chapter on resilience perspectives and possible misunderstanding of the resilient cities catchword, the second chapter will focus on tools and methods for applying resilience to urban environments within STS and transition frameworks.

The sprawl of cities: a step behind sustainability

A first press release from the international conference "planet under pressure", London March 26-29th, states "Cities Expand by area equal to France, Germany and Spain combined in less than 20 years" (www.planetunderpressure2012.net) and as Dr. Mark Stafford Smith (Planet Under Pressure co-chair) says, "a more general theme of the conference is underlined by the urbanization issue". In fact with a growing population rate of 1 Ml each week (and for the next 38 years) cities should be receiving around 1 billion additional people till the forecasted urban global population in 2050 standing around 6.3 billions (UN, 2012).

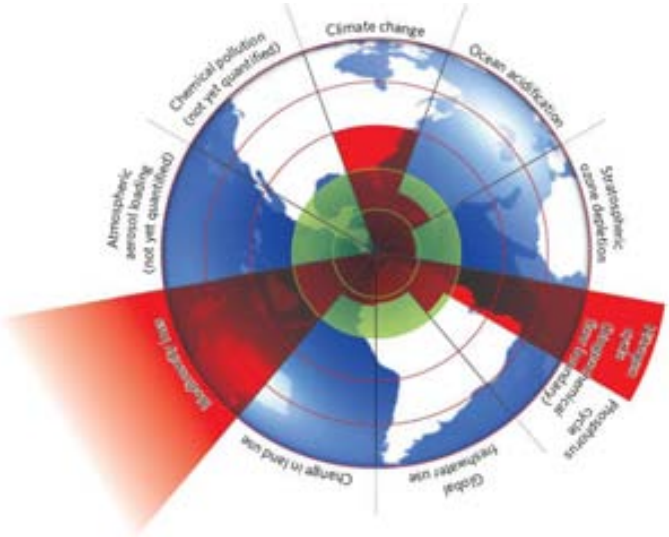
Fig 0.2: The world populated (urban) areas by night.

Source: NASA at http://antwrp.gsfc.nasa.gov/apod/ap001127.html

Although we do not want to simplistic addressing just to cities the entire human's responsibility of the unsustainable global trend that pushes beyond ecological planetary boundaries (Fig, 0.3) (Rockstrom et al, 2009) our SES equilibrium, it seems there are enough evidences to suggest that (global) sustainability challenge definitely relies on cities.

Fig 0.3: Planetary Safety (ecological) Boundaries. Beyond the boundary the inner green shading represents the proposed safe operating space for nine planetary systems. The red wedges represent an estimate of the current position for each

variable. The boundaries in three systems (rate of biodiversity loss, climate change and human interference with the nitrogen cycle), have already been exceeded.



Source: From Rockstrom et al, 2009.

In particularly, we believe there are two main and complementary challenges in relation with cities (both on structure and functioning) that justify why the focus on cities should be thought beyond cities borders. The first, related also to climate change (CC from now) mitigation, is about pollution and so urban metabolism. In fact at the moment around the 70% of Carbon Dioxide emissions come from cities and cities needs (Global Carbon Project, 2012). Indeed, from a urban metabolism point of view (Baccini, 1997; Newman, 1999; Brunner., 2007) it's easy to demonstrate cities environmental impacts in their functioning (Decker. et al. 2000; Kennedy et al. 2007; Barles, 2010) and the increasing dependency cities have from outside resources (food, water, products, energy etc)(Dunn and Steinmann 1998; Brunner 2007). The global market, which permits such unsustainable world scale cities functioning in network, is the nexus with our second cities challenge: the (local) social adaptation to the cross-scale dimension of cities. In fact while since ever cities were considered local entities (even if in networks but depending over local or near natural

resources) (from Socrate to Mumford, 1961) now, as Ernstson argues, "cities need to be viewed as loci in multiple networks of relationships at different scales" (Ernstson et all, 2010).The urban phenomenon seeing as cross-scales networks of cities (Batty, 2008) explains the challenge that nowadays local societies have in adapting locally economies that flow (as power, information and capital do) throughout immaterial worldwide networks (Castells, 1997). The competition between cities, classified following national and international rankings criteria (Sassen, 2006), dictates for occupy an active place in the global economy offering adequate services to international firms (responsible of choosing where to locally and temporally take advantage of profitable conditions). Following this perspective, urban development has become a key marketing factor (Leitner, et al., 2007) while planners co-responsible for a "good ranking" more than for social wellbeing (Saskia Sassen, 2001; Calderon, Chelleri 2012). Growing social inequity and consequently increasing stratification are from the most common characteristic of contemporaneous cities, as this cross scales economic structure has still to be equally adapted by social-economical systems in order to deal with this global-local (functioning and structural) new configuration.

Both the (ecologically) unsustainable urban metabolisms and local unequal (and conflictive) social-economical configurations are between the most urgent issues to be solved in this century. Both those issues are related to environmental and social vulnerability increase and to urbanization processes. **That's why**, stepping back to this section question of why urban (resilience), **cities matter**.

The Sprawl of Urban Resilience definitions: a step forward?

Cities "after suffering wars, earthquakes, religious transitions, destructions with no reconstructions and the maintenance of the ruins, still remains nowadays a place of special significance» (Beinart, 2005:181). At a first glance this seems to be why resilience principles logically fit within urban (evolution and) essence, because this definitely remarks the societal capacities to rebuilt the city and at the same time the tendency of people to live in cities. This statement brings us to Lewis Mumford, resuming that

before the metropolis «the city, the village, the cave and the cairn, there was an essential disposition to social life. It (the city) begins as a meeting place» (Mumford, 1961:5).

Resilience (in this sense as system persistence thanks to recovery capacities) emphasizes that although time has dissolved some built structures, the social tender structures remained durable, as most of us have read from the largely cited Campanella and Vale book "*The resilient city. How modern cities recover from disaster"* considering "cities as most durable humans artefact" (Vale and Campanella, 2005).

However, this is just a very partial vision of what a resilient city should look like and how resilience thinking addressed and applied to urban environments. In fact this risk management scholar's vision is built around and emphasizes mainly the recovery principles. These are also linked to the people physiological need of rebuilding in order to make sense of the disaster happened (Kai, 1995). By this view the links with resilience stay in a matter of political and social functions, in facing natural hazards preventions and recovery (Berke and Campanella, 2006). Similarly to the Schumpeter's creative destruction economies model, city is seen as a cyclically ongoing process of destruction, redesign and reconfiguration.

Fig 0.4: Resilient city: between recovery and protection. In this image the reconstruction of New York Ground Zero square after 9/11 and the logo of the UK engineers without borders "Resilient City" competition.

Source: Author from the web.

Consequently to this view on system recovery and protection (see Fig 4) "such (resilient) cities are capable of withstanding severe shock without either immediate chaos or permanent deformation or rupture. Designed in advance to anticipate, whether, and recover from the impacts of natural or technological hazards, resilient cities are based on principles derived from past experience with disasters in urban areas. While they may bend from hazard forces, they do not break", (Godschalk, 2002:2).

The recent CC impacts related practical and scientific evidences (IPCC, 2011) make the binomial of resilience and cities sprawled the webs, politic programs, international (till local) programmes focusing on urban protection and climate proof development. Because the total amount of people suffering CC related disasters reached the number of 262 Ml in 2004 (ICLEI Global) and because of the unsafe conditions in which poorer people live the urbanization processes (UNHABITAT) many international initiatives started in the last decade to promote networking, actions, fundraising and support for the urban CC adaption[5]. Both mitigation and adaptation strategies (climate resiliency) are in fact being used in increasing numbers of countries, and been implemented in various urban development plans and action measures (for Europe see Swart et al., 2009).

From those CC impacts and responses urban related vision, critics emerge because as explained by Walker the resilience of one system can erode the resilience of another (Walker et al, 2004). This means fostering the "climate" resiliency of a city (of the down town, for example, where most of key financial and economic activities are placed) can erode other urban components (or functions) resilience. This last statement underline an important lesson for managers, policy makers, NGO etc, which is that resilience is a neutral value. It does not exist a positive resilience or negative one. As promoting resilience as a normative goal it is a tremendous error in terms of values. In fact chronic poverty, for example, it is a highly resilient state, and you wish to erode such resiliency pushing for a transition. The key issue then is to always determine and critically evaluate the "resilience of

[5] For example see ICLEI, C40, UNHABITAT programmes, Asian Cities Climate Change Resilience Network (ACCCRN), Program for Hydro-Meteorological Disaster Mitigation in Secondary Cities in Asia (PROMISE), UNDP-RBAS Arab Climate Resilience Initiative, Rockefeller Foundation Building CC resilience Initiative.

what to what" (specific resilience) we're pushing for. In fact each specific "of what" means to focus just on some groups (or city function, or specific zone or issue), while the "to what" will respond only for determined pressures (or challenge, hazard etc). Furthermore, from values conflicts to ethical concerns, we should also answer the question of "resilience for whom?" (Breen and Anderies, 2011).

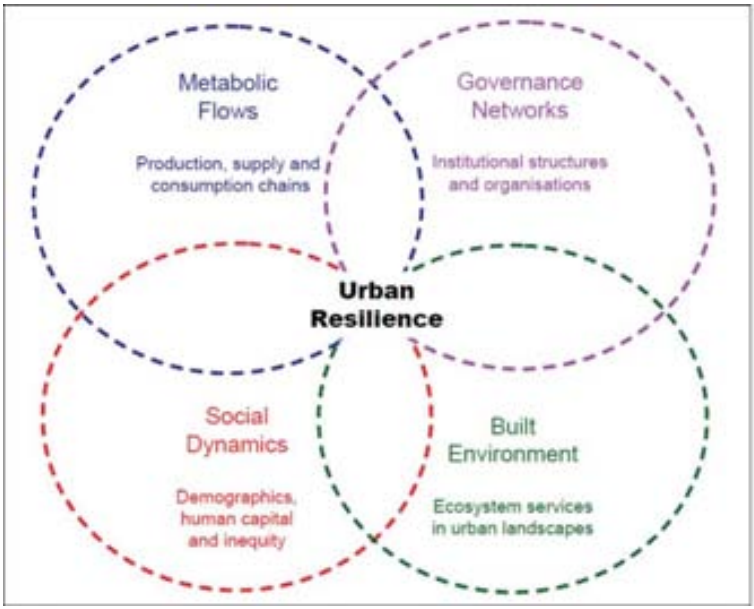
The key question of resilience for whom, bring us back to answer the main section question of: is there some steps forward in the urban resilience sprawling definitions and perspectives?

Because of the (metaphoric and broader) Generic Resilience meaning, for instance "the capacity to adapt and be flexible[6]", each discipline involved in the urban system (or its component) study has developed its own understanding and specific resilience definition. As far as a brief literature consultation can demonstrate resilience has been recently apply to planning (Wilkinson, 2010, 2012) and design (Colding, 2007), regional economies (Christopherson, 2010), energy and food supply (Transition Towns initiatives), security (Coaffee, 2008), CC (ICLEI, C40, Rockefeller Foudation and others) and water management (Blackmore and Plant, 2008).

This is actually why (urban) resilience is detached of being consider like a fuzzy catchword and meaningless concept (Markusen, 1999) with paradoxes when referred to urban management (Redman et al, 2003; Ernstson, 2010). In this complex and fuzzy panorama Resilience Alliance tried to make sense of all this disperse specific resilience definitions framing the components of generic urban resilience (see Fig 0.5). From such comprehensive framework emerge that urbanisation is considered in its broader dimension as a "complex dynamic process playing out over multiple scales of space and time" (Alberti et al 2003). Resilience in urban SESs is so defined as the the capacity to "simultaneously balance ecosystem and human functions" (Alberti, 2003) and the "degree to which cities are able to tolerate alteration before reorganising around a new set of structures and processes" in order to maintain their functions (Resilience Alliance, 2007).

[6] As mentioned in previous sections, resilience thinking theory defines as "Generic Resilience" the system capacity to adapt changes, while "Specific Resilience" is hte "resilience of what to what" (Walker et al, 2004).

Fig 0.5: The four components of Urban Resilience (research framework from R.A.)



Source: Resilience Alliance, Research Prospectus for Urban Resilience

Looking for a generic urban resilience approach can be seen just as a normative academic goal. Challenges in managing urban resilience will be a matter of urban governance, policy and planning because of the difficult task of politics and social parts in managing the different specific resilience perspectives dealing in the same spatial areas but looking at different structural and functional results. From this thesis, as from the website we founded on urban Resilience Research (urbanresiliencenetwork.blogspot.com.es) we hope different useful specific urban resilience perspectives can help framing the resilience principles translation for urban governance and planning, aiming at the middle and long term[7] sustainability transitions. **And this is why urban resilience matter**.

[7] The short-middle-long term perspective of urban resilience will be deeply analyzed in the next chapter.

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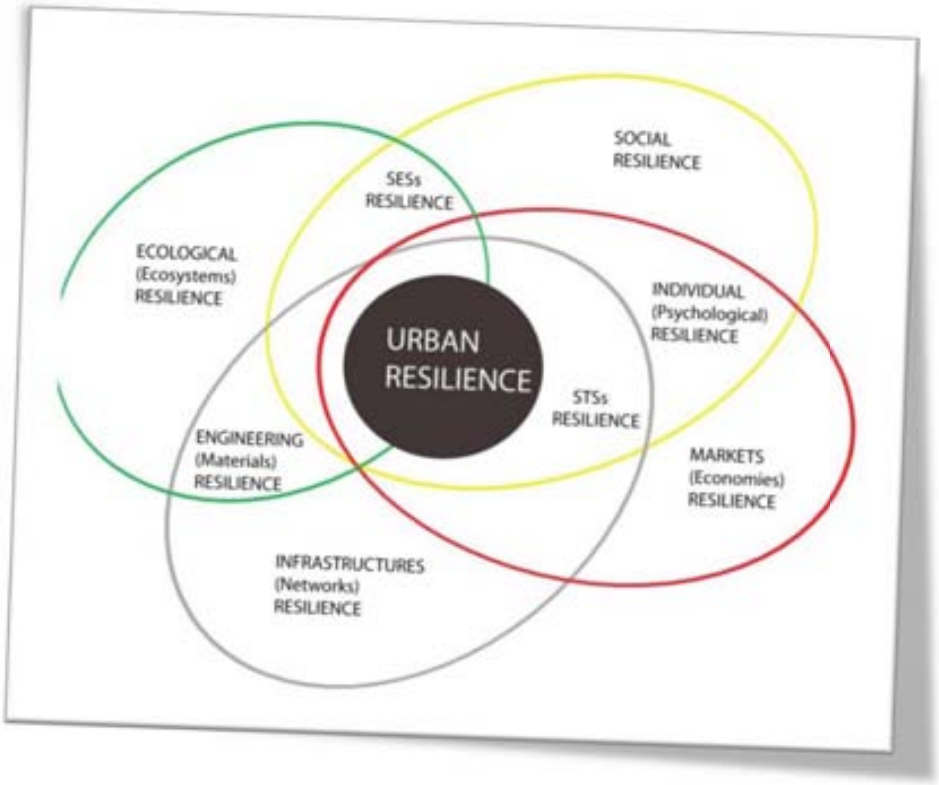
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ECOLOGICAL
(Ecosystems)
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INDIVIDUAL
(Psychological)
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RESILIENCE
STSs
RESILIENCE
ENGINEERING
(Materials)
RESILIENCE
MARKETS
(Economies)
RESILIENCE
INFRASTRUCTURES
(Networks)
RESILIENCE

CHAPTER I

STATE OF THE ART

RESILIENCE AND THE CITY: DANGER, CATCHWORDS ZONE AHEAD! FIRST INSIGHTS FOR BUILDING THE URBAN RESILIENCE THEORETICAL FRAMEWORK

"New powerful theories re-direct us toward problems and issues we might otherwise have ignored"

Forester (1993: 1–2)

Previous page image from Chelleri et al, 2011.

Summary

Resilience nowadays seems to have became a buzz word since ecological, psychological, social and economical sciences use it to refer to the property of (respectively) the ecosystems, people, societies and economy (recently even urban systems) to cope with disturbance. In fact it seems unclear even what the catchword "Resilient City" exactly stands for. Based on those assumptions this chapter wishes to review and clarify resilience thinking perspectives and their possible application to the urban environments.

In the first part the concept of resilience, its evolution and perspectives (from the engineering to the complex adaptive systems' one) will be analyzed framing the different meaning of recovery, adapting, transformative principles. In the second part we will try to clarify the panacea of (resilience related) perspectives applying them to cities.

Important review insights are that some engineering resilience perspective (as the recovery and persistence views) can lead to unsustainable patterns of development in cities. While from complex systems resilience, sustainability and transformability principles emerge as the consequent and necessary trajectory.

1.1 From "Resilient City" to Urban Resilience: understanding and integrating the resilience perspectives on urban systems

Societies and cities evolution have been largely studied across their past until the more recent adaptations (Geddes 1915, J.Diamond 2005, Agder 2005) and many unsustainable trajectories had emerged and been recorded (Meadows et al. 2004). Resilience is about adapting and reducing vulnerability (to…). It is the property of any system to deal with external changes maintaining its structure, functions and identity (Hollings 1973). Even if it seems relatively easy to link resilience and adaptation to evolution and sustainability, long-term history of human-environment interactions contained in the archaeological records, reveal that many human responses and adaptive strategies that apparently helped to increase resilience in the short term, or even over a few generations, led to a serious erosion of resilience in the long term, resulting in the collapse of both environmental and social systems (McGovern et al. 1988, Van Andel et al. 1990, Kirch et al. 1992, Kohler 1992, Rollefson and Köhler-Rollefson 1992, Redman 1999).

Following this question, we argue that, resilience is much more than "being adaptable", and if translated into the urban arena, the complexity of the concept increases and so do the potential misinterpretations (Redman and Kizing 2003).

In spite of a clear definition of the concept in an urban context, in recent times the notion of "Resilient Cities" has become a buzzword, mainly related to CC urban adaptation. Conferences, workshops, programs and worldwide networks rose from risk management, ecological, sustainability or political sciences but under the new "resilient cities" concept umbrella (see Fig 2.1). Such a sprawl conferred more and more meanings to resilience, making it be taxed of fuzziness from some authors (e.g. Markusen 1999). However, fuzziness and policy detachment (some of the critics to resilience theory) may just be symptoms of the immaturity of a concept (Lagendijk 2003) that we will navigate in its perspectives and evolution along the chapter.

In fact resilience shares with vulnerability and sustainability studies part of its framework, being a complementary concept (Miller 2010). The systemic

vision (dealing with complex systems theories) confers to resilience the relevance for a debate on the city and the shortcomings of urban planning. The most promising and challenging advance of resilience approach applied to cities is precisely because of the notion that not everything can be planned (Churchill 2003, Ernstson 2010) because of the dynamic and highly complex and adaptive (cross scales) nature of the cities (Aberti 2008). Furthermore resilience perspectives emphasize the integration of ecosystem functions within the social dynamics (Andersson, 2006), an essential issue for governing and managing cities transition toward more sustainable development paths, one of the greatest challenges facing humanity (Lambin, 2005).

Fig 1.1: ICLEI Campaign "Resilient Cities"

Source: Author from the web.

From the next sections we will analyze the different dimensions of resilience and the different possible interpretations out coming from relating those dimensions to cities. As from ecological to SESs resilience the shift we will make is from a resilient city vision to a complex urban resilience framework.

1.2 Resilience perspectives

1.2.1. From engineering to social-ecological resilience: from stability to multi-equilibrium patterns

The existing literature on resilience spans several disciplines and is fragmented due to its different starting points and consequent evolutions of the same concept. For example from an engineering perspective resilience is

defined as the property of a specific material to absorb energy when it is deformed elastically and then upon unloading to have this energy recovered (Avallone, 2007). This definition deals with systems stability properties, of recovering after a disturbance (Fig 7). This same principle is used in psychology and psychiatry sciences when referring to individual resilience, defined as the capacity to deal with changes during life course transitions and events (Rutter, 1987; Kaplan, 1999, Bonanno, 2004). Therefore (withstanding) shocks or difficulties are key factors in children, adolescent or adult's resilient life.

From those stability and recovery principles, referred o materials and individuals, we can translate them into upper conceptual scales (from material to infrastructures and from people to societies). First examples emerge from the Neil Adger definition of social resilience, described like the "ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental changes" (Adger, 2000:347)

Fig 1.2: Different expressions of resilience as shocks recovery capacities. The cases are A) Psychological resilience, B) Markets resilience, C) Coastal ecosystems resilience, D) Infrastructures resilience.

Source: Author from the web

At the same time, from engineering resilience literature (focusing on people and places vulnerability), social resilience depends on the hazardous environments, the forecasting of catastrophic events, systemic breakdowns and their social and economic implications (Vale and Campanella, 2005). In other words this represents a way of thinking about safety, where resilience view is about trying to express or ensure the organization keeps (or recover to) a safe stable state, helping people to cope with complexity under pressure and achieved success (Hollnagel et al 2006). The concepts of "maintain", "recover" and "looking for equilibrium" are key points at the very beginning of those different meanings and frameworks of resilience. However, far from such views, resilience thinking had already explored new dimensions of what resilience could mean, referring also to complex systems (Levin, 1998) with multi equilibrium states (Holling, 1986, Gunderson and Holling, 2002).

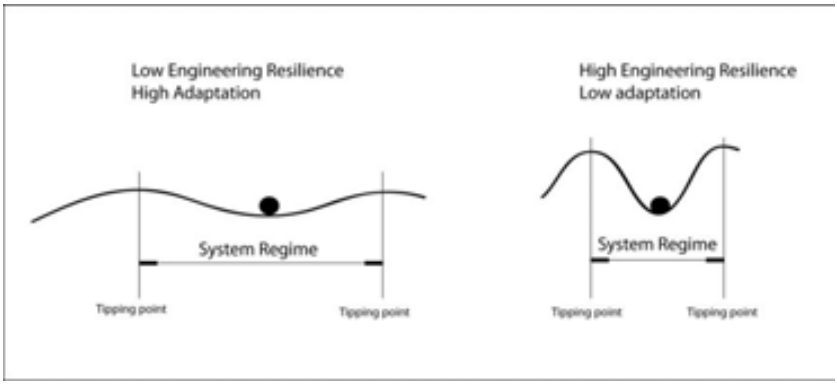
The evolution of the term starts when from recovery principles we start thinking on adaptation. The shift is in the nature of perturbation. In fact if I consider just recovery capacities a system threatened by shocks will survive. But if the same system is threatened by a slow increasing pressure probably he will not survive. As illustrated in the Fig 1.3 the difference stands in the nature of perturbation, which should be distinguished between fast or slow variables (of change).

Fig 1.3: Fast and Slow Variables of change. A hurricane (left) and a constant flow of pollution (right) represent respectively a fast (shock event) or slow (increasing pressure) variable of change requiring respectively recovery or adaptive capacities.

Source: Author from the web.

It is from environmental science that emerges the larger evolution of the concept, firstly referred to the ecosystems resilience (Holling, 1973 and 86) and than focusing at the social-ecological systems (SESs) one (Folke et all 1998; Berkes et al 2003) which emphasizes also the management dimension of this coupled system dynamics (Folke et al 2005, Olsson et al 2006). The key step in this evolution is the shift from a recovery to transformation principles, adapting disturbance. In fact at the very beginning Crawford Stanley Holling defined resilience in ecosystems as the system's capacity of reorganizing and managing changes in order to maintain the same identity, structure and functions[8] (Holling, 1973). While far from this old dominant perspective (see fig 1.4 Engineering resilience), focusing on systems identity and structure (within the "one-equilibrium"- stability view), rising concerns begun underlining that the ecological resilience was built and related better to the functioning of the system, rather than the stability of its component (populations), or even the ability to maintain (recovering) a steady ecological state (Pimm, 1984; Holling *et al*., 1995; Gunderson *et al*., 1997).

Fig 1.4: Ecological (Engineering) Resilience and Social-Ecological Resilience



Source: Author after Marten, 2001.

Many examples of ecosystem functioning (Schindler 1990) began indeed to demonstrate a somehow of predictable, however surprising, variability in

[8] This equilibrium focused first definition is also known as "Engineering resilience", aiming at the system stability.

ecological systems (Holling, 1986), while at the same time the science of complexity was explaining its new understandings in system theory (Costanza et al,1993; Kauffman, 1993; Levin , 1999). From those new approaches nonlinearity, but also uncertainty or self-organization (Levin 1999), were the main attributes that emerged with emphasis influencing resilience theory. The importance of such advances brought a new (and common) framework, based on the multi equilibrium and nonlinearity properties, between complex and ecological systems thinking, and reframing so ecological systems stability theory (Holling, 1986, Scheffer et al, 2001). At the same time resilience in term of ecological recovery (functions, structure and identity) was shifting into a more complex paradigm when evidences from case studies begun to demonstrate that the human system interactions were the main responsible of the not expected changes and shifts in the ecosystem's regimes (Wilson, 2000; Scheffer et al, 2001). These evidences were supporting the novel conceptual framework that natural and social systems are in synergistic and co-evolutionary relationship (Norgaard, 1994, Berkes and Folke, 1998) and that the resilience of ecological systems strictly depends by the social systems dynamics.

As represented in the Fig 1.4, the paradigm shift for resilience that represented the aperture from recovery to multi-equilibrium frameworks can be graphically resumed within the difference between stability and adaptability. Resilience for stability (Engineering resilience) is expressed by the system's capacity to stay and remain within a certain basin of attraction, or regime (Walker, 2006). While adaptation (and transformation) is represented by the capacity for reconfiguration and transition to other regimes (so passing tipping points toward a different configuration, something we better know under the name of SES resilience). Obliviously, and as represented in Fig 1.4, conservation capacities are opposite to the transition ones. We will say that engineering resilience it is a (short term) resilience for maintain stability, while resilience of SESs consider adaptation[9] (for long terms patterns of development).

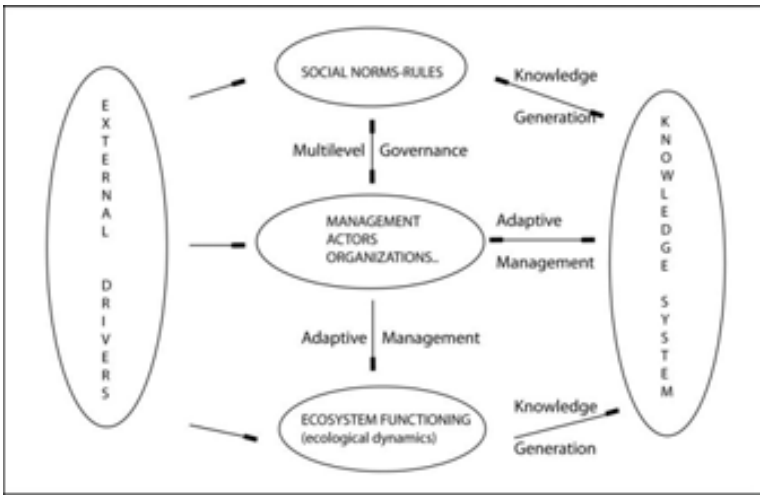
[9] In order to clarify why two different ways (almost opposite) of responding to changes are under the same "resilience" umbrella we will clarify in the next section the resilience of SESs, and the differences from the resilience of Ecological ones.

Although many disciplines (from human geography, human ecology, , political ecology and other) address the SESs dimension (Zimmerer, 1994; Gunderson *et al*., 1997; Levin *et al*., 1998, Adger, 2000, Folke 2006) at the very core of resilience thinking there are two main ways of understanding SESs (Salt and Walker 2006, Folke, 2006) that explain resilience itself: the first is about system's thresholds (Scheffer, 2001;Walker and Meyers, 2004) and regime domains, while the second is represented by the adaptive cycles theory (Gunderson and Holling, 2002). In the next section we will analyze them in order to frame the resilience in SESs perspective.

1.2.2 Thresholds and Adaptation: Two ways of understanding (Complex) Systems Resilience.

As highlighted earlier, SESs deal with the assumption that living systems are continuously evolving toward different trajectories, within multi equilibrium states and integrating the social and ecological dynamics (Folke, 1998).

Fig 1.5: Conceptual model of a Social Ecological System (SES) and its dynamics.

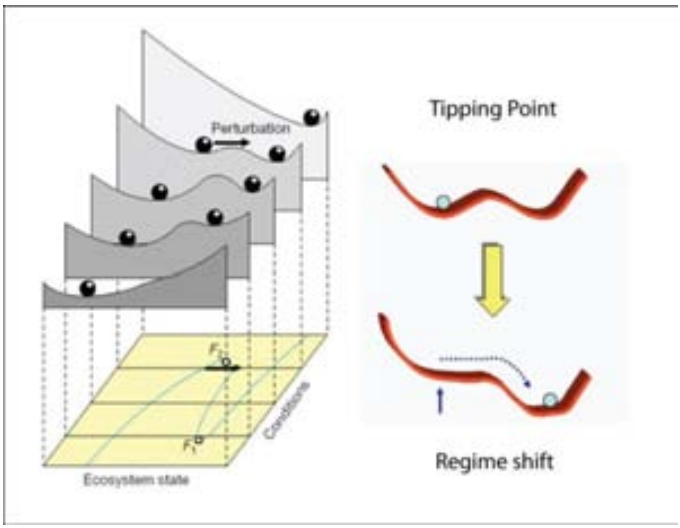


Source: Author from Hahn et al. (2006).

Within this new framework resilience perspectives are then re-focused on different properties like renewal, transformation and re-organization, instead of recover, maintain and bounce back (Bellwood et al 2004, Folke 2006). The precise differences between them need to be clarified to avoid conceptual misinterpretations.

When defining how resilience of SESs could be expressed towards renewal and transformation capacities, we need to introduce clearly the concepts of threshold and regime. In itself a threshold is defined as a crossing point, near and after which the feedbacks to the rest of the system begin to change (Walker and Salt, 2006). Knowing that any system, independently from how many variables describe it, naturally tends to a dynamic equilibrium state, the (thresholds) complementary concept of "regime" expresses all the possible system's movements within a basin of attraction (Walker et al. 2004). Notwithstanding this equilibrium inside a basin of attraction a system can flip from one basin to another one, crossing a threshold (or a tipping point) assuming different functions and structure within the new regime.

Fig 1.6: Regime Shift Schematic representations



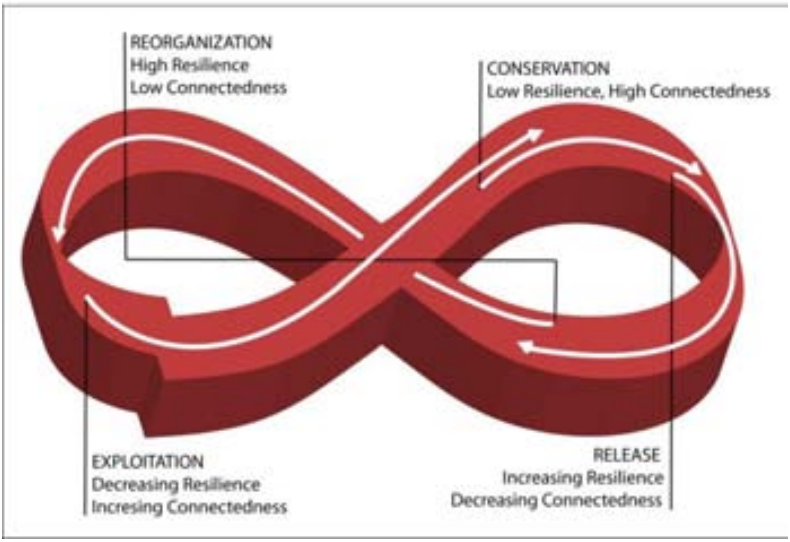
Source: Author from Gunderson et al, (2002)

Many examples of that had been made in the real world. Perhaps one the clearer is the example of the lakes eutrophication (Scheffer et al, 2001; Carpenter 2003) while receiving plant nutrients (phosphorus for example) in runoff from the surrounding lands (social system). In a first stage the lake can copy with the increasing level of algae growth because the capacity of the lake sediments (mud) to absorb phosphorus. That way decreases the source of nutrients for the algae growth. However, in a second stage the phosphorus level could reach a tolerance threshold (lake sediment saturated with phosphorus) and a tipping point is crossed. The feedbacks between lake's bottom mud and algae growth (no more capacity of the sediments to absorb phosphorus) change. A new regime in the system is installed and the lake structure and system functions are different from the previous equilibrium, dealing now with a murky water lake in which even if no more phosphorus is added the system will not recover to previous conditions. This exemplification of SES dynamic reveals from one side the nested relationship between the social (phosphorus incomes caused by land agriculture) over the ecological (lake and its ecological functions) systems, from the other side emphasize the importance of recognize thresholds and the drivers that lead the systems cross tipping points.

Resilience here is about threatening the equilibrium within a concrete regime (Folke et al. 2004; Scheffer, 2004) or moving the system thresholds to make the equilibrium last longer in such regime (Berkes et al 2003, Walker and Salt, 2006). In doing that, adaptability and transformability are the two main properties of SESs facing changes (Holling, 1973; Walker et al. 2004; Folke et al. 2010) and reflecting our second paradigm of resilience toward renewal and re-organization.

Such a dynamic systems development is symbolized in the adaptive renewal cycle concept (see Fig 1.7) from CS Holling (Holling 1986). In this model systems evolution is expressed toward a dynamic cycle of growth (exploitation phase), conservation (a steady state phase), collapse (release phase) and finally the reorganization phase of the system. Resilience differs and depends on the phases. It is lower within the system conservation and collapse phases (because of the specialization and then system's loss of response diversity), higher in the renewal and growth ones.

Fig.1.7: Renewal Adaptive Cycle model

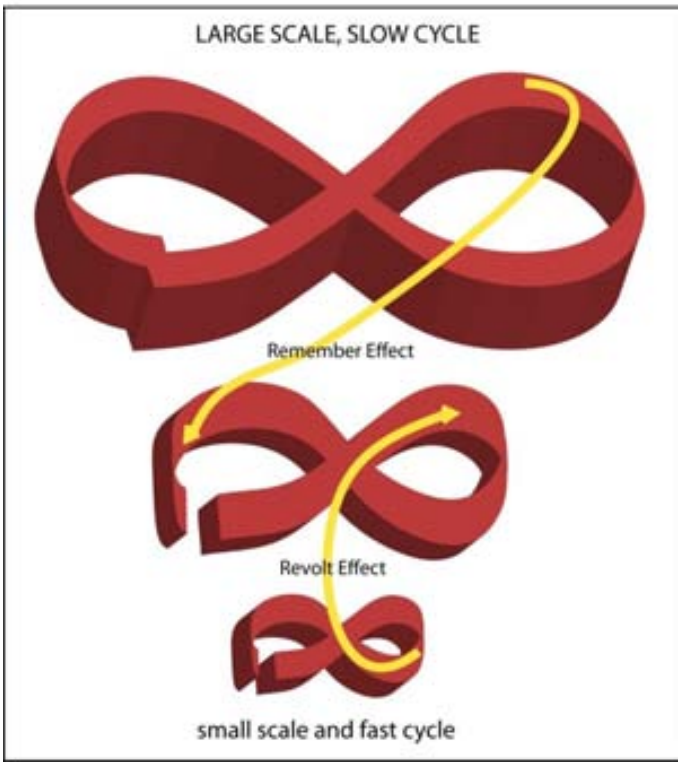


Source: After Gunderson et al, 2002 in Chelleri, 2012.

This model emphasizes two essential messages from resilience theory: that disturbance is part of development and that renewal, much more than conservation, is a resilient strategy (Gunderson and Holling, 2002).

Contrary of what engineering resilience view claims within the recovery to equilibrium principle, in SESs evolution and development justify adjustments, transformations, even by sub system collapses, because multi equilibrium, diversity and renewal are the key for new and sustainable systems trajectories (Berkes et al 2003, Folke 2006, Folke 2010). Furthermore in all systems (human, social, ecological ones) adaptations and transformations happen as multi-scales (spatial and temporal) processes. In fact as Holling underlines in his Panarchy (see Figure 1.7) book introduction: "there are several different ranges of scales each with different patchiness, attribute and textures"; referring to the systems and groups: "the one play into the others a dynamic interaction" as in "a nested adaptive cycle" scheme (Holling, 1992:15).

Fig. 1.8: Panarchy. Cross scales interactions.



Source: After Gunderson and Holling, 2002, in Chelleri, 2012.

Translating to cities, Panarchy concept reflects the complex cross-scale effects between neighbourhoods, cities, suburbs and the metropolitan regions (Porter, 2003) or in economic studies by the concept of regional economic resilience itself. Literally it means the ability of a region to recover successfully from shocks to its economy (Hill et al, 2008) that assumes the potential adaptation in term of renewal capacities, in which partial collapses represent the needed (and the opportunity for) adjustments in order to cope with changes (Arthur et all, 1997). All those systemic vision of SESs and resilience should really be deeply understood from politicians, business men, and city managers facing changes (and challenges), coping with

Climate Change (CC) and human's impacts on the environment. Our societies and industries are usually organized toward economic efficiency paradigms, trying to growth constantly and last over crisis and because of the (short term) recovery perspective of resilience some important (long term) sustainability goals can be missed and misunderstood. In fact trying just to make systems more robust to changes (recovering and sustaining them) can lead many unsustainable systems to resist over time. As in the Schumpeter economic concept of creative destruction (Schumpeter, 1942) system's long period resilience required constant changes across different scales, components (groups), or subsystem collapses in order to evolve (Folke 2010).

Although these useful and logical evidences, as Salt and Walker mentioned defining the differences in our societies between engineering and social ecological resilience perspectives "when you hear managers and planners using the term resilience (for example "we're building a resilient industry" or "we are planning a resilient city") it is unclear which meaning they have in mind. Often they are talking about engineering resilience in which the aim is to bounce back quickly to business as usual following a small disturbance. The distinction between "bouncing back" and "retain the ability to get back" is crucial." (Salt and Walker, 2006:73). That is what we are going to clarify in the next sections, trying to address the first urban resilience perspectives.

1.3 Fixie or multi-speed Cities? The Urban capacity to last over time and space

Recently, Lawrence Vale and Thomas Campanella argued the conception of the city of being "the humankind's most durable artifact", since "despite the cities were sacked, burned, bombed, flooded, starved, irradiated – they have, in almost every case, risen again like the mythic of the phoenix" (Vale and Campanella, 2005:3). Such an assumption is built on many historical studies and evidences. As reported by Chandler and Fox only forty two cities worldwide were permanently abandoned following destruction between the years 1100 and 1800 (Chandler and Fox, 1974). Narratives of destructions and reconstructions had in fact dominated the literature on the cities

resistance following any natural or human induced disaster (Eugene et al 1977). Jerusalem, maybe the most destroyed and rebuilt city in history (Elon, 1989), after suffering wars, earthquakes, religious transitions, destructions with no reconstructions and the maintenance of the ruins, still remains nowadays a "place of special significances" (Beinart, 2005:181) as in Fig 1.9. This expresses the powerful of the city (one specific perspective of) resilience over time.

Fig 1.9: Cities as Special Significance Places. Two examples respectively (from left to right) of religious significance, Jerusalem, and historic significance, Rome.

Source: Author from web

1.3.1 Social significance and learning: just recovery?

From Plato to Thomas Man the city has always been and recognized as a cultural and societal living artifact. As Lewis Mumford related, before the metropolis "the city, the village, the cave and the cairn there was an essential disposition to social life". In fact (the city) "it begins as a meeting place" (Mumford, 1961:5). Resilience throughout resistance perspective on the city emphasizes that although time has dissolved some built structures, the social ones remained durable (as in the examples of the "lost cities" like Pompei, now a still alive site for remembrance). As far as we analyze or critic a city concept, it remarks the human's social living property that makes the cities express, toward the tenacity of the urban life, their resilience over the time. Almost any planner, architect, philosopher or economists will agree that the city in itself represents the maximum societal energy point in a territory, the place in which the time and the humans experiences become

visible throughout a process of power and cultural built symbols (Mumford, 1960). As in the adaptive cycle model of Holling for the SESs, cities too evolve cyclically toward an ongoing process of destruction, redesign and reconfiguration (Vale and Campanella, 2005). Notwithstanding some experienced trauma in the short period (after shocks like earthquake, wars etc) the narratives of disasters are permeated of a optimism culture, in which resilience is a matter of political and social functions (Berkes and Campanella, 2006) while urban rebuilding is a social-psychological need in order to make sense of the disaster (Kai, 1995).

Fig 1.10: Resilience as recovery in Messina (IT) in 1908. From left to the right the city after the hearths quake and till the reconstruction.

Source: Author from the Web.

The conceptual step between the disaster recovering process and the ongoing evolution one is represented by the social learning elements and processes, that make people changing in their behaviors adapting a stress/shock, and that let the system evolves while recovering in the longer term (Walker and Salt, 2006; Folke et all 2004), differentiating shock reaction (or short term bouncing back principle) with evolution. However from many case studies on urban disaster we can observe that social learning was evident yet, from the first moment, in the reallocation of some destroyed cities (Tidball, 2010).

The most evident link between adaptation and conservation (just recovery) stands in the social learning process. It represents in fact that notwithstanding a city or region recovers, it is seldom “transformed” by what happened (Mitchell, 1999; Pelling, 2003; Vale and Campanella, 2005). This assumption links cities evolution perspectives (Geddes, 1915; Mumford,

1972) with the recovery and disaster narratives, both aiming at a process of development and renewal notwithstanding disturbances.

1.3.2 Urban resilience or robustness?

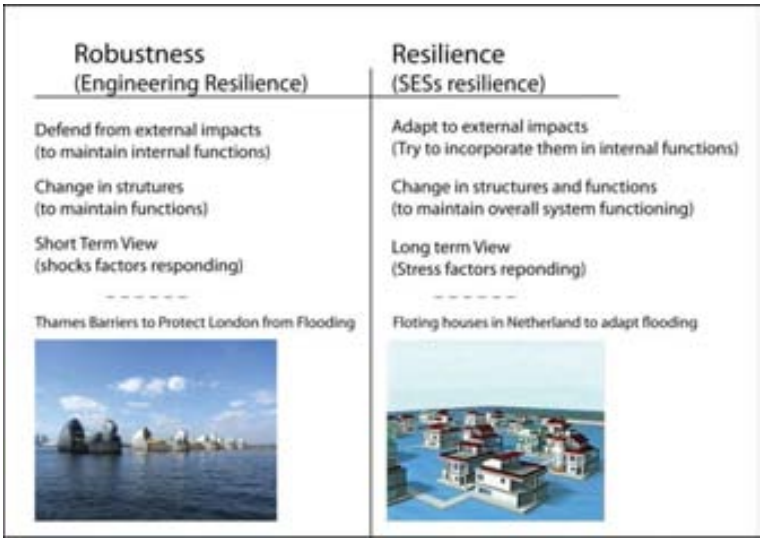
It seems unclear how to distinguish these two concepts, mainly if we have in mind the "resilience as recovery" principle and robustness as "system that can resist changes". They sound like the same and in fact if we look at the ecological definitions we find respectively: "the rate at which a system returns to a single steady or cyclic state following a perturbation" (Engineering resilience, by Resilience Alliance, 2007), "the amount of change that is required to transform a system" (Ecological resilience, by Resilince Alliance, 2007) and "the capacity to stay 'on track' despite the myriad vicissitudes that inevitably plague a developing organism" (Keller, 2002).

In just few words, these definitions play around two main concepts: resistance to change and recovery after a change (Levin and Lubchenco, 2008)

As we're not interested in entering in detailed distinction within ecological-engineering literatures, but understanding the usefulness of the concepts to be translated for urban systems management, we'll assume that the main distinction has to be done between Robustness (or Ecological-Engineering Resilience) and (Social-Ecological) Resilience respectively as synonymous of maintain the system *status quo* (recovering, protecting etc) or adapting it (transformation or parts, structures, functions). In the Fig 1.11 the conceptual differences are schematically explained. The most important difference stands in the defend from impacts (robustness) or adapt impact trying to assume them within the system functioning (mitigation).

First insights from urban resilience or robustness come from models (like for example the cellular automata) trying to explain fundamental principles at the base of city spatial self-organization (White and Engelen, 1993; Portugali et al, 1997; Frankhauser, 1998) as proxy of urban resilience (Portugali, 2000, Chen and Jiang, 2009).

Fig 1.11: Robustness and (SES) Resilience.

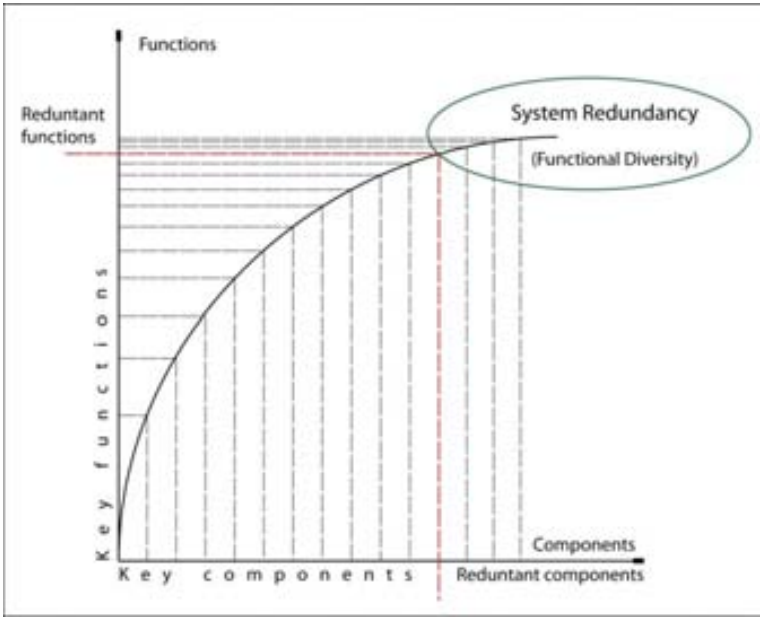


Source: Author, photos from the web.

Others disciplines have focused on cities resilience from the "enhancing urban robustness" lens. It is the case of economy, infrastructures and networks. For example by the term of territorial resilient strategies, since the 1964 in technology studies, Paul Baran introduced the concept of network resilience (Baran, 1964) and it was determined by the systems structure configuration: centralized networks (one source, more vulnerable), decentralized ones (set of sources networking, less vulnerable) or distributed networks (nonhierarchical mesh and the more resilient ones). Recent terroristic-war versus natural disaster literatures (Körner, 2000; Gastil and Ryan, 2002; Massard-Guilbaud et al., 2002;) confirm the tendency to turn the attention specifically to consider spatial and territorial aspects of resilience in local and regional development and planning (Foster, 2007; Hill et al., 2008). Furthermore, since 9/11, safety began to be more and more a synonymous of resilience (Chernick, 2005) because the more city functions are spatially sprawled the more the city vital elements (electricity, water, internet and more infrastructures) are saved (resilient) from attacks.

From these last cases the concept of redundancy (from ecology) helps in bridging disciplines. In fact in resilient ecosystems redundancy (see Fig 1.12) is represented by the abundance of functional diversity (many groups dealing with the same/similar functions, and able to substitute one the others in case of emergency or change) like here in cities the spatial decentralization of many essential functions can express resilience toward robustness, because each element can substitute another in case of need and let so the whole system survives and bounce back to its functioning and equilibrium.

Fig 1.12: A simplified scheme of system redundancy. It can be easily seen the decreasing function importance (size) at increasing components number (functional group). When all the key functions, explained by the key groups, are keeping the system functioning, the added groups which play minor roles constitute the system redundancy (the potential of substitute key groups functions in case of such group collapse, and maintain the system functioning).



Source: the Author

Furthermore, from this perspective, urban resilience has a strong link with the ecological one in term of "patterns of connectivity" (Mitchell and Townsend, 2005). The same we can stand, as a fundamental property, from the new economical perspectives of resilience (Swanstrom et al, 2009; Hassink, 2010), because of the well known economics cross scale effects of (and on) the regional urbanized systems. The case is when, for example, a surge in community mortgage foreclosures disrupts the broader regional economy.

From all those evidences and disciplines looking at the short term resilience of built a more robust and resistant system (city, network, or economy) we can anyway recognize an element that goes beyond the recovery principle itself: change and learning. In fact even in those short terms resilience examples systems must change (thanks to social learning or networks and economies configuration) to recover (previous) equilibrium (or functions).

In the next chapter we will try to address the second framework of urban resilience, the middle and long term views in which sustainability patterns emerge. They are expressed toward systems transformations at different scales in order to adapt changes in the long term.

1.4 The Sustainability dimension of Resilient Cities

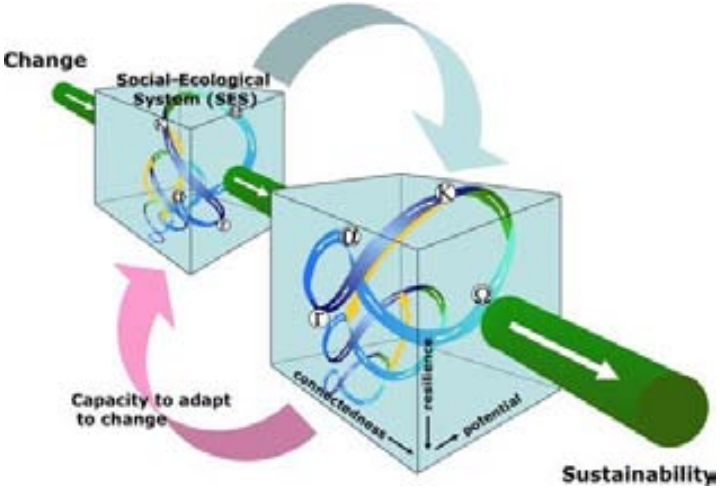
1.4.1 Introducing sustainability: between risk, resilience and robustness.

In the previous section we have somehow related the capacity of the cities to last over time, throughout different strategies and disciplines, with resilience (short term) perspectives. However, in this debate one might find an overlooked element: the natural environment. In fact all those discourses and evidences were built around the capacity of lasting over time, reflecting social and cultural skills and values, but nothing mentioned about the environment till now.

Based on the most recent framework of sustainability (Kajikawa 2008) system thinking emerges as the essential lens to investigates, define and put in practice it. In systems thinking, sustainability is a dynamic process (Folke

et al, 1998) "featuring the networks of relationships among the purposeful motions toward a shared vision, the properties of complex SES (i.e., complex collective behaviour, sophisticated information processing and adaptation), and the forces acting on them (e.g., change, disturbance)" (Joon and Taikan, 2011).

Fig 1.13: Visualizing SESs adaptive capacity facing sustainability patterns.



Source: From Joon and Taikan (2011) after Berkes and Folke (2003).

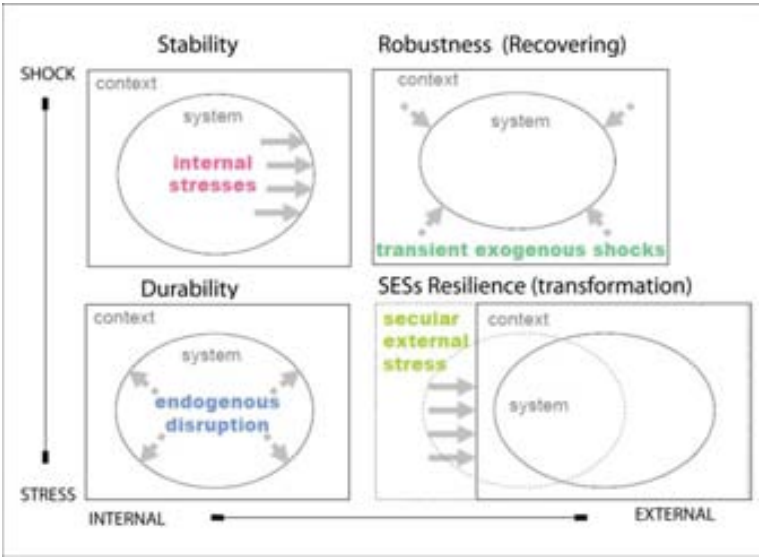
Why have we chosen this last complex definition of sustainability when many other more easy and intuitive are the most cited (see Daly, 1993 and others)? Our interest is in underling that as in SESs sustainability is maintained by relationships among nested sets of adaptive cycles (Holling et al. 2002, and as in Fig 1.13) the linkages across scales play a major role for sustainability (Mitchell 2009). Those linkages constitute our social (and so economical and political) structural (not functional) configuration.

As resilience (both adaptations and robustness) approaches insist on our SES functioning, sustainability is strictly depending on the resilience approach we choose to promote, between: maintain (robustness) our living networks in the actual determinate configurations, or pushing them (adaptation) toward new configuration. It seems relevant then to frame and understand

the meanings of robustness (engineering resilience: protect and enhance the system actual regime facing changes) and SESs resilience (adaptations and transformation) at the light of sustainability. Because the same functions can be developed relying on different configurations and structures, transformative and not conservative policies should be the meaning of resilience in face of changes, to put in practice sustainability patterns of development.

In fig 1.14 we try to simplify the different possible responsive capacities facing changes. Those responses vary in case change is happening in the short term (shock) or long one (stress, as in Fig 1.3). In both cases system can be threatened by internal changes or external (for example in the case of shocks it could be a strike or an hurricane). Within the four possible cases we should distinguish between stability or recovery in case of shocks and durability or resilience in case of stresses.

Fig 1.14: Framing Responsive Capacities depending on type and timing of change.



Source: Author after Stirling 2007.

To better understand the difference between these four actions we will frame[10] each in regard of policy (to be promoted), infrastructure (qualities to address such response) and the technology focus needed.

- STABILITY: the policy attention prioritizes Co-ordination between system's parts, reliability of existing infrastructures and incremental innovation of technology. More in general the actions that follow Stability principles are supporting political and social stability, promote efficient markets, enforce operational margins etc.
- ROBUSTNESS: the policy attention prioritizes vigilance because of the potentially unexpected nature of shock (from outside of the system), suppleness of existing infrastructures in order to maintain system functioning and an agile innovation in technology is required in order to recover quickly.
- DURABILITY: being slow and increasing the change from inside the forecasting is the policy action that should accompany the persistence of the infrastructures, while directed innovation is the framework for the technology focus.
- RESILIENCE: policy should address foresight, while infrastructures adaptability and systemic innovation should accompany the transition to new structural regimes in order to adapt those inexorable external long term changes.

The relationship of those actions (on system structure) and sustainability is intuitively explained within the next figure (Fig 1.15).

[10] The framing we propose here is based on the work of STEP Centre and Andy Stirling researches and publications. The main improvement, or difference, stand in the inverse use here is done between robustness and resilience concepts. This change is been developed because Stirling work focuses on ST systems and power influences on actions and policies. In so doing he consider resilience as the bouncing back action and robustness as the capacity to change the system, which is the exact contrary of what Resilience Alliance and this thesis is conceptually following.

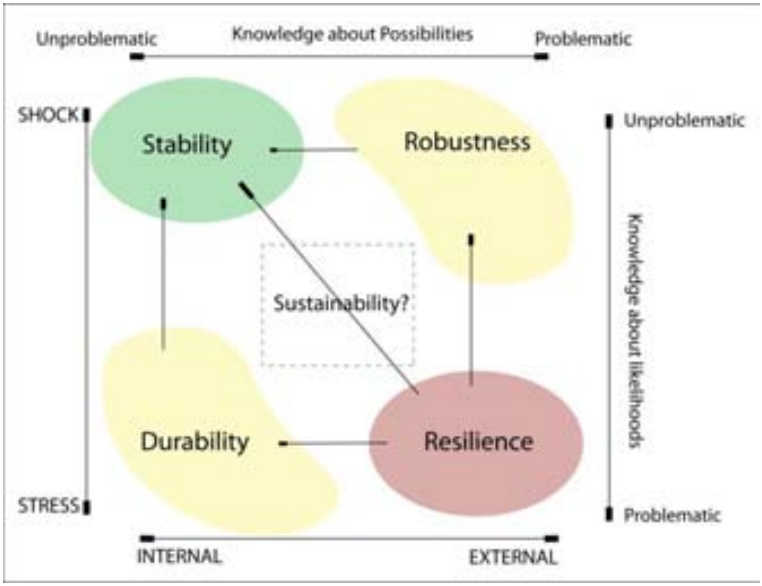
Fig 1.15: Framing sustainability between different responsive capacities (depending on type and timing of change).

Source: Author after Stirling 2012

But reach such balanced approach between recovery, adaptive, stability and durability principles it is not just a matter of simple and rationale top-down decision making, since in complex adaptive systems powers and existing infrastructures can lead the process toward stability principles (Fig 1.16).

In fact, as argued by Smith and Stirling incumbent socio-technical regimes are by definition structurally resilient (Smith and Stirling, 2010:4). This means considerable investments are made in order to sustain the performance of determinate configuration of STs, cause the high competition with emerging new technologies that can substitute the actual one (Smith et al. 2005). So, incumbent infrastructures interests favour stability-based strategies more than resilient-transformative ones (Fig, 1.16).

Fig 1.16: Incomplete knowledge (and organized irresponsibility) as shaping stability political principles forces.



Source: Author after Stirling 2012.

As also Ulrich Beck points out there's a synergistic element that push for systemic conservation before transformation, and this is the risk-based knowledge our contemporaneous society is built around (Beck, 2006). He describe already in 1986 the "Risk Society" as an inescapable structural living condition (Beck, 1986), in which society it is increasingly occupied with debating, preventing and managing risks that itself has produced. The risk calculability is closely connected with the "uncertain knowledge" (Keynes, 1937) so that when facing uncertainties societies more than ever relies and insists on security and control (Stirling, 2012). In fact, as resumed in Fig 21, the incomplete (problematic) knowledge we have about external drivers and long term structures evolution make our actions-focus being oriented toward stability conservation patterns (Stirling, 2012), which is not sustainable at all as explained in our sustainability framework (Fig 1.15).

Those last heuristic models of framing sustainability depending of risk related responses are built mainly around the Social-Technical systems theory (Rip and Kemp, 1998; Smith, 2007). As STSs are not place-bound as SESs (Smith and Stirling, 2010) we've started trying to tackle sustainability from such (STSs) perspective, although complementary evidences should be delivered from the SESs approach in which cities fit spatially within the coupled system view.

1.4.2 Urban SES Resilience: the link with transition theory.

As in SESs (Folke et al, 1998; Berkes et al 2003), the link between two nested systems (anthropic and natural) in cities is also crucial, and well expressed in the Mumford said, "the shaping of the earth was an integral part of the shaping of the city" (Mumford, 1961:17). Throughout the history, in this coupled system, societies' success or collapse was determinate by both the availability of close natural resources and the capacity of men to adapt the changing environmental situation (Diamond, 2005). This explains why during medieval period as far as we know the limits of the cities were clearly determined by the natural resources availability. Looking at the literature the interplay between urban and ecological systems was clear almost one century ago from Geddes (1915) to Park (1925), from social ecologist like Mumford (1960) and Dubos (1956), more recently from natural scientist like Odum (1975) or Leopold (1968). Urban designers like Mc Harg (1969) or Lyle (1985) delved into the ecology of human systems, comparing cities to ecological systems, in which their urban metabolism (Wolman, 1965; Douglas 1983) represented the energy and material flows requested and consumed by the system. The assumption that humans exists wholly within nature and its processes (Jacobs, 2000) is shared by geographers (Zimmerer, 1994), anthropologists (Redman, 2005), planners (Beatley and Manning, 1977; Steiner, 2000) and the concept of studying ecology in cities (analyzing environmental stress and humans pressures) shifted to the study of the ecology of the cities (Grimm et al 2000), toward some human ecosystem models in which social and ecological processes are integrated (Pickett et al, 2001 and 2008; Alberti, 2003 and 2008). Definitely, the clear interplay between cities and social ecological systems is described from Alberti as

"humans are the dominant driving force in urbanizing regions, and changes in ecological conditions also control humans decisions" (Alberti, 2008:70).

From the beginning of this chapter, we had passed throughout different perspective of resilience, from a linear (equilibrium state) to multi equilibrium points of view. The same path we can now pass through in the cities case. From the linear (mainly past) relationship between cities and the (surrounding) natural environment, nowadays concept of urban landscapes spam with almost no spatial limits the entire planet with their influences in a very complex, multi equilibrium, and cross scale effects (Rockstrom et all 2009). In fact as far as we know from regional thinkers (since the beginning of XX century) regions are in a dynamic equilibrium in constant evolution, without definable boundaries and in which human political systems should be always ready to adapt changing conditions (Geddes 1915, Mumford 1961). Such a description was also a first and surprising preamble to the next complex adaptive system theory view (Levin, 1998 and 1999, Holling 2002), expressed toward multi-equilibrium states and no linear trajectories of evolution.

Cities so can be so consider and defined as complex adaptive systems within its regions, following than the resilience in SESs concept and perspective (Alberti 2008). Throughout such a theoretical advance, patterns of sustainability emerge consequently from the resilience perspective on the cities (Norberg and Cumming, 2008). Basic on this assumption, urban resilience framework would consists of non-predictable trajectories patterns, where collapse and transformation of subsystems is desirable for an upper system resilience and survival (Folke 2010), and path dependency is almost a negative influence for resilience.

At the light of those principles many policies and urban plans should be carefully revisited and some paradigms changes because unfortunately (oil and many other) path dependence, fixed long term urban design and social-economical system organization throughout efficiency (not redundant in its functions) are common in cities background.

Those conclusions lead to a necessary link from resilience perspective with transition theory (Hopkins 2008, Rotman et al 2010). Both those theoretical frameworks look at long term sustainability patterns, throughout adaptation (from SESs resilience theory) or transitions (STSs transition theory).

But it is not only a matter of theoretical approach. Increasing evidences are calling for such new framework for acting now and with urgency changing urban models and philosophy. In fact for the first time and as stated in our introduction, in 2008 urban population surpassed the rural one (UN, 2008) and the number of cities with over a million people went from 11 in 1900 to 378 in 2000 and this number will increase to 599 by 2025 (UNEP, 2009). Moreover close to 80 per cent of these (479 cities) will be in developing countries (UNEP, 2009) thirsty of growth. In such a panorama where cities occupy just 2 per cent of the world's terrestrial surface, but contain almost 50 per cent of its population and consuming over 75 per cent of its natural resources (UN-Habitat, 2006), calls for global sustainability are coming from the most important institutions worldwide.

1.5 The Cross Scales dimensions of Urban Resilience: the global urban networks that erode sustainability.

Recent contributions in the social-ecological literature (Reid et al 2010; Power and Chapin 2009) emphasize the growing concern on the identification and evaluation of planetary safety boundaries, inside which humanity should stay in order to avoid dangerous (but possible) global regime shifts (Rockström et al 2009). Obviously cities play a key role in this process (Andersson, 2006) as human dominated systems are considered the main responsible of global diffuse impacts (Folke and Grunderson, 2010). Those impacts and CC stressors both contribute to "rise triggering events to which the human response is to organize on a global scale" (Beck, 2006:11). But it's not just a matter of impacts from local to global; the worldwide dimensions of market, issues of social justice, technology and knowledge are nowadays dimensions around which cities play a key role.

As local systems are interconnected with global driving forces working throughout different networks in which flow resources (material and immaterial) tradeoffs, cities host groups directly involved in those network (a minority group of stakeholders), indirectly involved (users, citizens who use the products that come throughout those networks but with no direct control over such flows) and finally people excluded from those networks

(and their benefits) but that live trying to adapt this cross-scalar dynamic that dominate urban style life rhythm. As ironically represented in Fig 1.17, the global urban networks rely on the design of a strategically market oriented resource and supply of material and immaterial resources. Its design and management paradoxically it does not come from the ground but from the desktops of big corporations, lobbies and global stakeholders who play with financial markets tools in order to maximize their own benefits from the intricate cross scales potential factors.

Fig 1.17: Representation of Cities networks and its cynic design management

Source: Author from the web

As be part of this network is a fundamental resilient capacity (Sassen, 2002) because the opportunity of taking advantages from worldwide resources, emergent global cities (Sassen, 2001) enter both in synergy and competition to represent essential nodes of this network.

Regarding to those capacities Ernstson (Ernstson et al, 2010) split the paradigm of "resilience IN cities" from the "resilience OF cities" one. "The first concern operates at the city scale and deals with sustaining local-to-regional ecosystem services. The second operates at the scale of a ''system of cities,'' which is a concept from geography meaning a set of cities tied to each other through relations of exchange, trade, migration, or others that sustain the flow of energy, matter and information among the cities" (Ernstson et al, 2010: 533).

At a first glance the result of such difference stands in the increasing capacities of a "networked city" to cope with local stresses and difficulties because it becomes somehow "disconnected from its local environment and can stand over network (worldwide) resources thanks to global economy.

However this increased cities resiliency erodes the whole global sustainability. In fact, as Miller points out, the lifestyles of a globalized economy are increasingly disconnecting people (societies) from the natural environment and the related ecosystem services (Miller 2005).

As in fig 1.18, the extreme examples of this separation and artificiality are the so called 'resort cities' (Koolhaas, 2006), such as Dubai or Singapore where the demand for leisure dictates the form and essence of the urban landscapes. But more dangerous indeed is the false perception of local natural environments status. In fact we believe that in occidental dense cities smart codes and greening practices represent the solutions to environmental problem, while in reality they are just local facades that mask the overall worldwide extended ecological impacts and unsustainable footprint that support our globalized urban lifestyle.

In a global market built on invisible networks of capitals flows (Fig 1.17) local forms and functions can't be but the reflections of our lives artificiality. This shock with our past paradigm of local identities, based on social capital and accumulated territorial practices and knowledge, lead to globalized self referred urban styles (Muñoz, 2010) and provokes the sustainability shifts from local resources and environmental care to global resources depredation.

Definitely the resilience conferred by global networks to cities and citizen hides the local irresponsibility for the consumption of non local resources that entered in the global market tradeoffs flow.

This panorama helps making sustainability even a more ambiguous concept to lead governances and policies, underlining as the main challenges in building sustainable cities rely the political and power networks issues (Swyngedouw, 2004).

Fig 1.18: Dubai unnatural growth speculating on Cross Scales market factors.

Source: Author from the web

1.6 Final Remarks and research questions

Resilience identifies, understands and provides clear and useful insights from system dynamics, which constitute a large potential for urban systems applications in adapting external stresses or shocks.

For CC adaptations and Risk management researches and practices resilience is the concepts mostly related to vulnerability and responses studies (Gersonius et al. 2008; Prasad et al. 2009; Chen and Graham 2011). From recovery principles to learning and adaptation strategies (Campanella and Vale, 2005; Leichenko, 2011) resilience also provides useful insights related to new adaptive governance and transition management dimensions (Loorbach, 2010, Van der Brugge and Van Raak, 2007, Loorbach and Rotmans, 2010).

Following this line of thinking, multiple ways of assessing and looking the resilience of cities can be undertaken (Alberti and Marzluff 2004; Colding 2007; Rose 2007; Christopherson et al. 2010; Newman et al, 2009; others) and have been explored along this first state of the art chapter. These aspects of urban resilience differ mainly because of the scales (spatial and temporal) or discipline point of view, but the more interesting think in comparing them relies on the new dimension given to Urban boundaries (and other system interdependences).

Because cities recovery capacities and climate adaptations actions insist over stability patterns (while urban systems are highly complex and adaptive systems functioning within global networks of social ecological systems) emerging importance is given to urban sustainability transitions research trajectories (Hodson and Marvin 2010; Smith 2010; Dawson 2011).

Critical aspects of Urban Resilience emerge when resilience is taken as normatively positive concept. In fact as the resilience of one system can decrease the resilience of another (Carpenter et al. 2001) when governances and planning try to enhance a specific resilient dimension in cities this could erode another group resilience. As the resilience for protect urban built environments can foster lock-in regimes and avoid potentially positive transition to more sustainable patterns of developments. Resilience “of what to what” (specific

resilience) has to be but one of the principal research question related to sustainability.

Some of the main researching questions are in fact:

- How to deal with a coherent framework for Urban (Generic) resilience?
- How should be urban resilience related with planning in practices and policy making in order to avoid lock-in regimes?
- How to assess and measure Urban resilience?
- How far we could expect from the descriptive urban resilience framework useful insights and links with prescriptive ones (for governance, economy, climate change adaptation etc)?
- How smart and climate resilient codes related to the resilient dimension (better than simply to impacts mitigation ones)?

Along the case studies we will critically try to address the answers to those questions. In order to cover a large spectrum of possible urban configurations to analyze different faces of resilience we've chosen three main case studies related to Climate Change vulnerability and adaptations strategies (The Netherland), developing country emerging cities (Morocco, Ouarzazate) and finally urban renewal programs in emerging OCSE global cities (Spain, Barcelona).

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PART II

CASE STUDIES

CHAPTER II

THE RESILIENCE OF URBAN HIGHLY VULNERABLE COASTAL AREAS: LESSONS FROM DUTCH POLDERS DELTA URBANISM.

"Those who cannot remember the past are condemned to repeat it".

G. Santayana, *The Life of Reason, Volume 1, 1905*

Photo in the previous page: from the Web

Summary

The expected impacts of Climate Change (CC) pose new and considerable challenges mainly to the coastal areas (IPCC 2011), where a concentration of human and economic values are placed and expected to increase (EEA, 2007). Netherland is considered one of the most well known cases in the world where both these concentrations are located in a territory reclaimed from the sea and actually below its level. In fact, 75% of the total coast is protected by sandy dunes and the 15% of the coast consists of hard constructions (like sea-walls, dykes and other barriers) in order to protect the 9 Ml people living and producing the 70% of the Dutch gross domestic product. Unsurprisingly, CC is just one of a continuous series of threatening drivers of (environmental or climatic) change that Dutch society had to deal with along its history.

This chapter aims to explore and learn from the different and possible meanings of urban resilience related to urban recovery, adaptation and transformation facing external increasing environmental vulnerabilities (both related to shocks or increasing external stresses).

In first part, along the storyline of Dutch delta urbanism (polders construction, protection and evolution), we will frame these different urban resilience past strategies. In a second part of the chapter we will focus on the actual planning and management practices that foster systemic urban resiliency to coastal (and climatic) vulnerabilities.

Insights from this chapter make clear that urban resilience is a framework that deals at the same time with recovery, adaptive and transformation capacities of cities. Finally the core of Urban resiliency related to sustainability patterns of cities stands in the transformative capacities, in order to internalize threats intro system functioning, toward a resilience lens that teach to revert impacts into system resources. Adaptations and recovery resilient principles will be considered useful for urban systems but respectively and just facing the medium and short term challenges.

2.1 Resilience perspectives from Dutch polders storyline.

2.1.1 Dutch Water Management phases along polders and Dutch landscape evolution.

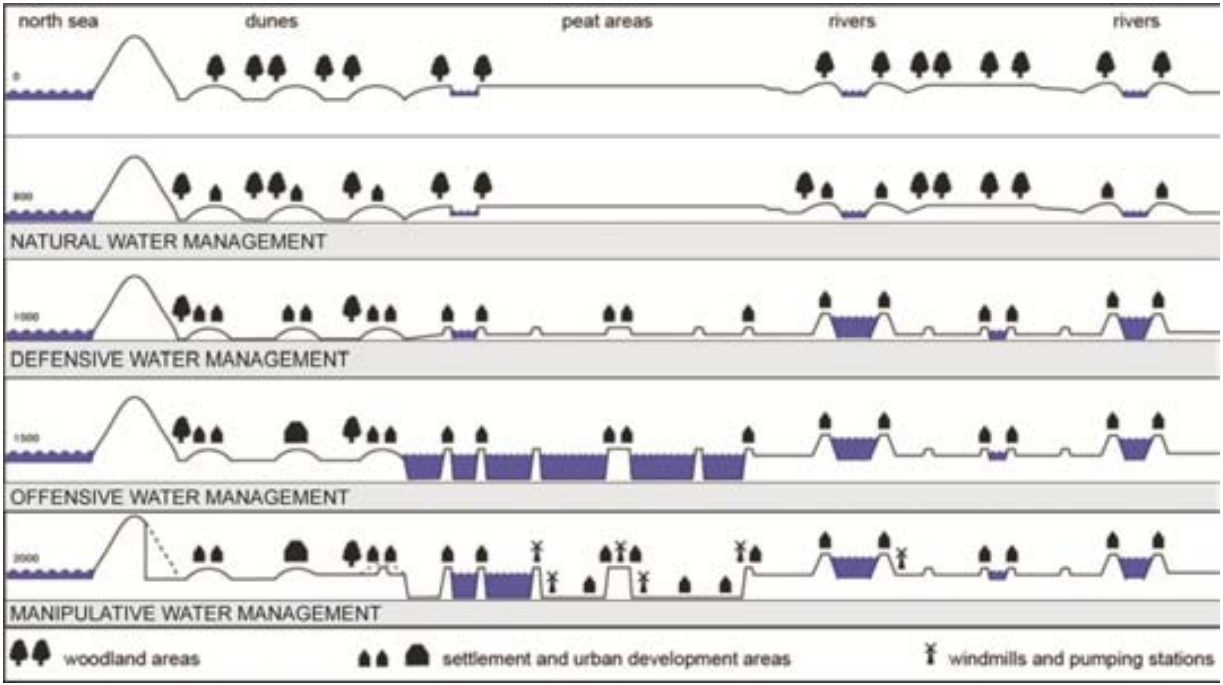
Netherlands delta urbanism (Meyer et al, 2010) has faced (and still represents a worldwide well known example of responding to) environmental and climatic challenges. Water protection, drainage and (from centralized to decentralized) management represent the core element of such urban (adaptations and) resilient evolution. Netherland landscape is a result of five big steps of water and land uses strategies. Built one with the increasing knowledge from the previous, this patterns of growth protecting settlements and activities from waters (both sea and river waters) constitute the living experience of Dutch people.

To better understand this territory we will go through these five steps of water management and consequent landscape creation, from "natural" to "manipulative" practices (Figure 2.1).

From the natural landscape configuration (initial phase 1), the urban "natural" water management (represented by the phase 2) in Holland was practiced until the year 1000 after Christ and was characterized by taking advantage of the protection from the existing territorial topography and dealing with minimal interventions in the natural water system. In fact human settlements (such as The Hague) were located on the top of naturally elevated grounds, for example dunes or hills, to facilitate the drainage of rainfall and the protection from rivers - or tidal flooding.

A third period can be recognized as "defensive" water management, which lasted until the 15th century. The passive draining and flood protection of cities (such as Dordrecht, Leiden and Amsterdam) was achieved by manmade structures, like dikes and dams. The territory morphology was not changed so much until this point. Peats and wetlands still constituted the main landscape, while the human settlements were built and protected from the threats of flooding from the sea and rivers in a defensive way.

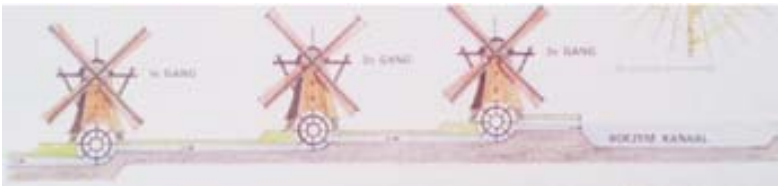
Fig 2.1. Different phases of Dutch water management and corresponding territorial configurations



Source: Schuetze and Chelleri (2011)

A shift in model identified within the fourth, so-called "offensive" water management period, which lasted approximately until the middle of the 19th century. It was characterized by the intensive drainage of large wetland areas, for urban and agricultural purposes (and to protect the neighbouring cities from flood threats) and this was facilitated by the invention of the windmill.

Fig 2.2 Windmill flooding protection function



Source from Meyer et al, 2010.

The last "manipulative" water management phase started in the middle of the 19th century and was enabled by technical inventions, like the steam engine and construction technologies in the framework of the so-called "industrial revolution". Effective pumping technologies with previously unknown capacities facilitated large-scale interventions, like the drainage of big lakes for agricultural and urban purposes. One of the biggest and most famous examples is the Haarlemmermeer, which consisted of a lake that was drained and transformed into a polder in 1852. Today the area houses amongst others Schiphol international airport and one of the fastest growing urban developments in the Netherlands. Another large-scale plan developed in this period is the water project for Rotterdam, which was adopted by the municipality in 1854.

Figure 2.1 provides a schematic overview of the development of the Dutch lowlands from the year zero until the year 2000, synthesising the five historical main water management phases. Contemporary water management systems in the Netherlands are generally still based on the principles of the last manipulative water management period, and the polders are still the resilient Dutch territorial unite of any anthropologic development

Fig 2.3 Simplified illustration of urban development reclaiming land from the sea.

Source: Bureau Alle Hosper, The Netherlands.

Similarly to Holling heuristic adaptation cycles (Holling and Gunderson, 2002) we can navigate those different territorial configurations and in each of them, and from the entire storyline, we can notice:

- *The persistence of each phase* (capacity to protect the system, respond to any unexpected hazard, and avoid changes in order to keep functions and structures).

- *The re-organization* from one configuration to a different one (capacity of adapt changes when thresholds come closer and actual structure can't afford longer to keep system functions).

- The inexorable *learning process* that leads to sustainability in the long run (increasing capacity of manage between persistence and re-organizations strategies).

The entire process involving the four described phases covers somehow a (urban) "protection from water" principle in the background. Such protection played around both the recovery (from occurred disasters, like the flooding of 1998) and adaptation (enlarging system boundaries in order to keep on going determinate regimes thanks to innovations like windmill etc) resilient strategies. The institutional dimension of such urban resilience perspective included a strong normative hearth of laws (Delta Act 1957; Flood Defense Act 1996; Water Act 2009) ensuring safety against flooding and guaranteeing safety standards for all the flood defences that we will analyze in the next section.

2.1.2 Delta works: Dutch polders physical protection.

As seen in the previous section, water management and landscape configuration were strictly related to safety standard and hard constructions in order to protect the reclaimed lands from existing wetlands and potential flooding. For centuries the safety of the dikes and dunes has been an important responsibility of the authorities.

The construction and maintenance of dikes was an important task of the first water authorities, in charge of control the local flood defence and managing a tax system for that. Notwithstanding such controls there have been major floods throughout the country's history:

- 1421: The Saint Elisabeth Flood destroyed more than 20 villages in the south-western part of the Netherlands, causing over 2,000 casualties

- 1570: The All Saints Flood flooded large parts of the coastal area between Belgium and the northern parts of Germany and more than 20,000 people died

2.4 The dramatic “de Ramp” flood of the 1953

Source: Author from the web

- 1717: The Christmas Flood. Again the northern coastal areas between Denmark and the Netherlands were flooded and 14,000 people were killed

- 1953: A storm flood caused breaches in several dikes in the south-western part of the Netherlands, in Belgium and southeast England. In total

1836 casualties were counted in the Netherlands. This flood is known as "de Ramp" (the Disaster).

As a result of this last disaster the "Delta Law" was implemented by the Dutch government. This law had two major impacts. The first was the "Delta Works" (Fig 2.5)

2.5 “Delta works” interventions along the south-western Netherlands

Source: Author from Meyer et al, 2010

Delta works program aim was to close the large sea arms of the deltaic area in the south-western part of the Netherlands between 1953 and 1990 (see figure 2.5). Due to rivers sediment retentions one of the consequences of such works was a tremendous decrease in the length of the sea barriers. The total length of the sea barriers (dunes and dikes) along the south-western part of the Netherlands decreased by 700 km.

The second impact of the Delta Law was the establishment of the necessary dike safety. After a thorough study of the risks associated with a breach of the dunes or dikes it was established that the dikes had to be constructed to resist a water level that could occur once every 1,250 to 10,000 years (see figure 2.6). The dikes along the rivers are mainly developed on the basis of 1:1,250 year and the dikes and dunes around the center of Holland have to be strong enough to withstand an event of 1:10,000 year intensity. Along the coast the safety level was established at an event of 1:4,000 years and the dikes open to a certain sea influence have a safety level of 1:2,000 years. (Just to have in mind a reference term the dikes in New Orleans have a safety level of 1: 100 years).

Coastal ecological systems cover an essential role related with safety because make up three-quarters of the Dutch coast and cover about 40,000 hectares (or 11% of the land area). The government has been keeping a careful eye on the coast for centuries. In 1990, the government decided on a "dynamic maintenance" approach to the coastline. This means that the coast is allowed to move, within certain limits, and that wind and water have free play. Within these limits, the level of sand is maintained by bringing it in from elsewhere (most sand replenishments these days are taken from the sea bed).

So it was a serious shock when, in the late 1990s, parts of the water system seemed to be unfit to withstand a number of extreme weather events. At that time the country was confronted with extremely high water levels as a result of heavy rainfall upstream. Not only did the rivers burst their banks, it also became clear that the river dikes were not always high enough, nor strong enough. As a precautionary measure, 250,000 people were evacuated from low-lying areas and when in 1998 the big flood occurs the damages ran billions of Euros.

It was clear that the protection for water strategies were not sufficient yet. The resilient capacities of recovery and adapting by protecting (hard engineering practices) reached their limit and system needed and adaptation in its functioning.

2.6 Dikes safety standards introduced by the Delta Works.

Source: from Delta Works webside

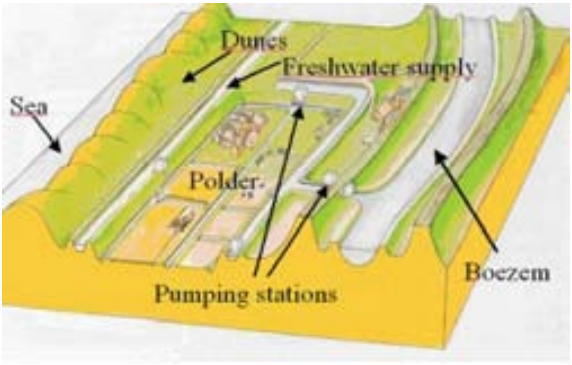
In the next chapter we're going to explore such paradigm shift in polders planning and management.

2.2 From protection to adaptation: challenges and solutions for planning climate resiliency.

2.2.1 Polders structure, functioning and the limits Climate Change poses

Polders are embanked lowlands, which are equipped with individual area wide water supply and drainage systems. Traditionally, these consisted of open ditches. Generally, the ground and surface water levels in polders are artificially stabilized to facilitate urban and agricultural developments and uses. The enclosing dikes aim to protect the lowland from flooding by the surrounding and elevated rivers or canals (Dutch: "boezems"), which are connected to the hinterland and empty to the sea. These boezems are connected to polders via pumping stations. On the one hand these stations can discharge surplus drainage water from polders to canals or rivers to avoid flooding. On the other hand they can supply freshwater from these water bodies to polders to avoid drought. Boezems have therefore two important functions for polders: freshwater supply as well as drainage and discharge of surplus water to the sea (Fig 2.7)

Figure 1.7 Perspective section of a polder with typical water management elements: drainage and water supply canals in a polder are connected to a "boezem" via a pumping station. The intrusion of saltwater from the sea in the groundwater of the polder is prevented by freshwater supply and infiltration between the polder and the dunes.



Source: Schuetze and Chelleri (2011) after (Vlies et al., 2006)

The natural water balance and available water quantity in polders is influenced mainly by climatic factors (such as precipitation and evaporation) as well upward seepage from adjacent water bodies, such as rivers. Upward seepage from the sea (salt water) as well as from rivers and boezems (fresh water) can influence not only the water quantity but also negatively impact the water quality in the adjacent polder areas. Dependent on the soil types and the water pressure, significant amounts of water can infiltrate the polders. The infiltrated water contributes to water surplus and a declining surface water quality in the affected areas.

Investigations regarding the effects of upward seepage of groundwater originating from rivers Rhine and Meuse found for example positive correlations with nitrate, potassium, sodium and chloride (Vermonden et al., 2009). The effects of groundwater seepage originating from large rivers in lowlands on the chemistry of urban water systems should therefore be taken into account for the improvement of the water quality status in polders.

Salt-water intrusion in polders through seepage of seawater is generally prevented by naturally or artificially recharged freshwater aquifers, which are located between polders and the sea (refer to Figure 2.7). However, the seepage of freshwater through salty soils can lead to salinisation in polders. Additionally, the intrusion of saltwater in rivers during high tides and/or periods with low river discharges causes problems for the freshwater supply of polders in the coastal areas. The effects of CC such as the rising sea level and more frequent low river discharges during periods of drought (mainly during summer months) allow the salty seawater to flow further inland. The resulting salinisation of the river water in the Rhine-Meuse estuary causes therefore growing problems for the freshwater supply (for instance for drinking water production and irrigation of regional agriculture (Rijkswaterstaat, 2007).

Urban development in polders generally deteriorates the described situation due to sealing of grounds as well as reducing the evaporation and the potential storage areas for rainwater (if decentralized water management solutions are not applied and integrated in the urban system). Nevertheless, the specific regional climate in the Netherlands is one of the most important basic conditions for the water management in Dutch polders. It is generally

characterized by quite equally distributed rainfall over the year and periods with high and low evaporation.

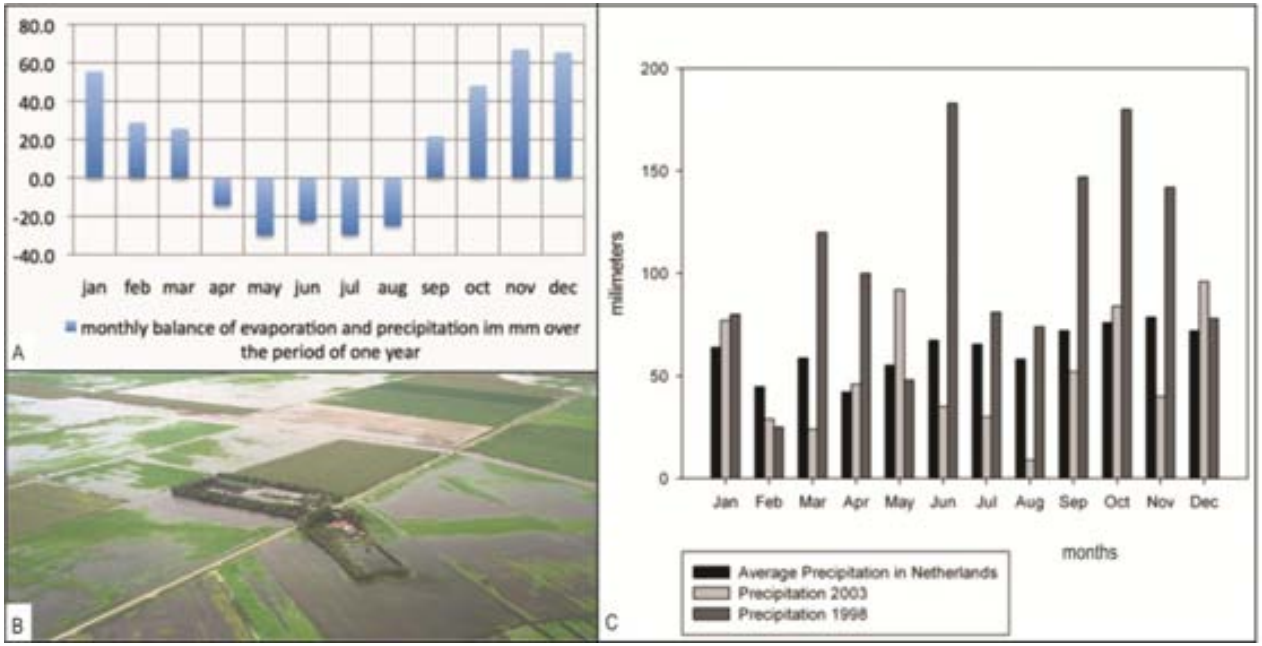
2.8. An example of the Netherlands complex spatial planning: an highway and a Boezem representing the highly mechanized Dutch polders water management.

Source: Tjallingii (2008)

During the cold months, between September and March, the average potential evaporation is lower than the rainfall. Therefore these periods generally feature a positive water balance. During the warm months, between April and August, the average potential evaporation exceeds the rainfall. Therefore these periods generally feature a negative water balance (Figure 2.9 A).

To keep a stable water table in the polders, a surplus of relatively clean rainwater has therefore to be pumped away during the cold seasons and in

Figure 2.9: A) Monthly balance of averaged precipitation and evaporation in the Netherlands from 1971 to 2000 (Schuetze, 2008). B) Flooding in September 1998 (Vlies et al., 2006). C) Monthly average precipitation in the Netherlands from 1971 to 2000 (black columns) compared with the two extreme years 1998 and 2003 (After: KNMI, 2008 & 2011).



Source: Schuetze and Chelleri (2011)

case of heavy rainfall into canals or rivers, which are located on a higher level than the polders. During the warmer months and the agricultural growth period (from April to September) relatively polluted water from the waterways has to be led into the polders to top up the declining water levels. These are caused by higher water demand for agricultural activities in polders as well as by the high evaporation rates, which generally exceed the precipitation rates during that period. This procedure is leading to multiple problems regarding water quantity and water quality in polders, particularly in the framework of the occurring effects of climate change.

In fact, the described existing system is not adaptable to climate change because heavy rainfall cannot be managed well. The increased pumping of surplus water from polders, during extreme precipitation events (or in case of rainfall exceeding the evaporation rates) includes the risk of flooding in polders, due to limited pumping capacity, and also the risk of overflows of the entire drainage canal systems in downstream areas. For instance, the standard drainage capacity in the Dutch polder landscapes is calculated to remove 14 mm rainfall per 24 hours. In September 1998 (Figures 3B and 3C) in some areas 130 mm fell in 24 hours, exceeding the drainage capacity and leading to the flooding of large agricultural and urban areas. Since then comparable scenarios have occurred quite regularly in different regions of the country, causing damage running as mentioned into several billions of Euros. (Vlies et al., 2006)

Due to global warming it is not only expected that the sea level will rise, but also that floods by storm tides and extreme precipitation events, with a return period of 100 years, may occur more often in the future. In contrast, extreme droughts, causing water quality and quantity problems, which also have multiple effects on eco– and infrastructure systems, are expected to occur more often (Intergovernmental Panel on Climate Change, 2007). A climate adaptive water management strategy therefore requires the development of preferably sustainable and self-sufficient systems in polders, which can be based on decentralised rainwater management. Such systems should avoid the drainage and discharge of clean rainwater and should allow its' seasonal storage, as well as flood control during extreme precipitation events. The working principles of such systems and the consequences for climate adaptive urban design will be further discussed in the subsequent sections of this chapter.

2.2.2 Decentralized water management principles for climate resilient planning: reducing (not protecting from) water related problems.

To cope with the rising problems of water management in the Netherlands, a team of experts, the "Dutch Advisory Committee on Water Management in the 21st Century" was asked by the government to develop strategies and guidelines for sustainable Dutch water management. One of the outcomes was the "three-step-strategy" paper (Ministry of Transport, Public Works and Water Management, 2000), enacted by the government in a new approach to ensure safety by reducing (not defending from) water related problems in the 21st century.

The guideline that has been introduced in the Netherlands is focused on new urban developments. The strategy is based on the concept that by the introduction of self-sufficient water management systems, which reduce the discharge of rainwater and the inlet of river or canal water to the greatest possible degree, rainwater management problems should not be shifted to other areas. This aim can be achieved by following the "three-step-strategy" (Van Stokkom and Smits 2002):

- First priority is for rainwater collection & retention
- Second priority is for rainwater retention & storage
- Last priority is for the drainage of the surplus water

Collection, and respectively retention, includes the separation of rainwater from the sewage stream at the source. The retention can be realized either by natural methods (for example by green roofs or wetlands) or technical (for instance by tanks). Retention with nature-orientated systems allows multifunctional use of the retention areas and technical measures can be realised in a way that they are not limiting the use of buildings and properties. The measures are feasible in new urban developments as well as in remodelling projects and are applicable on different scales, such as building, property and city levels (Schuetze, 2005). The retention of rainwater with open water bodies may limit the use of properties and buildings, but due to the high groundwater levels, close to the ground surface, and the impervious soils, the nature-orientated underground

retention and infiltration of rainwater is mainly not, or only to a very limited degree, possible in Dutch polders. Therefore such measures can generally only be realised in open water bodies. Accordingly, and based on guidelines for future water management in the Netherlands as well as the "three-step strategy", some district water boards insist that 10% of the land surface area of new developments consist of open water bodies (Tjallingii, 2008).

2.3 Urban (Climate) Resilience in Practice: Planning for self sufficient Polders

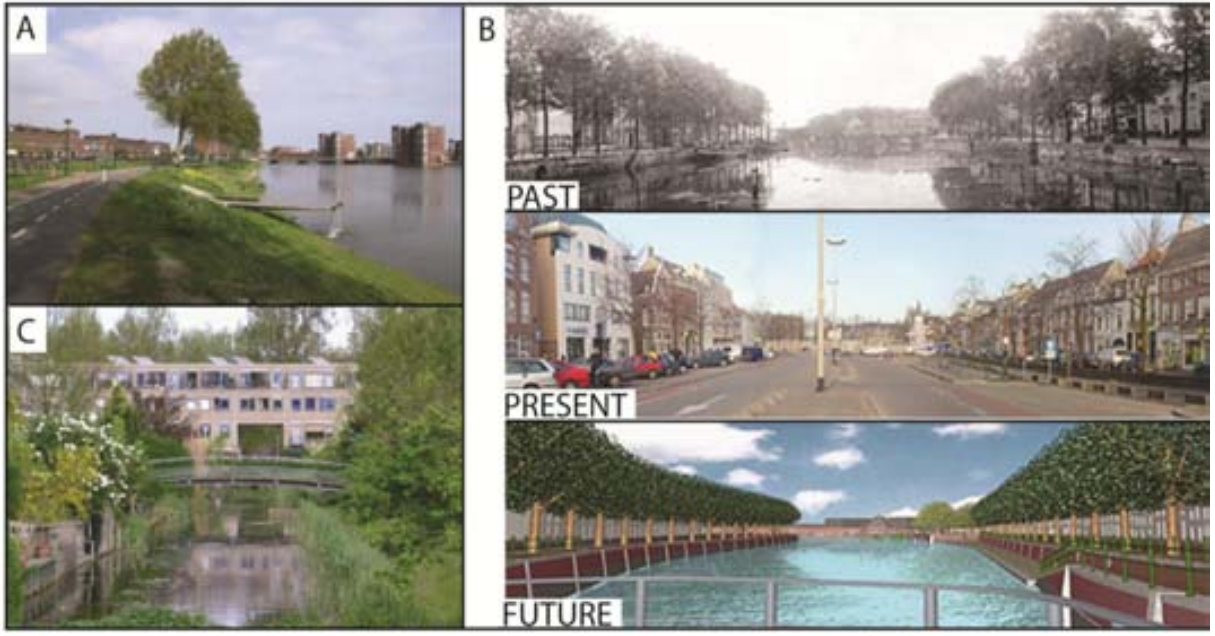
As from theory to practice herewith we want to technically describe the planning and design processes to build urban climate resiliency in polders using decentralized water management practices.

An example for such a concept, realized in the framework of new urban developments in formerly agriculturally used polders between the cities Delft and Den-Haag, is the area "Wateringse Veld". The new developments are located in polders, which are still separated by dikes, some of them with roads (Figure2.10 A). In fact the surface and groundwater levels in the polders have different heights and are connected with each other by overflows, which can be used to control the water flow from higher to lower polders. In some areas the rainwater from roofs and traffic areas is collected in open drains and discharged through sand filters directly in the open water bodies.

The urban design with open water bodies is relatively easy to realise in new development areas, but it is more difficult in existing cities. However, there are also numerous projects that focus on the integration of open water bodies in urban renewal projects to enhance the climate adaptability of existing Dutch polder cities.

In historical cities, the restoration of old water bodies is used for issues of water management and for the enhancement of the living environment. Actual examples of projects are the restoration of the old harbour in Breda (Figure 2.10 B) and the restoration of the old ring-ditch structure in Utrecht (Toorn Vrijthoff and Heurkens, 2008).

Figure 2.10 A) Impression of the new urban developments in "Wateringse Veld" (Schuetze, 2007). B) Past, present and future Breda harbour (Municipality of Breda, 2008). C) Impression of a canal, which is part of a circulation system in a housing estate in Delft (Schuetze, 2007)



Source: Schuetze and Chelleri (2011)

The planned projects are providing on the one hand more room to the river and therefore are contributing to the flood protection of downstream areas. On the other hand, they are allowing the retention of rainwater runoff. However, additional measures at the source (for example on building and property levels) are required for the disconnection of rainwater drainage from the existing domestic waste water systems.

2.3.1 Guiding models for the design of self sufficient polders

The new climate adaptive and environmentally sound water management approach in Dutch polders avoids the discharge of the surplus water from the polders as well as the inlet of polluted water from canals and rivers to the polders to the greatest possible degree. Nevertheless, a further step towards the resilience of those systems has to be promoted to address the future challenges in terms of climate change and growing urban population trends. Consequently the design of desirably self-sufficient water systems for each polder is required.

A first step towards this new polder configuration is that the retention of clean rainwater has to be facilitated over dry and wet periods of a year by the so-called "seasonal storage", as well as for extreme precipitation events by so-called "peak storage". The first problem faced in such practices is to keep a good water quality of rainwater which is collected in open water bodies and kept seasonally in closed systems. However, preliminary results suggest that the water can be circulated through a pond and ditch system with aquatic plants, which contribute to the purification of the water (for example phragmites).

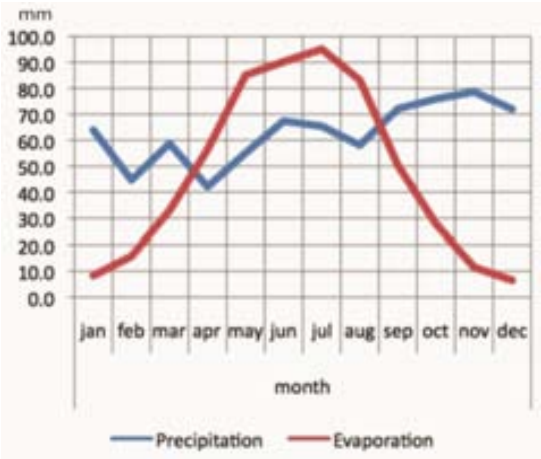
A guiding model for the design of such a system is the so-called "circulation model" (Tjallingii, 1996). Figure 2.10 C shows a canal, which flows through a housing estate in Delft, where such a system has been constructed in the framework of a new urban development.

Another basic guiding model for the design of independent and self sufficient rainwater management systems is the so-called "fluctuation model", which is based on the concept of the seasonal and peak storage of

rainwater. It requires fluctuation in water levels due to seasonal variations in evaporation and precipitation, which affect the water quantity in open water reservoirs.

In Figure 2.11 the average monthly rainfall and evaporation in millimetres over the annual profile in the Netherlands is displayed. It is clear that the rainfall exceeds the evaporation losses during the cold months (the total surplus is 313 mm) and that the evaporation losses exceed the rainfall during the warm months (the total deficit is 122 mm). According to this balance the water level in a closed water system would decline in the summer, while it would rise in the winter accordingly.

Figure 2.11: Annual profile of average monthly rainfall and evaporation in millimetres (1971 – 2000) in the Netherlands.



Source: Schuetze, 2008)

However, the total average annual rainfall (755 mm) exceeds the total average annual evaporation (563 mm) by 192 mm. Furthermore the average precipitation deficit during the warm months (from April to September) exceeds in more than 50% of the years the average value in the Netherlands. In 45% of the years it is up to approximately 280 mm, while in 5% of the years it is greater than this.

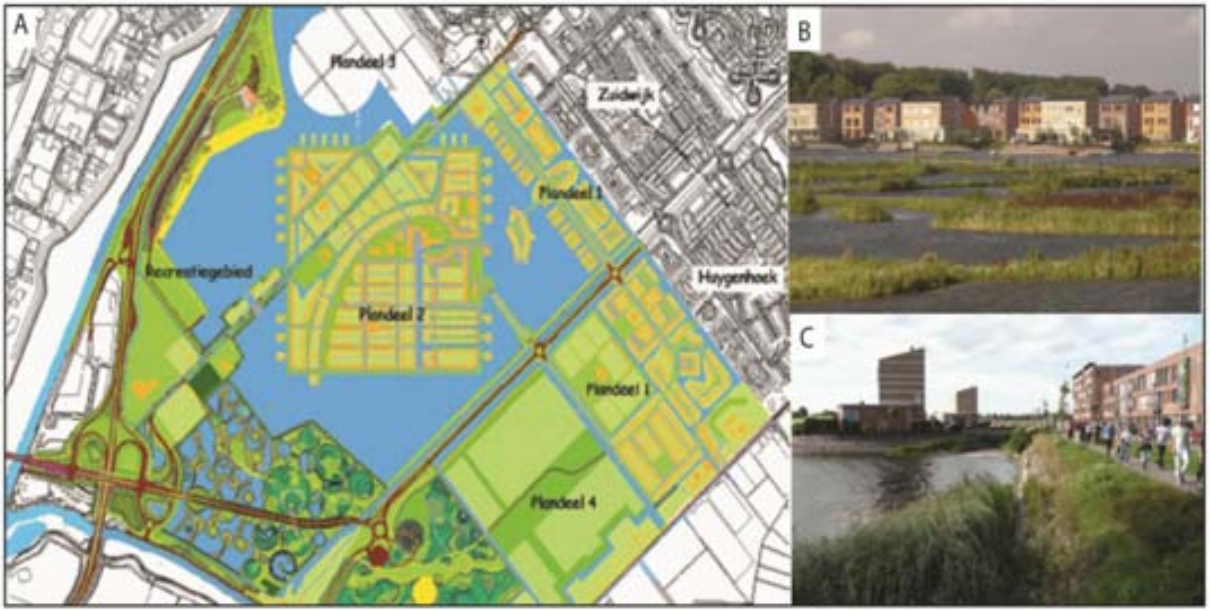
The record year was in 1976, when an average precipitation deficit of approx. 330 mm was measured during that period (KNMI, 2008). Accordingly, projects that are based on "fluctuation models" should facilitate the storage of more than the average precipitation deficit of 122 mm and include also a sufficient "peak storage" volume for heavy rainfall. Presently systems are designed in the Netherlands for example with a storage volume of 180 litres/m^2 rural and/or urban polder area.

The required fluctuation of the water level is dependent on the available water area in relation to the catchment area. According to a simplified calculation model and based on the assumption that 100% of the water area requires a fluctuation of approximately 18 cm, an urban area, which has a portion of 25% open water area, requires approximately 72 cm fluctuation, and an urban area, which has a portion of 10% water area, requires approximately 180 cm fluctuation. These assumptions are based on the average rainfall and precipitation values and do not take into account the possible storage capacities of soils.

2.3.2 Built examples: from the City of the Sun to floating houses

A recently built example, where a combination of measures for retention, storage, circulation and fluctuation of collected rainwater has been realized, is the "City of the Sun" in Heerhugowaard, near Alkmaar in North Holland. Approximately 25% (75 ha) of the total city area is covered with water, which is part of the recreational area (177 ha) and the building area (120 ha), which comprises 2,900 dwellings. The city is equipped with a closed surface water system, which should mainly be fed by rainwater from the development area. Furthermore, the discharge and the inlet of water, in the cases of water surplus and scarcity, are avoided. The "seasonal" and "peak" storage of the total rainfall in the area has been facilitated by the construction of an open water system with a fluctuation between maximum and minimum water level of approximately 70 cm per year.

Figure 2.12: A) Site plan of the City of the Sun. (Hoogheemraadschap Hollands Noorderkwartier, 2005). B) Constructed wetlands of the City of the Sun "lunapark" used both for intensive purification of surface water and recreational uses (Schuetze, 2010). C) Clearly visible in the urban design with water the sufficient freeboard for the fluctuation of the water level in the city of the Sun. (Schuetze, 2010)



Source: Schuetze and Chelleri (2011)

Figure 2.12 shows the sitemap of the development area, which has been surrounded by a dike and built on top of the existing polder. It is important to notice that the new "elevated" polder city with its self-sufficient water system is therefore not negatively affected by upward seepages. Any surplus of water occurring in the "City of the Sun" can be easily discharged to surrounding drainage canals via gravity without any pumping effort.

In case of water deficit in the city's system, for example in the case of extreme droughts, water can be pumped into the polder from a bypassing canal. However, that water has to be purified before it is added to the city's water system, due to the comparable bad water quality in the external drainage canals (boezems).

In addition to the treatment by artificially constructed wetlands, the canal water can be treated by chemical means, particularly to remove particles and nutrients. The "circulation system" of the City of the Sun, is aimed to improve the open water quality during seasonal storage. The system is based on an anti-clockwise circulation and nature-orientated purification of the open water which consists of collected rainwater.

All sections of the water system are designed for multiple functions but have specific focuses. The primary function of the wetland park (the so-called "lunapark") which is located in the south-western part of the development area (see Figures 2.12A and 2.12B) is the intensive purification of water, but it serves also as a recreational area. The other water bodies have primary storage and recreational functions (particularly the north-eastern part with beach, bathing and water skiing facilities), but they also contribute to the purification and maintenance of a good surface water quality (Figure 2.12C).

For the design of the buildings, which must be adaptable to the fluctuating water levels, there are various options. In the City of the Sun, buildings and urban infrastructure systems are constructed in conventional way, but the distance between the maximum expected water level and the ground level of the developed area is high enough to prevent damages by extreme precipitation events and rising surface water levels (Figure 2.12C).

Examples for other solutions are for instance the building of the "Aluminium Centre" in Houten near Utrecht, which is elevated on piles above the water, with the advantage that the space below the buildings can be used for the

creation of open water bodies and fluctuation of water levels (De Haas, 2001). Another project, also with elevated buildings on piles, is designed for the domestic development "Plan Tij" in Dordrecht, in a water area, which is connected to the river Maas (Klunder, 2008). Hence the area is unaffected by fluctuations of the water level in the river. For holiday houses in Maasbommel, located in a branch of the river Maas, two different versions have been developed to allow the adaptability to fluctuating water levels, an elevated version at the riverside and a floating version.

3.4 Beyond climate resiliency: Urban sustainability transitions for living with water as a "from threats to opportunities" paradigm shift.

Along this chapter we have navigated different resilience perspectives, from the natural hazards (flooding) protection until adapt climate change increasing stressors. Although there could be thousand methods and practices to defend of adapt any system from different kind of stressors, we should recognize some important "background conceptual borderlines" between the different strategies.

In fact, from the initial scheme on the historical evolution of Dutch water management, we can notice that although many *socio-technical transitions* (Smith et al, 2005) happened between the different phases (from windmill technology to industrial machines etc, see Fig 2.1) we consider, from a systemic Urban Resilience point of view, that no deeps urban transitions had occurred.

Why that?

Recovery and protection principles (built robustness) reflect changes just in system structures in order to maintain functions. In Fig 2.13 we have synthesized three different resilience approaches, deduced from literatures (Chapt 1) as from many built example of resilient climate change strategies and from this Dutch case study. Along this scheme we can notice how system's boundaries are respectively:

- Maintained as they are acting on system maintaining equilibrium (recovery)

- Changed-enlarged making systems more “tolerant” or robust to stresses (adaptations, acting with system structures)

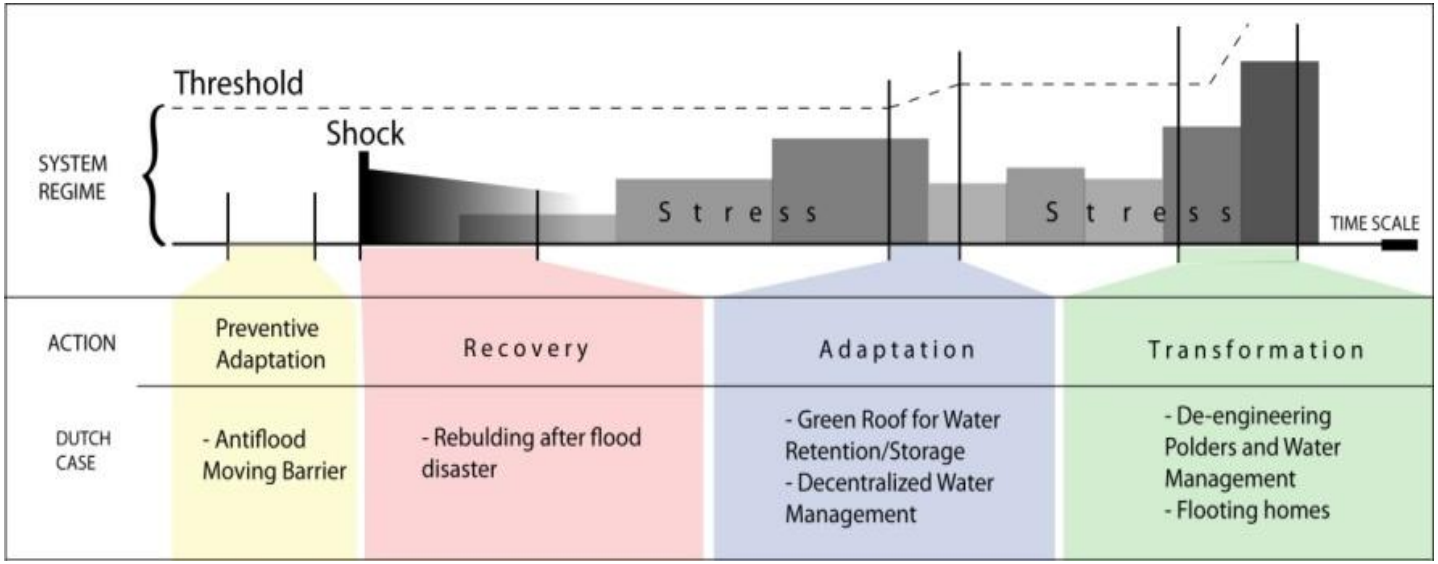
- Eliminated assuming within new system functions the previous impacts-stresses (boundaries) in the new system regime (transition to a new regime, acting on functions and consequently structures).

To make some example, practically speaking, protect against flooding (building robustness) is about to build a dam without change anything in the system. Adapt flooding would mean try to change system structures (existing infrastructures, for example) to be flooding resilient (tolerate or resist better water). One step further would be a transition (or transformation) approach; working not just on system structures but modify functions too and re-frame these in order to make sense, use, what before was considered a stressor. A living example would be building floating houses (so my house would cover the social function of protection from natural hazard and home at the same time) better than modify structures in order to tolerate and resist increasing flooding pressures in a vulnerable environment.

The step between adaptation and transformation strategies are sometime fuzzy because obviously, as in this chapter case study, all the protection, prevention, adaptation and transition strategies are co-existing representing different places-moments-sectors resilient strategies within the whole urban or regional system. Furthermore transitions occurs in the middle or long run, which mean there is a need of experimentation, testing, and slowly developing those innovation in small system’s parts until the whole system can start a transition in it functioning (Rotmans et al, 2010; Loorbach et all, 2011).

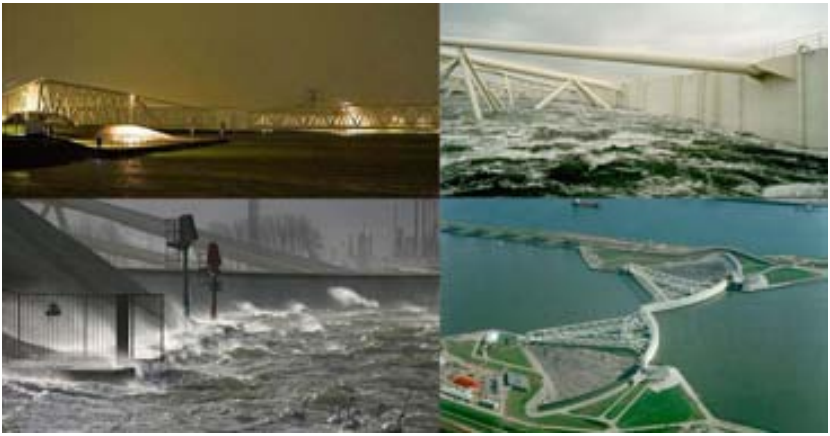
To see and understand the practical difference between protection, adaptations and transitions we can look at an important lesson for urban resilience that comes from the last decade signals of change in the adaptation philosophy of Dutch polders. Facing the upcoming thresholds they cannot sustain in the long run water protection for urban system anyway

Fig 2.13. Urban Resilience Timeline. Figure framing different resilient strategies. It distinguishes between preventive and reactive capacities (which aim is to maintain a system *status quo* both in term of functions and structure). As the system face stresses there are two options: act over system boundaries in order to enlarge them (it confers to our system a vaster regime in which stay) and this we would referred to as adaptation strategies. Or, last long run option, act over system functions, in order to incorporate the impacts (stressors) in system functioning (which means to completely shift in another new regime).



Source: from the Author

Fig 2.14 Maeslant Barrier built for Rotterdam harbour. This barrier is movable ans it close harbour mouth only when sea storms are threatening the harbour, and the city.



Source: Author from the web.

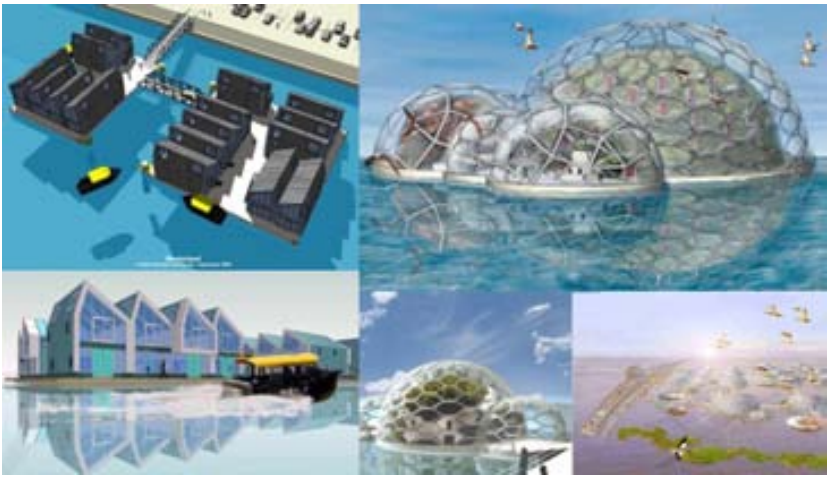
After centuries of increasing skills for protecting the lands from waters, by means of hard-engineering command and control practices, it seems that this perspective radically changed toward a more flexible and de-engineered[11] one (Wolsink et al, 2006).

New urban developments on Ljburg, an artificially created island in the urban fringe of Amsterdam, have started to build an area with floating

[11] For de-engineering we mean the shift from structural to non structural measures. For instance while structural measures for disaster risk reduction include dams, flood levies, ocean wave barriers, earthquake-resistant construction, and evacuation shelters, common non-structural measures include building codes, land use planning laws and their enforcement, research and assessment, information resources, and public awareness programmes (UN/ISDR, 2009). One of the best and more exemplificative example of de-engineering polders comes from the proposals for re-naturalization of southern Rhine–Meuse–Scheldt delta, a large and long scale time project presented by Haein Lee, Gyoung Tak Park, and Soomin Shin (Harvard Univeristy) at the Rotterdam Conference "Deltas in time of climate change" and titled "Ecology as Industry". The work is available in the booklet "innovative solutions for deltas" at http://www.delta-alliance.nl/nl/25222819-%5Blinkpage%5D.html?location=-20938558752035054,10641831,true,true

buildings and a floating information centre (Zaaijer, 2001). During the development phase the information centre was shipped to the harbour area of Amsterdam (in 2010) to inform the people toward this possible new offered solution for living with water. Another example of such constructions is placed in Almere, a city located close to Amsterdam, where you can find floating and elevated domestic buildings.

Fig 2.15 Floating experiments and projects in Holland.



Source: Author from the web

This new perspective of transforming urban systems not just in its structures (to defend it from water) but in its functions (begin living with water) complete an exhaustive framework for delineating urban resilience different perspective.

The Dutch case seems to fit perfectly in such scheme, as has been preventing and protecting urban settlements from floods and water, adapting structures until a point in which a paradigm shift was necessary in order to survive in the long term (Van der Brugge et al., 2005). The new policy direction, introduced by the Directive "Room for Rivers" (V&W, 1996) contains regulations concerning the use of riverbeds and presents the goal of removing vulnerable land uses from the floodplains in order to let them be flooded when it's necessary. Other minor measures include the building of green roofs, water retention, storage and reuse inside buildings,

decentralized water management practices as also experiments of floating houses to test future possible settlements configuration options.

3.5 Closing remarks on Dutch cases Urban Resilience

The construction few years ago of the Maeslant Barrier[12] (Fig 2.14) describe the complexity of Urban Resilience, expressed by different approaches (prevention, adaptation, transformation) acting simultaneously in different parts-systems of the same city or territory (see Fig 2.13). In fact the Maeslant barrier is a flooding prevention measure, an adaptation in the middle term strategy, working while experiments of future floating houses are been testing in the northern part of Dutch territory.

From the previous sections we can learn four main lessons that need more investigation:

- We have to distinguish between short term (recovery or prevention), middle term (adaptations) and transformation faces of urban resilience. All those approaches are necessarily part of a durable urban system and synergistic[13], notwithstanding transformability (even if it is the more challenging aspect of resilience) is the only property that definitely confers sustainability (long term resilience) to any system.

- Shocks are essential part of development because of the windows of opportunities that are opened. In fact as Wolsink et al (2006) state the (policy) window of opportunity for the transition was created thanks to the dramatic floods in the 90's, demonstrating that higher flood barriers would only increase the system's vulnerability (versus a false feeling of safety and a reduced risks perception from the citizens).

[12] This storm surge movable barrier (fig represents the final stage of the Delta Works (a series of construction projects in the southwest of the Netherlands to protect a large area of land around the Rhine-Meuse delta) and its aim is to protect Rotterdam harbour from flooding for the next 30 years at least, while another solution is founded.

[13] By synergistic we DO NOT want to refer to the complementarily of such sometimes opposite approaches, but just to the simultaneous application of them, cause transition practices need decades to act systemically, adaptation can cover middle term periods (saving systems from tipping points) and recovery capacities are essential part of everyday life in reacting shocks.

- The historical Dutch experience has revealed here the key role of learning from the past events in order to better manage next adaptation and transitions processes (and so the way in which use innovations, for protection, adaptation or system transformation depending on the stress level system has to face).

- The last lesson comes from the Special Governmental Advisory Commission on Water Management 21st Century (CW21, 2000) which has elaborated the new water principles for spatial planning. As in-deep analyzed within models and built cases, one of the key resilient principles is to banning geographical transfers of water or of water-related problems[14]. This means that each polder (territorial unit) should start to be self-sufficient and aware (responsible) of the water management, retaining, storing, or releasing (flooded and rain-waters) in order to keep safe its functioning. The lesson here is clear and aiming at the self sufficiency as a resilient strategy.

Concluding, insights from this Dutch case study suggest that Urban Resilience dimensions sprawls simultaneously between short, medium and long term perspectives of protecting, re-organizing and learning in order to experiment system transitions, necessaries to face sustainability patterns of development. Self sufficiency emerges definitively as a resilient principle facing uncertainty and the transition to a "from threat to opportunity" vision express the root of the sustainable resilience strategy.

We should mention finally that such resilience views are limited just to physical (environmental and climatic) impacts and stresses over urban environment, and do not take into consideration the also essential factors as internal socio-economical changes, or related social justice and other endogenous factors of change, that can affect system functioning and dynamics as well.

[14] One of the challenging problem that are facing Dutch polders is represented by the cumulative impacts of water quantity and pollution flowing along a chain of drainage channels network (called Boezem) from one polder to another.

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CHAPER III

DRYLAND SOCIAL ECOLOGICAL RESILIENCE AND URBAN TRANSITION: RESILIENCE FOR WHOM?

INSIGHTS FROM THE MOROCCAN DRÂA VALLEY.

"*saba' shina wa saba' zina" (*Seven years hard, than seven good)

Ancient Berber said expressing the root of social-ecological and urban resiliences facing droughts.

Previous page photo by the Author.

Summary

If from the previous case study we learned how urban resilience was to be framed toward transformability principles, in order to shift threats into opportunities for system sustainable living, this second case explores urban resilience not only related to climate change threats but also to the synergistic stresses of human induced environmental crisis. The construction of a big dam upstream oasis chain, the boom of the movies industry in the main Moroccan Drâa Valley city, namely Ouarzazate, and tourism new market development pushed in this valley a deep urban transition and regional social-ecological transformation.

From one side we're here interested in explore the cross scale dimension of urban transition and the relationship between the urban resiliency and the regional social-ecological sustainability. From the other explore the relationship between the autonomous adaptations concept, social resilience and urban resilience.

Insights from this chapter underline the way in which urban transition will reframe the social behaviours, access and distribution of ecosystem services along the whole region. Furthermore from the analysis of resilience in city will critically emerge the "resilience for whom?" perspective, because urbanization process, linked with new cross-scales (global) economies, will shape new societal equilibrium in which patterns of un-equity and lock-in regimes will increase social stratification and poverty traps.

3.1 On developing countries (dryland) urban transition and Climate Change impacts and responses.

After the last chapter in which our focus was on the most vulnerable coastal areas cities, the focus here goes to others from the most worldwide threatened and vulnerable: developing countries dryland populations. In fact as underlined from the beginning of the IPCC reports developing world is but one of the most threatened from CC impacts (IPCC, 2007) both because of the climatic forecasted conditions and because of the lack of adaptation capacities.

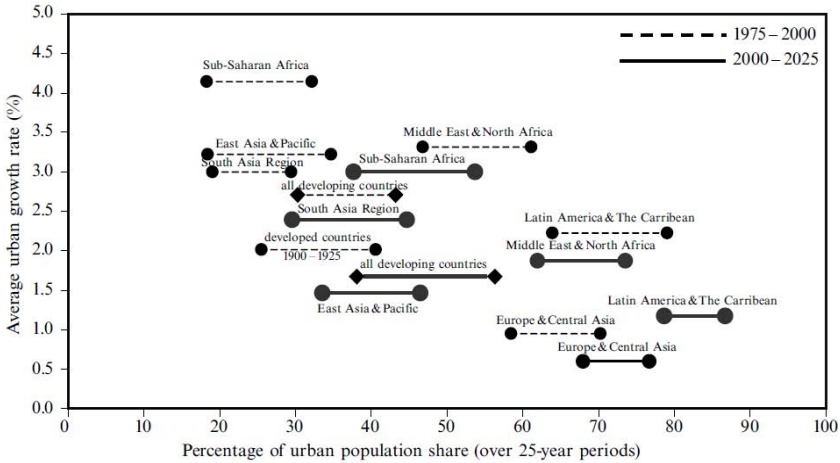
Dryland cover 41% of the terrestrial surface supporting more than 36% of the world's population (Washington-Allen, 2008) which particularly rely and depend on essential provided ecosystem services. Those services are all undoubtedly linked to water availability in a highly water scarce environment suffering droughts and increasing desertification (IPCC, 2007).

Talking about drought, two main categories can be highlighted: conceptual and operational definitions. The former, conceptual, states in relative terms, e.g., a drought is a long, dry period (WMO, 1986; UNCCD 1994); while the latter, operational, aims to identify the onset, severity, and termination of drought periods (FAO, 1983). Notwithstanding, it is worth to underline that drought is a normal, recurrent feature of climate. In fact as we will analyze along the chapter farmers, nomads and even cities in dryland are used to cope historically with droughts. Much more worrying is the threat linked to the desertification process, related to soil degradation and derived both from climatic and humans pressure over fragile environments (UNCCD, 1999).

History shows a strong link between economic development and water resources depletion since human demands also interact with climate change to exacerbate the pressures on the water supply. Agriculture is by far the largest consumer of freshwater. Globally, about 70% of freshwater withdrawals go to irrigated farming, and far greater volumes of water are used in rainfed agriculture. But perhaps the most common conflict is between agriculture and cities.

In fact while more than half of the world's population lives in cities (UN, 2008) developing countries are hosting unprecedented rates of urban growth for humanity (Montgomery 2008) and Africa (Fig 3.1) is projected to have the world's shortest urbanising period (Lwasa, 2010, The Economist, Dec 2011).

Fig 3.1 urban growth in developing countries



Source: after Kessides (2007

Such urbanization process erodes regional and dryland oases (and local populations) resilience since while a deep environmental knowledge, common decisions over resources uses and flexible lifestyle characterize oases functioning, urban systems development are not used to be linked within local and regional environmental dynamic and thresholds.

As we will demonstrate along the text also in our case study urbanization is a multi-scalar complex process where no actor, or set of actors, can have full control and respect of sustainability regional boundaries. Going beyond such boundaries means threaten the people living from those ecosystem services linked along water related services chains in the region. So, since ecological processes are modified and entangled in social and therefore political processes (Erstson et all, 2011) city could be seen as political social-ecological processes driving the management (and distribution) of regional ecosystem services.

In this chapter we will face the problem of drought and desertification, framing different adaptation strategy linked with dryland people and urban resilience. This will let us go through an important theoretical step from an environmental vulnerability framework to a political (geopolitical) and governance related one. In fact although droughts do affect individuals, in reality it happens at regional level and represent a community problem having characteristics of Hardin's famous ''Tragedy of the Commons''(Yevjevich and others, 1978). In fact each individual interest when facing crisis and using communal property (as groundwater) is to maximize it for immediate gain. The net result can well be the destruction or deterioration of the communal property as will happen in our case study referring to groundwater extractions along the valley facing droughts. In fact, given these circumstances, the solution for an individual during drought conditions might be to drill a well. If all individuals act in the same manner, a variety of consequences can occur to the detriment of each. A shallow aquifer eventually can be depleted and the individuals can be competitors.

Those environmental dilemmas occur in relationship with urbanization processes. Even is it sounds strange at a first glance, droughts are temporary processes, and in a short period even if under stress environmental system use to recover, demonstrating their resiliency, and people bounce back to their previous regimes too. When on the contrary drought impacts are enhanced by humans urban and agriculture development pressures (a constant increasing impact) than environmental equilibrium is far to be bounced back, drought can easily lead to the starting point of a desertification process and acute environmental crisis.

In the next sections we will explore both sides of social-ecological resilience of the oases past equilibrium, coping for centuries with droughts. Then we will go through the urban transition phase (last decade urban growth) related to global market new drivers of developments, which will threaten ecological regional boundaries interacting with oasis resilience and regimes. Finally we will consider urban (previously Kasbah, later on sprawled cities) resilience in adapting environmental and energetic challenges due to their development in fragile environments. The Moroccan Drâa Valley hosts both those processes between rich pre-desertic oases and emerging urban centres, allowing a comprehensive understanding of all those different resilience perspectives.

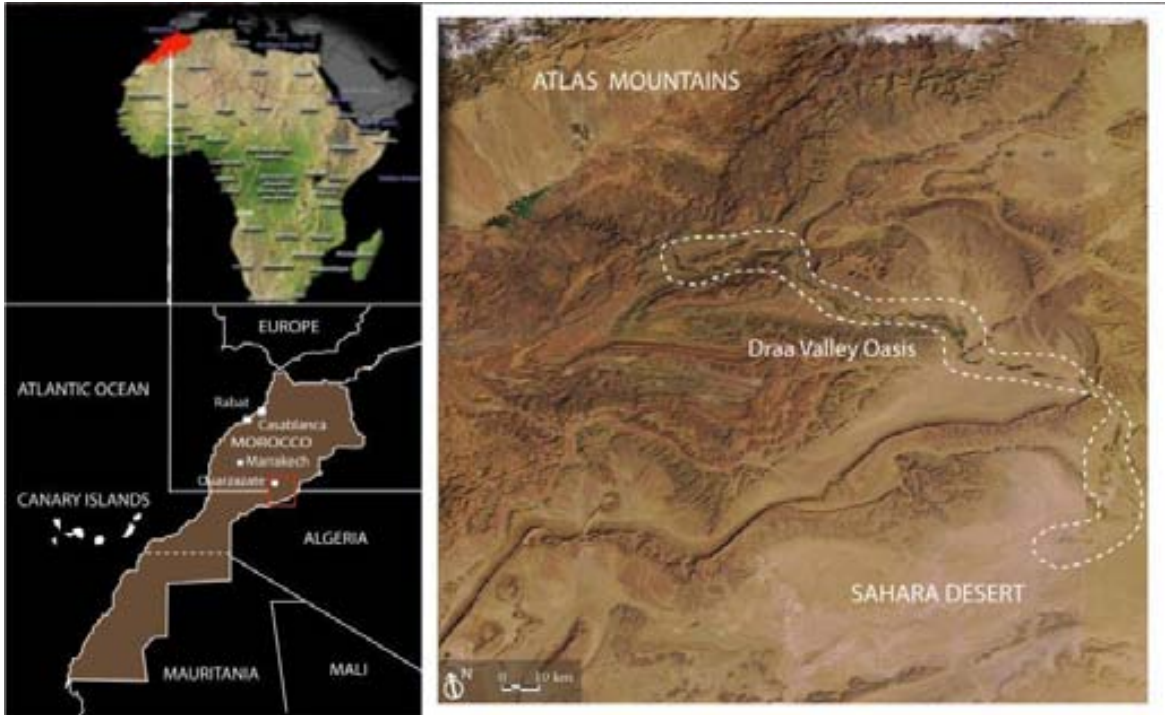
3.2 Drâa Valley Social-Ecological Oases structure: Lessons from past resilience.

3.2.1 Introduction of the study area: physical and social-ecological premises.

The Drâa Valley, located in the southern part of Morocco between the Altas Mountains and the Sahara desert. It is characterized by high evaporation rates due to the frequency of storms and high temperatures, which prevail in most months of the year. Despite rainfall scarcity and irregularity (around 117 mm per year) it is the largest exporter of agricultural products in the country and it is well known as on of Morocco's richest regions due to its strategic position at the heart of the trans-Saharan route that links Timbuktu with northern African countries (the most important caravan route between Europe and Timbuktu until XV century). The oases have always provided the Drâa population with both fertile terrain and a good microclimate for agriculture, as well as dates that nomads used to exchange with silver and other valuable products twice a year at the Timbuktu market. The Drâa basin (as in Fig 1) is divided into the Upper Drâa and the Lower Drâa: the former is part of the Ouarzazate province. The latter is part of the province of Zagora and consists of a chain of 6 oases (Mezguita, Tinzouline, Ternate, Fezouate, Ktaoua and M'hamid, rom Ouarzazate towards the desert).

A complex population mix, including interactions between farmers and nomads, has settled in this chain of oases. The origins of the *Draoua* (current population of the Valley) include Berbers, Arabs, and Jews. Within their different lifestyles, they represent the valley's three main economies: agriculture, grazing and trade. Each of these characterizes different social ecological configurations that take place respectively along the Oasis hearts due to obvious ecological reasons (agriculture and water availability), extensively along the valley in order to adapt to the pre-desert landscapes conditions (grazing), while trade was practice along the routes between western Africa and Maghreb (Casciarri, 2003). Nomadic groups and sedentary people have lived together despite this social-ecological frame, such as in the Drâa Valley system, affecting their ethno-linguistic roots, economic features and status identities. At the bottom of the social hierarchy is the *Abid peoples*, former slaves from sub-Saharan Africa.

Fig 3.2 Moroccan Draa Valley and the chain of oases from Atlas Mountain to the Sahara Desert.



Source: From the author

The *Draoua, on the other hand*, whose name means the population living in the Valley of the Drâa, are the indigenous population and sedentary farmers of the oases villages. The concept refers to all black populations of Saharan or sub-Saharan origin, who are generally known for being attached to agricultural land without possessing it. The *Berbers* who have played a major role in this area since the seventeenth century, were divided in two main groups: one composed mainly of sedentary farmers cultivating date palms (the lower class) and inhabiting old villages built around the *Kasbah* (which means in Arabic language "fortress") and the other group consisting of merchants (the upper class), who due to their business settled around the hinterland of the entire southern Mediterranean basin.

Fig 3.3 Two Kasbah examples. From the upper to lower: the kasbah in Ouarzazate city centre (UNESCO site) and an abandon Kasbah in one of the pre-desert oasis of Mhamid.

Source: Upper photo from the author, lower one from Minucci G.

In this context, Kasbahs, a type of castle nowadays recognized as a cultural heritage by UNESCO (fig 3.3), played a key role due to the fact that they served as the residence for the head of the family (*quàid*), his family and for the servants living within this fortified village (Biondi et al., 2006). These Kasbahs hosted high density of people living inside them in order to maximize usages of resources and guarantee people a shelter from the harsh climate (Bondi et al, 2006). During that time, agreements about protection (*raya*) were signed between farmers living in the *Kasbah* of the oases, and the nomads. Although the French colonial administration tried to dissuade and abolish the *raya*, while forcing nomads toward sedentarisation, these protection pacts were held until the 1970s and even now they continue to exist and to be respected. Moreover, where they have been abolished the current economic, as well as political and social relationship between groups still works under the past tradition of *raya*.

3.2.2 Oasis social-ecological resilience.

As described in the introduction, an oasis area can be defined as a complex (fragile due to the difficult environment that hosts the ecological system) social-ecological system in which local communities have learnt for centuries how to manage the delicate equilibrium between limited resource availability and environmental pressures (i.e. how to survive avoiding dangerous ecological thresholds) (De Haas, 2001). The oasis economy is strongly linked with the agricultural sector which has been formed through centuries of adaptation, so that an oasis could be considered as anthropogenic agricultural systems (De Haas and Hein, 2001). Two main parts constitute an oasis: on one hand, the cultivable part, where due to the high water consumption rate of cereal farmers (arabic: *fellahs*) mixed farming methods are preferred. On the other hand, the part outside the oasis is mainly exploited as rangeland. Inside the oasis, palm trees serve as umbrellas offering a favourable microclimate for the development of other crops. At the same time date palms also represent the first level of a complex irrigation channel system, that fit (the bigger, called *seguías*) into other smaller (the secondary irrigation system made of mud channels) channels, creating an intricate network (Faouzi 1986; C. Yves & V. Dolle 1998). From the mud-channels (managed and owned by each village)

the community, according to traditional local water property rights, distribute and transport the water to all of the fields (Ouhajou 1996; Liebelt 2003). It it is these that activities that require strong collective and hierarchic cooperation in the local management, which permit them to cope with scarce resource availability and recurrent droughts (Beaumont, P., 1989). Their strategies are built and persist thanks to a complex and strong social capital, accumulated from ancient knowledge regarding the cultivation of dates palms (Clouet, Yves & Vincent Dolle, 1998) or herd movements of nomads (*Aarib*) (Davis, 2005; Idriss, 1991). In fact different adaptive strategies were taken both by nomads and farmers to face the lack of water and the difficult environment. The flexibility (and persistence) of nomads was expressed by their periodical changing of grazing lands possible due to the non-exclusivity of rights of admission upon lands, allowing them to access new grazing areas or migrate temporally. Migration, in fact, represented a key strategy both for nomads, who kept their status by becoming temporary soldiers[15], and for farmers, who remained out (thanks to temporal jobs) of droughty areas used to farm once rainfall came back. In sum, resilience in dryland was deeply influenced by a constantly flexible and adaptive lifestyle condition, in which social capital and temporal migrations play an essential role in maintaining those communities, their identity, structures and functions.

Following this rhythm of periodical migrations in order to keep the oasis social-ecological systems in a sustainable (although precarious) equilibrium, cities too were experiencing periodical fluctuation in size and population. Urban areas have always represented key points along the territory both for nomads and farmers. At the same time urban form, structure and functioning were strictly related to the ecological thresholds of the surrounding environment. Consequently, and in general terms, oasis carrying capacities have been never exceeded and the availability of freshwater never pushed beyond the watershed recharge potential. This respect and knowledge about ecological thresholds is also explained by the fact that date palms (and so the oasis ecosystem) represented the key essential element for those societies,

15 Being temporally solders for the nomads was the strategy to remain nomads. In fact during this temporal job they could gathering climatic and other useful (for grazing) territorial data, waiting the moment to come back to their nomad life.

providing microclimate and soil for agriculture (and survival from the desert) and wellbeing thanks to the dates palm commerce. As the social pressures were always below environmental resource availability, the stresses that these social-ecological systems could experience mainly depended upon external drivers (such as sandstorms or temporal droughts) and recovering has always occurred without the need of societal transitions (relying on the natural and climatic cycles and seasons happening). The capacity to withstand crisis is best expressed through the local saying "*saba' shina wa saba' zina" (*seven years hard, than seven good) (Casciarri, 2005). These seven year cycles have not been confirmed by any meteorological evidence from the Valley population's adaptive strategies, however the local dependency on resources has prevented any substantial sprawl or development from occurring in the past. The flexible lifestyle practices in the valley illustrate the importance of social capital in managing and coping with cyclic water-stresses.

3.3 A new regime in Valley water management: the inception of a deep transition.

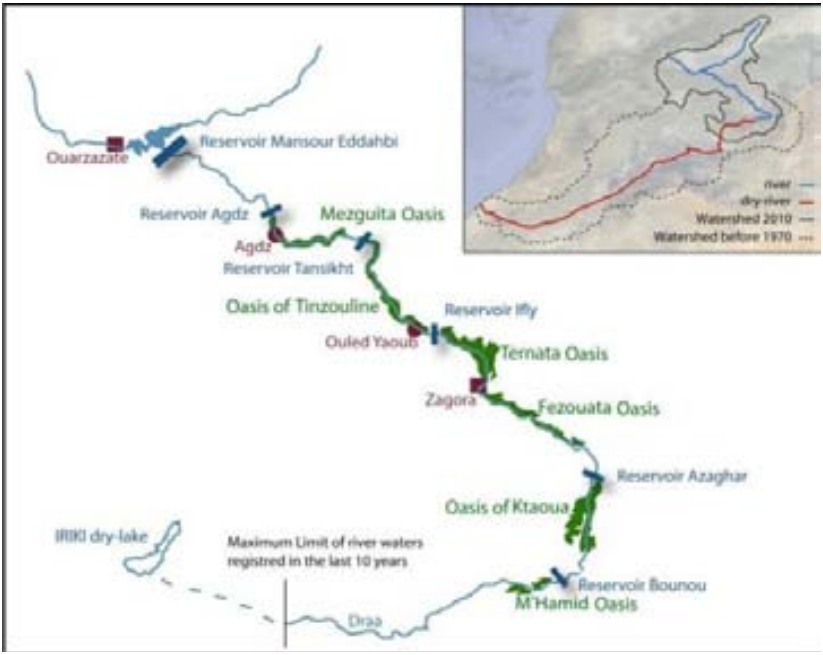
3.3.1 The Mansour Ad-Dhabi construction: dam and droughts

At the end of the IX century, Foucauld (De Foucauld, C. 1888) described the Dra region as a continuous flow of flood waters. Later, Jacques-Meunié would testify that the Drâa river extended to the Atlantic ocean six times between the 1960s and the 1970s. Nowadays the river belongs to the 10 most arid catchments of the world (Ravenaterga et al 1998) and it one of 25% of the world's rivers that run dry before its estuary (Molden, D. et al 2007). A turning point in the history of the watershed was the year 1968 when the Mansour Ad-Dhabi dam commenced development in Ouarzazate. A decade after the independence of Morocco (1956), the government was planning a series of national energy production projects under the optimistic policy program "grande hydraulique" (ANAFID[16]) which aimed to develop the country. The

16 Association Nationale des Améliorations Foncières, de l'Irrigation et du Drainage 1990

objective of the Mansour Ad-Dhabi dam was threefold: provide regular water flows for irrigation along the entire valley, flood protection for the 19,000 ha of agricultural land, and lastly, to produce electricity for Rabat using two turbines (ORMVAO 1995). Originally, the reservoir had a volume of 560 million m³, unfortunately this volume decreased rapidly due to sedimentation (Abou-Otmane 2002). The current volume is estimated to be 439 million m³ (MASEN 2010), which provides approximately 250 million m^3 of stored water for irrigation and ground water recharge along a total area of approximately 26.500 ha. As illustrated in figure 2, each one of the six oases is assigned a shallow groundwater aquifer (Klose et al. 2008) so that the total reserves of groundwater vary between each oasis from the largest (Fezouata, with 127 Ml m³) to Mhamid (less than 30 Ml of m³)(Heidecke et al. 2008).

Fig 3.4 Structure of the chains of the Draa Valley oasis and their water reservoirs.



Source: from Chelleri et al (in review).

Twice a year, a technical committee[17] makes decisions regarding the quantity of water to be released and distributed among the six oases (Faouzi 1986). Wter is first distributed to the southern oases, and then retained in the five local (dams) reservoirs upstream that direct the water to the oases *seguías* for irrigation (Ouhajou 1996). This *campagne d'irrigation*[18] is not without its drawbacks such as the rainfall deficit the caused severe droughts in the '80s, 90's and around 2000. These droughts diminished the water discharges until it reached an ecologically unsustainable minimum during 2002–3 (2 times less water than the 40 million m^3necessary to recover the groundwater systems). As a result, serious ecological crises were provoked in the last oasis, where the increasing water (and consequently soils, Fig 3.5) salinity levels reached a threshold that caused a massive loss of the valley's animals that were not able to drink the salty groundwater (H. Outabhit 1992, Casciarri, 2003). In short, what the dam construction originally wished to avoid by regulating river flows (namely, environmental crisis) paradoxically became what the dam itself caused.

As proposed by the national government, and until the beginning of the severe drought in the 90's (ORMVAO 2000), dam construction (therefore a new practice of centralized water management) helped to stabilise the irrigation water supply. Unfortunately, unexpected declines in rainfall and high evaporation rates seriously threatened the ability of this system to function sustainably during the '80sand early '90s. In 1994 the discharged waters were incapable of filling up the shallow groundwater aquifer level of the last oasis (Heidecke, 2006; Klose et al. 2008).

17 which members are local authorities, representatives of the population and the farmers, and the regional agricultural office instituted with the dam contruction ORMVAO

18 The Six annual discharges of the dam in 1973 (the minimum for a satisfying agricultural cycle) diminished to 4, then 2 discharges in 2002–3.

Fig 3.5 Salty soils from groundwater pumped water in Mhamid (near desert) and around Ouarzazate (as from left to the right)

Source: Right photo from the author, left one from Minucci G.

3.3.2 Impacts and responses: beyond ineffective determinisms

Forty years later, the main environmental consequences and measured impacts of the implementation of the dam water regime can be identified as:

- the disruption of the downstream water table feeding and of soil fertilization (previously ensured naturally by floods)
- increase in soil salinity
- migrations and conflicts within the traditional and new irrigation systems
- drying up of the previous lakes located downstream of the valley (the so called lake Iriki, see Fig 3.4)

Moreover, other environmental stressors during those years exacerbated the social-ecological crisis, such as the locust invasions or the *Bayoud Fungus* ephidemy (*Fusarium oxysporum f. sp. albedinis*) which destroyed more than 2/3 of palm trees in Morocco (thus in most oases more than half of the commercial date palm trees have been destroyed[19], with consequent losses of income sources, foreign currency, reduced extension of annual crops protected by the palm trees and finally increased speed of soil desertification). Consequently the social autonomous adaptations (of individuals and farmers) drastically changed from the previous temporal migration practices, responding to the new shocks with unsustainable short-term strategies such as abandoning land or installing an increasing and uncontrolled number of motor pumps for groundwater extraction (As in Fig 3.5).

Data on the number of motor pumps shows a remarkable growth from just 2.000 in 1977, to 4.000 in 1985 (Faouzi 1986), nearly 7.000 in 2005 and more than 10.000 in 2010 (from interviews). Furthermore, although the salinity of groundwater is naturally high due to the geological characteristics of the region (ORMVAO 2000), salt concentrations were increasing because of the high evaporation rate and the increasing extraction of groundwater for irrigation (Ouhajou 1996). During this last environmental crisis the impacts of changing socio-economic conditions (and behaviours) were (and continue to be) significantly higher than that of climate change (Michael et al., 2005; Zhang & Liu, 2005 ; Zhang & Nearing, 2005; Marker et al., 2008).

We should carefully avoid the risk of falling into an ineffective determinism, starting from the dam's environmental impacts and consequently deriving the last severe social-ecological crises *per se*. In fact any relationship between centralized water management (or immigration, or soil degradation) and environmental crisis is not symmetric or linearly linked, but related to

19 In recent years the selection of resistant cultivars and breeding from these bayoud-resistant, high quality varieties, in addition to **putting into quarantine the infected areas**, has been the more effective solution to this ephidemy. Furthermore the declaration of an "Oasis Du Sud Marocain", Biosphere Reserve, helped to preserve some oasys from the disease. (http://www.unesco.org/mabdb/br/brdir/directory/biores.asp?code=MOR+02&mode=all). Nevertheless, even today, the effect of the disease plus the transplantation and transport of palm trees to cities for decorative purposes remain important impact factors for Oasis sustainability.

complex, social, political and economical phenomena (adaptation and changes) occurring at different spatial and temporal scales that may or may not exacerbate the crisis at any moment during this long systemic transition process

As we will be critically analyzing in this section, the shift between the previously sustainable social-ecological equilibrium to the ecologically unsustainable centralized water management brings a wave of different, unplanned and unexpected functional, structural and behavioural dynamics within the entire valley transition. At the first glance we can see that resilience, expressed as adaptive capacity of farmers, shifted from an awareness of the valley's ecological thresholds, its functioning and equilibrium (thanks to social capital and behaviours), to short-term, unsustainable activities such as ground water extraction using motor pumps. At the same time, migration radically changed in its function as a temporal and flexible strategy to a permanent land (and previous lifestyle) abandonment due to the failure of groundwater extraction and competition among farmers and between oases.

3.4 The resilience and transition of urban systems

The following two sections will explore the urban perspective of dryland transition and evolution, from being a regionally structured dense network of oases (agricultural systems each characterized by the presence of a little fortified settlement), to a polycentric urban dominated valley.

The key role of a city has can be characterized by its strategic territorial position and its capability to represent a nexus between different (both spatial and temporal) scales of flows of social and environmental resources. As we illustrate in the first section, ancient Kasbahs were strategic check points along caravans routes where people could meet, sell, exchange, share knowledge and goods before leaving again on the main route. In the second section we illustrate how nowadays urban systems are becoming local cruxes for a globalized market of commodities and services, and represent in our case study a local platform linking tourism (a resource from the global market) and remote oasis landscapes and communities

The resilience of the cities can be expressed through two related perspectives. On one hand, it represents urban functional persistency, by being a cross-scale flows nexus along different social-ecological configurations and eras. On the other hand, resilience is at the same time expressed through the self-sufficiency of these urban systems, which are capable of withstanding local environmental crises, while finding the way for the provision and maintenance of a certain level of resources (like water or energy supply) in order to be the most attractive human habitat.

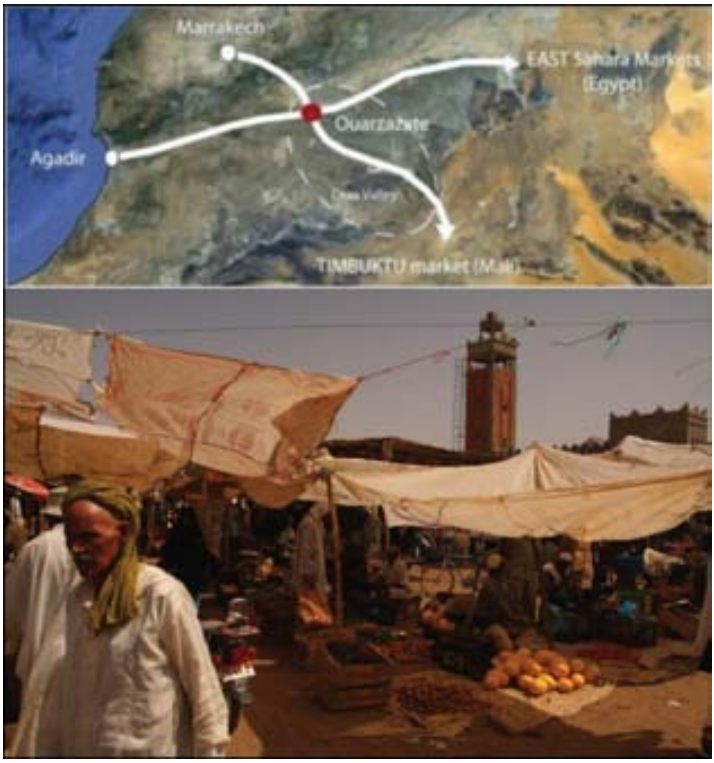
3.4.1 The Urban phenomenon: from oasis networks to centralized urban (resilient and sustainable?) structures

As introduced in the first case study section, oases are fragile but essential ecological (and at the same time anthropogenic agricultural) systems (De Haas, Hein, 2001). Oasis economy usually strictly depends on essential ecosystem services which consequently determine the size and spatial configuration of each settlement (each Kasbah). Like a medieval settlement, it seems that oasis Kasbahs have always had the same functions as medieval walled cities: dependent on the local natural environment, limited in growth and defending the citizen from the potentially hostile outside environment. In fact the nowadays capital city of Ouarzazate was no bigger than a Kasbah, positioned as a crossroads for strategic territorial routes as illustrated in Figure 3.6 (from Marrakech to the south, and from Agadir, the principal southern coastal city, to the east).

Since 1912, Ouarzazate was converted into a garrison town and only after the 80's did the urban growth phenomenon take place due to the new independent Moroccan Government developing plans (including the Mansour Eddabi dam construction) and the envisaged mass tourism thanks to the new vocation as a film-making location[20]. Thus, between 1994 and 2004, with an annual population growth of 3.3 %, the city reached 74,600 inhabitants

20 Ouarzazate nowadays boasts the biggest Moroccan cinema studios, welcoming many international film companies.

Fig 3.6: urban (Kasbah) as territorial strategic check points.



Source: Author from the web and Author photo

As mentioned before, the urbanization process was a result and a cause at the same time of the environmental crisis that lead to land abandonment and migration of entire families to urban areas. Furthermore, thanks to the policy of decentralization advocated by the state since 1976, the reinforcement of the role of communal districts was improved. As a result, urban centres have developed faster than the rural areas (0.8 % average annual growth) and the four urban areas of Ouarzazate, Tabount, Zagora (considered previously as part of Ouarzazate, it became an independent province in 1997) and Tinerhir, nowadays contain 77.6 % of the urban population of the entire valley (Zainabi 2003).

Fig 3.7 Ouarzazate present urban assessment.

Source: author design from the web background image.

At the same time, due to unsustainable autonomous adaptations to droughts (uncontrolled pumping of freshwater from groundwater reservoirs) the ancient structure of common resources management collapsed within the oases previously stable social-ecological equilibrium.

Almost 40 years after those first wave of changes (centralized water management, tourism market increasing dependency and urban phenomenon) another element is now enhancing the territorial hot spot consolidation, namely the development of a new strategy to boost the share of renewable energies to satisfy the increasing domestic demand and to avoid the dependence on imported energy (almost 70% nowadays, from O.N.E.) It seems a necessary sustainability step since the last decades (social and) environmental crisis has proven that such new centralized (water management and urban structures) equilibrium model could not deal with the fragile provision of valley's ecosystem services and new and massive resources, for outside, were needed.

Indeed the urban resilience, once related to the Kasbahs capacity to maintain the structure and dynamics within the environmental thresholds, now requires a new sustainable dimensions to be reached. This new sustainable dimension starts with the self (sufficiency and) provisioning of the energetic resources for urban centres.

In fact the target for the whole county is to develop around 2,000 MW wind, 2,000 MW hydraulic and 2,000 MW solar installed capacities by 2020 (which is expected to represent 42% of total capacity by then). Under the Moroccan law 57/09, the newly created state-owned company, named the Moroccan Agency for Solar ENergy (MASEN), has undergone the first project in Ouarzazat for the production of a 500MW plant to be commissioned by the beginning of 2015.

This new centralized energy production strategy will consist of a plant of 3,300 hectares, whose position 10 km from Ouarzazate city centre will also take advantage of the Mansour Eddahbi dam water reservoir (just 4km from the plant). The energy produced by this plantwill prioritise local needs (MASEN, 2010). This project should "stabilize" and sustain the desirable development and future physical growth of Ouarzazate in the next years (in fact a new large10ha urbanization is already planned for the southern part of Ouarzazate, west of Tarmigt, see Fig 3.8).

Fig 3.8 Planned expansions southern Ouarzazate, commissioned from Emirates group in 2008 and stopped in 2010 due to global market crisis.

Source: Photos from the author

We can critically put in evidence here two different faces of urban resiliency. The first one is related to the cross scalar dimensions of sustainability. In fact this capacity of self provisioning of the resources needed (when lacked locally either due to environmental crisis or an unsustainable growth rate) could be seen as a resilient capacity. Although this capacity has a negative drawback in the long term (sustainability) dimension because of the maintenance of a growth (or status) beyond the local ecological thresholds and a dependence on outside resources. In turn, this dependence on external ecological thresholds will shift the sustainability of the local scale social-ecological equilibrium to the global scale social-ecological equilibrium (expressed in term of chains of production and consumption patterns). By this view, urban resiliency is standing over self produced resources (like in our case for energy supply and water) and at the same time over outside (not quantified but finished) resources provided thanks to global market.

A second face of urban resilience is expressed in terms of the capacity to withstand unforeseen disasters and protect city's vital elements. From this last point of view the resilience of any centralized system (like a dam or as the solar central) is lower when compared to the decentralized or distributed ones (Baran, 1964). From an urban security perspective, as in our case study, the urban source of energy depends on a single centralized system which is partially dependent on the fresh water availability from the water reservoir The local society cannot control or manage these infrastructures by themselves (the enterprise that built and manages the solar plant is owned by MASEN, state and king property). In case of some natural hazard or technical problem in the dam or solar plant the entire city would be affected. A more resilient approach to face energy self sufficiency would be to decentralized (many little solar plants) or improve the distributive network of solar energy production by gardens-building that can be easily managed, replaced or upgraded little by little depending on the specific needs at each moment.

Finally we can conclude that this ongoing valley transition has shifted from a territorial social-ecological balanced equilibrium (made of small Oasis and Kasbahs aware of ecological functioning and thresholds) to a few growing urban centres trying to become independent from the regional ecological processes through the renewable energy, water reservoirs and tourism sectors. In the next section we will in further analyze another fundamental driver of the transition: tourism.

3.4.2 Cities as local cross-scales services platforms: tourism as the new resource flow

If the urban phenomenon seems the new self sufficient protagonist, it's useful to get a deeper view on its drivers and out coming resources. Mechanized agriculture (only in Ouarzazate up to the 60% of urban population are employed in the agricultural sector) (Zainabi, 2003) and increasing tourism rates make urban economy survive.

In Ouarzazate the tourist arrivals have increased rapidly from 76.702 in 1999 to 326.692 in 2006 (Centre Régional d'Investissement Souss Massa Draa, 2008). Such are reflected in the building of 27 classified hotels (with a capacity of 2263 rooms), 767 unclassified hotels rooms, 08 campsites and 303 lodges and shelters in less than 30 years.

In addition to an increase in infrastructure building, tourism, which has long been centred on the coastal areas and imperial cities of the North, has recently extended to oasis and desert safaris. These safaris have contributed towards the growing importance of several territorial check points, such as the city of Ouarzazate where the big and comfortable *riads* and hotels are placed, as well as Zagora and Mhamid, which are the starting points of desert safaris. In this sense, Ouarzazate is once again a key point in strategic territorial routes as the starting point for desert safaris. The valley's abandoned Kasbahs are becoming a touristic attraction and as such, a place where Berber lifestyles with their rich cultural heritage is being re-established in everyday life.

Oases, from being complex agricultural systems, are becoming the authentic breath of charming desert atmosphere that tourists are looking for (see Fig 3.9). Paradoxically, we could state that the urban phenomenon, which contributed to the extinction of the cultural landscape of oases, has taken responsibility for oasis landscape protection and conservation in order to meet the needs of tourism.

Fig 3.9: Charming Oasis desert camp atmosphere for tourists

Source: photos by the author

Notwithstanding the apparent oasis renaissance and preservation of their landscape, the most dramatic transformation has occurred in social and cultural terms for the local population.

The touristic western ideal of the desert has romanticized, thereby destroying and simplifying the complex social structure that maintained the social-ecological interlinked systems for millennia.

An example of a transformation of societal functions is the nomads who are increasingly employed as camel guides or as 'living examples' of the Bedouin stereotype for the tours of caravan tourism. Notwithstanding this, factors of resistance exist and the shifts between resistance or transformation are complex and depend on multiple variables (it can vary from place to place and from family to family). For example, compared to other groups, the *Ait Unzâr* (pastoralist) have begun participating in the touristic sector only recently and with much resistance. This resistance is predominantly because the tourism sector is controlled by managers from urban areas who retain most of the

profit while local communities receive a small income in exchange for giving up their traditional livelihoods. This means that the tourism sector is a highly precarious and unpredictable alternative for the poorer local people who change their lifestyle to accommodate or benefit from tourism (Casciarri, 2005).

The number and use of camels can be used as a key indicator of these societal transitions in the lifestyle of the nomads. In fact, as has happened with other species of livestock (graph 1), the recent decrease in the number of camels (the exact amount is unavailable) can be considered as the end of the nomadic way of life (Zainabi, 1989), and the beginning of a new era, in which those animals, earlier key species for milk, meat, wool, leather and for their use as a means of transportation for caravans and commerce, nowadays are increasingly used as an element of attraction for the tourist hiking trips

These societal transitions are a result of numerous factors. Not only are the transitions related to an autonomous adaptation to drought and environmental crisis by taking advantage of the synergetic effects of living along key routes for desert tourism, but are assisted by the arrival and availability of new technologies (like internet for promoting and publicizing some small touristic agencies) as well as the development from cinema production since the '80s in Ouarzazate (which contribute to the diffusion worldwide of the charming desert landscapes). The difficulty in accessing the Morocco-Algerian borders (Mhamid) during the Sand War in 1992 contributed to preventing the abandonment of these lands, as did the last national policies for tourism and country development from King Mohammed VI.

In 2000, tourism was officially declared as one of the principal drivers for the development of the country. When in 2001 the Ministry of Tourism presented the first strategic national Plan called Vision 2010 (a long term program to attract 10.000.000 tourists before 2010) stated that tourism will be the engine for the country development. The 9.300.000 tourists who visited the country in 2010 confirmed the success of the program. The tourism strategy runs within the Vision 2020 (aiming at the construction of 200.000 new beds, promote national tourism, and reach 20 Ml of tourist before 2020) which calls for a more sustainable tourism, preserving both local identities (and local well-being) and ecological systems.

The evolution of oasis systems will be deeply affected by these new national neoliberal policies, while Ouarzazate confirms its resilience in terms of being (and persistently remaining) a strategic territorial point, once between ancient routes and nowadays as key local cross-scale nexus capable of linking global economy flows of resources (as tourism) with the valley oases and their communities.

3.5 Two territorial consequences of urban transition: cultural homologation and ecological values commoditisation.

As mentioned previously, urban emergent transition was reflected in new regional social-ecological configurations. Transformations of the structural, functional and cultural models of the valley communities have been individuated and synthesized within those two present and challenging momentums of change. The first one is explained by a trend towards a sedentary lifestyle, expressed within the two different cultural model conflicts (happening along the marginal settlement societies, not capable to adapt the new wave of transformations). The second one is represented by the behavioural changes around the functions of the oases (key elements in the societal valley structure) and ecological values. This is resulting in a commoditisation of the landscape at the expense of the oases' ecological meaning.

Both these can be considered significant and challenging social ecological momentums along this transition pattern, deeply related to the sustainability and resilience dimension of the regional dryland evolution. Cities represent the core cross-scale nexus between the new local social-ecological configurations (oases transitions) and the global market's flow of capital, opportunities and resources.

3.5.1 Marginal settlements at the transition border line: between the nomadic and the developers' cultures

It should be noticed that while urban centres and extreme peripheries (last oases) are increasing their strategic territorial importance (De Haas, 2003), marginalized areas (for example the villages and oases out of the main touristic routes) are the ones that are experiencing the same regional ecological consequences of the transformation without being compensated by the generation of new opportunities.

Indeed along those marginal areas agriculture is still highly dependent on irrigation (therefore from groundwater availability or the Ouarzazate dam water releases) and during the last decade it could not generate sufficient income to survive, nor for paying for the shift to the modern cost-intensive agriculture. When the more severe droughts occurred, the strategy to survive in those areas was that men left homes looking for temporary job opportunities. Women stayed in the villages and played a key role in oasis life, guaranteeing continuity and the transference of the ancient local cultural heritage. However, nowadays new urban dynamics have altered the situation. Unmarried women or widows may leave to work in the city, or even in Europe within the framework of bilateral agreements (mainly agricultural work in Spain). This signified a step in the migration culture: from temporal in order to be resilient and flexible to the environmental crisis, and persistent at the same time in term of oasis lifestyle, to definitive and permanent by abandoning the oasis lifestyle and moving to cities.

This factor is a serious threat to ancient oasis cultural heritage and resilient lifestyle, which plays a fundamental role in the oases water management practices and identity.

On the other hand, due to the high cost of living in the city (that precludes most of the rural population from relocating their families to the city) huge parts of marginal areas population have adapted remaining on those marginal territories. Many shepherds, for example, have sold their camels and have adopted a sedentary lifestyle (Zainabi, 1989).

At the same time the common view about the pastoral movements was changing and seen as an unmanageable model which has to be controlled.

Hence authorisations to access the markets were requested and the mobility was limited by implementing projects to plant exotic plantations (Idriss, 1991) and pasture rotation, until the imposition of the most recent (and contested) fees for grazing.

Furthermore, new crisis narratives and discourses on desertification began to arise in order to speed up and legitimize policy (and legal) changes which have marginalized herders and have pushed local farmers to the new and exotic farming of cereals. Moreover, the Moroccan popular press, academic/scientific researcher, and official government documents started supporting the belief in the widespread destruction of the environment and the increasing desertification rates as a result of overgrazing (Vaxelaire 1987, vol.3; Davis, 2005, Korachi, 1995). Based on these estimates, nomads and other pastoralists have been strongly encouraged to settle down and reduce herd numbers while communal land has been privatised and put into agricultural production.

Many projects tackling desertification, as well as planting thousands of hectares of exotic forage plants (such as *Atriplex Nammularia)* and stabilising sand dunes, have been implemented throughout the country (El Gharbaoui, 1985; Waibel et al 1993). Despite this trend, botanical studies (Schoenenberger, 1994) indicate that localized land degradation in this region may be attributed to the over-collecting of perennial grass species for fuel for the local pottery kilns, over-irrigation, and the politically motivated spread of cereals cultivation into marginal lands (Davis, 2005). Furthermore, regarding ecological resilience and robustness, Schoenenberger discovered that one of the primary indigenous Halophytic browser plants, *Atriplex Halimus* or *Artemisia Herba Alba*, requires clipping or grazing to remain robust (Schoenenberger, 1994; ORMVAO, 1990).

Hence, it is worth nothing that, as underlined by Davis (2005), it seems that instead of two different kinds of knowledge (ancient oasis culture and expert, or simply the local and the globalized one) do exist a privileged knowledge and a suppressed one.

Furthermore, from a geographical point of view, and as reported by Casciarri (Casciarri, 2005) there is a clear absence of a logical balance in the geographical distribution of the AID and NGO interventions. This means that the part of the valley most affected by crises (like the last oases of Ktaoua and

Mhamid) are most neglected by these projects. In the last century the colonial discourse defined the geographical limit of possible modernisation and civilisation as the Jebel Bani Mountains (Azam 1946). Nowadays the logic is still true that development is promoted where it is more profitable, rather than more needed. Thus, the last villages of the oasis chain risk being marginalised further because less attention is paid to them as 'developable' areas. Nonetheless, as we will explain the next section, the last oases play a key role in regional transition.

3.5.2 Poverty traps and Oasis commoditisation: from producers to products?

Until a few decades ago, nomadic cultures found resources and richness thanks to the biannual traditional market of Timbuktu. The camels were the only animal that could make the 52 day travel through the desert possible. Oases produced the precious commodity to be changed (dates palm in fact represented the bigger Draa Valley richness, to be changed in Timbuktu with silver and precious stones). Nowadays, oases, camels and nomads are still there although their functions have dramatically changed. As tourism became the alternative source of income after hard droughts, oases, from being key ecological elements (which for centuries provided essential ecosystem services both for nomads and local farmers) have slowly been turned into commodities in themselves.

Since tourists began visiting the valley, a radical transformation has been occurring and the tourism sector has slowly taken the societal function of the Timbuktu market in terms of the new source of possible income for nomad communities. The behavioural change happening within oases environmental values (ecological thresholds and production capacities became to be not such essential elements as their aesthetical appearance and the exploitation of the freshwater availability for tourism) acts as a scissor between the regional populations reframing the access to the essential resources. From a spatial point of view, and as explained in the previous sections, the urban-touristic phenomenon has provoked the marginalization of some oases and communities.

The exploitation of tourism in some oases has caused the poorer community people (once fully sustained by local environment) to lose their deep environmental knowledge and their common resources management practices. This has resulted in an increase of unsustainable practices when urgent autonomous adaptations are needed for the new tourism market competition[21] between the big foreign companies and local population. An example could be represented by the water used for the swimming pools. In fact although looking at numbers it's easy to demonstrate the growing water use for touristic activities in the main cities as Ouarzazate or Zagora (water consumption of tourism sector just in Zagora city has increased from 15,967m3 in 1982 to 89 575 m3 in 2000, representing an increase of 461%) for oases and marginalized settlements environmental data area objectively difficult to find[22] and the accelerated depletion of aquifer water is evident just looking at the dramatic salt water level of some oases.

Notwithstanding all those impacts on freshwaters there are some hotels with swimming pools rose at the feet of the desert. The hotels we interviews explained that swimming pools were used like storage for hotels grey waters that than could be used for agriculture after have being depurated. So the paradox situation stands in the fact that the more sustainable practices come from those big hotels, where the tourist incomes go thanks to common resources (desert landscapes).

The poverty trap in this transition is represented by the cumulative impacts of the rain and groundwater scarcity as a result of urban development upstream, and increasing dependence on the tourism sector (which is pushing them toward an unsustainable pattern of development for the oases system[23] cause the water uses). Furthermore, from a resilience perspective, the whole regional system which once relied on temporal migration and common resources management practices to exist within ecological thresholds is now living beyond such ecological thresholds becoming increasingly dependent on

[21] Obviously nomad and oases community people stand at the last chain of a globalised market structure where the bigger international companies are capable to attract, manage and benefit from the huge flows of tourists, while few opportunities left for the local people.

[22] water is mainly drawn from wells owned by the hotels and than the data are unreported

[23] The Oases, being anthropogenic agricultural systems, needs a constant level of maintenance of the irrigation cannel networks, which allow within the agricultural practices the necessary soil humidity for the habitat thanks to the microclimate generated.

external resources. The social-ecological configuration is reframing its functions and structure around this dependency.

Furthermore, market-based individualistic behaviours have drastically reduced the social capital of these communities resulting in less sustainable and equitable practices.

3.6 Final consideration on Resilience and Urban Transition in dryland

As mentioned from the beginning dryland cover 41% of the terrestrial surface and although being very fragile ecosystems is supporting more than 36% of the world's population (IPCC, 2007). Notwithstanding droughts represents a recurrent phenomenon local population for centuries has adapted resilient strategies to cope such difficulties (Beaumont, 1989; Yevjevich et al, 1978; Liebelt 2003, Washington-Allen, 2008).

Because in dryland droughts and environmental stresses occur at regional levels local peoples resilient strategies have always been founded on strong collective and hierarchic cooperation in the resource management. The flexibility both of population lifestyles and urban systems (periodical immigrations and emigrations) kept the regional social-ecological systems living within regional ecological boundaries (Outabhit 1992, Casciarri, 2003).

The impacts of a big dam construction (Heidecke, 2006; Klose et al. 2008), aimed to provide regular water flows for irrigation while protecting the valley from flooding and producing energy, bring the catchment to the stand between the 10 worldwide most arid (Ravenaterga et al 1998). In the meanwhile urbanization of Ouarzazate, the main city, proceeded unstopped till the 2008 global financial market crisis (Chelleri et al, 2010). Urbanization is a complex multiscales process that in dryland exacerbate, thanks to water increasing demand, climatic change environmental stresses.

This chapter demonstrate how social resilience (and individual's resilience) shifted from being oriented toward the social-ecological sustainability into an unsustainable pattern of adaptation[24] Furthermore migration radically changed in its function as a temporal and flexible strategy to a permanent land (and previous lifestyle) abandonment. Those unsustainable shifts are linked to urban expansion phenomenon and the entry within regional regimes of external new markets as tourism.

Another key insight from this case study is that the impacts of changing socio-economic conditions (and behaviours) were (and continue to be) significantly higher than that of climate change (Michael et al., 2005; Zhang & Liu, 2005 ; Zhang & Nearing, 2005; Marker et al., 2008).

Around city resilience we can underline how ancient Kasbahs were closed system living within local ecological boundaries and the roots of resilience stands in the cross-borders (nomads) markets and the flexibility of lifestyles. Within new globalized urban growth, cinema industry boom and tourism sprawl the resilience of the city shift toward a global networks resources (material and immaterial, like technology and knowledge) dependency. Its resiliency nowadays stands in the capacity to overcome resources crisis thanks to the self sufficiency skills to produce them for itself (the case of solar power plant). Although should be mentioned that such resiliency stabilize and sustain the political unsustainable physical growth of the city, living far from the local and regional ecological boundaries.

Lastly we have to mention some of the regional communities and environmental consequences of such urban transition. Two main cross-scales consequences have been individuated. The first is that tourism as the new resource has provoke a deep behavioural change around oasis, which shifted from producers (of precious commodities like date palms, sustaining both local population and ecological system equilibrium) to products, for tourists, themselves. This point is related to both the access and the indirect limitation of resources exploitation of the poorer not involved in tourism business. The second main consequence is affecting nomads and marginal valley

[24] One of the most significative indicators is related to water adaptive responses to prolungated droughts and it is the number of motor pumps. It shows a remarkable growth from just 2.000 in 1977, to 4.000 in 1985 (Faouzi 1986), nearly 7.000 in 2005 and more than 10.000 in 2010 (from interviews).

populations. In fact due to the new markets and urban phenomenon mechanized agriculture and speculative market interests push the common view about the pastoral movements detaching them of being the main responsible for desertification due to overgrazing (Davis, 2005; Idriss, 1991). The consequences of those pressures represented the end of the nomadic way of life because of common pastoral lands privatization and the imposition of the most recent (and contested) fees for grazing.

Both those consequences of urban transition are dealing with a deep social behavioural change on environmental values, reframing the access to the essential resources. The exploitation of tourism in some oases has increased social stratification and caused the poorer community people (once fully sustained by local environment) to lose their deep environmental knowledge and their common resources management practices. The nowadays Ouarzazate living beyond regional ecological boundaries, becoming increasingly dependent on external resources, have drastically reduced the social capital of local population and the patterns of development follow less sustainable and less equitable practices, inducing new regimes in which the majority of the people are locked into urban services and (external) resources dependency.

If from the first case study we learned how urban resilience was to be framed toward transformability principles, in order to shift threats into opportunities for system living, from this second case urban resilience, facing climatic and environmental challenges, demonstrates how system speculates over cross-boundary opportunities (global markets and networks) in order to not depend from local-regional resources. The consequences of such transition are complex and to be framed within cross scales social ecological consequences, mainly dealing with increasing social inequity, loss of social capital and environmental thresholds respect and finally increasing dependency from outside resources. The “resilience for whom” emerges here as a critical perspective, related to social justice, cultural landscapes and geography transformation, ecosystem services access re-distribution and power issues.

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SPACE FOR
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CHAPTER IV

URBAN RESILIENCE AND RENEWAL CAPACITIES

STRATEGIC SPACES AND INDIRECT SOCIAL EXCLUSION: THE CASE OF LA MINA NEIGHBOURHOOD RENEWAL IN BARCELONA, SPAIN.

"The issue here is not a theory of the city. It is a theory of how the new empire functions"

Sassen, 2010:159

Previous page photo from the Author

Summary

The first chapter of this thesis wished to navigate urban resilience perspectives linked to the climatic and environmental vulnerability conditions. The second chapter introduced humans induced stresses into urban resilience framework. Now here we want to explore the urban resiliency expressed as system renewal capacities in order to face challenges.

Such innovation, renewal and transition capacities are nowadays more than ever linked to global (cities and markets) networks, where knowledge, capital and power tradeoffs flow. The opportunities of being linked within such networks represent a potential increase of socio-economical capacities, for cities, to deal with crisis because of networks provided solutions-resources. At the same time those potentially provided opportunities and resources rarely are equally distributed onto local societies, generating increasing conflicts and social stratification, gentrification and local economies crisis.

The analysis I propose in this chapter is about such cross scalar influences, expressed into urban renewal projects in emerging global cities, and what the lessons are for urban resilience theory.

To deal with this the study applies an istitutionalist understanding of actors and structuring forces operating within the renewal of a deprived neighbourhood of Barcelona (Spain). The focus is specifically on the (public) spaces production and the applied strategy for transformation. Results underline as the complex influences of the different structuring forces lead powerful actors to drive the entire renewal process through the resilience of the city much more than the resilience of the citizen. This means renewals are mainly linked to global market forces and drivers while very little attention is paid for the social adaptation to such (local for the global) transition.

Insights from the case study suggest many resilience principles could help the better local social-economical integration within such neighbourhood transition to global city lifestyle, structures and functioning.

4.1 Resilience and the Urban Global Networks: toward the terminal city?

Cities have always been, as demonstrated along the transition of Ouarzazate in the previous chapter, meaningful social places strictly related to local ecosystem services (Mumford, 1961) and often gateways for providing transformed goods and services to more distant hinterlands. The classical function of the city as a centre of goods transhipment was acknowledged in traditional urban theory as Weber argued: 'regular exchange of goods was one of the basic characteristics of cities, distinguishing a city from towns or other settlements" (Weber, 1921: 61).

The strategic territorial situation as cross-roads points conferred to cities the ability to concentrate people, knowledge, richness, and specialized services, all indirect products of patterns of high connectivity (Hesse, 2010). In fact as Ullman argued hardly any single place is (economically or socially) independent and exists on its own, but is interwoven in a network of interaction and interdependency (Ullman 1953: 56).

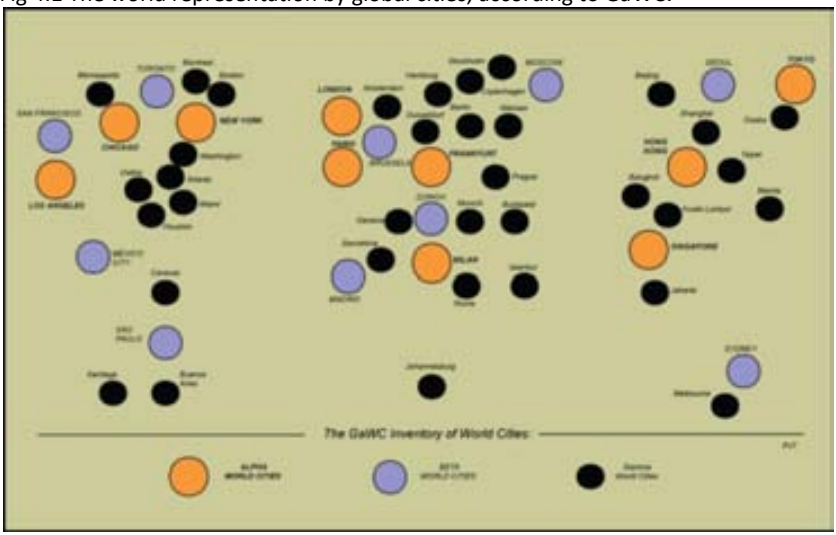
Within the creation of global economy and world cities (Friedmann 1986) a spatial reorganization is been taking place in the last 20 years around the relationship between site and situation (Janelle 1969). In fact in a global economy, where capital and knowledge flow through worldwide invisible networks (Castells, 1993), the site would no longer determine situation because is "the space of flows that dominates the space of places" (Castells, 2002).

In fact as Markus Hesse points out the early understanding of spatial interaction is advancing towards the relative notion of places in networks (Hesse, 2010: 88). The seamless organization of flows (network) would be decisive for the site because "place, scale and networks have been deployed as geographic tropes for discussing globalization, sidelining a fourth trope: "positionality"' (Sheppard 2002: 308). The analysis is so not on city or cities networks per se, it about new types of geographies and geographies of centralities.

Such centralities are within the Global Commodity Chains (GCC). In fact cities and urban places, they all have different means to attract, manage and

redirect flows in such networks, which, in turn, shape the overall performance of the chains (Sassen, 2010).

Fig 4.1 The world representation by global cities, according to GaWC.



Source: GaWC webside.

The establishment of GCC put pressure on urban policy to adapt to the emerging logic and imperative of flows (Hesse, 2010), for example by providing accessibility and infrastructure as in the Spanish case study in which we will deepen our analysis. Because of those adaptation to fluxes attractions there is also a certain dependence of cities on connectivity, which becomes increasingly important for urban competition (Savitch and Kantor 2002). In fact global cities (Sassen, 1991, Sassen 2002) thanks to strong business performance and amenities are able to meet the needs of global service firms and the associated business milieu. Consequently, such cities were ranked at the top of the increasingly popular hierarchies of the new urban system (Beaverstock et al. 2002; Derudder and Witlox 2008).

Only a few of these cities may profit from globalization and serve as relevant nodes in the system of global exchange (Palpacuer and Parisotto 2003) while the more receive and adapt the impacts of globalization (Amin and Thrift

1994; Marcuse and van Kempen 2002; Smith 2001) which can be economically problematic and socially exclusive (Sassen, 2011).

As shown by the Fig 4.1 the increasing number of global cities is a worldwide phenomenon that exceeds the old fashion discourses related to the big North-South. In fact while for GCC is still functioning around the geography of the core/periphery concepts, for Cities networks powerful elites and sectors of the global south (Jakarta, Cape Town or Seoul, for example) are deeply linked to big Northern centres and economies. "Global firms and markets do not want to operate only in a few cities on the Global North, but in multiple cities worldwide. This is why actually there is a systemic demand for global cities growing number" (Sassen, 2010: 159).

Of course such opportunity (to become a global city) represents, as shown also along the Moroccan case study, a tremendous chance for a city to strengthen its own network of resources supply and exportation, something undoubtedly conferring resilience to the city (Erstson et al 2010). We should remember that the root of resilience stands into the adaptability, the capacity to react crises and change (Folke, 2006), and as far as cities are strictly depending on natural resources and economic tradeoffs to be connected within a GCC represents the maximum resilience potential for a system because of the potential synergy with the whole global chain of other SESs.

However, from a theoretical point of view, the relationship between GCC and Global Cities Networks (GCN) is still under debate (Jacobs, 2007, 2010; Hesse, 2010; Parnreiter, 2010) although is clear the interdependency of the two nested cross-scales networks in which cities plays a key role in placing the management of those networks. The question is, as posed by Hesse, wherever the city, once prime market place and site of economic exchange, becomes transformed to a mere terminal, providing the transhipment of commodities from A to B? (Hesse, 2010: 81).

Barcelona, still far from being a relevant global city, but an emerging one, retains the characteristics of being an important European harbour, a fashion international city with high well being living standards and scores, trying to fix its position within the GCN fluxes. The global cities shift to the new so called flexible and deregulated modes of operating (Sassen, 1991) is what metaphorically we see within the new knowledge based districts physical appearance in Barcelona city centre (Poblenou 22@), where the regular form

of the urban landscape loses its geometry leading to globalized architectural forms shaping an "urbanal" globalized landscape (Muñoz, 2010). One important consequences of such globalization induced spatial reorganization of the city stands in the public spaces design and functions shift, within the urban project and neighbourhood renewals programs, as we will analyze in the next sections.

4.2 Barcelona: Urban resilience, renaissance and revolution in an emerging global city.

In the last decades the urban spaces transformations have happened so deeply that it seems easier to talk about its breaking-off from the last models than not reading the process of restructuring its public spaces. "Each break-off from the last moment registers a new regime, a new city in its physical form and functions" (Benach 2004).

In this chapter we consider cities like system, in particular complex adaptive systems (CAS[25]), and will study their capacity to recreate, reinvent their shape and functions in order to stay and maintains their social-economical success although different challenging momentum along cities history. It is worth nothing that such systemic approach hides behind urban (large spatial scale) success and resilience social (subscales) conflicts. Is therefore those cross-scalar aspect of resilience and urban transformation that this chapter want to fix its roots.

4.2.1 The construction and resilience of the Barcelona Model.

After the 1992 Olympic Games Barcelona became well known in the world for its ambitious programmes of planning and urban regeneration. The "Barcelona Model" of integrated planning and urban renewal has been seen

[25] After Santa Fe University definition and study of CAS, resilience emerge as one of the CAS properties. Alberti et al 2003 starts to define urban system as CAS in the field of urban ecology related to the (urban) phisical and biophisical interacting systems.

from the outsiders as an example of how urban regeneration should harness a transition from an industrial city to a globalized and tertiary one (able to catch the opportunities from global financial and resources networks). In the image of the outsider, lies a city with impressive and pleasant public spaces, an attractive built environment and important cultural elements.

However, this model (and urban strategy) it is not new at all. Far from these recent transformations Barcelona has always taken advantages of the international events to build and rebuild (updating) its structure. In fact from the winning of the 1888 Universal Expo (thanks to what the ex-military city centre lands were converted in the now famous Ciutadella Urban Park near waterfront) and the Universal Expo of 1929 (that make possible the construction of the central *Plaza de España*, nowadays near the famous Montjuic Olympic Games installations, and one of the larger square of Spain) Barcelona built its urban excellence symbols within the big events opportunity and funding. Furthermore the urban effectiveness of such interventions (urban big projects) is represented by the criteria expressed by the arquitect Bohigas for the Olympic Games Plan saying "in choosing the hot spots for the city transformation they must be able to transmit in the surrounding areas their transformation principles" (Bohigas, 1992)

4.2 Historical International events propaganda. From the left to the right: the "Globo Cautivo" at the 1888 International Expo and the propaganda of 1929 International Expo illustrating the new palace and avenue built at "Plaza de España".

Source: Author from the web

As most of Barcelonese citizen remember, decades before the Olympic Games, Porcioles (Barcelona's Franco party delegate) already declared "*Barcelona, ciutat de ferias y congresos*[26]" during the "*Congreso Eucaristico*" of 1952, which from one side represented one of the biggest diplomatic advantages of Franco Regime (and the Opus Dei entering in Barcelones Businesses, a never confirmed step further for the next winning of the Forum Mundial de las culturas 2004) and from the other the chance to build the southern part of Diagonal (one of the most important and big urban project in Barcelona). Furthermore, when Porcioles himself declared the wills to participate in another Expo (of 1982) for develop and finish the last part of Montjuic (that will be completed within the Olympic Games in 1992) it was already clear the trajectory of the city along transformation related to the bigger urban projects, with an international fashion.

So what we nowadays from literatures call Barcelona Model is just the top of the iceberg, because the root of Barcelona resilience stands in its vocation during the whole past century to build its environment around strategic international events.

4.2.2 From renascence to revolution: shaping the new dimension of global city spaces

Although within the international planning, architecture and design circles, Barcelona and its model is highly valued and promoted as an example of successful urban renascence (Balibrea, 2005), many authors (Balibrea 2006; Capel 2005, 2006; Casellas 2007, 2009; Delgado 2005, 2007; Von Heeren 2002) agree that such a urban governance model, oriented to local economic growth for the internationalization of the production and labour forces, leaves behind the social premises of the ideologically left parties that from 25 years have ruled in the Catalonia government. (McNeil 2003).

Nothing new if we think that, as it is common in other cities, urban development in Barcelona has been highly dependent on private funding for most implementation (Marshall, 2000), and that local architects have always

[26] Ignasi, Riera (1999)"Porcioles, Ministro de Franco en barcelona" in "Los catalanes de Franco". Plaza & Janés, Barcelona, 356 pp.

recognize that they was clearly devoted to a "*capitalismo asistido*", which means the way public administrations supported being the designer and executor of the private firms wills (Guillamond, 2003). This confirms that the decisional power still is hold by the public administration. Although that, the urban planning in Barcelona followed always two main directions: from one side the longer term big urban projects, and at the same time there has always been a manifested will to create public spaces of high quality (Bohigas 1985).

Delgado conceptualizes a high quality public spaces in Barcelona as

"son espacio depurados de conflicto sociales, son espacios que representan valores idealisticos de ciutadania, igualidad etc, que según muchos autores críticos constituye el marco elegante para vender y hacer apetecible el espacio de calidad privado (resultado de especulaciones y "renovaciones" de barrios conflictivos) en venta que hay rodeado en este entorno ideal y no conflictive" (Delgado, 2007)

Also other authors like Garnier (Garnier 1991) insists that those short term strategies upon public spaces were justified by the will of convert the public spaces in advertisement spaces thanks to their high level of design. In fact the so called "Barcelona Model" consists also in putting art in the public spaces (Goodey, 1994).

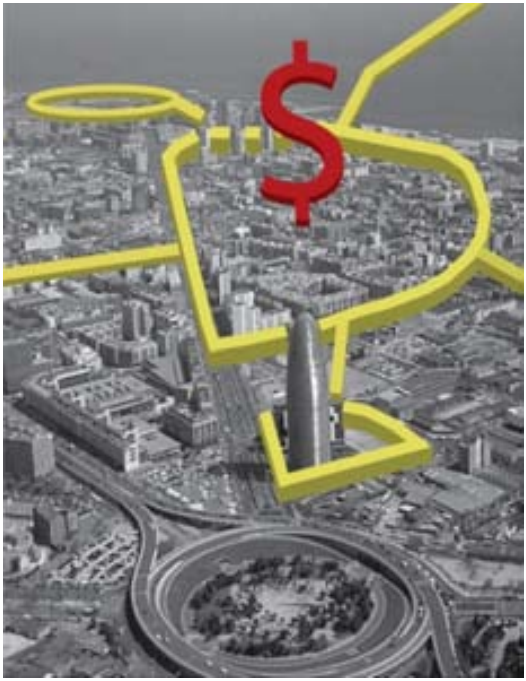
The same Bohigas (designer of the Olimpic Games Barcelona Plan) apprised that "Public spaces is a key factor in building local identities, and it can turn into something negative and dangerous if the identification is lead toward forms and designs, and the acceptation of the ideal public images could mask the reality and the problems behind it, and finally represents a starting point for the ghettos consolidations" (Oriol Bohigas, 2000:5). In fact as also Jordi Borja admits that "in Barcelona the public spaces given priority it was just to mask the real lack of funding to build necessary infrastructures" (Borja, 2000:10) and planned as advertisement spaces (Goodey, 1994) in order to attract potential foreign firms inversion in city strategic places (Bohigas, 2000; Barceló, 2011).

From another side the lack of clear participatory models (Capel, 2007) lead the public administration to consider participation not only not positive, but furthermore as a tool that contributes to make even more difficult the collaboration between public sectors and local key stakeholders (Cruz, 2010;

Delgado, 2007; Marshall, 2000). In fact in Barcelona, as in general for the Spanish model, the participation followed the instance of "a complementary way of reinforcing" conventional democracy practices (Font and Blanco, 2003).

All those factors lead Barcelona renaissance and international success to be driven by almost top-down planning and governance practices. Furthermore the long trajectory based mainly over big events and large scale urban (redesign and renewal) projects contributed to increasing gentrification and social stratification processes, increasing neighbourhoods differentiations, speculative interventions (Capel, 2007) and the rise of new global-city spaces (Sassen, 2002).

Fig 4.3 Barcelona emerging global city: provocative illustration of the dynamics and market base planning logics.



Source: Author from the web

Those capacities, to stand over the time between the most appealing European cities, made of Barcelona an interesting case study for framing the resilience expressed (in this case) toward top-down strategic planning. Our interest than is in evaluating those systemic resilient capacities in relationship with the social domain dynamics that accompanies such transformations. In particular we've found the most interesting insights happening along the public spaces design in strategic urban areas. "Which resilience" and "resilience for whom" are emerging questions that arise from such framework. Urban renewal and strategic planning confer international success to the urban system seen as a whole, but critical issue arises from the social local adaptation and wellbeing derived from such new spaces shaping.

4.3 Behind renewal resilience: an in-depth theoretical examination of the complex dynamic of the (public) spaces production.

On the behalf of the resilience lens of urban renewal and regeneration mentioned in the previous sections, is of our interest herewith have a better understanding of the components of such resiliency. In the case study selected for this chapter (La Mina neighbourhood of Barcelona, Spain) we will focus on the complex social relationship that shape public spaces in strategic areas of an emerging global city. Before entering the concrete case study we individuate here in this section a theoretical analytical framework for shaping actors and forces behind such urban transformative capacities.

4.3.1 Public spaces: an institutionalist model for the analysis of specific resilience.

There is increasing interest in understanding the close relationship between social, economic and political processes and the way public spaces are provided and managed (Schmidt and Németh, 2010; Thompson, 2002; Inam 2002). Central to this understanding is that *space*, and thus public space, results from complex social processes in which a wide variety of forces and

actors interact, combine, conflict and oppress, in order to determine how an urban area develops (Healey, 2007; Lefebvre, 1991; Massey, 2005).

Understanding public spaces as the result of interactions or struggles between different forces and actors is something already explored by geography and urban sociology (see e.g. Low and Smith, 2006, Mitchell, 2006) although such discussions are gradually entering the field of urban design.

In order to understand the complexity of the social processes shaping cities, neighbourhoods and public spaces, several authors have suggested the need to understand the relationship between the political-economy guiding the development of an urban area and the interaction between different actors involved in and affected by such development (Cuthbert, 2007; Healey, 2007; Bentley, 1999; Madanipour, 1996). Central to this analytical framework is Giddens' (1984) *theory of structuration* showing how the interrelations between structuring forces and actors shape actions and decisions within society.

Building on Giddens' ideas, Healey (2007, 1999, 1992) developed an institutionalist model for the analysis of the processes shaping the qualities of places. Within this model she argues that the ways of seeing and knowing the world and the ways of acting in it, are dynamic, deeply contextual and contingent to the interactions between the structuring forces and the different actors operating in each socio-political context. Although the applicability of Healey's model has had both its critics and supporters (e.g. Guy & Henneberry, 2000; Ball, 1998), in the field of urban design Smith et al. (2009) and Madanipour (2003, 1996) have used Healey's institutionalist perspective as a way to broaden the understanding of public spaces, from focusing on the physical alone to understanding the complex economic, social, cultural and organisational (i.e. institutional) factors affecting physical outcomes.

From the dominant aesthetic paradigm to today's plurality of lifestyles, from the value of land in the market to the political and economic ideas guiding urban policies, it is the interactions between structuring forces and actors that create the lens through which planners and designers understand problems and frame solutions. As such, it determines the ideas and actions that are to be incorporated or prioritised in an urban project, as well as the inclusion or exclusion of actors, their interests and values, during its decision-making

processes. This is ultimately reflected in decisions concerning the type of public spaces developed, allowing certain forms of collective/social behaviour, uses and functions and facilitating certain forms of movements, users, relations to the environment or aesthetics, while excluding others. In other term the definition of the specific resilience: the resilience of what to what (Walker et al, 2004).

4.3.2 Defining structuring forces

Based on Giddens (1984), it can be argued that planners work is influenced by structuring forces that operate in each context, city or neighbourhood, although structuring forces are at the same time conditioned and shaped by the actions of these and other professionals and actors. These structuring forces are defined as allocative structures (the way material and human resources and distributed), authoritative structures (formal and informal rules and norms), and systems of meaning (knowledge and cultural structures which frame how actions are developed and legitimated). According to Healey (2007) and Madanipour (1996), within planning and urban design these structuring forces correspond to: 1) the sources and amounts of resources allocated for the development of an urban area; 2) the regulations and procedures governing the development of an urban area; and 3) the ideologies or discourses which inform what is considered to be the appropriate development trajectory for an urban area.

Structuring forces have guided urban development throughout time, observed in the influence that the social dynamics of a given time-space context has had over physical form. In recent decades the structuring forces influencing the development of western cities have been highly determined by the new role of information technologies, the formation of a global economy and the neoliberalisation of urban policies (Castells, 1993; Harvey, 1989).

In many cases this has led to an entrepreneurial stance of *discourses* that guide urban development towards international ranking, global competiveness and economic growth, where public spaces are used for

attracting high income groups, capital investment and tourism like in our case study happened (Beaten, 2011; Pomeroy, 2011; Kohn, 2004).

It has also resulted in the way that *resources* for the development of urban areas are increasingly dependent on private investors or often allocated to projects that render short term benefits or the highest profit on capital investment; which in turn has led to an increasing commercialisation, privatisation and homogenisation of social life and public spaces (Muñoz, 2010; Turner, 2002; Zukin, 1998) Affected also by the current socio, economic and political dynamics has been the *regulations and procedures* guiding urban development. Although these are now considered to be more democratic, they often reinforce the power and involvement of only a few actors and interests, while excluding less powerful ones (Rios, 2008; Van Deusen, 2002) or seen in the way that that principles such as 'sustainable development' or 'place-making' are often shaped in ways that favour only a few (Foster, 2005; Aravot, 2002).

Although structuring forces guide and condition planning and urban design practice, the level of influence that such forces have depends on the way that the actors operating in a specific context and project, uphold, reject or manage them (Healey, 2007; Giddens, 1984). This means that attention needs to be given to the different actors involved in and affected by an urban project and the power or capacity they have to influence that project, which will be discussed in the next section.

4.3.3 Defining Actors and their roles

The development of a public space has the capacity to affect, among others, property rights, business interests, social dynamics, health and wellbeing, movement patterns, ecological networks and collective and individual values about a place. Consequently, the provision or transformation of a public space touches upon the interests and values of a wide variety of actors (individuals, groups or institutions) with different driving dynamics and histories, with diverse concerns about and attachments to the same place. From institutions, corporations, and investors (*funders*) to politicians and policymakers (*regulators*), from developers, planners and designers (*producers*) to *occupiers*

and everyday *users*, different actors claim public spaces in different ways in order to carry out desired activities or achieve a desired state (Carr et al., 1992). In making choices about places and how to develop them, the interest, knowledge and lived experiences of different actors rub up against one another, raising questions about whose knowledge constitutes proof, and when, where and how such knowledge should be deployed (Campbell, 2002). Thus, disagreements and conflicts often emerge as each actor may try to shape a city's or neighbourhood's public environment based on their own interests and values, with or without consideration of what others may need (Harvey, 2005). Understanding and coping with the contrasting interests and values of different actors has become one of the greatest challenges for theorists and practitioners of planning (Watson, 2006; Madanipour, 2006).

As resilience of one group can erode the resilience of another the transformation interests of one social group can interfere physically or symbolically with another group's or individual's activity or values (Loukaitou-Sideris and Ehrenfeucht, 2009; Thompson, 2002; Zukin, 1998; Hernandez, 2008; Madanipour, 2004). Different actors have different power and influence capacity, which affects which/whose interests or values are included/excluded from an urban project (Bentley, 1999; Flyvbjerg, 1998; McGlynn, 1993). The influence capacity of different actors is highly dependent on the structuring forces operating in the socio-political context of each project (Maruani and Amit-Cohen, 2007; Foster, 2005; Aravot, 2002) as in any particular time and place, the actors involved in the development of an urban area may receive reinforcing or conflicting signals from *discourses, resources, regulations and procedures* (Healey, 1992).

Similarly depending on how inclusive and/or participatory its process is there will be a greater or lesser number of actors included (Madanipour, 2010; Rios, 2008). However the potential contrasting interests and values highlights the political dimension of urban space production practices and shows the power relations in which they are always inscribed (Bentley, 1999; McGlynn and Murrain, 1994). This is meaningful in order to compare and understand the systemic urban resilience (as it works and) as the capacity of self regeneration and renewal versus the social (resilience) and citizen capacity to overcome and adapt top-down decisions about spaces restructuring.

4.4 Case Study: La Mina renewal plan

The theoretical discussion outlined above it is here used as the framework for the description and analysis of the renewal and transition of the neighbourhood of *La mina* in Barcelona. Focus was given to the way that structuring forces and different actors influenced the decisions and actions that shaped the transformation. From here the findings outline some generic statement on urban resilience facing physical renewal and new social dynamics related to such transformations. Public space are but the strategic focus and key elements along which main actors influences emerge as descriptors of the new equilibrium expected and generated.

4.4.1 Introduction of the neighbourhood of La mina

La mina is a neighbourhood built during the 1960s in what was then a peripheral area of Barcelona, surrounded by small-scale industrial activities and close to the Mediterranean Sea. The neighbourhood was part of a low income public housing programme aimed at providing apartments for 10000 people. Following modernistic planning principles, *La mina* was conceived as an 18 hectare neighbourhood with buildings distributed along a complex network of public spaces (including boulevards, small squares and green areas and a 65 000 square metre park, *Besos Park*) and public facilities (Figure 4.4). Differences in population density and building and public space typology divided the neighbourhood's residential area into two: *La mina Vella*, characterised by five-floor buildings with small squares and gardens, and *La mina Nova*, characterised by long twelve-floor buildings with a significantly high population density (approximate 7000 people living in 6 housing blocks) and boulevards in between buildings.

Soon after its construction, the neighbourhood began a process of physical and social decay, which was strongly manifested in some of the neighbourhood's public spaces.

Figure 4.4 Morphology and land use of the different areas of *La Mina*.

Source: Calderon and Chelleri (In Press).

High levels of vandalism and littering, product of the uncivil behaviour of a small part of residents, combined with poor maintenance by public authorities, the presence of drug dealers and users in some of the neighbourhood's public spaces and the high population density, especially in the area of *La mina Nova,* reduced the areas available for social activities and led to the deterioration of the neighbourhood's public environment. (Barcelona Regional, 2001a). All this created a general atmosphere of degradation, discomfort, territorialisation and social conflicts, which was considered to be the main problem of *La mina* (Borja and Fiori, 2004; GDES, 2001; Barcelona Regional, 2001a). Despite the fact that most social problems were located in the public areas of *La Mina Nova* and *Park Besos*, the whole neighbourhood became stigmatised as one of the most deprived neighbourhoods in Barcelona (Barcelona Regional, 2001a).

In the late 1990s, solving the deprived condition of *La mina* became a high priority on Barcelona's political agenda. The significant outcomes that were achieved with the large-scale urban transformation that the city's coastline underwent when hosting the Olympic Games in 1992,encouraged the continuation of the renewal of industrial and working class neighbourhoods located along the coastline, soon reaching the area of *La mina*. This provided strong political and economic support that led to a ten-year urban renewal plan aimed at improving both the physical and social problems of *La mina:* The Transformation Plan for La Mina (TPLM).

4.4.2 Structuring forces influencing the renewal of La Mina

Over the past ten years, the neighbourhoods surrounding *La mina* have undergone significant urban renewal. Thus in order to understand the structuring forces influencing the TPLM and the type of public spaces developed, it is important to understand the socio-economic and political dynamics guiding the development of the greater area in which the neighbourhood is located.

Since the early 1990s, the large scale renewal of working class and industrial neighbourhoods located along Barcelona's coastline has become one of the most important strategies for making the city a leading global metropolis.

Through this strategy, the greater area in which *La mina* is located has experienced significant urban transformation, guided by political and professional discourses (*systems of meaning*) aiming at creating new centralities for the city that would boost real estate development in the area and attract capital investors, tourists, and new forms of production and services (Walliser, 2004). This has resulted in the development of strategic urban projects around *La mina* such as the *22@ innovation district* with companies focusing on knowledge-based services, including the planned international business and education cluster *Campus Diagonal-Besos*; the high-class residential and commercial neighbourhood *Diagonal mar*; and the *Area Forum* with convention centres, museums, a yachting marina, luxury hotels and office buildings (Figure 4.5).

The type of urban environments that characterize the strategic urban projects surrounding *La mina* have been determined by the predominant architectural and design discourses guiding the renewal of areas located in attractive parts of the city. Within these discourses highly aesthetic buildings and public spaces are seen as an important instrument for improving deprived or obsolete neighbourhoods and a medium for attracting new high class residents/users, reactivating the real estate market and thus changing the negative perception of the place (see e.g. Bruquetas et al. (2005) and the example of the renewal of the Raval neighbourhood in the historic centre of Barcelona). While these types of interventions have made Barcelona very visible within international urban design and architecture circles, they have also received strong critiques from local community organisations and academics arguing that the fixation with aesthetics has conditioned project priorities and resources, led to strong gentrification processes and failed to address local needs (Majoor, 2011; Montaner and Muxí, 2002). As Balibrea points out, the city is "*being built for only those who can afford it (-) embellished for the new citizen/consumer/tourist*" (Balibrea, 2007: 244).

The focus on large-scale urban interventions has made project's resources (*allocative structures*) to be highly dependent on public-private partnerships and/or financial strategies based on the real estate market (Delgado, 2007), Such dependence has made private developers powerful actors influencing the way urban projects develop, and made real estate and private interests a high priority (Majoor, 2011; Delgado, 2007).

Figure 4.5 Strategic urban projects surrounding *La mina*.

Source: After Calderon and Chelleri (In Press)

This has also led to planning and urban design processes and procedures (*authoritative structures*) that reduce residents' capacity to influence projects and exclude dissident opinions (Casellas, 2007). As argued by Blakeley (2005), despite the existence of participatory processes and active civil society, many times the influence of these processes has been limited because of the municipality's strong development visions and its dependence on private investments.

4.4.3 Actors involved in or affected by the renewal of La Mina

The location of *La mina* and its proximity to strategic urban projects added a wide variety of actors with direct and indirect influence on the type of public spaces that should result from renewal of the neighbourhood.

The first group of actors is the *government agencies* that regulated and funded 30% of the TPLM. This group was formed by four different agencies working at regional, metropolitan and local levels conditioning the project to the political agendas operating at these different scales. These agendas are expressed in the *Barcelona Metropolitan General Plan* where it is stated that *La mina* and the area surrounding it should be renewed based on the synergies that aroused from the strategic developments along the coastline. This meant "*a radical change of its physical configuration, as well as the introduction of elements that give continuity to the quality and public use that has been established in* - Barcelona's - *coastline* (Barcelona Regional, 2000: 14). Thus, as argued by the Barcelona Field Studies Centre (2011), it was within the interests of this group of actors to improve the living conditions of the residents of *La mina*, but also, following the political discourses mentioned above, to create a social and physical environment that reinforced and did not conflict with the strategic goals established for the greater area in which *La mina* is located.

Another important actor was an external *funding agency,* the European Commission through its Urban II program, which provided 8% of the TPLM's resources. This actor operated in *La mina* by setting unbinding guidelines required for receiving financial aid, such as actions aiming at the renovation of existing buildings, the creation of green areas and improvements in public

transport. Furthermore, these actions were to be complemented by social programs and involvement of the community in decision making processes (European Commission, 2008).

The proximity of *La mina* to the Mediterranean Sea and to the new neighbourhoods and projects constructed around it made it a very desirable neighbourhood for real estate development (Benvenuty, 2005). Thus, following Barcelona's tendency to fund projects based on profits from the real estate market and private-public partnerships, it was determined that private housing developments should guarantee the economic feasibility of the project, estimating that 30% of the TPLM's resources would originate from profits the provision of land (CBLM, 2006). This can also be seen as a result of the pressure that real estate market had in the area which made *private developers* an important group of actors with indirect influence over the TPLM. For this group, the renewal of *La mina* should provide an attractive environment for investment and an opportunity to continue consolidating an area with high real estate value.

The *planners and urban designers* of the TPLM represent another important group of actors. These actors did not have interests of their own, since they followed the agendas and guidelines established by the *government agencies* and were supposed to gather and facilitate the claims made by the different actors involved in the project. Nonetheless, in the preliminary studies of the TPLM this group of actors considered the fact that the neighbourhood was now located in "*a privileged area* (of Barcelona)*, and a very attractive place where to live"* as one of the main ideas guiding their proposal (Barcelona Regional, 2001b: 2). Consequently, attracting new users, activities and residents, especially high income ones, was seen as the main strategy for improving the social conditions of the neighbourhood (interview with TPLM architect, October 24, 2010). Thus, it can be argued that this group of actors was aligned with the political and professional discourses prevailing in planning and urban design practices in the area surrounding *La mina.*

The actors belonging to the local community fall into two groups: *community organisations* and *residents of La mina*. The *community organisations* group consisted of 15 community-based groups and NGOs working in areas such as culture, sports, the arts and education. The *residents of La mina* comprised the different social groups living in the neighbourhood. Although most residents were low income, there were significant differences in terms of

levels of education, employment conditions, lifestyles and ethnic background, making this group of actors a highly heterogeneous one.

The interests, values and needs of both the *community organisations* and *residents of La mina* can be seen in the claims and opinions that were expressed during the participatory process of the TPLM. Although there were differences between the claims of the members of both the *community organisations* and the *residents*, 70% of the opinions gathered during the participatory process claimed that the problems of the neighbourhood were more related to social matters than its physical characteristics and stressed the importance of finding solutions to problems existing in the neighbourhood's public areas and relating to social conflicts, littering, public disorder and illegal activities (ASAB, 2002).Both groups of actors welcomed physical improvements, but emphasised that unless social problems were addressed, physical changes would not do much to solve the deprived situation of *La mina* (Barcelona Regional, 2001a). The need for new playgrounds and meeting areas was also among the priorities of the community, not because there was a lack of them but because the high density population of the neighbourhood (especially of *La mina Nova*), often lead to a rapid deterioration of these areas and conflicts among residents (Cr-Polis, 2006).

4.4.4 How to deal with social diversity in a deprived neighbourhood? The TPLM propositions and solutions

Being guided by and responding to the structuring forces and the actors described above as well as aiming at solving the multiple problems of *La mina,* the TPLM was based on an integrated and participatory urban renewal approach that combined physical interventions with social programmes (CBLM, 2008). A main objective of this approach was to improve the neighbourhood's public environment both physically and socially.

Influenced by the structuring forces and the interests of the *government agencies, planners and designers* and *private investors* described above, the physical improvements proposed by the TPLM were grounded on the idea that "*the complexity and magnitude of the problems of the neighbourhood*

made crucial a drastic change in its physical environment" (CBLM, 2008, p. 14). For the *planners and designers* "*the main problem of La mina was not its density but its lack of* (class/income) *diversity (…) It was the fact that the existing public facilities and public places offered activities that were only for the residents of the neighbourhood and not for anyone from the outside (…) what was missing in La mina were normal people, professionals, lawyers and even posh people*" (TPLM planner, October 24, 2010).

As diversity is one of the most important factor for resilience and adaptability, social mixing and a close physical and social relation of *La mina* with the surrounding strategic project (especially with the *Campus Diagonal-Besos* planned to be located beside the neighbourhood) became the main strategy for improving the deprived situation of the neighbourhood and led to a large scale transformation of *La mina* (ASAB, 2002). The large scale physical transformation was given high priority despite many residents' concerns about the suitability of such propopsal for solving the main local problems of the neignbourhood (ASAB, 2002; MLM, 2001). As one resident stated: "*the project should aim at benefiting us* - the residents of *La mina - and not the Forum 2004*" (MLM, 2001, p. 19), referring to the projects surrounding the neighbourhood. It was also given priority despite independent studies that highlighted that a deficient built environment was not the main problem of the neighbourhood (e.g. GDES, 2001; Borja and Fiori, 2004).

The urban transformation of *La mina* entailed the demolition of approximately 10 hectares of land (half of which were occupied by public facilities and public spaces and the other half by the small-scale industrial activities) and the construction of a new urban environment (Figure 3). This last consisted of: a *rambla* (a wide street with a tree-lined promenade in the middle and an international symbol of Barcelona's public life) running across the neighbourhood; new residential buildings (1,145 new apartments, 733 for the free market and the rest for social housing) with commercial premises on the ground floor; and new city scale public facilities (a library, a primary school and a police station located next to the *rambla* and a high-school, a church and a sport centre) aimed at serving both residents and outsiders.

With a total width of 40 meters and a 14 meter wide tree-lined promenade in the middle, the new *rambla* was considered to be the most significant physical intervention of the TPLM and conceived as the new centrality of *La mina*.

Figure 4.6. Urban structure of *La mina* before (left) and after (right) renewal.

Source: Calderon and Chelleri (In press)

A space that would ease the high and conflicting use of the existing public spaces, becoming a vibrant place for social relationships and activities where both existing and new residents and users could come together and revitalize the neighbourhood's social life. Its linear shape gave space for the construction of new roads and a new tram line, allowing the connection of the *La mina* with the surrounding projects and the future continuation of the *rambla* to the coastline, crossing the planned *Campus Diagonal-Besos* and arriving to the yacht port of the *Area Forum* (ASAB, 2002). Furthermore, the design of both the *rambla* and the surrounding buildings intended to renew and diversify the neighbourhood's appearance, bringing to it Barcelona's contemporary architectural/urban design style, making it attractive for the new residents (CBLM, 2006), and thus helping to the financial strategy opted by the TPLM as well as benefiting the interests of the *private developers*.

Responding to the *community organizations* and *residents* and their demands of making interventions in areas with a greater concentration of social problems, such as *La mina Nova*, the TPLM improved common areas of the high-rise buildings (stairs, elevators and entrances), which were deteriorated and a source of conflicts among neighbours. In the boulevards between the

buildings of *La mina Nova*, an area with more than 1000 children below 14 years of age (Barcelona Regional, 2001a), three small playground areas were provided. Improvements were also made to existing streets and sidewalks, as well as the provision of 9 small playground areas in *La mina Vella* and *Besos Park* (Figure 4.7).

Figure 1.7 New public spaces of *La mina*. A) Panoramic view of the *rambla* and the new buildings. B) *Rambla of La Mina* and tram line. C) New playground in *La mina Nova*. D) Improved sidewalks.

Source: Consortium of *La mina*.

Following the guidelines and conditions established by the *external agency* as well as the demands of the *community organizations* and *residents* the TPLM implemented several programmes to cope with the social problems present in *La mina*'s public spaces (Figure 4.8). In collaboration with local community-based groups and NGOs several community activities have been organized in order to deal with the differences and conflicts among the different social groups in the neighbourhood An institutional outdoor playing area was built in *Park Besos* aiming to encourage greater use of the park and change the

unsafe and negative perception that most residents had of it. Programmes aimed at dealing with public disorder, littering and vandalism included public campaigns on civil behaviour and environmental awareness. Furthermore, a police station and a centre for drug addicts were also located in the neighbourhood in order to control the presence of illegal activities (CBLM, 2008).

Figure 4.8 Social programmes and activities organised within the TPLM. A) Institutional playground area in *Besos Park*. B) Social activity organised by community-based group. C) Recreation activities organised by NGO. D) Leaflets of public campaigns on civil behaviour and environmental awareness.

Source: Consortium of *La mina*.

4.4.5 Emptiness in the new centralities? Causes and lessons beyond transition inception failure.

The new built environment of *La mina* has brought a dramatic change to the neighbourhood, making it more accessible and connected to its surroundings, as well as equalling the aesthetic/design standards of the nearby strategic projects. Although the new *rambla* and most of the surrounding buildings were finished by 2008, the social revitalization that was expected to occur with the new built environment has still not happened.

Two main reasons explain this. The first one is that the TPLM's main strategy of attracting new residents/users and of a close relation to the surrounding strategic projects has been hindered by a very slow occupation of the new apartments and commercial areas as well as by the fact that the construction of the *Campus Diagonal-Besos,* which was planned to be ready by 2011 and serve as a driver of change for *La mina*, has not yet started (in both cases this has partly been due to the economic crisis of 2008). This has had considerable implications for the TPLM's budget, significantly affecting the continuation of some social programmes and other actions planned in the area. The second, consequently to the first one, is that the new built environment does not fit within actual residents, who simply admit "*the rambla as the new library are very pretty, but almost nobody uses it*" (interview, 26 October 2010).

Furthermore, even if more than half of the new apartments have been sold, the new residents are seldom seen using the public spaces of *La mina,* "*they make their lives outside of the neighbourhood, up to now there is no social mixing*" noted a public servant of the TPLM (quoted in Tusell, 2011). All this has resulted in the new built environment becoming a desolate area with very little public life (Figure 4.9).

The location of *La Mina* within a strategic area for the development of Barcelona's metropolitan area and that is highly valued by the real estate market, defined the specific socio-political context and thus the particular characteristics of the structuring forces guiding the TPLM. It also increased the amount of actors affected by and interested in the renewal of the neighbourhood, adding more demands and claims to the project (regional and metropolitan political agendas, economic interests and opportunities,

pressure from the real estate market, specific planning and design tendencies) than just those of the existing residents (see fig 4.10)

Figure 4.9. Low use of the new built environment of *La Mina*.

Source: from Calderon and Chelleri (In Press)

Why such results?

The structuring forces and the actors of *La Mina* described above show two main and contrasting strands, exposing the tensions between global-city and local-neighbourhood scale actors, interests and influences present nowadays in many urban projects (Sassen, 2006). The first strand aimed at improving the neighbourhood's public life based on the spill-over effect that would result from a large scale physical change, the creation of an urban environment with high quality and attractive public spaces, the close relation with surrounding strategic projects and by attracting new residents, users and activities[27]. The second strand claimed the need of physical and social actions that would directly benefit the existing residents, reclaiming the areas of the neighbourhood where most problems occurred, providing more meeting

[27] Actors belonging to this strand operated at the city and metropolitan scale and were directly related to and/or conditioned by the structuring forces guiding the development of the greater area in which *La mina* is located: the *government agencies*, *private developers* and *planners and urban designers*.

Figure 4.10 Actor's influence in the renewal of *La mina* and its public spaces

Source: from the Author

spaces for children and families and giving higher priority to social programs and activities than to changes in the neighbourhood's built environment[28].

The two different strands of interests and claims managed to influence the TPLM into a plan that integrated physical interventions and social programmes. However, the way in which such integrated approach was implemented demonstrates the power imbalance between the different groups of actors involved in and influencing the TPLM. It also shows how in urban areas where multiple, diverse/contrasting interscalar interests and actors meet, powerful actors are often the ones making substantial physical changes while the claims of less powerful groups take softer temporary forms.

Furthermore as the main engine for change inception resides within external market factors, the unexpected crisis of this driver has influenced and paralyzed the overall transition processes (both the social neighbourhood diversity increase and the creation of new centrality for the city). From such conclusion we can stress useful insights for building resilience both at neighbourhood and city levels. We will define that in the next conclusion section.

4.5 Conclusion and insights from resilience thinking for Urban Renewal

4.5.1 Diversity and system thinking lessons

In this chapter we talk about regeneration, refresh and renewal urban capacities, which definitely could be assumed to express cities innovation capacity, and innovation, flexibility and deal with change are but the most resilience attributes.

As along cities last decades evolution the urban spaces transformations have happened so deeply it seems easier to talk about its breaking-off from last models, and we assume each break-off from the last regime is socially

[28] This can be seen in the interests and demands of those actors interested in and operating at the local neighbourhood scale and outside the structuring forces guiding the TPLM: the *community organizations, residents* and the external *funding agencies*.

problematic (Benach 2004). In fact under global economy and GCCc new cities networks starts to influence urban functions, identity and structure (Ernstson et all, 2010; Sassen 1991). Nowadays we can resume such dynamics saying as Manuel Castells mentioned that "the space of flows dominates the space of places" (Castells, 2002). In fact as within places changes we can easily follow the social and structural urban change we have decided to focus on a case study exemplifying such cities transformation, and built a first tentative framework for reading the different resilient perspectives related to urban regimes and transformations.

As already mentioned only a few of these cities may profit from globalization and serve as relevant nodes in the system of global exchange, for the others it could be an influence economically problematic and socially exclusive (Sassen, 2011). Notwithstanding that it seems there's an increasing demand for global cities and cities competition for entering in such networks. Undoubtedly these networks confer much more resources than local environments for a city, which represent an increasing adaptability potential facing local crisis.

Barcelona example illustrates through resilience lens both the opportunity and the problematic such globalizing the city is. In fact from one side we can state Barcelona express a high generic resilience because its renewal capacities, withstand economic international competitors thanks to its strategic planning that in the last decades was recognize as a Barcelona Model (Goodey, 1994). The resilience of this model stands in its capacity of attracting potential foreign firms inversions, tourists, new residents thank to the high design quality of its public spaces (Bohigas, 2000; Barceló, 2011). From the other side since the success of Barcelona Model many claims it lefts behind the social premises of such transformation (Balibrea 2006; Capel 2005, 2006; Casellas 2007, 2009; Delgado 2005, 2007; Von Heeren 2002) which means the specific (social) resilience of such innovation and renewal model is compromised: in fact from one side city resilience (capacities for withstand crisis, stresses and hallenges) is increased but at the expenses of local social resilience (the social local capacities to adapt changes). The La Mina examples really address within its analysis such perspectives between generic and specific resiliency.

Through Giddens' (1984) *theory of structuration* we analyse the interrelations between structuring forces and actors shaping actions and decisions within the La Mina case study. The istitutionalist model of Healey (, 2007, 1999,

1992) help us in expressing how those forces and actors influence the new spaces, and public spaces, creation.

First insights from the case study are that 'place-making' are often shaped in ways that favour only a few (Foster, 2005; Aravot, 2002), that the influence capacity of different actors is highly dependent on the structuring forces operating in the socio-political context (Maruani and Amit-Cohen, 2007; Foster, 2005; Aravot, 2002) and finally that the transformation interests of one social group can interfere physically or symbolically with another group's or individual's values (Loukaitou-Sideris and Ehrenfeucht, 2009; Thompson, 2002; Zukin, 1998; Hernandez, 2008; Madanipour, 2004).

Most specific insights are that due to important actors like the external European *funding agency* (Urban II program) the large scale physical transformation received the priority over the local social (programs and) problems even if "*the main problem of La mina was not its physical density but its lack of* (class/income) *diversity"*(TPLM planner, October 24, 2010). So as stated in the previous section, the transformation inception was almost top-down planned around the external market force driver. This strategy was the same Barcelona uses to practice since Barcelona Model, and the same that big urban projects linked to La Mina transformation was dealing with in the city centre transition from old industrial neighbourhood to knowledge based districts (Casellas, 2007). The crisis of one (pillar) driver, due to economical crisis started in 2008, provoked the crisis of the planning transformation model.

From a resilience perspective we can explain here two main lessons. The first one is that urban system must be thought in a systemic way (so with a cross scalar perspective) and that diversity is the main systemic strategy to cope with difficulties. Our case study problem is that giving priority to the built environment change (over the social) the transformation was mainly and irreversibly linked with real estate market force. A more resilient strategy would be to differentiate between many (local and external) drivers of change, or (as it happened) the finally built new environment would not fit with the present local social system (ASAB, 2002; MLM, 2001). Second and more complex lesson is that as the structuring forces and the actors of *La Mina* show two main and contrasting strands, exposing the tensions between global-city and local-neighbourhood scale actors, systemic resilient thinking would suggest to critically increasing the specific resiliency of all the actors

included in the transformation. This means if a radical and new regime is planned for the neighbourhood try to provide to the social existing groups the tools to follow the transformation (in the case of La Mina, social and local economical innovations and programs in order to create new possibilities for the existing citizen to be integrated in a near future into the new planned environment).

The resilience of what to what (Walker et al, 2004) explain the most of the urban conflicts, cause increasing the resilience for one group erode the resilience of another. Neighbourhood renewal programs should learn from systemic resilient thinking providing not just new spaces or potential links with global economy for themselves (refreshing urban built structures) but new niches (innovation) and functional redundancy in order to fill the gap between global(izing) forces and local regimes and interests.

4.5.2 How to do that?

Social-ecological systems resilience (Folke, 2006) (and so transition theory) suggest that in order to built generic resiliency is necessary for a large scale system to deal with subscales functional transformations (Folke et al, 2010). In an urban environment those sub-system adjustments could be represented by groups or neighbourhood transition to new functions, integrated in the future vision that the larger system is planning for. Translating theory into practice this means that if the vision for La Mina neighbourhood is to be integrated in the new high-tech Diagonal Mar cluster (international Campus Diagonal-Besós) we should act over actual neighbourhood functions and structures in order to make compatible its functioning with the new expected cross-scale one. New local knowledge, education, local economies supporting the future cluster, institutional innovation etc are some examples of conferring resilience (capacity to deal with the next change) to La Mina actual neighbourhood configuration.

Since it began in 2000, the TPLM has implemented around 70 social programmes to improve the social conditions of the neighbourhood in terms of employment, education, support to local businesses, and for coping with the problems present in the neighbourhood's public environment (EUKN,

2011). Priority has been given to programmes aimed at reducing the number of school dropouts and unemployment which have had significant outcomes (CBLM, 2008). However, according to residents and community leaders, the social programmes that aimed at the problems present in the neighbourhood's public areas lack continuity, have low coverage and are attended by very few residents, thus improving little the social conditions of the areas that were considered to be problematic (interview, 9 March 2011). After 10 years since work started the sentence stating the common perception about transformation (derived from more than 30 interviews) was:

"*the neighbourhood feels like if somebody put makeup on an old sick lady, on the outside she looks very good but in the inside she is still dying*" (interview, 26 October 2010).

That sentence hide the very root and significance of urban renewal and city definition: is it about living people and social dynamics (which generate economies) or about building attractive structures and environment for fluxes of tradeoffs and knowledge that will use temporally local people before decide to change direction and place?

In Barcelona, as in many global cities, those two aspects fight and coexist within the same macro-system. It seems relevant to say here that interviews with key persons of local Barcelona institutions revealed that notwithstanding their wills of integrating local people and needs into the (top down) transformations it was really challenging because of upper systems institutional inflexibility. Some examples to clarify this. In the case of La Mina many tentatives of building synergies between existing schools and the new cluster of Diagonal-Besós were done. The aim was to introduce changes (innovation) in the surrounding schools programs in order to fit better with the future working demands coming from the cluster. This was not possible due to the inflexibility of the public national system. Other examples from the case study demonstrate that deal with a local functional transformation deeply depend also from the upper scales structure and functioning. To enhance local transitions and create local new functions we need to operate cross-scales synergistically.

4.5.3 Final remarks

As the main urban transitions in Barcelona were leading by top-down planning and market forces interests (from global fluxes to local environments) those multifunctional subsystems transformations (local needs) creating niches and new capacitates for social groups to deal with change were not developed.

In this example increasing resilience (generic resilience) is expressed only by the capacity of the whole urban system to take advantages from increasing resources and opportunities coming from global market and cities networks. This confers to the city more capacities to react to possible local crisis by the network supply of other resources.

At subsystem level (specific resilience) due to top-down planning serving external markets driving forces the neighbourhood resilience was decreased because the lack of capacities (and tools provided by the transformation in order) to face and being integrated within the new built environment and regime.

From resilience thinking lessons on cross-scales dynamics, redundancy and functional diversity, flexibility of institutions and structures, innovation at subsystem level in order to face upper system transitions are the most useful insights to deal with urban renewal.

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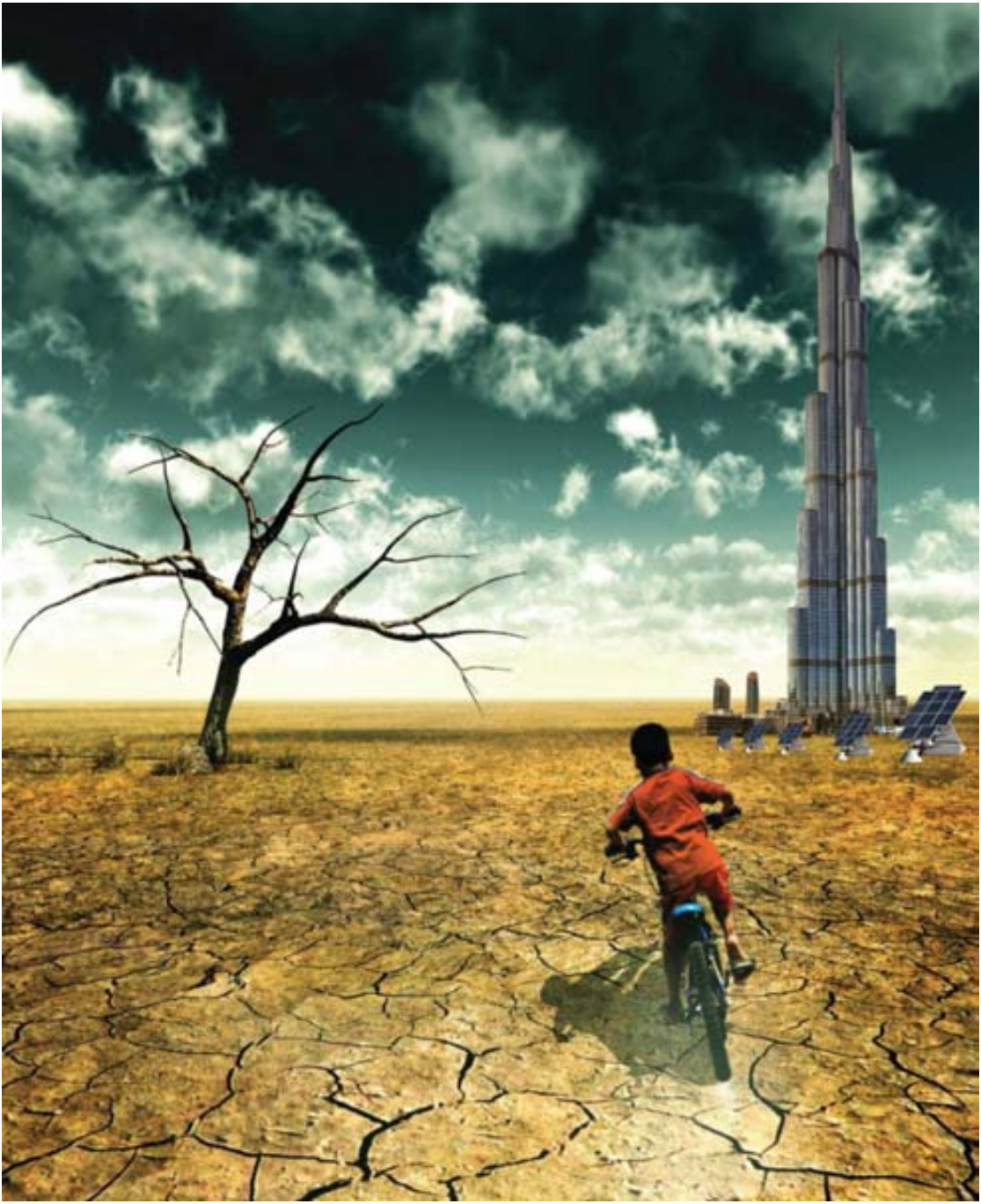


PART III

CONCLUSIONS

CHAPTER V

CONCLUSIONS AND FINAL REMARKS ON URBAN RESILIENCE

Previous page image: Author edited photo from *GL Stock Photos.*

5.1 Framing Urban Resilience theory between disciplines and scales: a call for local, more equal and redundant transformation.

As introduced since the beginning of this thesis resilience thinking is usually synthesized and expressed as the capacity to adapt while undergoes a change (Walker and Salt, 2006). It is also related to the (fast or slow, external or internal) drivers of change and thresholds concepts (Scheffer, 2001). Finally it's linked to the sustainability dimension (Folke and Gunderson, 2010; Holling, 2001) because of possible system or sub-systems transformations patterns (Folke et al, 2010).

Urban systems are but the most complex adaptive (Alberti et al, 2003) and denser human dominated systems (Ernstson et al, 2010) in which recovery, transformation and adaptive capacities have been expressed in order to keep them lasting over time (Campanella and Vale, 2005).The focus on urban resilience is challenging, exiting and needed in order to frame, direct and coordinate all the social capacities to deal with and dominate changes over both the ecological and socio-technical systems (Folke et al, 2003).

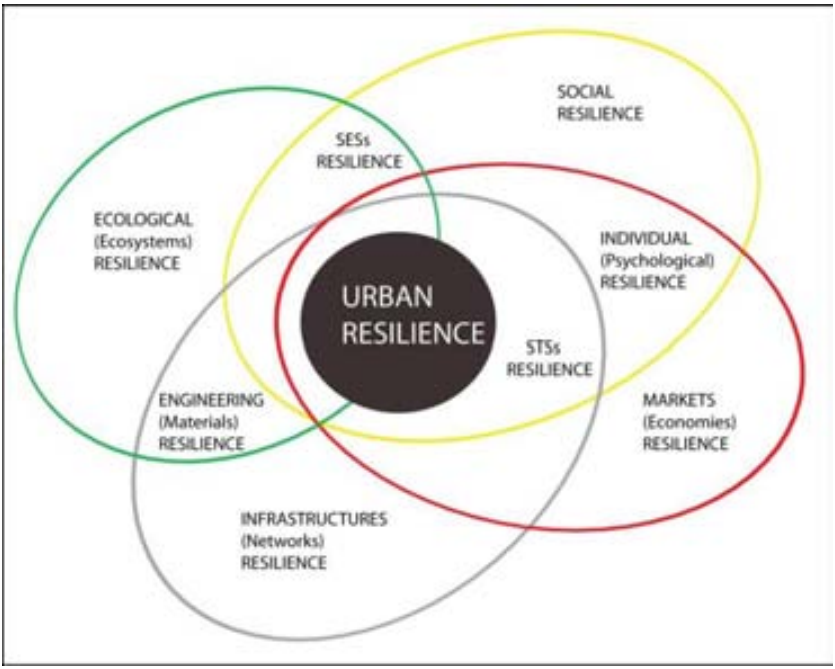
5.2 Insights from the multi-disciplinarily nature of urban resiliency.

When navigating the existing literature to frame urban resilience (Chelleri, 2012), or from the few explorative workshops done on this topic, the first issue related to this complex, new and fuzzy concept is regarding the different definitions and focuses given by different disciplines. In fact as illustrated in Fig 5.1 depending on the discipline urban resilience is framed through economical oriented reorganizational capacities, better than infrastructural management or till urban ecosystem services and biodiversity increasing approaches (Urbe project).

Obviously many disciplines share some guiding principle, or as in the case of Social Ecological Systems or Socio-Technical Systems studies they are built themselves in a complex multidisciplinary theoretical background. This help us to understand hidden guiding principles and the lens through which many different focuses are linked more to a system equilibrium (engineering

resilience[29]) or transformation (SES resilience) perspectives. The differences in building resilience from a stability or multi-equilibrium view is so relevant as could be decide between protect or pushing for change.

Fig 5.1 Multidisciplinary perspective of Urban Resilience



Source: after from Chelleri et al (2011).

Because of this conceptual difference between disciplines focuses and because the difference between generic and specific resilience[30], "the resilience of what (subsystems) to what (stressor-challenge)" (Walker et al,

[29] Fort the detailed differences betweeen stability or multiequilibrium views of resilience, as respectively engineering or social-ecological systems resilience, see state of the art chapter of this thesis.

[30] As stated by Walker since the very beginning of the resilience thinking theory the resilience of one system (or at one scale) can erode the resilience of another system (or scale), and this explains the relevance of the specific resilience (the resilience of what to what) versus the generic.

2004) emerge as an essential research question driving the overall urban resilience work.

This is actually why in the next sections we will frame, from generic to specifics, urban resilience critical perspectives around temporal and spatial scales and do not give some holy definition of what generic urban resilience is or should be.

5.3 Insights from the cross (temporal) scale perspective of Urban resilience: the emerging of the learning for sustainability paradigm.

As underlined along the entire chapter II, resilience is linked and framed with different meaning across temporal scales. In fact as illustrated in the Fig 5.2 "Urban Resilience Timeline" we can frame resilience following a timeline dividing specific actions as preventive adaptation, recovery, adaptation or transformation. Each of those capacities and actions reflects somehow a precise resilience meaning and mainly referred to shocks or increasing stress levels.

As already mentioned in Smith and Stirling (Smith and Stirling, 2010) the action we put in practice building resilience differ significantly is we react to something or if we plan how to adapt system due to a slow increasing stress. This difference is something well known also in Ecological and SESs scholars, namely it is consider the difference from slow and fast variables, or drivers of change (Holling and Gunderson, 2002). Both the scholars consider the responses to external shocks as a recovery process, aiming at bouncing back to a previous system status as soon as possible. Such perspective of resiliency is better known as engineering resilience (Holling, 1973) or simply resilience (Smith and Stirling, 2010).

Another completely different meaning is the one of the resilience facing increasing stress (impacts) levels. In fact system has to consider somehow the strategy for coping with a future change and thresholds approaching. In this case a first capacity is expressed by adaptation, acting over system boundaries (structural changes) in order to maintain system functions. The second is transformation, in which both system structures and functions changes in

order to move the entire system in a new regime, in which the previous stressors do not represent a threshold threat anymore.

Chapter II demonstrate with different practical planning and water management examples hoe to frame and distinguish between recovery, adaptive and transformability capacity of Urban resiliency. But a confusing element in this framework comes from literatures. In fact, as synthesized in Fig 5.2, system robustness (for SES scholars defined as "the capacities of staying within a stable equilibrium", or determinate regime) is considered the capacity to transform system from the Socio-Technical System scholars. And obviously vice-versa. Resilience and robustness are used representing the one the characteristic of the other depending of the STS or SES scholars.

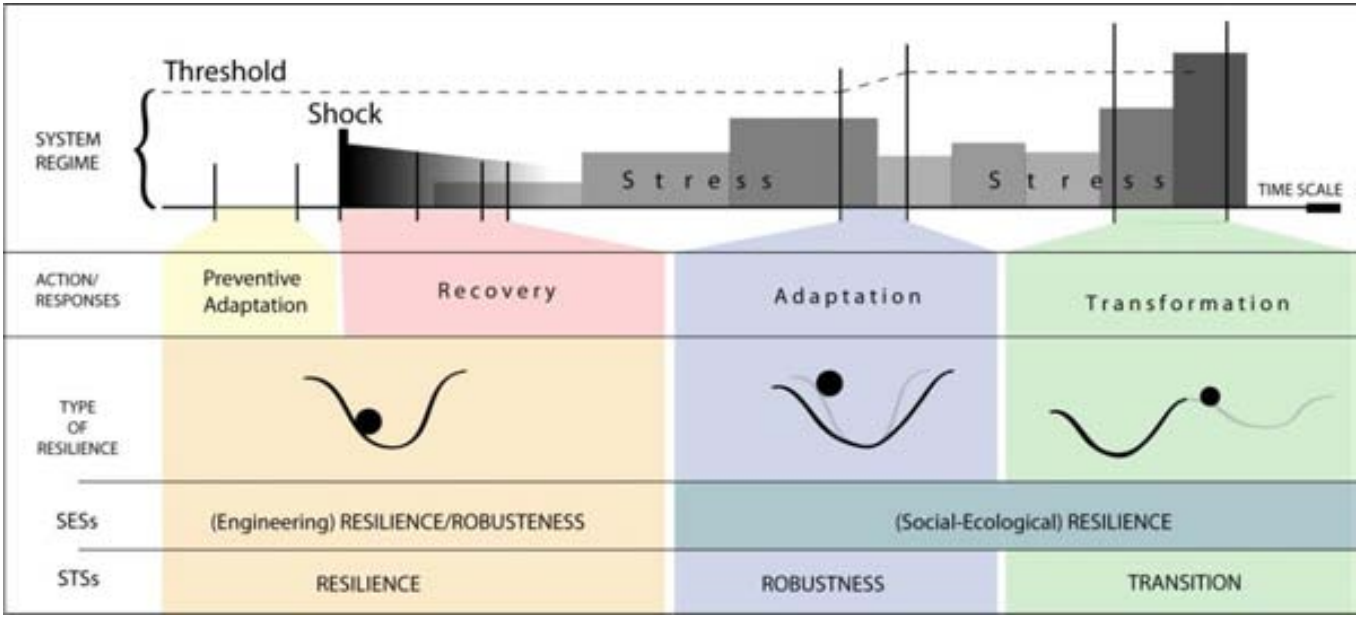
Notwithstanding such fuzziness, there are meaningful insights to learn from such timeline resilience perspectives. As underlined in chapter II recovery strategies are essential components of an urban system, although they can work just in the short term and coping with shocks (not stresses). This means that protection, robustness, it is not a middle of long time possibility and in case of increasing stresses system should change its structure or function toward adaptive capacitates or transitions. Two main lessons from Urban Resilience emerge from this assumption:

1. Sustainability is the necessary element for systems survival in the middle and long term, which in turn emphasizes and call for adaptive and transformability perspective of resilience (Chelleri, 2012). Urban resilience toward system protection and increasing robustness (recovery and stability strategies) lead unavoidably to increasing system vulnerabilities and protection needs. This is a fundamental learning related mainly to Climate Change Adaptation planning.

2. Learning is a fundamental characteristic for sustainable adaptations and transformations, which in turn can facilitate the shift from recovery to adaptation because of the learning process beyond rebuilding (quoting Campanella 2006: "rebuilding has in itself a learning from what has occurred process").

Even if we have tried to frame resilience through different actions and capacities along a timeline, dividing between shocks or stresses the forces pushing the system near thresholds, more exiting and complex insights come from the spatial scale perspective.

Fig 5.2 Urban Resilience Timeline. Definitions and approaches.



Source: From the author.

5.3 Insights from the cross (spatial) scale perspective of Urban resilience: a call for equity and local redundancy.

Chapter III (and chapter IV) underline urban resilience spatial scales significance in framing the "resilience for whom?"

As Holling's Panarchy theory states, systems constantly interact within upper and lower scales systems, (Holling and Gunderson, 2002). In the globalization era cross scales components of most of the systems functioning express their being "locally interconnected with global driving forces working throughout different networks in which flow (material and immaterial) resources tradeoffs" (Chelleri and Olazabal, 2012). Urban resiliency could be in fact determined by the access to these networks resources.

Is in this context that spatial scales, and the concept of "resilience in city" and "resilience of cities" (Ernstson, 2010), play a fundamental game in determining the links between resilience, environmental sustainability and equity. In fact the local access to such panarchies can provide opportunities and capacities, somehow resilient capacity, although not always with positive outcomes. In the Morocco case study, for example, the new resources (tourism and technologies) push for an urban transition and behavioural change whose (regional) environmental impact and decrease in resiliency is worst than what CC for itself is manifesting. The increasing urban local resiliency is built at the expenses of other subsystem resiliencies.

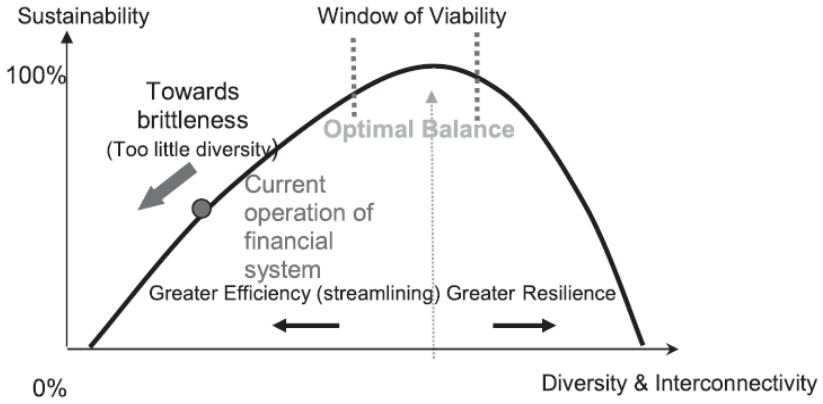
These evidences want to put ahead a first insight on Urban Resilience: resilience is not always a positive normative concept. Furthermore if from the 5.1 section we've learnt the resilience "of what to what" normative principle, here we have to go one step ahead framing that from the "what to what" (define the specificity of resilience framework) we should move into a more critical and political issue of defining the "resilience for whom" (ethical concern). Because, as analysed in chapter IV (La Mina case study), global dynamics tends to increase locally the social stratification, this critical, political and ethic perspective of urban resiliency is even more essential to be stated.

A second key insight from spatial cross-scales interactions helps us to frame a clear message for urban resilience. This is a message we can obtain from

ecological resilience, looking at the example of how our financial system works in a globalized world during the financial crisis.

As we learn from ecology, in any system, placing too much emphasis on efficiency (maximizing outputs) means eroding redundancy and connectivity until the entire system becomes unstable and collapses. Ironically our financial system tends to be the most efficient the possible, based on a monoculture (legally imposed in the name of market efficiency) of a single type of money (the bank-debt one) and following the principle of "too big to fail" (in case of some bank bankrupts, something that could sounds to you nowadays) ensuring the stability of the whole system.

5.3 Relationship between Resilience and efficiency (of our global financial system) at the light of potential system Sustainability



Source: Lietaer et al (2010).

As we can see from the figure 5.3, our financial systems (dictating both the social-economical and international tradeoffs networks configurations) is operating far from the windows of viability (conferring sustainability to a system) and advocated to an efficient functioning (maximization of the flux functioning benefits).

Definitely this is a call for a more decentralized (local) monetary system, which would confer resilience to our global financial system. The same we could suggest for our city structures (networks configuration) and functioning elements (within the global cities networks each city tends to specialize and

cover one niche function to fit and serve within the network. See Sassen 1991). The second insight comes here: the more functional diversity (less efficiency) expresses our urban structure the more resilient would be the city.

This means in practice to avoid monopolistic control of functions (like energy or water supply, but also avoiding big corporations controlling the flow of tradeoffs) and a claim for distributed services, which would reflect somehow a more equal distribution of (incomes because of different) roles in the urban functioning.

This way of conceptualizing urban resilience, in term of more distributed, less efficient, social-economical configurations, also aims at the increasing of local social responsibility policies, avoiding social poverty traps and finally urban (unsustainable) lock-in regimes due to path dependency.

5.4 Final remarks on Urban Resilience

In conclusion, trying to finally frame Urban (generic) Resilience, we have learnt that although recovery, adaptation and transition principles coexist in complex environments (chapter II) a change in urban systems structures and functions have to be done in order to match sustainability patterns and face both short and medium or long term challenges (Chelleri, 2012). This is why we can clearly define urban resilience as "a multidisciplinary framework to explore the reactive, recovery, adaptive and transformability capacities of (and in) urban systems".

In so doing the way in which we use this framework is problematic because the need to frame the resilience "of what to what" (the object) and even more important the "resilience for whom" (chapter III). Ethical and political concerns on urban resilience practices are but a very critical and core issue to be addressed by this emerging perspective of resilience in and of cities (Chelleri and Olazabal, 2012).

Undeniably in fact those learning capacities confer and prevent innovations to fall into Jevons paradoxes linked to path dependency and unsustainable trajectories.

It seems nowadays "Resilience is one of the most important research topics in the context of achieving sustainability [...] promoting research efforts across disciplines and between science and policy" (Brand and Jax 2007). At the same time, as it's been developed along all this thesis chapters, URBAN resilience emerging theory needs deep ethical and political roots to be critically laid. Resilience is not a normative good principle, and enhancing some unsustainable aspect of specific urban resilience can produce social (chapter IV) and environmental (chapter III) dramatic consequences. As in fact I decided to put in the thesis cover, the image evocating the dramatic urban resilience perspective, built around the resources and capacities locally (anywhere) conferred to some connected urban spot, leave behind all the sustainability, equity, redundant, self sufficient and transformative principles of resilience. Avoiding unsustainable patterns of specific urban resiliency should be the first critic and guiding criteria in approaching, studying, building and promoting urban resilience.

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ANNEX I

Links to usefull resources produced and used during this Doctoral thesis

During the last International Resilience Conference (Arizona University, March 2011) I've entered in touch with a group of young researchers from different countries and we started to build up a network of people involved in Urban Resilience projects and researches.

In November 2011, we was organizing the First International Workshop on Urban Resilience aiming to present, reflect and reframe resilience perspectives applied to urban systems. More than 40 students and practitioners attended the event. The workshop was organized by Marta Olazabal (University of Cambridge, UK) and me, while the Master Programme in Landscape Intervention and Management at the Barcelona History Museum (MUHBA) hosted the event. Invited speakers debating on different Urban resilience perspectives were: Jeff Ranara (Stockholm Resilience Centre, Sweden); Lily Yumagulova (British Columbia University, Vancouver, Canada); James Waters (Tyndall Centre, UK); Anna Kunath (Helmholtz-Centre, Germany) and Guido Minucci (Politecnico di Milano, Italy).

Is was so interesting for us, and we received so many mails of people asking for a workshop proceeding that we built up a Website to serve as a virtual platform to discuss on urban resilience. The web is : http://urbanresiliencenetwork.blogspot.com, while for discussions we created a specific group in which everybody can be subcribed and contribute to the debates : http://groups.google.com/group/net-urb?hl=en-GB&pli=1. In a specific section of this webside we have a growing source of literatures, comunications and videos updating constantly the topic of urban resilience worldwide.

If the first workshop deliverable is the webside, at the time this Doctoral thesis is been finishing, Marta Olazabal and me we were also involved during this 2012 spring in the review process of our first workshop report titled "**Multidisciplinary perspectives on Urban Resilience**", which counts with the contributions of Anna Kunath, Guido Minuchi, Marta Olazabal, Lorenzo Chelleri, James J. Watters, Lilly Yumalogava and different useful comments

and reviews from professors from the prestigious Stockholm Resilience Centre, Tyndall Centre for Climate Change, and other universities.

Fig A1: The webside on Urban Resilience Multidisciplinary Perspective

So unfortunately I cannot link here now the report because it is not published yet, but thanks to those links surely this Annex can in few months provide useful materials and deeper insights on Urban resilience, especially in the short run from our first report, thanks to which this thesis “State of the Art” chapter, as the conclusions have benefitted in term of critic contents.