Water service delivery solutions in rural and peri-urban areas in developing countries : are public-public partnerships a valuable alternative to private sector participation?

Ciro Avolio

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UPC – Polytechnic University of Catalonia
Càtedra UNESCO en Sostenibilitat

PhD description

Water service delivery solutions in rural and peri-urban areas in developing countries: Are public-public partnerships a valuable alternative to private sector participation?

PhD candidate: Ciro Avolio

UPC – Polytechnic University of Catalonia
Càtedra UNESCO en Sostenibilitat

Coordinator of the program
XAVIER ÁLVAREZ DEL CASTILLO
Tel: 93 739 87 62
Fax: 93 739 80 32
Email: xalvarez@catunesco.upc.edu

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Resolución del Tribunal

Reunido el Tribunal designado a tal efecto, el doctorando / la doctoranda expone el tema de la su tesis doctoral titulada ***Water service delivery solutions in rural and peri-urban areas in developing countries: Are public-public partnerships a valuable alternative to private sector participation?***

Acabada la lectura y después de dar respuesta a las cuestiones formuladas por los miembros titulares del tribunal, éste otorga la calificación:

☐ NO APTO ☐ APROBADO ☐ NOTABLE ☐ SOBRESALIENTE

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El resultado del escrutinio de los votos emitidos por los miembros titulares del tribunal, efectuado por la Escuela de Doctorado, a instancia de la Comisión de Doctorado de la UPC, otorga la MENCIÓN CUM LAUDE:

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(Nombre, apellidos y firma) Presidente de la Comisión Permanente de la Escuela de Doctorado	(Nombre, apellidos y firma) Secretario de la Comisión Permanente de la Escuela de Doctorado

Barcelona a _____ de _____ de _____

Information

PhD programme:	SOSTENIBILITAT, TECNOLOGIA I HUMANISME (Sustainability, Technology and Humanism)
Project title:	Water and Sanitation service delivery solutions in rural and peri-urban areas in developing countries: Are public-public partnerships a valuable alternative to private sector participation?
Name of PhD candidate:	Ciro Avolio
Previous education:	Master of Art in Development, Environment and Policy
Institution:	Sussex University - UK
Supervisor:	Xavier Álvarez del Castillo
Institution:	Polytechnic University of Catalonia (UPC) - Càtedra UNESCO en Sostenibilitat
Co-supervisor:	
Institution:	Polytechnic University of Catalonia (UPC) - Càtedra UNESCO en Sostenibilitat
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Signatures

		Ciro Avolio
_____	_____	_____
Date	PhD candidate's signature	Printed name

		Xavier Álvarez del Castillo
_____	_____	_____
Date	PhD supervisor's signature	Printed name

_____	_____	_____
Date	PhD co-supervisor's signature	Printed name

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Abbreviations

EC	European Commission
ECOSOC	Economic and Social Council (United Nations)
EEA	European Environment Agency
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GhG	Greenhouse Gas
GWP	Global Water Partnership
HDI	Human Development Index
IA	Impact Assessment
IDWSSD	International Drinking Water Supply and Sanitation Decade
IFAD	International Fund for Agricultural Development
IPCC	Intergovernmental Panel on Climate Change
IRC	International Reference Centre for Community Water Supply
ISG	Inclusive and Sustainable Growth
IWMI	International Water Management Institute
IWRM	Integrated Water Resources Management
MDGs	Millennium Development Goals
MNC	Multinational Corporation
NGOs	Non-Governmental Organisations
O&M	Operation and Maintenance

OECD	Organisation for Economic Co-operation and Development
PPPs	Public-Private Partnerships
PSIRU	Public Services International Research Unit
PuPs	Public-Public Partnerships
R&D	Research and Development
RWSN	Rural Water Supply Network
SAI	Sustainable Agriculture Initiative
SDG	Sustainable Development Goal
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCSD	United Nations Conference on Sustainable Development
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WASHCO	Water and Sanitation Committee
WCED	World Commission for Economic Development
WDM	World Development Movement
WHO	World Health Organization
WSP	Water and Sanitation Programme
WSS	Water Supply and Sanitation
WSSD	World Summit for Sustainable Development
WTO	World Trade Organization

Summary

This dissertation will focus on the analysis of water and sanitation service delivery solutions in the context of peri-urban and rural areas. In particular, it will investigate if public-public partnerships (PuPs) can represent a valid and effective alternative to private sector participation. As highlighted by PSIRU (in Hall *et al*, 2005: 4), there are different types of PuPs, including a large variety of actors: national public authorities, communities, NGOs, Trade Unions, international public authorities and international associations.

This dissertation will focus on a specific kind of PuPs, the partnerships between public authorities and communities, where the responsibility for service provision is progressively transferred from national governments to local people. This choice is motivated by the growing importance given to the participation of local people in the development of initiatives directly or indirectly affecting their condition of life. As argued by IRC (IRC, 2007), in the last years community management has become one of the most important concept, a 'guiding principle' in most rural water supply and sanitation schemes. The purpose of this study, therefore, is to examine if community-based management could possibly represent a better option than public-private partnerships (PPPs) for the delivery of rural water and sanitation services and capable to be successfully adopted in various national contexts, playing a role of growing importance.

The dissertation will first outline the general situation of water resources at world scale and in particular in developing countries. The relationship

between water / poverty reduction and water / sustainability will be examined. The dissertation will realize an overview of the water management systems.

Then, this study will analyze the water services in rural and peri-urban areas of developing countries, where, according to the IFAD (2001: 2), more than half of the world's poor, over 70%, live and depend on farming activities for their survival. The characteristics of rural areas, including the presence of isolated settlements and the lack of infrastructure facilities, and the inefficiency of central and local governments have, in many cases, produced critical situations in terms of inadequate rural water supplies and sanitation infrastructure. This dissertation will, then, define the concepts of PPPs, PuPs and government-communities partnerships, delineating their historical evolution and the increasing attention and support they have received. In particular, it will explore the main literature and critics concerning PPPs, highlighting strengths and weaknesses that have been attributed to this kind of partnership. This study will examine two case studies where PPPs systems have been implemented.

Moreover, this dissertation will analyze the link between community management, on one side, and efficiency and sustainability, on the other, by presenting two case studies - Salvegu, Ghana and Karnataka, India - where local communities are responsible of the operation and maintenance of rural water and sanitation services. Through the analysis of the case studies, in fact, it will identify some of the characteristics of Government-communities partnership that could contribute to improve water and sanitation service delivery even in remote and disadvantaged

rural areas and, on the other side, the weaknesses and limits of this kind of partnership.

Finally, the dissertation will propose a new concept of water partnership, the Local Water Partnership, based on the cooperation among 3 local water partners: local government, local community and local private sector.

Introduction

'Water supports life. It is a crucial resource for humanity, generating and sustaining economic growth and prosperity. It is also at the core of natural ecosystems and climate regulation' (European Union, 2010a). 'But it's a finite resource, and less than 1% of the world's fresh water is accessible for direct human use. (…) Water scarcity occurs when demand for water exceeds the available sustainable resources' (European Union, 2010b). Water is essential for a huge range of human activities including agriculture, farming, livestock, energy generation, industry uses. In addition, 'water is indispensable for healthy ecosystems, which themselves underpin our quality of life. It is not only a provisioning service – a basic material – but also plays a part in the regulating services that govern climate and weather and keeps our planet functioning. (…) Therefore, good water management has to be integrated into all these areas' (European Union, 2010a).

Efficient and sustainable management of water resources is also one of the main development pillars outlined in the Millennium Development Goals (MDGs). These commit to halving, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation. 'In 2010, the UN declared access to safe drinking water and basic sanitation services to be a human right, and the 2012 Rio+20 Declaration reaffirmed this right' (European Commission, 2013:25). Access to water is a basic human need and a fundamental human right. Water scarcity undermines productivity and economic growth. Efficient water management is therefore crucial for both environmental sustainability and economic development. For this reason, governments needs to do their

best to guarantee the most efficient, sustainable and equitable access to water.

'Collectively, billions of dollars have been invested in the provision of rural water supply systems in developing countries over the past three decades. Although progress is being made and rates of coverage are increasing, users often find that, once installed, water supply systems are poorly maintained and eventually break down, leaving them with an unreliable and disrupted water supply' (Lockwood and Smits, 2011). 'As much as 50% of water wastages in some areas of Europe are the results of leaky infrastructure' (European Union, 2011a). In developing countries, leaks, inadequate infrastructures and inefficient management and provision schemes highly increase this percentage in contexts of worse water scarcity.

In addition, water resource managers should assume climate change makes worse the current pressures in water management. Climate change is one of the factors that necessarily must be considered by water supply institutions and companies in assessing their future resource availability (IPCC, 2001).

In this frame, rural areas of developing countries are the most heavily stricken by water scarcity and climate change. These are the areas where a sustainable and effective water management is highly crucial. Planning and improving water resource management can help to reduce future vulnerabilities, protect one of the most precious environmental resources and contribute to fighting poverty.

Chapter 1

General and Specific Objectives

1.1 General Objective

The main objective of this dissertation is to study the management of water resources in rural and peri-urban areas of developing countries and to develop a comparative analysis between two of the most popular models for water management and water services delivery: Public Private Partnerships (PPP) and Public-Public (PuP) Partnerships. In particular, a specific type of PuPs, the government-community partnership, will be presented and examined as a valuable alternative to the private sector involvement in the water services sector.

The main problems to be discussed, therefore, include the peculiarities of rural and peri-urban contexts and the strengths and weaknesses –above all in terms of sustainable use and water protection- of PPPs and government-community partnerships for the provision of water and sanitation services.

This study intends to provide policy and operational guidance for public bodies and institutions at various levels, NGOs, funding agencies and development banks facing decisions in the planning, implementation and operation of water services delivery systems in rural areas of developing countries.

Specific choices in terms of water management have caused and still cause water conflicts both at international level –among different countries that share common water resources- and at national level -among different regions, local and national authorities, national relevant authorities and local communities, representatives of private companies operating in the water sector and local communities. Even if there can be a strong link between selection of water management and water conflicts, this study will not focus on the analysis of the nature, cause and consequences of these conflicts.

Furthermore, this study will deal with the implementation of PPPs and Government-communities partnerships in water management within the borders of specific states. Therefore, the study will not take into account models of PPPs and PuPs managing international water resources (as for example international water basins, rivers, etc…) common to different countries that have to agree on how to share them.

Water resources management at national level might sometimes include political decisions in terms of virtual water. Virtual water is the quantity of water used for the production of a specific good. Water scarcity situations can drive governments to the decision of avoiding the production of certain water intensive products (grain, rice, textile, etc…) and start to import them. The consideration of virtual water can highly affect water management strategies and policies. Nevertheless, this study will neither deal with this concept, nor with all those political decisions of water management related to it.

This study will also avoid facing in details the discussion between those who believe that water is and should be treated as an *economic good* and those who believe that water is a *fundamental human right*. The author considers that both positions can be rationally supported and the assumption of both of them might affect the selected regime of water management and its performance. Nevertheless, it is not the aim of this report investigating the pro and cons of each of the two definitions.

This study pretends to avoid any extremist consideration based on ideological views of the role of the market and communities involvement in water management. Finally, it is not the main objective of this study to address in full details the economic performance and benefits of Public-private and Public-public partnerships and their financial sustenance and accountability, even if the author recognizes the high importance of these aspects for the correct functioning of every water management model. The focus of this study will be instead on the sustainability, efficiency and resource protection of the analyzed rural water service delivery systems.

1.2 Specific Objectives

The dissertation will start by defining its key concepts. In particular, the researcher will define the concepts of Sustainability, Sustainable development, Water management and Community participation. This dissertation will evaluate the water issues in rural areas of developing countries and the government responses in terms of water management efficiency.

First, the dissertation will analyze the concept of public-private partnership (PPP) as an alternative to water service government management. Therefore, it will evaluate the origin and the evolution of the concept and how it has been received by the government, intellectuals, civil society and the rural poor. This dissertation will analyze the view of PPPs supporters and opponents, including the opinion of international funding institutions and donors, NGOs and pro-poor organizations. The research will focus on the analysis of public-private partnerships in two different selected case studies -Rwanda and Bolivia-, evaluating their performance in terms of efficiency, sustainability and costs of the water services delivery.

Secondly, this dissertation will analyze the concept of public-public partnership (PuP) as an alternative to public-private partnerships and government management of water services. Therefore, it will evaluate the origin and the evolution of the concept and how it has been received by the government, intellectuals, society, local authorities and communities and the rural poor. This dissertation will analyze the view of PuPs supporters and opponents, including the opinion of international funding institutions and donors, NGOs, local communities and pro-poor

organizations. The research will focus on the analysis of public-public partnerships in two different selected case studies –Ghana and India-, evaluating their performance in terms of efficiency, sustainability and costs of the water services delivery.

Finally, this dissertation will try to draw an analysis of government-community partnerships, evaluating their strengths and weaknesses. The research will analyze in detail the environmental and financial sustainability of government-communities partnerships. Therefore, the dissertation will draw some policy recommendation that would contribute to a more efficient and sustainable cooperation among public sectors organizations, in order to guarantee a service delivery approach to rural water supply, moving towards the delivery of a reliable, resource-efficient and indefinite service.

1.3 Research questions

Those reported below are the key questions the dissertation will try to answer:

1) Which are the factors that obstacles the provision of a sustainable water service to rural areas?
2) Are water management PPPs working in rural contexts?
3) Do PPPs implement a resource-efficient and sustainable management of water?
4) Are PPPs cost effective?
5) Are water management PuPs working in rural contexts?
6) Do PuPs implement a more resource-efficient and sustainable water management than PPPs?
7) Are PPPs cost effective?
8) How can Pups be improved?
9) How can PUPs resolve some of the financing challenges of public utilities?
10) How can we support the adoption of a more efficient and sustainable service delivery approach to rural water supply?

1.4 Dissertation hypothesis

1) There is not a pre-defined default option applicable to all cases of water resources management. The appropriate water service delivery solution should be evaluated and decided on a case by case basis.
2) Public-public partnerships (PuPs) can represent a sustainable and effective alternative to public-private partnerships (PPPs) in the management of rural water and sanitation services.
3) PuPs have the potential to overcome the limits of pre-existing approaches in the provision and management of water and sanitation services in rural and peri-urban areas.

1.5 Water relevant terms

Community participation and management:

The United Nations has defined community participation as 'an active contribution by people to development and involvement of people in decision making at all levels of society' (in Desai and Potter, 2002: 117).

According to the European Union (2010c: 29), 'community management of water services has been developed as a solution in the most disadvantaged suburban areas. The populations in these areas form user associations, water committees, community assemblies or water cooperatives. The recipient population makes the investments, thereby compensating for the authorities' inability to provide the service'.

Drinking water supply:

'The provision and storage of potable water, or the amount of potable water stored, for the use of a municipality, or other potable water user'. (EEA Glossary 2015).

Environmental impact:

Any alteration of environmental conditions or creation of a new set of environmental conditions, adverse or beneficial, caused or induced by the action or set of actions under consideration. (European Water Partnership, 2013: 2).

Environmental performance:

'The relationship between the production site and the environment; it includes: the environmental effects of resources consumed, the environmental impacts of the production process, the environmental implications of its products and services, the recovery and processing of products and meeting the environmental requirements of law'. (European Water Partnership, 2013: 2).

Integrated water resources management:

'Integrated water resources management (IWRM) expresses the idea that water resources should be managed in a holistic way, coordinating and integrating all aspects and functions of water extraction, water control and water-related service delivery so as to bring sustainable and equitable benefit to all those dependent on the resource' (European Commission, 1998:215).

Participation:

'Participation must be organized in such a way that it leads to popular involvement in decision-making, not simply in making voluntary contributions of time, effort or payment' (European Commission, 1998:217).

Sustainability:

Sustainability, as well as historic debt, is a concept with many dimensions, among which environmental, economic, human and social. Goodland

(2002: 2) defines *economic sustainability* as the 'maintenance of the capital'.

According to Goodland (2002: 2), *environmental sustainability* can be defined as the protection of the natural capital, meaning 'water, land, air, minerals and ecosystem services', by 'ensuring that sink capacities recycling human wastes are not exceeded, in order to prevent harm to humans'.

Goodland (2002: 1) defines the *human sustainability* as the maintenance of human capital, including 'health, education, skills, knowledge, leadership and access to services'.

The concept of sustainability, in its social dimension, reflects people's quality of life, including issues as cultural identity, poverty, human rights, equal opportunities, political representation, and opportunities for education. According to Goodland (2002: 2), *social sustainability* includes, among the other things, 'cohesion of community, reciprocity, tolerance, compassion, (…) commonly accepted standards of honesty, discipline, ethics and common shared rules and laws'.

Sustainable development:

Pearce and Turner define the concept of sustainable development as an approach aiming to maximise 'the net benefits of economic development, subject to maintaining the services and quality of natural resources over time' (Pearce and Turner, 1990: 24). This concept 'implies that total biological assets are not reduced, in the long term, through use' (Ghai, 1994: 70).

Virtual Water:

'Virtual water is the water 'embodied' in a product, not in real sense, but in virtual sense. It refers to the water needed for the production of the product. Virtual water has also been called 'embedded water' or 'exogenous water', the latter referring to the fact that import of virtual water into a country means using water that is exogenous to the importing country' (Hoekstra, 2003).

Water Consumption:

'Water abstracted which is no longer available for use because it has evaporated, transpired, been incorporated into products and crops, consumed by man or livestock, ejected directly into sea, or otherwise removed from freshwater resources. Water losses during transport of water between the points or points of abstractions and point or points of use are excluded' (Eurostat/OECD Joint Questionnaire on Environmental Statistics).

Water Demand:

'Water demand is defined as the volume of water requested by users to satisfy their needs. In a simplified way it is often considered equal to water abstraction, although conceptually the two terms do not have the same meaning'. (EEA. 1999. Environment in the European Union at the turn of the century. Page 159. Environmental assessment report No 2).

Water demand management:

‘Water demand management refers to the implementation of policies or measures which serve to control or influence the amount of water used’. (UKWIR/EA. 1996. Economics of demand management - Main report and practical guidelines. UK Water Industry Research Limited. London. Quoted by: EEA. 2001. Sustainable water use in Europe: Part 2. Copenhagen).

Water Distribution System:

‘The system of pipes supplying water to communities and industries’. (EEA Glossary 2015).

Water Exploitation Index:

‘Annual total abstraction of fresh water divided by the long-term average freshwater resources’. (EEA Glossary 2015).

Water Governance:

‘The Global Water Partnership (GWP) defines water governance as the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society’ (EEA, 2014:31).

Has several dimensions, including:

a) Creating a fair legal, policy and regulatory framework in which the rights of people to access resources are secured.

b) Improving the effectiveness, accountability and transparency of government agencies.
c) Ensuring the participation of the poor in decision making.
d) Enhancing the role of civil society
e) Ensuring basic security and political freedoms and others.

(European Water Partnership, 2013: 3).

Water management:

'Water management is the intervention of humans in the manner in which surface and/or ground water is captured, conveyed, utilised and drained in a certain area; it is a process of social interaction between stakeholders, each employing different methods, resources and strategies, around the issue of water control' (Wester and Bron).

In the view of the author, water management does not only include the construction and maintenance of appropriate water infrastructures (depurators, pipelines, etc…). Water management includes a series of other managerial approaches and tough political decisions. For this reason, the role of public authorities is considered fundamental in all the partnerships managing water and that it is not possible to leave water management just to the private sector. Water management, therefore, could include approaches and decisions like water recycling, desalination, the use of grey water for agriculture, water pricing, etc…

Water Pricing

'Applying a monetary rate or value at which water can be bought or sold'. (EEA Glossary 2015).

Water quality:

'Physical, chemical, biological and organoleptic (taste-related) properties of water'. (United Nations. Glossary of environment statistics).

Water recycling:

The act of processing used water/wastewater through another cycle before discharge to final treatment and/or discharge to the environment. In general, there are three types of water recycling/reuse:

a) wastewater recycled back in the same process or higher use of recycled water in the process cycle.

b) wastewater recycled/reused in a different process, but within the same facility.

c) wastewater reused at another of the reporting organization's facilities.

It is also referred as water reuse (European Water Partnership, 2013: 8).

Water resources:

'Distinction is made between renewable and non-renewable water resources. Non-renewable water resources are not replenished at all or for a very long time by nature. This includes the so-called fossil waters. Renewable water resources are rechargeable due to the hydrological cycle unless they are overexploited, comprising groundwater aquifers and surface water like rivers and lakes. Internal renewable water resources comprise the average annual flow of rivers and groundwater generated

from endogenous precipitation'. (United Nations. Glossary of environment statistics).

Water scarcity:

'Occurs where there are insufficient water resources to satisfy long-term average requirements. It refers to long-term water imbalances, combining low water availability with a level of water demand exceeding the supply capacity of the natural system' (European Water Partnership, 2013: 8).

> 'Where water supplies are inadequate, two types of water scarcity can be identified that particularly affect developing countries:
>
> **Physical water scarcity** where water consumption exceeds 60% of the usable supply. This means that there is limited spare capacity, and so even with the highest feasible efficiency and productivity, water supply is not sufficient to meet the demand of agriculture, domestic and industrial sectors while satisfying environmental needs. Countries in this category include those in the Middle East. To help meet water needs some countries such as Saudi Arabia and Kuwait import much of their food and invest in desalinisation plants increase the cost of water to around twice the cost in the UK.
>
> **Economic water scarcity** where a country physically has sufficient water resources to meet

> its needs, but additional storage and transport facilities are required. This will mean embarking on large and expensive water-development projects. For many countries, specifically in sub-Saharan Africa, it will be difficult to mobilise the necessary financial and other resources to increase water supply to adequate levels' (Post, 2002).

Water Security:

'Water security is the availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems and production and the capacity to access it; coupled with an acceptable level of water-related risks to people and environments, and the capacity to manage those risks (ODI, ECDPM and GDI, 2012:47).

Water Stress:

'Water stress occurs when the demand for water exceeds the available amount during a certain period or when poor quality restricts its use. Water stress causes deterioration of fresh water resources in terms of quantity (aquifer over-exploitation, dry rivers, etc.) and quality (eutrophication, organic matter pollution, saline intrusion, etc.)'. (EEA. 1999. Environment in the European Union at the turn of the century. Page 155. Environmental assessment report No 2).

Water Supply:

'Water supply refers to the share of water abstraction which is supplied to users (excluding losses in storage, conveyance and distribution)'. (EEA. 1999. Environment in the European Union at the turn of the century. Page 159. Environmental assessment report No 2).

Water use:

'Three types of water use are distinguished: (a) withdrawal, where water is taken from a river, or surface or underground reservoir, and after use returned to a natural water body, e.g. water used for cooling in industrial processes. Such return flows are particularly important for downstream users in the case of water taken from rivers; (b) consumptive, which starts with withdrawal but in this case without any return, e.g. irrigation, steam escaping into the atmosphere, water contained in final products, i.e. it is no longer available directly for subsequent uses; (c) non-withdrawal, i.e. the in situ use of a water body for navigation (including the floating of logs by the lumber industry), fishing, recreation, effluent disposal and hydroelectric power generation'. (EEA Glossary 2015).

1.6 Justification

The reasons why I have chosen this topic as focus of my PhD are related to my personal interests, my studies and professional aspirations.

I believe I have always had a strong interest in all the aspect related to development issues and potential ways to deal with them. I take very seriously the belief that every person should have and be granted equal opportunities to be embraced or not according to the individual and personal will. I consider unacceptable the fact that different sections of the society, in different national or regional contexts, or entire counties are lost in ocean of poverty without hope. I believe it is unacceptable that millions of poor people have no access to opportunities equal to those that the so called "developed world" can enjoy. Poor people living in rural areas often represent the forgotten world, out of sight, out of the majority of development programmes of international funding authorities and development projects developed by local authorities and NGOs.

As the poorest populations, above all in rural areas, are the most highly dependent on the availability, use, sustainable management and conservation of natural resources, I think that all the strategies coping with poverty have to take into account the sustainable management of environmental resources. In this context, water is the key. It is the perfect element of conjunction among environmental management, poverty reduction and sustainable development. Water is essential for human survival and the whole life system of the Earth and is central to the entire range of human activities. As reported in the Resolution of the Council of the European Union of 17 May 2002 (in European Union, 2008), 'water is a

primary human need and water supply and sanitation are basic social services. It is a fundamental economic and environmental resource, and is thus a key issue for poverty reduction and sustainable development'. Water is one of the most precious environmental and economic resources, and, for this reason, it represents a strategic element for sustainable development and environmental management.

About my studies, both my degree and Master of Art have been highly focused on development and environmental policies, projects and initiatives for international cooperation, in particular in Africa, Latin America and South East Asia. In these immense regions, the rural poor represent a reality of millions of people, and development and international cooperation and environmental issues are strictly related. Access to water, the protection of this precious resource and its sustainable management are essentials for improving the living conditions of the rural poor. The implementation of sustainable water management systems will contribute to achieve the Millennium Development Goals and in particular to 'halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation' (European Union, 2008).

About my professional aspirations, they are clearly directed towards the implementation of development projects and initiatives in favour of poor people in developing countries. In particular, my aspiration is to build a career in the fields of environment and international development, with a focus on water resources issues in developing countries.

1.7 Limitation of the study

One of the limitations of this research is that the findings presented are based on the analysis of an extensive literature review but only on the examination of a limited number of case studies of public-private and public-public partnerships. The chosen case studies involve rural areas of 4 selected countries: Rwanda, Bolivia, Ghana and India. This selection is motivated by the necessity to focus and, at the same time, to deep into the analysis of the water management models implemented in each case and all its related environmental, social and economic dimensions and consequences. A more extensive analysis of public-private and public-public partnerships should be undertaken and a comparison among management models implemented in rural and urban areas would be desirable to establish the generalisability of these findings.

Another limitation of the study is caused by the characteristics of literature on PPPs and the relatively limited number of direct and literature sources found on PuPs case studies. In fact, many studies have been written about the Water management systems in developing countries and public-private partnerships experiences in the management of water services, mainly in urban areas. Nevertheless, according to Burnett (2007: 2), 'much of what is available both in books and on the conference and seminar circuit is written by those with either a commercial interest in promoting PPP because they wish to be engaged in it as suppliers or as professional advisers or those who are ideologically opposed to its use'. Moreover, a much smaller number of documents and publications have been focused on the Public-public partnerships experiences – and all its related environmental, social and economic dimensions and consequences – in the management of water services in rural and peri-urban areas of developing

countries. In particular, the author has found just one report where a comparative study –similar to the one performed in this dissertation- has been performed. It is the paper '*A Comparative Evaluation of Public-Private and Public-Public Partnerships for Urban Water Delivery in ACP Countries*' of the Policy Department of the Directorate-General for External Policies of the Union – European Parliament (2010). There are three main differences between this present paper and the one published by the European Parliament: the first is the scope of the study –the present paper embrace all developing countries while the European Parliament study focus only on ACP countries; the second difference is that the present study deals mainly with rural water supply while the European Parliament study focus on urban water supply; the third difference is given by the fact that the present study will focus on a specific kind of PuPs, the partnerships between public authorities and communities, where the responsibility for service provision is progressively transferred from national governments to local people. This choice is motivated by the growing importance given to the participation of local people in the development of initiatives directly or indirectly affecting their condition of life.

Finally, this study recognizes its thorough debt towards the extraordinary research of PSIRU (Public Services International Research Unit), whose updated work has been extremely valuable for this dissertation.

1.8 Research Methodology

This study aims to assess different partnership approaches in water service delivery. The adopted approach is interdisciplinary and broad, addressing issues of strategy, management and stakeholder's participation.
The research and methodological framework will adopt a fixed design and will combine both quantitative and qualitative approaches. A fixed design is motivated by a series of predefined hypotheses about the potentialities of the Public-public partnerships in the management of water resources. Finally, the researcher will analyse numeric data and estimations, for example concerning the water pricing and the economic performance of the examined management models, but also qualitative data, for example concerning the effects of these models on rural poor quality of life.

This dissertation is library based. It is mainly based on secondary sources and has relied on a number of different documents. Referencing is in the Harvard Style. The data will be used to build up this dissertation will come mainly from two different sources: literature reviews and analysis– comparison among case studies.

The research will start with the collection and thorough analysis of literature review of published and unpublished research - produced by the international and local organizations – national and international governmental agencies, associations, NGOs, the European Union, the Organisation for Economic Co-operation and Development, the United Nations Development Programme and other researchers - on the short- and long-term outcomes of the analyzed water service delivery solutions and the potential measures to compensate them. The collected documents

could be very helpful in providing significant economic, ecologic and social estimations of the consequences of the described partnerships on the water resources conservation and sustainability. The purpose of this Literature Review is to provide a comprehensive review of current and past literature published on a topic.

The dissertation will also provide examples of several case studies for an in-depth examination of PPPs and PuPs. The analysis and comparison among the considered case studies will be based on the survey of environmental impact assessment studies, cost-benefit analysis, academic journals, conference proceedings, review papers, project implementation reports and other publications. This study is not intended to be highly rich in number of reported case studies, but to offer a comparative perspective that helps to critically review strength and weak points of PPPs and PuPs and be a reference point in the analysis for the community involvement in water management.

Chapter 2

State of the art and progress beyond it

2.1 Water resource situation at world scale

Water represents a key element for human life: it is 'essential for satisfying human needs, protecting health, and ensuring food production, energy and the restoration of ecosystems, as well as for social and economic development and for sustainable development' (UNEP, 2005).

The water crisis issue can be analysed under several perspectives. This section concerns the global dimension of this crisis rather than its impact on developing countries. The section shows how water is a finite resource even being a renewable one and it tries to delineate the interaction of factors that concur to cause this problem. In describing some of the possible strategies to cope with such crisis, I underline the ambiguity of certain solution in terms of effectiveness.

As indicated by the UNEP (2002), 'the total volume of water on Earth is about 1.400 million km^3 of which only 2.5%, or about 35 million km^3, is freshwater. Most freshwater occurs in the form of permanent ice or snow, locked up in Antarctica and Greenland, or in deep groundwater aquifers. The principal sources of water for human use are lakes, rivers, soil moisture and relatively shallow groundwater basins. The usable portion of these sources is only about 200.000 km^3 of water - less than 1% of all freshwater and only 0,01% of all water on Earth'.

Water resources are renewable at a rate of 40.000 km³ per year, mainly through rainfalls (Cosgrove and Rijsberman, 2000: 10). The world is using approximately 10% of its renewable water. Even if this quantity seems a small percentage, it must be considered that 'not all renewable water resources are usable' (Cosgrove and Rijsberman, 2000: 6-7). Water resources are, actually, unequally distributed in the world, both in terms of space and time. A considerable amount of the world water resources is located in areas where the need is lower. On the other hand, the percentage of renewable water, used for human purposes, rise up to 90% in more arid countries, poorer in water (Cosgrove and Rijsberman, 2000: 7).

The WHO and UNICEF (2000) have estimated that about 1.1 billion people in the world lack drinking water and about 2.4 billion people have no access to adequate sanitation. According to the WHO (Cosgrove and Rijsberman, 2000) millions of people die every year from water related diseases.

The UNFPA estimates that the world population is growing at a rate of 77 million per year and 'the global consumption of water is doubling every twenty years' (UNFPA, 2003). 'Under current trends, two-thirds of the world's population may be subject to moderate to high water stress in 2025' (UNFPA, 2003).

The agricultural sector, in particular irrigation, uses about 70% of the total amount of water used for human purposes. Industry uses approximately 20% and the remaining 10% is destined to municipal supplies (Cosgrove and Rijsberman, 2000: 7). 'The rate of expansion of irrigated land is the most important determinant of water stress' (Cosgrove and Rijsberman, 2000: 27). The FAO and other international organizations foresee that, by 2025, the harvested area will increase by 30% to support the need of food of the increased population (Cosgrove and Rijsberman, 2000: 27). Consequently, as indicated by the UNFPA (2003), by 2025 'it is expected

that the world will need 17% more water to grow food for the increasing populations in developing countries, and that total water use will increase by some 40%'.

Groundwater resources are heavily used for irrigation purposes. In several countries the groundwater levels are decreasing because the withdrawal, mainly for irrigation, is faster than the rate of recharge (UNEP, 2002). In some populous areas, 'groundwater levels are declining at rates that range from 1 to 3 meters per year' (Moench in Gleick, 2004: 79). With the growth of the population, this situation is destined to get worse. Furthermore, according to Cosgrove and Rijsberman (2000: 25), between 2000 and 2025 the global average annual per capita availability of renewable water resources is predicted to lower from 6.600 m^3 to 4.800 m^3. Finally, it is estimated that 'in 2025, if present rates of water consumption are maintained, five billion out of the world's 7.9 billion people will be living in areas where it will be difficult or even impossible to meet basic water requirements for drinking, cooking and sanitation' (UNFPA, 2003).

Water consumption can vary significantly depending on the irrigation system which is used. The remaining water mainly goes to feed groundwater basins but it 'is often contaminated with nutrients, sediments and chemical contaminants (pesticides, herbicides) that can damage the ecosystem' (Cosgrove and Rijsberman, 2000: 8). 'In many places, pollution is rapidly diminishing the usable supply. Each litre of polluted wastewater contaminates many additional litres in the water body that receives it' (Postel, 1992: 21). As observed by the UNFPA (2003), 'in many localities, particularly in coastal areas, unregulated use of groundwater supplies has resulted in a falling water table that becomes progressively more contaminated by seawater or other pollutants'.

Water, is often required as a raw material in many industrial processes. It is probably the most widely used raw material in the process industries and it has been used in abundant quantities by chemical, petrochemical,

petroleum refining, food and drink, pulp and paper and many other industries. In some cases it may be a direct raw material, bound to the manufactured product. In other cases, water is an indirect raw material, used in the industrial process (washing and cooling, raising steam for energy, etc.). In the latter case, the wastewater may be returned to the local water system through the sewerage system or directly to watercourses. Although industry requires water of good quality for manufacturing, the water it discharges may not meet the same quality standards. At best, this represents a burden on treatment plants responsible for restoring water quality to appropriate standards and suitable for recycling. At worst, industrial wastewater is discharged without treatment to open watercourses reducing the quality of larger water volumes and, in some cases, infiltrating aquifers and contaminating important groundwater resources. This endangers downstream communities that rely on those resources for their primary water supply users.

Traditionally, industrial water management practices have been designed to meet the demands of the owners with little attention paid to the post-use discard of water resources. The general trend has been to have wastewater pumped away from the demand setting with little regard for its use as potential resource; wastewater is often seen as a heavy burden to industries and the natural environment.

Nevertheless the pollution deriving from industrial and agricultural activities does not affect only groundwater. According to the World Commission on Water (UNEP, 2002), 'more than half of the world's major rivers are seriously depleted and polluted, degrading and poisoning the surrounding ecosystems, threatening the health and livelihood of people who depend on them'.

The terrestrial ecosystems play an important role in the water cycle (Cosgrove and Rijsberman, 2000: 15). Several factors - including deforestation, change of land use, urbanization - contribute to deteriorate the land, affecting in this way the water resources. In fact, 'with reduced vegetative cover and soils less able to absorb and hold water, degraded land increase flash runoff and decreases seepage into the soil and aquifer recharge. As result, less soil moisture and groundwater are available to draw upon during the dry season, and during the rainy season the rapid runoff intensifies flooding and soil erosion' (Postel, 1992: 35-36)

The solutions proposed to face the global water crisis can be divided in two categories: 1) strategies in favour of a reduction of water demand; 2) strategies in favour of an increase of water supply.

The strategies in favour of the reduction of water demand focus on the increasing of water productivity. According to the IWMI (2000), 'there is a direct relation between increase in water productivity and the need for future water developments. The more productive agriculture becomes, the less the need for water resources development'.

The IWMI (2000) believes that increases in productivity of water can be achieved 'by introducing shorter-duration and higher-yielding crop varieties', supported by fertilizers.

This approach, nevertheless, should be supported by a wide range of strategies, so far scarcely considered, which aim to reduce the water demand enhancing the productivity.

The adoption of alternative methods of irrigation, as the drip irrigation, defined by the IWMI as forms of 'precision irrigation', would afford to enhance the production up to 70% compared to ordinary irrigation (IWMI, 2000). The collateral adoption of small scale alternatives – mainly 'rainwater harvesting methods' and 'moisture-conserving land techniques'

– could further improve the results in terms of yields/water consumption (Postel, 1992: 115).

The recycling of fresh water, including the reuse of treated wastewater, and a better allocation of various qualities of water to different usages could alleviate the pressure on the development of new freshwater sources (Postel, 1992: 127).

An economical strategy, destined to reduce the water demand, appears controversial in its application because based on the idea of water as an economic good rather than a human right: pricing water 'at full cost for all users', which means 'all costs related to operation and maintenance and investment costs for at least domestic and industrial users' (Cosgrove and Rijsberman, 2000: 41). This approach has opened to private companies which 'are taking over the management, operation and sometimes even the ownership of previously public systems (Palaniappan et al. in Gleick, 2004: 45). In some countries, like Bolivia and Ghana, the privatization of water services has resulted in rising prices, leaving the poorest families without access to water.

To avoid the risks of this strategy, it is important to guarantee the satisfaction of basic needs for users who cannot afford to pay. The government should keep the main responsibility of water and water service provision, so that it can ensure a good equilibrium among private interests, water demand's reduction and respect of human rights (Palaniappan et al. in Gleick, 2004: 46-53).

The strategies in favour of the increase of water supply mainly focus on developing technologies' contribute, which can affect also the water demand through the selection of 'salt-tolerant' and 'drought-resistant' crops (Postel, 1992: 58).

Sea water desalination appears to represent one of the possible solutions to face water scarcity problems, but it has still not acquired the due relevance because of the economic costs. As the WWC (2000: 17) claims,

'in recent years, the cost of desalination has declined sharply, driven by technological advances and declining energy prices and better management. All indications are that this technology will play a major role in providing water to coastal cities and industries, but it is unlikely that it will be cheap enough to provide water for the cultivation of most food crops'.

In terms of technology, the construction of dams has been seen as a response to water scarcity problems and therefore amply pursued in the last decades. The result of this kind of strategy has been controversial because of significant damages to the environment and scarce attention to resettlement measures. According to the World Commission on Dams (Shiva, 2002: 67), '40 to 80 million people have been displaced by dam projects. The commission concludes that too often an unacceptable and unnecessary price has been paid to secure those benefits, especially in social and environmental terms, by people displaced, by communities downstream, by taxpayers, and by the natural environment'. Therefore, the reduction of large scale dam projects might be advantageous.

As the WWC states (2000: 16), 'dam construction may continue to play an important role in some developing countries, but only if there is much greater attention to options assessment, social and environmental impacts, and the participatory decision-making processes'.

Finally, far less considered among the strategies aiming to increase water supply, the fight against pollution and land degradation can be as precious as the new technologies. Williams observes (1989: 91), in fact, that 'in many instances, it would be more cost-effective to protect a vegetated watershed than construct additional reservoir storage'.

The consciousness of the complexity of the water crisis has produced a wide support in favour of the adoption of an Integrated Water Resources Management approach (IWRM). The validity of this approach derives from the fact that it is focused on the inclusion of all possible dimensions –

cultural, economic, environmental and institutional - affecting water resources management. As Calder states (1999: 151), 'IWRM involves the coordinated planning and management of land, water and other environmental resources for their equitable, efficient and sustainable use'.

The importance of this approach appears to be even more meaningful in the context of trans-boundary river basin management. As the WWC sustains (2000: 31), 'with 50% of the earth's land surface made up of trans-boundary basins and 70% of the total surface oceans, the majority of the world's water resources must be managed internationally as trans-boundary ecosystems'.

There is not a unique solution to cope with the impending water crisis: the necessity to satisfy a wide range of human and environmental needs requires the flexibility of adopting a different mixture of old and new strategies on a case by case basis.

A holistic approach, based on the integration of global and local levels of action, a national and international cooperation among economic sectors and actors involved, needs to be supported. The IWRM approach seems to go in this direction.

2.2 Water and Climate Change

In the assessment of the water resources status, it is necessary to consider the impact of global climate change. Climate change is recognised as one of the greatest environmental and economic challenges facing humanity. Climate change can be defined like the alteration of the atmosphere's chemical composition, which produce relevant effects in term of temperature and precipitation variability. In particular the overall effect is a global warming of the earth's climate. Most of the warming over the last 50 years is attributed to human activities. Global warming is expected to take place as a result of increasing amounts of greenhouse gases emissions that affect the absorption and emission of radiation in the atmosphere (UNFCCC, 2003).

The impacts of climate change are still unpredictable with a certain degree of accuracy. Climate models are still unable to make precise regional predictions. This suggests to be prudent in assessing the changes that can be foreseen and in planning the countries capacity of both facing and adapting to the new environmental conditions. Nevertheless, some types of changes can be foreseen with relatively high confidence.

Climate warming will cause hydrologic changes that will affect freshwater resources. Scientists have estimated that the increase of the world temperature will affect the precipitation and runoff regimes, which could have severe influences on the aquifers recharge and watershed erosion rates (Williams, 1989: 84-85). As a result, precipitation will probably increase in some areas and decline in others. Precipitation is the main driver of variability in the water balance over space and time, and changes in precipitation have very important implications for hydrology and water resources. So changing precipitation patterns will affect how much water can be captured**.** These combined effects could, in turn, influence the

floods and droughts frequency, the water quality and, above all in arid and semi-arid areas, increase the water demand for irrigation (Williams, 1989: 84-88). Under the future climate change scenario, runoff generally increases in high latitudes and the equatorial region, and decreases in middle latitudes. Some parts of the world, most notably South East Asia, annual runoff is projected to increase substantially. In other populous regions, however, such as southern Africa, large parts of the Indian subcontinent, northern South America, central America and Europe, experience substantial reductions in runoff and hence water resources (UNFCCC, 2003).

One of the most serious negative impact of climate change on water resources in arid and semi-arid regions is the variation in the frequency and intensity of droughts. Arid and semi-arid regions will be particularly sensitive to reduced rainfall and to increased evaporation and plant transpiration. Changes in seasonal patterns may affect the regional distribution of both ground and surface water supplies. Changes at the surface would influence the recharging of groundwater supplies and, in the longer term, aquifers (McMichael *et al*, 2003).

A reduction in water availability could lead to desertification in zones where the balance is particularly fragile. In fact, variations in runoff, groundwater flows, evaporation and precipitation would affect nutrients and dissolved organic oxygen, and therefore the quality and clarity of the water. Changes in water temperatures and in the thermal structure of fresh waters could affect the survival and growth of certain organisms, and the diversity and productivity of ecosystems. At the same time, vegetation cover, type, and properties play a very important role in evaporation. Interception of precipitation is very much influenced by vegetation type: different vegetation types produce different amounts of evaporation. A change in vegetation, directly or indirectly as a result of climate change, therefore may affect the water balance (UNFCCC, 2003).

In many developing countries, climate change will increase stresses. North Africa, southern Africa, the Middle East, the Indian subcontinent, Central America and large parts of Europe will be adversely affected by climate change by the 2020s. By the 2050s, some more countries in southern Africa will move into the stressed class due to climate change. An increasing proportion of the world's population will live in countries with extreme water stress (McMichael *et al*, 2003).

Therefore, climate change will present challenges to water utilities, and planning now could prevent freshwater crises in upcoming years. The regions that are actually stressed in water and do not manage the water resources in a sustainable way are expected to be more vulnerable to the climate change effects. Water resource managers should assume climate change makes worse the current pressures in water management. Climate change is one of the factors that necessarily must be considered by water supply institutions and companies in assessing their future resource availability. Planning and improving water resource management can help to reduce future vulnerabilities (IPCC, 2001). 'The most recent reports by the Intergovernmental Panel on Climate change (IPCC) conclude that "water and its availability and quality will be the main pressures on societies and the environment under climate change"' (in European Commission, 2010b:6). The effects of climate change on water resources will exacerbate the existing implications of water shortages on human health as follows:

- *Water-borne diseases*: result from the contamination of water by human/animal faeces, or by urine infected with pathogenic viruses/ bacteria, both of which are more likely to occur during periods of flood and therefore intensify with the projected increases in natural disasters under climate change. Diseases are transmitted directly when the water is drunk or used in food preparation.

- *Water-washed diseases:* those resulting from inadequate personal hygiene as a result of scarcity or inaccessibility of water (including many water-borne diseases and typhus).
- *Water-based diseases:* those caused by parasites that use intermediate hosts living in/ near water (e.g. guinea worm).
- *Water-related diseases:* borne by insect vectors having habitats in/near water (such as malaria).
- *Water-dispersed diseases:* infections where the agents proliferate in fresh water and enter in the human body through the respiratory tract (e.g. legionella).

Agricultural demand, particularly for irrigation water, is considerably sensitive to climate change. The water demand for irrigation is projected to rise in a warmer climate, bringing increased competition between agriculture, already the largest consumer of water resources in semi-arid regions, and urban as well as industrial users. Increased evaporation from the soil and accelerated transpiration in the plants themselves will cause moisture stress. The occurrence of moisture stress during flowering, pollination, and grain-filling is harmful to most crops and particularly so to corn, soybeans, and wheat (McMichael *et al*, 2003). The increasing water scarcity and demand, together with the resulting increase in the energy needed to pump water, will make the practice of irrigation more expensive, particularly when with drier conditions more water will be required per acre. Peak irrigation demands are also predicted to rise due to more severe heat waves. Finally, intensified evaporation will increase the hazard of salt accumulation in the soil. New water structures, like pumps, small artificial basins, deeper wells and so on, will be needed to develop irrigation networks (UNFCCC, 2003).

The potential impacts of climate changes on water resource availability depend both on environmental features and social characteristics that could affect the water resources management. There are many social characteristics that could increase the climate change impact. These features refer to: 1) poverty which prevent long-term planning in water management and the control and maintenance procedures development of existing water infrastructures; 2) the high population growth and densities that could produce an increasing water demand; 3) Institutional commitment in the water resources management (McMichael *et al*, 2003).
From an environmental point of view, the most vulnerable regions are arid and semi-arid areas, some low-lying coasts, deltas, and small islands, because of their environmental features. Nevertheless these areas are often poor or developing countries. As result of the climate change, the water resources situation in many developing countries will become worse, particularly during drought years, and this could represent a serious limit to their development opportunities.

In conclusion, the links among climate change, water availability, food production, population growth, and economic growth are many and complex. Thus, it is clear that implementing adaptation measures such as water conservation and applying appropriate management practices and technologies on water supply systems, providing access to sufficient quantities of safe water for both human consumption and productive purposes, providing facilities for a sanitary disposal of excreta, applying suitable solid waste management systems and introducing sound hygiene behaviours is of capital importance to reduce vulnerability to water diseases and to protect water resources for the sustainable development of poor communities. In order to prevent the climate change dangerous effects on water resources, in many developing countries, it will be necessary to develop an integrated approach for tackling all the factors of

social vulnerability, together with an integrated water resources management.

2.3 Water resource situation in Europe

Europe is not one of the areas most affected by water scarcity. Nevertheless, pressure on clean water supplies in Europe is constantly increasing (European Union, 2011a).

> 'Europe is not an arid continent, but water supplies are now a concern for almost half of the EU population. Europe's geography and climate mean that water distribution is uneven in the EU, a situation made worse by human activity. In southern Europe, for instance, tourist development has increased demand for water, resulting in desertification and salt-water intrusion to aquifers located in some coastal freshwater zones. Water scarcity is most acute in the south, but by no means limited to these areas: most Member States have suffered episodes of drought since 1976, and many now report frequent water scarcity problems and over-exploited aquifers' (European Union, 2010b).

Therefore, water scarcity is becoming a growing problem in Europe, while freshwater withdrawal is destined to increase every year.

> 'Water scarcity is an increasingly frequent and worrying phenomenon that affects at least 11% of the European population and 17% of EU territory. Since 1980, the number of droughts in Europe has increased, and they have become more severe, costing an estimated €100 billion

> over the past 30 years. One of the worst droughts occurred in 2003, when one-third of EU territory and over 100 million people were affected. Between 1976 and 2006, the number of people and areas hit by drought rose by almost 20%, and the yearly average cost has quadrupled. Demand for water continues to rise across Europe, putting a strain on our resources. It is estimated that some 20-40% of Europe's available water is being wasted (leakages in the supply system, no water saving technologies installed, too much unnecessary irrigation, dripping taps etc.). In a 'business as usual' scenario, water consumption by the public, industry and agriculture would increase by 16% by 2030. Climate change will add to the problems of water scarcity and droughts' (European Union, 2010b).

'Across Europe, 45 % of total water abstraction in the region is used for agriculture, 40 % for industry and energy generation (cooling in power plants), and 15 % for public water supply. However, this masks considerable regional differences. In some Mediterranean countries, the public water supply accounts for a higher than average proportion, (…), with seasonal demands varying considerably to cope with the inflow of tourists in summer' (European Environment Agency, 2007: 93). According to the European Environmental Agency, from the total water consumption in Europe, industrial freshwater demand is 10% (excluding cooling water) and 32% goes for cooling water, power generation and hydropower.

Industrial use of water amounts to 25.400 million m3 per year in the EU and varies greatly between countries and industries.

Water is one of the most comprehensively regulated area of EU environmental legislation. The EU Framework Directive on Water resources (2000/60/EC) introduces a new water management approach labelled the "integrated management of water resources". This directive establishes a framework for European Community (EC) action in the field of water policy in order to guarantee the prevention and reduction of pollution, facilitate the sustainable use of water, or improve the conditions of the water ecosystems. In the European countries, there is a variety of laws and institutions related to water, different kind of projects and even planning implementation capacity is not uniform. For this reason, the EU directive aims to harmonize these different European approaches to water resources management, and to promote the cooperation between countries in the management of their trans-boundary common water systems. Under this approach, all participating states would have to develop effective and sustainable cooperation agreements that guarantee the coordination of decisions and measures regarding the quality and the amount of the water resources and their relative socio-economic and political relationships (European Union, 2010a).

2.4 Water resources in the context of developing countries

The Millennium Development Goals have set the objective of halving the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015 and 'to stop the unsustainable exploitation of water resources, by developing water management strategies at the regional, national and local levels, which promote both equitable access and adequate supply' (POST, 2002). Even if the global community is close to meet the target of halving the proportion of people without sustainable access to safe drinking water, many developing countries, including African and Latin American countries, are still far from reaching these results (European Commission, 2013:25).

> 'Daily consumption of a person in a developing country without access to running water is typically around 20 litres, while a person with access to piped water may use in excess of 200 litres per day. Included in this high figure is pipe leakage, which may reach 50% in some cities. Conversely, it is not uncommon for women and girls in rural Africa to spend three hours per day fetching water from distant water holes and rivers' (European Union, 2003:4).

According to the World Health Organization and UNICEF (2006), around 1.1 billion people globally do not have access to improved water supply sources. About 2 million people die every year due to waterborne and water related diseases: 'every year, unsafe water, coupled with a lack of basic sanitation, kills at least 1.6 million children under the age of five years, – more than eight times the number of people who died in the Asian

tsunami of 2004'. The consumption of contaminated water causes severe gastrointestinal illnesses such as cholera, thyphoidal fever, dysentery, schistosomiasis, diarrhoea, hepatitis, etc. 'Throughout much of the developing world freshwater supply comes in the form of seasonal rains, such as the monsoons in Asia. Such rains often run off too quickly for efficient use. (…) Because of the seasonal nature of the water supply (without storage), many developing countries can use no more than 20% of their potentially available freshwater resources' (Post, 2002).

'If current trends persisted, by 2025 the demand for freshwater is expected to rise by 56% - more than is currently available' (European Union, 2003:4).

The rural inhabitants of developing countries, who are normally living in conditions of extreme poverty and deprivation, are the most affected by the lack or unsafe water. '84% of the population without access to an improved source of drinking water lives in rural areas. Although 73% of rural dwellers have access to an improved source of drinking water, only 30% have access to piped water in the home. If the current trend persists, nearly 1.7 billion rural dwellers will still not have access to improved sanitation by 2015'. 'Based on assumptions of population growth, projections of development and climate change, the Stockholm Environment Institute has estimated that the proportion of the world's population living in countries with significant water stress will increase from approximately 34% in 1994 to 63% in 2025, including large areas of Africa, Asia, and Latin America. This will impact their lives and livelihood' (Post, 2002).

Water scarcity and unsustainable water management in developing countries have several other serious repercussions. Women and children are forced to spend large parts of their day searching and collecting water; 'poor farmers and wage earners are less productive due to illness, health systems are overwhelmed, national economies suffer and community environments and natural ecosystems are further degraded due to the

pollution of soils and water reservoirs' (World Health Organization and UNICEF, 2006). 'More than 800 million people, 15% of the world population is malnourished, due in part to insufficient water for crops' (Post, 2002).

'Even though progress was made primarily in rural areas, those areas still remain at a disadvantage. Globally, eight out of 10 people who are without access to an improved drinking water source live in rural areas. 884 million people do not use an improved source of drinking-water (…). The number of people living in rural areas who do not use an improved source of drinking water is over five times the number living in urban areas' (UN Department of Public Information, 2010).

It is important to understand the differences between rural and urban provision of water supply and sanitation (Dangerfield, 1983: 239). Many of these differences depend on the peculiar characteristics of the rural poor and the areas where they live. As argued by Sharma *et al.* (1996: 6), 'in rural and peri-urban areas, the very poorest people often live where water is scarcest and most costly. Also, there are few incentives for utilities to extend services to the poor'.

> 'Because of social and economic disadvantages, the poor often live in fringe areas, where access to potable supplies and adequate sanitation facilities is limited and where higher mortality, morbidity, and disease rates prevail. Or they live in highly vulnerable areas (floodplains and degraded watersheds), where the buffering capacity to natural and human made shocks and disasters is diminished. Also, poor communities relying on flood recession agriculture, dry-season live-stock water supplies, or fishing are often left

> out when major upstream water allocation or urban/industrial development decisions are made without adequate consideration of downstream uses' (Hirji and Ibrekk, 2001: 2).

Rural population is often spatially scattered. Rural villages are usually very small and separated even kilometres from each other, with poor road connections and infrastructures. For these reasons, rural areas 'impose a more diffuse and dispersed load on the water resources of a region' and the costs have to be spread over a scarce population (Dangerfield, 1983: 240). This is confirmed by the OECD (in Dardenne, 2006: 6), which argues that 'compared to pure urban areas, peri-urban and rural clusters are obviously less attractive: lower population densities or anarchical urbanism increase investments and operational costs per capita'.

Furthermore, as argued by Dangerfield (1983: 240), in developing countries 'the perceived needs of the rural communities may be different from those seen as priorities in the urban situation'. Particularly in rural areas, water represents a key element as it is strategically linked to food production. It is, therefore, essential to rural households' survival and economic development. The need of abundant, numerous and widespread water sources represents a bigger concern than the provision of potable water for agricultural and pastoral communities (Dangerfield, 1983: 240).

Finally, as argued by the European Union:

> 'The lack of access to potable water and sanitation in developing countries is one of the principal causes of disease and death. It is also one of the principal factors in holding back education and economic development. Furthermore, potable water is a fragile

commodity and its vulnerability may also generate social and geopolitical conflicts. For example, in the Middle East, a region where water resources are inadequate or distributed unequally, access to water is crucial and constitutes a major geopolitical challenge. In other regions, particularly in Africa and Asia, access to water is complicated by large seasonal variations and periodic cycles due to droughts and floods which are more frequent than previously, due to the intensification of human activities. In fact, climate change today, which affects developing countries and more particularly the poorest populations within these countries, is adding to the water crisis' (European Union, 2008).

2.5 The rural and peri-urban areas of developing countries: targeting the rural poor

The rural poor represent the majority of the poor. According to the IFAD (2001: 2), more than half of the world's poor, over 70%, live in rural areas and depend on farming activities for their survival. This percentage is estimated to remain over 60% in 2025 (IFAD, 2001: 18). The IFAD defines the concept of rural through two dimensions. The first is the number of people, between 5,000 and 10,000, which identifies the rural-urban borderline (IFAD, 2001: 17). The rural people usually live 'separated by farmland, pasture, trees or scrubland' (IFAD, 2001: 17). The second dimension concerns the working activities of rural people that are mainly focused on farms (IFAD, 2001: 17).

There are many ways to define poverty, mainly depending on the dimensions and the measurements used to delineate this concept but also on cultural perceptions. 'Measurement of poverty can include material deprivation, isolation, alienation, dependence, and lack of participation or freedom of choice of assets, vulnerability and insecurity' (Malik, 1998). Poverty is 'operationally defined as the inability to attain a minimal standard of living' (Malik, 1998). Therefore, the problem is how to define and measure the standard of living. Most definitions tend to identify a concrete poverty line, measured in terms of consumption, income, calories' assumption or access to services such as education and health. 'Expenditures are found to be better measures of welfare than incomes especially at the lower ends of the income distribution because these reflect the household's ability to borrow to smooth consumption' (Malik, 1998). The poverty line allows to compare people, regions and countries, over time, and to evaluate the relative success or failure of specific development projects (IFAD, 2001: 19). According to Robert Chambers

(1995: 175) ‘poverty refers to lack of physical necessities, assets and income. It includes, but is more than, being income-poor’.

This study adopts a broader definition of poverty which includes dimensions of material deprivation such as income, food, clean water and other basic needs, but also non-material dimensions such as security, vulnerability and lack of decisional power over one’s own life (IFAD, 2001: 19).

People affected by rural poverty include smallholder farmers, wage labourers, landless workers, pastoralists and indigenous groups. In developing countries, the rural poor often live in ecologically fragile regions such as arid and semi-arid areas, steep lands, marginal and degraded areas and tropical forests. They are frequently remote and less densely populated areas, which are sometimes characterised by low agricultural potential, barriers to technological innovations and an inhospitable climate. The access to land appears strategic for the rural poor: the condition of landlessness is often related not only to poverty, but also to high level of vulnerability (IFAD, 2001: 26). However, the rural poor appear to have low access to ‘good quality land’ and to other productive assets (IFAD, 2001: 23). ‘Land size is often too small to ensure the nutritional well-being of the household’ (IFAD, 2001: 23).

The seasonal fluctuation in agricultural production and the climate, through periods of droughts and floods, can represent a serious source of risks for the rural poor. They can, in fact, affect farmers’ food security and the employment’s opportunities, above all for wage-workers. Furthermore, further risks can derive from ‘unexpected shocks such as crop failure, illness, funeral expenses or loss of an asset such as livestock through theft or death, or a natural disaster such as a cyclone’ (Montgomery in Johnson and Rogaly, 1997: 10).

Pearce and Turner (1990: 343) argue that 'developing countries, especially poor ones, have a more immediate dependence on their renewable resources than developed countries'. In developed countries, in fact, this dependence is weaker, thanks to technological and economic resources. 'For rural people there is often a trade-off between meeting short term food needs or taking a long-term view which conserves the resource base but sacrifices immediate access to food' (Davies et al, 1991: 21).

The rural poor are also characterised by the lack of human capital as well as social capital: the second is even more important in those contexts where the rural poor are geographically isolated (IFAD, 2001: 24). The isolation of the rural poor is aggravated by the scarcity of social, cultural and health services and a weaker access to governmental support. The absence of appropriate infrastructure and the difficulties of access to markets influence the production and the income of the farmers. As stated by IFAD (2001: 24), the rural poor are likelier 'to be unhealthy and illiterate, to have higher child/adult ratios, and to work in insecure and low-productivity occupations'. Many of these characteristics of the rural poor are strictly interlinked and contribute to prevent their escape from poverty. The rural poor appear, in general, 'much more vulnerable to fluctuation in well-being than the urban' poor (IFAD, 2001: 30).

2.6 Agriculture water use and management

Water resources management and usage in rural areas strongly affects one of the most important productive sectors and economic activities of rural people: agriculture. The relationship between water and agriculture is an ancient one; many ancient civilisations based their economy and their survival mainly on crops. In many rural areas of developing countries, agriculture remains the major water user and the diversion of water to other uses has implications for agriculture and food security. 'In many developing countries farmers use, on average, twice as much as water per hectare as in industrialized countries, yet their yields can be three times lower – a six-fold difference in the efficiency of irrigation. On top of this, only one-third of all the water withdrawn for agriculture actually contributes to making crops grow' (Post, 2002). Therefore, understanding the interactions between water and agricultural policies is crucial for achieving a more efficient water resource management policy.

Water and food security are intimately connected. The mismanagement of natural resources, and in particular water resources, can be causes of food insecurity. On the other hand, a good management of water resources, together with sustainable agricultural development can contribute to improve food security. The World Bank (in Desai and Potter, 2002: 117) defines food security as 'having physical and economic access to sufficient, safe and nutritious food, for an active healthy life, by all people at all times'. As stated by Conway and Barbier (in Davies et al, 1991: 4), 'on average, 62% of the labour force in developing countries depends on the primary sector for its livelihood and this rises to 72% in low-income developing countries'.

‘Coping strategies employed in times of food insecurity frequently rely heavily on natural resources outside the usual production system, or alternatively on intensifying exploitation of resources habitually used’ (Davies et al, 1991: 8). Pearce and Turner (1990: 343) argue that ‘developing countries, especially poor ones, have a more immediate dependence on their renewable resources than developed countries’. In developed countries, in fact, this dependence is weaker, thanks to technological and economic resources. ‘For rural people there is often a trade-off between meeting short term food needs or taking a long-term view which conserves the resource base but sacrifices immediate access to food’ (Davies et al, 1991: 21). On the other hand, natural resources are strictly interrelated. Pearce and Turner (1990: 342-343) argue that without importing food and using fertiliser, the mismanagement of natural resources, among which the unsustainable management of water or its lack, has the consequence to decrease food production. Poverty and environmental degradation form a trap from which there is little chance of escape’ (Adams, 1990: 87). Adams (1990: 87) argues that poor people ‘very often create environmental degradation because their poverty forces them to do so.

Irrigated agriculture has been an extremely important source of food production over recent decades. The quantity of water used for irrigation depends on various factors, such as climate, crop types, soil characteristics, water quality, cultivation practices, the state of infrastructure, and irrigation methods. The necessity for expanding and improving irrigation, in order to ensure sustainable agriculture, is steadily increasing in Europe and worldwide. Although several important advances have been made over the last several years, significant challenges still remain in the areas of technological, managerial, policy innovation and adaptation, human

resources management, information transfer and social environmental considerations

Irrigated agriculture can yield up to twice the amount of output than rain-fed agriculture, however it does not use water resources in an efficient way. Without careful water resource management, irrigation can therefore pose a significant negative environmental threat. The traditional approach of watering crops so "thoroughly" that ample runoff occurs is unnecessary and wasteful. Since agriculture is by far the largest water user, efficient irrigation management will undoubtedly be a major conservation option for the future. It can be achieved through irrigation requirements and irrigation scheduling techniques, use of localized irrigation systems, salinity management techniques, and reduction of losses from water conveyance systems In particular appropriate irrigation of vegetable crops is dependent on many factors mainly Irrigation schemes, the irrigation networks, the price of water per cubic meter and irrigation scheduling.

Irrigation water for vegetable production mainly is provided either by drip irrigation, or rainfall irrigation followed by furrow irrigation. Drip irrigation is currently used in only a fraction of the cases for which it would be suited. It depends on a pressurized system to force water through perforated pipes running above the surface, at rates of 1-10 litres per hour per emitter. Although the technology is simple, it nevertheless requires both an initial investment and careful maintenance. The most recent drip systems tend to be more efficient in their use of water, but they are often far too costly to be affordable to the majority of small irrigators.

In addition, although drip irrigation is highly advantageous little attention is given to providing water according to actual plant needs and this would affect deeply the environment (soil salinity, leaching of nitrate in water, etc.). Research works have clearly shown that most greenhouse crops can be grown with a fraction of the amount of water normally used. Many

growers have already begun to adapt low-watering practices with great success. (Barbieri and De Pascale, 1992).

Most of the problems of waterlogging, secondary salinization prevalent in irrigated lands and water pollution have resulted from the excessive irrigation due to lack of knowledge of the real needs of the crops, inefficient irrigation distribution systems and poor on-farm management practices.

'Improved agricultural irrigation could reduce water use by between 20% and 30%' (Post, 2002). This can be achieved by using improved irrigation systems that more effectively apply water to crops, improving land preparation for water application and encouraging the development of crops requiring less water (Post, 2002). These results have been often achieved through the adoption of traditional and indigenous techniques. The implementation of agricultural indigenous techniques in rural areas of developing countries has achieved a more sustainable, efficient and environmental friendly water management. In fact, in many cases, traditional techniques have permitted to improve irrigation efficiency. As Compton (in Warren et al, 1989: 23) states, the use of indigenous agricultural knowledge can represent 'an important strategy for promoting sustainable agriculture'.

The adoption of indigenous agricultural techniques, supported by governmental agricultural policies, has not only prevented land degradation and water waste and mismanagement but it has enhanced these natural resources productivity, increasing, therefore, population's food security. Furthermore these techniques 'significantly decrease the vulnerability of small farmers to natural disasters and other disturbances' (FAO, 2002). Even if the advantages of these indigenous techniques have been 'eroded by widespread poverty and increasing human and livestock populations, most of these strategies continue to be the only viable

alternatives capable of sustaining agriculture and maintaining ecological balance without external assistance'. Rural development programmes which include and improve indigenous agricultural techniques could be more acceptable 'to rural farmers and contribute to finding effective and lasting solutions to environmental degradation' and food insecurity (Nsiah-Gyabaah in Redclift and Sage, 1994: 127).

2.6.1 Rain fed agriculture

High water abstraction is a major problem in developing countries, where a reduction of water use is absolutely needed in order to increase natural water flow in rivers and groundwater. To prevent rural water crises, we need to manage water resources effectively at every stage: from the supply of clean water to its different uses by the consumers. This could involve reducing consumption as well as finding new ways of collecting and using water.

To reduce water abstraction, a Sustainable Water Management (SWM) approach envisages, besides water saving measures and more responsible behaviours by final users to decrease consumption rates, the use of non-conventional water resources, such as rainwater or treated grey-water, which could therefore substitute potable water, allowing to reduce the abstraction of natural resource. Among non-conventional resources, the harvesting of rainwater is one of the most promising solutions, due to the high quality of rainwater, that allow its safe use for several purposes.

Collecting rainwater appears to be one of the most promising alternatives to supplying freshwater for irrigation purposes given in a context of an increasing water scarcity and escalating demand. The possibility to increase further water extraction for more irrigation purposes is limited, however it may be possible to ensure adequate food for future generations by increasing and improving the use of other water sources such as rain water. Even in more arid and dry regions, rainwater is often abundantly available during the rainy season.

Rainwater harvesting (RH) is an ancient technology that has been used throughout history to supply water to human settlements and, more recently, to buildings in urbanised areas. Globally, millions of systems are currently in use (Heggen, 2000) and a wide variety of both potable and

non-potable applications are evident (Gould & Nissen-Peterson, 1999; Leggett et al, 2001). The use of RH has declined in much of the developed world as a result of the introduction of centralised large-scale water treatment and distribution systems (Gould & Nissen-Peterson, 1999). However, there is growing concern that this approach may be unsustainable as the available resources that they primarily depend upon (ground and surface waters) are becomingly progressively more expensive and difficult to develop (Hiessl et al, 2001).

Many countries have begun to show a resurgent interest in the use of rainwater harvesting techniques. Although not a panacea in itself, it is widely believed that these systems can form part of a new rural water management paradigm that is more sustainable than the traditional methods.

Rainwater harvesting is the process of collecting, concentrating, and improving the productive use of rainwater while at the same time reducing unproductive waste. Rainwater harvesting primarily consists of the collection, storage and subsequent use of captured rainwater as either the principal or as a supplementary source of water. Examples exist of systems that provide water for domestic, commercial, institutional and industrial purposes as well as agriculture, livestock, groundwater recharge, flood control, process water and as an emergency supply for firefighting (Gould & Nissen Peterson, 1999). The concept of RH is simple and systems can vary from small and basic, such as the attachment of a water butt to a rainwater downspout, to large and complex, such as the famous system realized in Berlin's Potsdamer Platz.

All rainwater harvesting systems share a number of common components (Gould & Nissen Peterson, 1999).

1. A catchment surface from which runoff is collected, e.g. a roof surface.

2. A system for transporting water from the catchment surface to a storage reservoir.
3. A reservoir where water is stored until needed.
4. A device for extracting water from the reservoir.

In dry areas, rainwater harvesting can both reduce the risk of crop failure and increase yields. Crop production can be improved substantially through the concentration of scarce rainwater which allows for the provision of supplementary water during critical dry times. There are various forms of rainwater harvesting, all consisting of collecting rainwater from a catchment area and channelling the runoff for supplementary irrigation during dry periods.

Rain fed agriculture produces by far the highest proportion (over 60 percent) of food crops in the world. But only a limited amount of effort has been directed to up-grading rain fed agriculture through improved water use effectiveness. In rain fed agriculture, more crops are lost due to wasted rainwater than are lost due to absolute shortages of cumulative seasonal rainfall. Increasing the productivity of rain fed agriculture, which still supplies some 60 percent of the global food supply, would therefore make a significant impact on global food production.

Although these techniques are more costly and require considerable know-how on the part of the farmers who build them, they have the advantage of greatly reducing the risk of small or non-existent harvests as a result of drought.

Rain water collection is a way to meet increased demand for water. It also helps people to mobilize their own resources in order to improve the local economy. Furthermore, some rainwater harvesting technologies can be simple to install and operate. [Local communities can be easily trained to implement such technologies, and construction materials are also readily

available. Rainwater harvesting is convenient in the sense that it provides water at the point of consumption, and community members have full control over their own resource distribution systems, which greatly reduces operational and maintenance problems. Finally, running costs, are almost negligible (Gould & Nissen Peterson, 1999).

When compared with other water supply technologies, rainwater harvesting has few negative environmental impacts. Although regional or other regional factors can modify local climatic conditions, rainwater generally offers a continuous supply of water for local agriculture. Depending upon household capacity and needs, both water collection and storage capacity can also be increased as required within the limits set by the catchment area.

This strategy has been successful in different part of the world, including Europe. Therefore, Rainwater Harvesting (RWH) will likely continue make an important contribution to resolving water shortages in the future. It offers a wealth of promising possibilities for households, livestock and agricultural use, as well as viable solutions for the urban environment of developing or developed countries. It is necessary only to foster the political will to implement the necessary policies and systems that will encourage the widest possible use of RWH technologies.

2.6.2 Using wastewater for irrigation

In recent years, water demand has increased dramatically. In order to avoid the overexploitation of existing water resources, developing countries should seek to identify and exploit new sources of water previously not used for agriculture, such as using treated wastewater effluent for irrigation. This is a practice which is already used in certain European countries, and which is expanding worldwide. Several developing countries are arid or semi-arid with mostly seasonal and unevenly distributed precipitations. Due to the rapid development of irrigation and domestic water supplies, conventional water resources have been seriously depleted. As a result, wastewater reclamation and reuse is increasingly being integrated in the planning and development of water resources in the developing countries, particularly for irrigation (Galiani *et al*, 2002).

Recycled water is a valuable resource. Instead of being thrown away, appropriately treated water can be recycled – used a second time – to reduce the demand on high quality freshwater sources and improve environmental water quality. Water recycling increases the available supply of water and enables greater human benefit to be achieved with less freshwater. Therefore, water recycling can make a substantial contribution to meeting the world's water needs and to lessening mankind's impact on the world's water environment (UNESCO, 2003).

Using reclaimed water in place of fresh water for existing uses can free up existing water supply system capacity to cater for new water needs. This results in savings in the cost of developing new water sources, water transfers, treatment and distribution systems. It can also result in significant improvements such as reduction in freshwater diversions (UNESCO, 2003).

Agriculture is the main economic sector – but certainly not the only one – where wastewater reuse can be beneficial. There are enormous potential benefits to using wastewater for irrigation. First of all, this practise permits the recovery of great amounts of water which could be used to irrigate thousands of additional hectares of farmland. Secondly, the fertilizer value of the effluent is almost as important as the water itself. Typical nutrients found in treated wastewater effluent from conventional sewage treatment include nitrogen, phosphorus and potassium. These substances are normally separately added in the form of fertilizer for agricultural crop production, whereas in this case they would be supplied by the effluent. Furthermore, other valuable micronutrients and organic matter contained in the effluent would provide additional benefits (Galiani *et al*, 2002). Another advantage is that many of these nutrients are absorbed by the crops, which means that they are removed from the water cycle and hence play no further role in the eutrophication of rivers and the creation of Dead Zones in coastal areas.

Certainly, water quality must be sufficiently high to make the use of effluent for irrigation purposes – although by no means a new practice – an absolutely safe technique. Public health and food safety requires setting safety standards to minimise potential problems, but also to gain public acceptance of the practice. Several risks are associated with the reuse of treated wastewater. First the receiving soil may become contaminated if the water content is inappropriate. Such accidents have already happened in the past. It is necessary to respect strict limits in the amount of heavy metals and in several pathogens which can sometimes be found in water. However, the most important risk is for human health. Wastewater contains a very high level of microbiology that can produce serious adverse health effects. Furthermore, chemical contamination can also have effects on human health as well as on the ecosystem in general. Therefore, food

safety must be seriously considered. Farmers will not reuse water if their products cannot be sold. Nor will consumers buy products irrigated by reused water unless it can be proven to be harmless (UNESCO, 2003).
There is also an economic aspect of this problem which extremely important to solve: the cost of water needs to be acceptable to farmers. Wastewater treated for reuse in agriculture must have at least a comparable cost to freshwater, otherwise there will be no chance of promoting the practice. Often, the necessary technology to produce water clean enough to meet minimum safety requirements is not cheap, therefore research should be conducted to find less expensive techniques for producing clean water (Galiani *et al*, 2002).

Reducing the levels of pollution in effluent water from farms, industries and urban areas would enable much more of it to be re-used for irrigation. Developing countries should work to guarantee high hygiene standards and low metallic and toxic organic content and nutrient values, bearing in mind that the potentially most interesting re-use opportunity for effluent water – namely its use for the irrigation and fertilization of crops – is currently not being exploited to its full extent worldwide. Towards this aim, developing countries should set-up common legislations or guidelines for the reuse of treated wastewater. The existence of guidelines for the use of reclaimed waste-water is necessary for the planning and safe implementation of wastewater reuse for irrigation. It also contributes to a sustainable development of landscape and agricultural irrigation. Guidelines must also clearly promote the development of best practices. This does not need to be defined in great detail but must take into account important specific local conditions, such as the quality of reclaimed wastewater, the type of soil, the climate, the relevant crops and the local agricultural practices.

2.6.3 Traditional water management (water heritage)

Industrialization and modern hydraulic networks fed mainly by overexploitation of water-wells, has led to serious imbalances in the equilibrium of river basins and in many cases has triggered saline intrusion and subsidence. Today, to avoid a shortage of natural resources essential for life (water, soil and natural ecosystems) in developing countries with high risk of fast desertification, a reorganization of the management of water resources should take place, with the support of new methodologies and technologies able to transpose the knowledge coming from the past in the key of modern techniques.

Water heritage reflects the way rural populations coped with the scarcity of water and how they organised local structures around water management. Today, most of this water heritage is unprotected and recent developments, both societal and economic, including the mechanisation of agriculture, migrations from rural areas, and unruly urban expansion, threaten its survival. The traditional water management knowledge can count on centuries of experience and technical means of water collection, distribution and prevention of hydrogeological instability of the territory. '80 per cent of the world's population depends on indigenous knowledge' (Fukuda-Parr, Lopes and Malik, 2002:211). Farmers have saved agricultural production by drought and by exceptional rainfall events since ages, by terracing hills, water harvesting, crop rotation, with appropriate identification cultivation sites and with whatever technique time and survival need brought them. The traditional knowledge is the effective strategy to protect against erosion and to increase infiltration of rainwater which has enabled the existence of populations in areas susceptible to desertification.

Technology alone cannot govern and solve conflicts and social dynamics associated with the scarcity of water resources, but if the technology re-discovers and integrates the wisdom of the past can achieve remarkable results, without strong interferences with the territory, or creating structures and modifications having great negative impact both economically and environmentally. Limitation of uncontrolled use of water for civil, industrial and agricultural purposes, by a rational management contributes to the re-equilibration of climate sensible territories. 'Developing countries must take into account the coexistence of modern and indigenous knowledge and technology' (Fukuda-Parr, Lopes and Malik, 2002:211). The preservation of this heritage is therefore essential, because it constitutes a living memory of an appropriate relationship between local societies and their environment. In a context of increasing water penury, it illustrates good management practices with a "natural" attitude to sustainability. It aims to mobilising civil society towards preservation of water resource and it includes interrelated activities where the participation of local populations is elemental: the success of traditional methods requires the empowerment of stakeholders.

The re-proposition of the successes achieved in the past by the population historically located in climate-sensitive areas and historically suffering from lack of water allows the re-appropriation of functional management logic from the past, low cost oriented and even possibly more effective now with the addition of the latest technology, in contrasting the shortage of water resources. Therefore, it is worth to promote the preservation of heritage linked to water management, to preserve the value of this heritage and the need to protect it; and promote water management techniques linked to this heritage, together with local populations.

2.7 Energy & water

It is estimated that by 2050, water consumption will increase in approximately a 36% in the global demand for primary energy, largely in non-OECD countries (ODI, ECDPM and GDI, 2012:49).

The link between Energy and water is a very intensive and strict one. Their link covers all aspects of water and energy relation: from the energy use in the process of water resources delivery to water use for energy production, including all intermediate steps related to the synergy between water and energy in hundreds of industrial processes. In fact, water and energy are the most extensively used commodities in process industries. For instance, a major industrial process where water and energy are interacting actively is the process of drying which is utilised in many industries. Even more, 'while withdrawals for cooling power plants are largely non-consumptive, losses through evaporation will be more substantial from biofuels and hydropower' (ODI, ECDPM and GDI, 2012:49). 'The energy sector represents 10% of global abstractions of water, though much of this is returned for other uses, but the demand for new energy sources could have major implications for water' (biofuels) (ODI, ECDPM and GDI, 2012:50). 'Different types of energy production also vary in their water demand and impact on water-resource systems. Biofuel production may be at the expense of food security and also increase pressures on the quantity and quality of water resources. (...) Hydropower is an important source of renewable energy, and reservoirs (often multi-purpose) may serve to buffer hydrological extremes' (ODI, ECDPM and GDI, 2012:53).

On the other hand, 'energy is an important input factor for water supply, especially in water-scarce areas where water is pumped over high altitudes or long distances or to desalinate seawater' (ODI, ECDPM and GDI, 2012:53). Significant water and energy efficiency gains can be achieved by

minimizing water losses in water supply systems, due to not only wasting the water itself, but also the energy used to pump and distribute it. ‘At the same time, because many water-scarce areas are rich in solar radiation (and some in fossil fuels), it may become possible to use renewable energy to develop water-conveyance and desalination schemes’ (ODI, ECDPM and GDI, 2012:53).

All these consideration highlight the importance of the link between water and energy management for the sustainable use of these resources and indicates the potential for economic saving that such a synergy possesses. Water and energy management are correlated and the optimization of one impacts the other.

Therefore, we can argue that integrated management solution for energy and water are essential to ensure a sustainable and cost-effective approach and potential reduction of the water and energy consumption. In other words, the efficient and sustainable water use and conservation can benefit from fundamental techniques of integrated water and energy management.

2.8 Virtual Water

In the debate regarding the water resources scarcity, at both national level and international one, the concept of virtual water is becoming more and more relevant, among the possible solutions that can be adopted to face this problem. In the production of industrial and agricultural goods and services it is generally used a certain quantity of water. The amount of water needed to create industrial and agricultural goods and services represents the virtual water that products are composed of Maize, for example, requires about 900 tonnes of water to produce one tonne of the staple. When a state imports a tonne of maize it is effectively importing 900 tonnes of water. In international and regional economies vast quantities of virtual water are present. For instance, it takes about 1000 tonnes (cubic metres) of water to grow one tonne of grain. When you consume one kilo of grain, you are in effect also consuming the one thousand litres of water needed to grow that grain, when you consume one kilo of beef, you are consuming the 13,000 litres of water needed to produce that amount of meat. Similarly, to produce one tonne of rice, 2 000 tonnes of water are needed; one tonne of wheat needs 1000 tonnes of water. Because virtual water is embedded in the international political economy, every state in the international political system is subjected to trade in virtual water (Hoekstra, 2003).

The contrast in water use can be seen between continents. In Asia, people consume an average of 1,400 litres of virtual water per day, whereas in Europe and North America, people consume about 4,000 litres of virtual water per day (Hoekstra, 2003). According to Daniel Zimmer (Zimmer and Renault, 2003), 'The magnitude of this variation demonstrates that diet is very important for water consumption. "If the entire world consumed as much virtual water as do people in North America, the world would need 75 percent more water than it currently uses for food production'.

The virtual water trade has relevance to water stress, water scarcity, and food security, as they reduce the need to use water for food production in importing countries and increase water use in exporting countries.
The World Water Council have made the first calculations of virtual water trade, (UNESCO-IHE) that show that nearly 20 percent of the water that is consumed by agriculture is traded to other countries in the form of the food and other products that result. This is quite a big amount, since five trillion cubic meters of water per year is used for agriculture, and out of that one trillion is involved in trade between countries. Among the biggest net exporter countries of virtual water are the United States, Canada, Thailand, Argentina, India, Vietnam, France and Brazil (Hoekstra, 2003).
According to Daniel Zimmer (Zimmer and Renault, 2003), 'The United States is such a major exporter of virtual water because of its agricultural exports. In fact, the annual virtual water volume exported by the U.S. is four times the entire annual water use for everything of Egypt'. Some of the largest net import countries of virtual water are Sri Lanka, Japan, the Netherlands, South Korea, China, Spain, Egypt, Germany and Italy.

The concept of virtual water is useful for two reasons: the first one is that it can help to show how strong it is the tie existing between water resource and food security. Some 70 percent of all water utilized by humans goes into food production. Since agriculture is the largest economic sector using water resources at the global level, trade in agricultural products is the main component of trade in virtual water. Secondly, it draws attention to the notion that serious local water shortages can be very effectively ameliorated by global economic processes (Hoekstra and Hung, 2002).

The virtual water trade could play an increasing role in the decisions regarding the production strategies adopted by countries that have scanty

water resources and, at last, it could affect the decision of national economic policy. According to the World Water Council virtual water could be a very successful mean by which water deficit economies and water deficit river basins can remedy their deficits and even a way of solving the problem of water scarcity. It states that the virtual water trade, food and other water-containing products could relieve the pressure on scarce water resources and contribute to mitigation of water scarcity at both local and global levels. So the WWC call virtual water trade should be encouraged in order to promote water savings especially for arid countries (Zimmer and Renault, 2003). According to this way of thinking, water-scarce countries can use the new concept of virtual water to determine their agricultural and industrial production strategies in order to achieve a sufficient food supply for their people and to preserve their water resources. In fact, it makes no economic sense for countries that depend on irrigation to grow low-value food with high water needs. The value of the water used for irrigating wheat, sugar or rice can end up being many times greater than the value of the produce: these crops cannot compete with food staples grown in countries that are rich of water resources and where the water rains down frequently. Water-scarce countries can best help themselves by importing cheap food grown with cheap water: instead of using their scarce and costly water to grow their own food, they can get **"**virtual water" through world trade. It costs them less, and their water resources can be better used: the water that provides the livelihood of one farming family can keep more farming families going (Zimmer and Renault, 2003).

Some experts state that virtual water is economically invisible and it goes politically unnoticed. Political decision-makers struggling with water deficits welcome solutions which are not influential on the national economy. Moreover they argue that showing people the virtual water content of various consumption goods will increase the water awareness of

people and it will help them to be more careful about water wastes (Hoekstra and Hung, 2002).

Certainly virtual water could represent one of the solutions for water scarcity in arid or semi-arid regions and countries with water-stressed economies, but we should consider the impact on national economic, political and socio-cultural conditions deriving by the adoption of political strategies based on virtual water trade. The adoption of an economic policy based on the strategy of virtual water trade could have almost four problematic and dangerous consequences (Hoekstra and Hung, 2002):

1. The first one is a *political* consequence, regarding what the European Parliament defines "the trap of offering virtual water". The choice, taken by a country, of importing products which needs a great quantity of water to be produced, above all agricultural goods, could bring, says the European Parliament, to a "greater dependency on the large food companies in terms of food crops".

   The situation could get worse when there will be an increased number of water-short due to an increasing population and/or an increasing water demand in order to satisfy the economic development necessity. When the number of water short will reach a certain level, and so on the demand for virtual water, the water rich countries could decide that virtual water trade cannot any more satisfy their national interests, and the necessity of reserve their own water resources. We should consider that water rich countries, once specialized on water-intensive production, could have to meet an overexploitation of water resources at the local level: even a water-rich country may be degraded into a water-short country in the near future.
2. The second consequence is a *social* implication. Supposing countries, which have scanty water resources, accept their food demands becomes more dependent on global trade and they decide, both for

economic reasons and their water resources availability, to re-define, even in a substantial way, their national production of industrial and agricultural goods. These countries could consider convenient or they could be forced to reduce dramatically, maybe to stop, their production and export of food with high water needs, like rise or wheat, even if these products are fundamental, staple diets in the traditional alimentation of those countries' people, and to import food with low water needs. This re-definition of the national production and, consequently, of the exports and imports could change, in certain circumstances, the existing social equilibrium and it could upset the whole social and cultural system.

3. The third consequence is an *economic* implication. Re-defining the national production, the imports and the exports could not bring immediately positive effects, because it will be necessary transforming a part of their own industrial system and the spreading of knowledge, techniques and technologies for the production of the new goods.
4. The last one is the environmental implication. From an environmental point of view this kind of strategy could not offer boosts to the countries in order to improving their environmental policy, to paying more attention to all the water related issues, as pollution, climate change, overexploitation, etc.

The author of this dissertation thinks that a strategy based on the virtual water trade, in order to face the problem of the water resources' lack, is unsatisfactory, if it is the only adopted strategy, and it could generate some dangerous implications. It is necessary adopting measures which allow of allocating and using water in an efficient way.

Moreover this solution seems to be unconscious that the problem of the scarcity and the gradual reduction of water resources affects the whole word. So it could be a temporary solution, good just for the short period,

which does not really face the issue in all its aspects but just postpones the search for an effective solution. In fact if the developed countries will continue using water at a so high rhythm as it happens today, and supposing economic development in developing countries will increase the water demand, states could not base their national strategies regarding water resources management and food security on the help and the benevolence of rich water countries.

It seems to be a kind of solution which does not go in the direction of the integrated water resources approach, which permits a global cooperation in water resources management, the integration of the analysis regarding all water resources, uses and factors that are causing the global water emergency. States, following the virtual water trade strategy, will try to face the water scarcity problem working on its own: there could be commercial agreement but they will last probably until they will be convenient for the water rich countries. This strategy should be adopted while at the same time considering the impact on national economies given the political and socio-cultural context.

Unless an integrated water resources management and a set of norms, shared principles and rules are carefully designed and successfully converged upon, the virtual water trade would lead to even more conflicting situations in the next future. Moreover this strategy needs to be carefully integrated into a shared water resource management strategies built on a shared set of norms, principles and rules which are carefully designed and acceptable to all.

2.9 Pricing Water

Several International organizations (OECD, World Bank, etc.) have become supporters of the policy of Pricing for water services to reflect scarcity values. This means to introduce the principle of the "full cost recovery" prices, which refers to the adoption of a water price which takes account of all the costs related to the use of that water. The motivation for such progressive pricing policies is the need for water prices to reflect the full environmental and economic costs of its supply and use.

The idea behind is that water resources are overexploited either because in some cases there are no costs in doing so, or because these costs are very low. Often resource prices do not reflect scarcity values. 'A major policy shift is required to account properly for the value of natural capital, and for the costs of its depletion. This is difficult, and it requires a push for research that might help to value natural capital adequately, as well as improving governance to incorporate it into national accounting systems and implement it in practice' (ODI, ECDPM and GDI, 2012:126).

According to the supporters, this policy would internalize environmental costs and promote efficiency and sustainability in water use: such a scheme should help to considerably reduce the use of irrigation water and to move towards a more rational management of water resources. The idea is that efficient and effective water pricing systems provides incentives for efficient water use and for water quality protection, while simultaneously generating funds for necessary infrastructure development and expansion. 'Developing pricing mechanisms is one way to account for the 'externalities' of resource use, i.e. ensuring that the prices reflect the cost of resource use to the environment' (ODI, ECDPM and GDI, 2012:126). According to experts, 'activities that harm the environment can be fully priced, while activities that help the environment can be rewarded by

payments for ecosystem services (PES). The public sector needs to encourage the proper valuation of ecosystem services in policy and planning processes. This will affect consumer patterns, steer private investment, foster supply and incentivise innovation' (ODI, ECDPM and GDI, 2012:9). 'Pricing mechanisms and regulatory frameworks can steer the allocation of natural resources to different user groups, incentivise investments and innovations (for more cost-efficient use), and encourage lower (and not only more efficient) use' (ODI, ECDPM and GDI, 2012:123).
Through appropriate pricing, together with education, and measures to encourage recycling would contribute to reducing the environmental footprint, by managing the water demand to reflect scarcity values.
'The practicalities of pricing differ by resource and socioeconomic context: volumetric water pricing is rare in many countries because delivery systems were not designed with this in mind, and cost-recovery through zero marginal cost pricing remains the only realistic alternative. An allocation-licensing system, however, can be used to manage demand effectively and is the principal approach used in those water-scarce countries that have managed to balance demand and supply' (ODI, ECDPM and GDI, 2012:10).

Agricultural water use, primarily for irrigation, remains heavily subsidised, which encourages inefficient use of often scarce resources. The price of water to farmers rarely reflects its full environmental cost of the resource. 'Pricing water for agriculture presents social and infrastructural challenges, but it is essential to rationalise water withdrawals in water-scarce regions' (ODI, ECDPM and GDI, 2012:126). Moreover, in many countries – but particularly among developing countries – there is a strong public sector involvement in building water supply infrastructure and managing irrigation systems. Adequate pricing will promote efficient irrigation.

‘Irrigation, in contrast, is a high volume and often low value user of water. Supply costs are generally modest, but opportunity costs can be high. Why then do we not see more use of prices to reduce inefficiencies (more crop per drop), and markets to encourage reallocation? First, most formal irrigation schemes have not been designed and built to deliver volumetrically monitored and controllable flows to farmers: the main challenge remains one of covering costs through non-volumetric charging systems, itself difficult with large numbers of users and political arguments around affordability. Groundwater users who have self-financed their boreholes do have to pay volumetrically-linked costs, but energy subsidies may encourage pumping and externalities associated with ‘chasing the water table’ are not included. Imposing ‘better’ prices is logistically impossible in most places given the numbers of people involved. Second, while informal water trading is common place within small areas (e.g. between farmers along a canal), formal trading between major users, or sectors, is rare. This is because establishing clear, enforceable rights according to available (and variable) supply is difficult. Moreover, where water trading has worked beyond the purely local level, there are in place: laws assigning rights; laws describing how rights may be traded; legal systems that enforce such rights and punish

> infringements; and (in most cases) systems in place for protecting the interests of third parties. These are stiff pre-conditions' (ODI, ECDPM and GDI, 2012:59).

The pricing water policy could represent a good initiative in order to reserve developing countries water resources. Nevertheless, developing countries should pay attention to guarantee the affordability of water resources: water services should be provided to all citizens, even the poorest, at an affordable price. 'Any pricing scheme (particularly for water or land use) must ensure that the poor do not lose out, hence the need for social protection' (ODI, ECDPM and GDI, 2012:22). Water prices affect water users and may not be affordable for some, hence tariffs should consider cross-subsidies. 'Higher resource prices disadvantage the poor, who already lack access to water, energy and land, while efficient pricing can have strong distributional consequences, which have hampered reform in the past. Thus subsidy reform needs to occur within a careful process that is appropriately communicated, and be accompanied by measures to protect the poorest and address affordability issues' (ODI, ECDPM and GDI, 2012:10).

The need for adopting the principle of the "full cost recovery" prices cannot deny citizens the right to have access to fresh water, which is essential for human life, even if a person does not have many to pay for it. From this point of view, we think that the governments always must take part, directly or indirectly, through some controls concerning the quality and the distribution of water services, in the water resources management. Governments would have to always guarantee the respect of the right to

the water access and they should try to analyse the impact of “full cost recovery” prices on the society.

2.10 Water management and Sustainability

Following the definition of sustainability created in 1987 at the World Commission on Environment and Development (the Brundtland Commission) - "forms of progress that meet the needs of the present without compromising the ability of future generations to meet their needs" – we can easily see that more efficient water management and water delivery models are essential to guarantee, from one side, the conservation and protection of a strategic natural resource and, on the other side, the sustainable development of the economies of both developed and developing countries.

Sustainability, as well as water management, is a concept with many dimensions, among which environmental, economic, human and social ones. Goodland (2002: 2) defines *economic sustainability* as the 'maintenance of the capital'. Especially in rural areas of developing countries, water resources management is a fundamental element for agricultural productivity and economic subsistence. Therefore, we can argue that water resources conservation is for the rural poor equivalent to the maintenance of the capital.

According to Goodland (2002: 2), *environmental sustainability* can be defined as the protection of the natural capital, meaning 'water, land, air, minerals and ecosystem services', by 'ensuring that sink capacities recycling human wastes are not exceeded, in order to prevent harm to humans'. 'Sustainable water use can be defined as the use of water that supports the ability of human society to endure and flourish into the indefinite future without undermining the hydrologic cycle or the ecological systems that depend on it' (Hirji and Ibrekk, 2001: 10).

‘The growth of the world economy and the rising global population (9 billion by 2050) mean that the Earth’s natural resources are being used up fast. Resources such as water (…) are vital for our health and quality of life, but they are only available in limited supplies. Resources need to be managed more efficiently throughout their life cycle, from extraction, transport, transformation and consumption, to the disposal of waste’ (European Union, 2011b). 'Water plays a fundamental role in sustaining land and water-related ecosystems, and forests, wetlands and floodplains are crucial in storing and regulating water. Hence, the protection of ecosystems is vital in order to enhance water security, and the provision of sufficient water is essential to sustain water-related ecosystems' (ODI, ECDPM and GDI, 2012:53). Resource efficiency is an imperative: this implies managing more effectively, ‘producing more value using less material and consuming differently. This will limit the risks of scarcity and keep environmental impacts within our planet’s natural limits’ (European Union, 2011b).

‘The world continues to experience a systemic water crisis as a result of unsustainable use and management of water resources due to poor social, environmental, or economic policies and actions. Unsustainable use (where use rates are exceeding recharge rates) is putting additional pressure on available supplies in many parts of the world. ‘Sound management of water resources and access to water and sanitation services are now regarded as key components of sustainable development, particularly as a precondition for the steady improvement in living standards in developing countries’ (Post, 2002).

> ‘Water development and use is too important and too costly to be short-lived. Considerable resources invested in the water sector are used inefficiently, and provisions for operation and

> maintenance are not sufficient to maintain the condition of vital assets, resulting in underuse and deteriorating performance. What has changed is the recognition that resource use and development should be sustainable, and that there is an integrated, multidimensional outcome. The implications of unsustainable land and water use practices (such as excessive water extraction, single-purpose use, destructive land use, urbanization, encroachment of wetlands, water pollution, and so on) are significant. Such practices not only cause irreversible degradation of the resource base and alter the hydrology (and therefore the available water supply), they also undermine investments in water supply, irrigation, and hydropower infrastructure as well as inflict harm on ecosystems and biodiversity' (Hirji and Ibrekk, 2001: 13).

According to the World Bank (1993: 32), 'countries have generally paid too little attention to water quality and pollution control. (…) The discharge of untreated industrial waste, the runoff of agricultural chemicals, and poor land use practices in agriculture, forestry, and mining cause widespread degradation of land and water resources'.

'Although humanity has long realised its dependence on water, we (…) are now also becoming more and more aware that the supply is not infinite, and that we need to value it accordingly. Water must be managed and protected. It is not merely a consumer product, but a precious natural resource, vital to future generations as well as our own. Without water, no

life can survive' (European Union, 2010a). According to the European Commission Communication COM(2011) 21: *A resource-efficient Europe – Flagship initiative under the Europe 2020 Strategy*, it is strategic to implement water management models and 'a water policy that makes water saving measures and increasing water efficiency a priority, in order to ensure that water is available in sufficient quantities, is of appropriate quality, is used sustainably and with minimum resource input, and is ultimately returned to the environment with acceptable quality' (European Commission, 2011:6). 'An adequate supply of good-quality water is a pre-requisite for economic and social progress, so we need to save water and also to manage our available resources more efficiently' (European Union, 2011a). 'As much as 50% of water wastages in some areas of Europe are the results of leaky infrastructure' (European Union, 2011a). In developing countries, leaks, inadequate infrastructures and inefficient management and provision schemes highly increase this percentage in contexts of worse water scarcity.

'The emerging "water crisis" in many parts of the world is a result of unsustainable use and management of water resources due to poor social, environmental, or economic policies and actions' (Hirji and Ibrekk, 2001: 9). A sustainable management of water resources is therefore an imperative for all water managers, from governments to local communities, who are called to 'safeguard ground and surface waters' and achieve the most efficient, effective and sustainable water services delivery approaches (European Union, 2011a). At the same time, there is a need to increase water supplies and services to needy populations in an environmentally sound manner' (Hirji and Ibrekk, 2001: 1).

According to the World Bank (1993:14),

> 'an important element in any strategy to conserve water will be incentives for adopting

> technologies and management approaches that increase the efficient use, allocation, and distribution of water. Such technologies and management approaches will make it easier to conserve water, to increase the efficiency of water use and conveyance, and to reuse wastewater. As water scarcity and waste disposal problems become more acute, adopting and improving water conservation practices, wastewater reuse systems, and overall approaches to reduce pollution will become increasingly important'.

In water management, 'sustainable development involves a shift from supply management (which attempts to meet rising demands by withdrawing more water from a depleted resource base) to demand management -which attempts to reduce consumption by increasing efficiency in use' (European Commission, 2000: 135). 'Fundamental policy, legal, and institutional reforms are needed to institutionalize the principles of sound water resources and environmental management and to promote their effective implementation' (Hirji and Ibrekk, 2001: 1). According to the European Union (2010c:7), 'the challenge over the coming decades will be less one of dealing with the scarcity of water resources than one of encouraging sensible water use. Despite the growing pressure on water resources, few countries have made progress in the rationalization of the sector'.

'Efficiency in water use does not equal sustainability'. Even if a highly efficient water management system is implemented, including wastewater recycling, desalination, etc. 'management plans should place limits on

water extraction so that sustainable water levels are maintained' (European Commission, 2010b: 11).

2.11 Water and Social Inclusiveness

Water is an essential element for food production (irrigation), energy generation (hydroelectricity, cooling, biofuels) and most industrial processes. Therefore, the provision of sufficient water of the required quality is not only important for economic development and growth, but it is crucial for social inclusiveness. This means that is necessary to guarantee access to safe drinking water and sanitation and to the water that rural smallholders for agricultural production (including livestock) and other productive uses to secure their livelihoods (ODI, ECDPM and GDI, 2012:51).

There is also a gender dimension in the water management and its relation with social inclusion: in fact women and girls are those who fetch and carry water, which, in turn, is 'time-consuming, hazardous and can have high opportunity costs in terms of girls' education and the economic opportunities available to women and girls' (ODI, ECDPM and GDI, 2012:51).

As acknowledged by the experts, 'it is primarily the responsibility of the public sector to provide access to water for domestic and agricultural purposes. Even if the private sector or local communities provide the services, the public sector usually needs to ensure that the poorest receive them' (ODI, ECDPM and GDI, 2012:51).

2.12 Water management and poverty reduction

The rural poor are highly dependent on natural resources for their livelihoods. In these contexts, 'environmental degradation is a serious threat to the developing world. (...) Protecting the environment helps to boost long-term economic and social development and is therefore a key element for achieving lasting poverty reduction and sustainable development in ACP countries' (European Commission, 2010c: 19).

Water represents together with access to land, financial capital and credit one of the main assets available to the poor (PEP-UNDP, 2006: 30). In Sub-Saharan Africa, South America and South Asia, the 'regions where mass poverty in the world is geographically concentrated, controlled supply of water is crucial for rural development' (Bardhan, 1993: 633). 'Inadequate water services have a particularly adverse impact on the poor, facilitating the spread of disease, especially in crowded low-income areas' (World Bank, 1993: 15). Insufficient and inadequate access to clean water and hygienic sanitation constitutes one of the main causes of poverty. In fact, on one side, this lack of access aggravates the situation of deprivation in which poor live and, on the other side, it threatens people's health conditions that represent one of their main assets.

According to the World Bank (1993:32),

> 'in many developing countries, water supplies are of poor quality and are often unsafe for human consumption. Using polluted waters for human consumption is the principal cause of many health problems such as diarrheal diseases, which kill more than 3 million people each year-mostly children-and render sick more than a billion more. In addition to human

> suffering, water pollution causes devastating economic and environmental damage (box 2-4). Inadequately treated sewage aggravates poverty by polluting water-dependent food sources, engendering disease, and limiting access to safe drinking water. Furthermore, water-related diseases such as malaria, filariasis, and onchocerciasis are common in Sub-Saharan Africa. They are caused not by water pollution but by inadequate water management, poor hygiene, and lack of adequate public health education. These diseases have a debilitating impact on people and significant, negative consequences on productivity, particularly in rural areas'.

For most people in developing countries, water is used for more than drinking, cooking, and washing. Water is the core of several economic activities. 'Agriculture is and will continue to be a key sector for many poor people, and limited and unreliable access to water is a determining factor in agricultural productivity in many regions'. Therefore, problems related to rainfall variability, which will probably increase with climate change, and inefficiency of existing irrigation systems can have a huge effect in terms of poverty reduction (PEP-UNDP, 2006: 22).

On the other side, 'water is also an important input into many industrial production processes and into many other types of economic activity. These include both large-scale activities and small, often home-based activities where the poor are themselves entrepreneurs (…). Access to key inputs into production, including water, is critical to the viability of these activities that can act as a ladder out of poverty' (PEP-UNDP, 2006: 22).

‘Water is a key to this, being a direct input into many productive activities and a determinant of the health and availability of other natural resources such as plants and animals from local ecosystems’ (PEP-UNDP, 2006: 32).

In conclusion, the author considers that ‘Water can make a major contribution to economic growth and development, both as a critical factor of production in many crucial sectors and through enhancing health, reducing vulnerability and ensuring greater livelihoods security that in turn create a climate more conducive to investments and enhance labour productivity’ (PEP-UNDP, 2006: 32).

2.13 Water service delivery solutions: Government management of water services and its crisis

'Sustainability of water supply and sanitation services goes beyond environmental considerations and entails dimensions such as equity, economic viability, policy and public accountability' (European Union, 2003:4).

Developing countries have been historically characterised by the government management of water and sanitation services. The idea of the public nature of water and sanitation services originated in Europe in the nineteenth century: it was based on concepts 'such as universality of the service and equality of its access' (Dardenne, 2006: 16). 'As a resource which impacts on a number of sectors (agriculture, industry, health, tourism, environment etc.), water is different from other issues such as education or health in that it is rarely the responsibility of just one minister of a national government' and therefore governments have been traditionally considered as actors to be naturally involved in this resource management (European Union, 2010c:6). As argued by Johnstone and Wood (2001: 1),'private sector involvement was considered inappropriate given the public good and basic need characteristics of water supply and sanitation services, and the belief that monopolistic tendencies were inherent in the sector due to economies of scale in service provision'. Furthermore, 'it was generally assumed that since most aspects of the sector were characterised by considerable economies of scale, they should be provided by a single authority at a standardised level' (Johnstone and Wood, 2001: 1).

Nevertheless, public management has produced in many cases expensive and inefficient systems, based on government subsidies and incapable to reach the poorest sections of society. 'Given the low coverage, richer

neighbourhoods have been the primary recipients of these subsidised services, while poorer households have tended to have to pay the full cost of whatever alternative strategy is used' (Johnstone and Wood, 2001: 2). As argued by the ECOSOC (2005: 13), 'government monopoly over service provision has resulted in lack of accountability and community ownership in the planning, implementation and management of water supply projects; poor management and sustainability; low quality of services; and limited service alternative'. Government support to the water sanitation sector has traditionally focused on designing and constructing systems based on prescribed needs, giving little consideration to demand for or sustainability of services. Furthermore, in many countries government policies for water sanitation are either inconsistent or do not exist. The traditional approach has frequently resulted in services that have not been sustained. Governments tend to pay more attention to building new facilities than to ensuring the use of existing ones. Roles for project planning, implementation, cost recovery, operations and maintenance, and asset ownership are poorly defined and communicated. According to the UN, in many developing countries governments have been and are still unable to finance the creation, maintenance and upgrading of appropriate water and sanitation systems (UN, 2006: 69). In conclusion, the centralized water management experience demonstrated the limitations of top-down and supply-driven approaches to delivering services.

According to the World Bank (1993:27),

> 'although governments may be involved for good reasons, their actions, when not properly formulated or implemented, often cause serious misallocations and waste of water resources. Three problems related to government activities are of particular concern: (a) fragmented public sector management that has neglected

> interdependencies among government agencies and jurisdictions; (b) reliance on overextended government agencies that have neglected financial accountability, user participation, and pricing while not delivering services effectively to users and to the poor in particular; and (c) public investments and regulations that have neglected water quality, health, and environmental consequences. (…) Many governments face growing problems because they have failed to address water resources in a comprehensive manner. Government activities are generally organized so that each type of water use is managed by a separate department or agency-for example, irrigation, municipal water supply, power, and transportation-each responsible for its own operations and independent of the others. Issues related to the quantity and quality of water as well as health and environmental concerns are also considered separately, as are matters related to surface and groundwater'.

During the 1990s, the governments of many developing countries, after years of inadequate public provision of water and sanitation services, had to face a decreasing support from international development agencies in this sector. Donors had started to realise of the failure of governments in providing these essential services: in fact, the service delivery was remaining highly inefficient and expensive (Kleemeier, 2000: 930). As consequence, donors progressively redirected their financial support in favour of those programmes where the private sector and communities

were taking over the management of water and sanitation services (Kleemeier, 2000: 930).

> 'Governments and the public sector are increasingly being transformed from owners and managers of water infrastructure and sole provider of water services to facilitators, enablers, and regulators. As part of a growing trend, community based organizations, user groups, and autonomous water utilities are assuming a greater direct role in management, operation, and maintenance of these facilities. The private sector is playing a larger role, particularly in the case of management of water utilities' (Hirji and Ibrekk, 2001: 3).

In this context, the concept of partnerships became crucial in the management of water supply and sanitation services, above all in the rural and disadvantaged areas where millions of poor lack the access to these resources. A partnership can be defined as 'a situation where two groups join together in a working relationship to share resources and responsibilities on an equitable and sustainable basis, so that each party benefits positively from the arrangement' (Wood in Pickford, 1998: 9). A partnership requires both sides to fully cooperate, integrating their areas of expertise in order to strengthen each other and reach an efficient and sustainable result.

2.14 The role of the private sector in rural water management

In this dissertation, 'private sector' refers to large and small domestic and foreign business and it also includes business associations (ODI, ECDPM and GDI, 2012:43). 'The profile of the operators vary widely, from multinational firms to respected elders living in a village served by the supply' (Kleemeier, 2010b).

In the context of water management, Private sector has been traditionally involved in urban areas rather than in rural areas due to several factors: mainly the large volume of investment that is required for the development/maintenance of rural infrastructures which has to be divided among a limited number (compared to cities) of citizens/clients. 'Private operators will engage only if the systems are or can become profitable. Cities and small towns tend to have lower delivery costs, greater demand, and more potential for profitability than rural communities. Rural areas have low population densities and incomes, poor communication, and a weak cash economy—all factors that hurt the bottom line' (Kleemeier, 2010).

Nevertheless, in an increasing number of countries 'governments and their partners are looking to private operators to provide the expertise, managerial know-how, and sometimes even the financing needed to construct and operate increasingly complex rural water infrastructure' (Kleemeier, 2010).

> 'Until relatively recently, private sector participation in the water supply sector was limited. However, in the past few years, interest in private sector participation has burgeoned,

> and various innovative forms have emerged. The most common form consists of concessions secured through competitive bidding. Typically, facilities are leased to the private operator, who contributes investment capital and who operates and maintains the facilities for a period of twenty to thirty years' (World Bank, 1993: 57).

The role of private companies in the management of water resources can be different and include the following activities:

1. 'constructing and maintaining water infrastructure;
2. providing water services via contracts;
3. investing in public water utilities; and
4. supporting water-service providers' (ODI, ECDPM and GDI, 2012:57).

'Rural private operator initiatives are often associated with decentralization, as a way for local governments to handle the responsibility for providing water services' (Kleemeier, 2010). Nevertheless, rural private operators have been involved even in context where local authorities did not have the control over water provisions (Kleemeier, 2010). According to several scholars, rural private operators approach implies 'less support from government than community management' (Kleemeier, 2010).

'Numerous factors weigh against the profitability of rural water supplies. Fixes for unprofitable schemes include metering and subsidized private connections to increase households' consumption and willingness to pay. Another tactic is to tender schemes in lots, based on proximity' (Kleemeier, 2010). 'Evidence is scarce on the financial sustainability of schemes

managed by rural private operators' (Kleemeier, 2010b). In spite of these factors, according to the World Bank 'governments and development partners will implement more rural private operator initiatives over the coming years, because this model has shown results in situations where other management models performed poorly' proximity' (Kleemeier, 2010). 'Rural private operator initiatives are a promising option for addressing the problems of sustainable operation and maintenance' (Kleemeier, 2010b).

2.15 Participatory approach in development and environmental management: the role of local communities

Development has gone in the direction of the decentralization of the interventions, the empowerment of the poor and the adoption of bottom up and participative approaches. The United Nations has defined community participation as 'an active contribution by people to development and involvement of people in decision making at all levels of society' (in Desai and Potter, 2002: 117).

Agenda 21, the most important document produced by the Rio Summit as an instrument for the promotion of sustainable development, 'encourages local governments to facilitate the involvement of community groups and the wider public in decision- and policy-making process' (Desai and Potter, 2002: 117). This underlines the idea that local communities can better manage local development than national governments.

As argued by Desai and Potter, 'since people themselves know best what they need, what they want and what they can afford, only close co-operation between project implementers and the community can lead to project effectiveness' (Desai and Potter, 2002: 117). This cooperation allows the further development of the project even after the withdrawal of the implementers. 'The empowerment of a local community so that it can have a greater input into decision-making processes will increase the community's capacity to consider and propose new and alternative strategies for development' (Pugh in Desai and Potter, 2002: 290).

Moreover, 'engaging all relevant actors in solution-finding will help avoid conflicts and produce a common long-term vision for development at local and regional levels. This includes enabling greater stakeholder participation in the setting of goals, the definition of activities, and the evaluation of results' (European Commission, 2010a:3). This belief is supported by Tanz

and Howard, who states that the involvement of local communities in the planning and management of natural resources allows to avoid conflicts, encourages public commitment and cooperation between government and stakeholders (in Herath and Prato, 2006: 3). Finally, it is important to remember that 'people have the right to participate in decision-making which directly affects their living conditions' (Desai and Potter, 2002: 117). According to Pugh, 'inequity and poverty are a reflection of a few interest groups having greater power over decision-making processes which affect the use of resources': 'inequitable access to resources confines many people to poverty' (in Desai and Potter, 2002: 289).

I personally found the concept of local communities participation and the way it questions the activity of development agents very inspirational and powerful so that I felt the need to deepen my understanding through several readings on the subject. For this purpose, I chose the literature by Chambers, given his enormous research and experience on these issues. According to Chambers (1997: 9), 'a massive shift in priorities and thinking has been taking place, from things and infrastructure to people and capabilities'. If the objective of putting poor people first has become clearer and stronger, it appears to me that the modalities adopted to reach this target are still very significant and complex at the same time. Chambers argues that 'a new paradigm and a new professionalism' are required for this purpose (1997: 14). These, in turn, require radical changes that involve not just putting 'the last first, which is altruism', but putting 'the first last, which is disempowerment': therefore, it is necessary to reverse the existing situation of imbalance in order to re-establish a true new balance (Chambers, 1997: 211). Chambers (2005: 195) considers the various participatory methodologies quite effective 'in enabling those who are subordinate to express their realities'. Chambers (2005: 191), in fact, argues that, through these methodologies, 'local people have again and

again presented values and preferences which differ from those of outsiders or those supposed for local people by outsiders'. Therefore, the participatory approach can be radical and force us to rethink our previous understanding and perceptions of poverty, the multiplicity of deprivation's dimensions and the nature of the approaches that development professionals adopt in order to cope with these issues.

These considerations also apply to the water resources management sector.

> 'With particular reference to the water sector, the participatory approach can be defined as one of the main development principles related to sustainability both from the point of view of the Integrated Water Resource Management (IWRM, Dublin 1992) policies and of the water sector governance (GWP , DfID 2009, EC 2010 etc.). Concerning IWRM, the Dublin principles (1992) states that water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels' (Donin and Leone, 2011: 5).

'As acknowledged by the 5th World Water Forum's Istanbul Water Consensus for Local and Regional Authorities of March 2009, "The local level plays an increasingly important role in the provision of water and sanitation services." Consequently, one of the demands of the signatories to the Istanbul Water Consensus is for national governments and international institutions to "involve local and regional authorities in the definition and implementation of political strategies taken at the national

and supra-national level for sustainable water management"' (European Commission, 2010a:36). In addition, it is important to consider that 'climate change is a global phenomenon but consequences differ from region to region: solutions therefore need to be developed and implemented regionally and locally, (…). Challenges facing local and regional authorities include being able to adapt local water management and water and sanitation infrastructure to meet the challenges posed by climate change, such as water scarcity, flooding/storm water, changing rainfall patterns, rising sea levels, and other impacts on water resources' (European Commission, 2010a: 37).

According to the World Bank (1993: 16), 'participation is a process in which stakeholders influence policy formulation, alternative designs, investment choices, and management decisions affecting their communities and establish the necessary sense of ownership. As communities increase their participation in managing water resources, project selection, service delivery, and cost recovery will likely improve'.

Participatory approach is an important challenge and shift in development and environmental management of the water sector. It represents

> 'the shift from centralized technical water resources planning and management to the inclusion of all stakeholders in planning and management decision-making, implementation, and operation of water infrastructure. This change tends to reshape objectives and priorities, and creates opportunities for more sustainable and efficient water use. What applies at the local level applies equally at the basin level, since all users and stakeholders, sub-

> basins, and ecosystems constitute the whole system. Moreover, achieving sustainable water use in a basin requires commitment to and ownership by all stakeholders of both the goals of sustainable water resources and the means to achieve them. This is more likely to be achieved if there is an opportunity for informed and substantive participation of stakeholders in decision-making' (Hirji and Ibrekk, 2001: 3).

According to the World Bank (1993: 30), 'in most cases users have not been consulted or otherwise involved in planning and managing the water resources. The result has been a vicious cycle of unreliable projects that produce services that do not meet consumers' needs and for which they are unwilling to pay'. This, in turns, has produced 'inefficient operations, inadequate maintenance, financial losses, and unreliable service delivery'.
The World Bank (1993:55) states that 'participation in planning, operating, and maintaining irrigation works and facilities to supply water and sanitation services increases the likelihood that these will be well maintained and contributes to community cohesion and empowerment (...). This justifies the need to consistently promote the organization and strengthening of water user associations as a means to enhance participation and effectiveness in water management'. 'In general participatory development is considered to be a process that empowers people by including local populations and stakeholders in the making and implementation of policies that affect their lives (Jennings, 2000). In particular, participation involves considering local knowledge so that actors can sustainably shape their own future (Jennings, 2000)' (in Donin and Leone, 2011: 6).

On the other hand, ‘as it happens in general with all new mantras of development cooperation, experiences of applying the participatory approach to the water sector, even if fostered with great emphasis, showed in the past little evidence of success, effectiveness and sustainability (Cleaver, 1999)’ (in Donin and Leone, 2011: 6). ‘Water management is typically a complex, multilevel process, and this creates challenges in terms of organising participatory processes' (EEA, 2014:31).
In addition, ‘participation has been accused of homogenising local differences often favouring local elites or not considering gender disparities, and therefore increasing local inequalities (Williams, 2004)’ (in Donin and Leone, 2011: 7). Furthermore, some authors have considered participation as a a rhetorical discourse which does not in practically empower populations, but rather serves as a way of legitimizing and enhancing the credentials of an – often Western- agency program (Mohan, 2008)’ (in Donin and Leone, 2011: 7).

Ostrom identifies key criteria which determine the success of community-based resources management. According to Ostrom, rules need to be ‘devised and managed by resource users’: this mechanism favours the acceptance and respect of the rules (McCay et al, 2003: 22). ‘When the users themselves have a role in making local rules, or at least consider the rule to be legitimate, they are frequently willing to engage themselves in monitoring and sanctioning of uses considered illegal’ (Ostrom and Nagendra, 2006: 7). Compliance and sanctions have to be well defined and easy to monitor: sanctions, in particular, have to be easy to apply and implemented in accordance with the degree of violation. At the same time, access to resources should remain available; monitors should be ‘accountable to users’ and ‘procedures for revising rules’ should be clearly established (McCay et al, 2003: 22-23).

Ostrom states that commercialization can have a negative effect on community-based water management, 'replacing traditional principles of cooperation with those of competition and causing resource deterioration' (Schlager, and Ostrom, 1992). According to Chase Smith, 'as younger people move away from tradition and embrace market economy values, this causes a confusion and ambiguity among community members over access to resources, usufruct rights and property rights' (in Richards, 1997: 100). On the other hand, there have been many case studies where indigenous people have resisted to market pressure, integrating the market economy in their traditional systems (Richards, 1997: 95).

2.16 Progress beyond the state of the art

This study aims to go beyond the actual state of the art on the analysis of water management models in developing countries.

First of all, this dissertation aims to be more geographically extended and more focused in the typology of PuPs analyzed that existing studies. This study will, in fact, take in consideration case studies of water management model in South America, Asia and Africa.

In the second place, this study aims to deepen the analysis of an integrated management between local communities and national authorities of one of the most challenging natural resource. This specific type of public-public partnerships can permit to integrate participatory approach in sustainable development and management of water resources with a long term perspective. In the mind of the author, this long term perspective can allow overcoming some of the already identified limits of the participatory approach in the implementation of water management single and time limited projects.

Moreover, the focus on rural areas of developing countries intends to address the needs of the poorest among the poor, often forgotten by the initiatives of international cooperation and development. They represent the most vulnerable and deprived section of the population in developing countries, the most dependent on natural resources and the most affected by an unsustainable management of water resource.

In addition, this dissertation proposes a new concept of partnership with a clear local focus, the Local Water Partnership (LWP) -with the participation of Local Government, Local Community and Local Private Sector. The LWP,

in the mind of the author, could represent a better solution compared to the existing bilateral model of partnerships (PPP=Government+Private sector and PuPs: Government+Local Communities), as capable of overcoming actual weaknesses of these models while pulling together their strengths.

Finally, the author considers that this study might provide policy and operational guidance for different types of public bodies and institutions operating at various levels, (NGOs, local and national governments, funding agencies, private donors and development banks) facing decisions in the planning, implementation and operation of water services delivery systems in rural areas of developing countries.

Chapter 3

PPPs as alternative to government management

3.1 PPPs: Analysis of the concept and its origin

PPPs are bilateral relationships between government, 'the contracting party who defines the object and who pays, and private sector – the deliverer of the gods and/or services and who receives the payment and gain the corresponding profit' (Miranda in Warwick and Cann, 2007: 63). They can be defined as 'the combination of a public need with a private capability and resources to create a market opportunity through which the public need is met and a profit is made' (Heilman and Johnston in ECOSOC, 2005: 3).

It has seen that PPP schemes can be divided in two main categories:

- Reciprocative PPPs, referring to projects or services for which the private sector undertakes not only their funding, design, construction and maintenance but their exploitation as well, in the form of user fees. Usually, reciprocative PPPs are in the form of projects for the transport sector (roads, harbours, airports, railway, car parks, etc), the environment (water supply, drainage works, and waste management), the energy sector, the tourism sector and thematic parks.
- Non-Reciprocative PPPs, referring to works or services which are

> not exploited by the private sector. It is thus infrastructure or services of a social nature, granted free to the citizens by the Public Sector. Examples are schools, hospitals, public buildings, provision of telecommunications services and computerization, as well works for the transport sector with low demand (e.g. provincial roads, public transport, etc.).

This dissertation will focus on reciprocative PPPs which are most typically implemented in the field of water supply and water management.

There are several typologies of private provision contracts in the water and sanitation sector: service contracts, management contracts, leases, boot contracts, concessions, shared ownership and full divestiture (Johnstone and Wood, 2001: 10-12). This dissertation will focus in particular on concessions because, as argued by Johnstone and Wood (2001: 12), they represent the most prevalent form of contract in developing countries, 'both in terms of number and size of the investments'. Concessions are 'long-term contracts which require the private company to invest in the system. The concessionaire has overall responsibility for the system, including operations, maintenance, investment and expansion' (Johnstone and Wood, 2001: 11). The private sector is, furthermore, responsible for the collection of the tariffs and for keeping the costs below the revenues level (Johnstone and Wood, 2001: 11). This type of contracts normally defines penalties if certain targets are not respected (Johnstone and Wood, 2001: 11).

'The traditional form of PPP is a concept developed in the north, in a context where public and private sector organisations are mature' (Plummer, 2002a). These countries, contrary to the developing ones, are

characterized by ‘strong institutional capacity, extensive service networks and infrastructure, a mature private sector proven in its efficiencies and management capacities, and appropriate and enforceable regulatory frameworks’ (Plummer, 2002b: 1).

During the 1990s, there was a boost in the establishment of PPPs for water and sanitation services delivery. This was motivated by the ‘three private sector virtues of efficiency, financial capacity, and proactive management which operates by matching the service supplied with the effective demand of the poor’ (Hall and Lobina, 2004: 1). In particular, the increase responds to the urgent need for investments in the water and sanitation networks as the public authorities are no longer able to finance the ‘rehabilitation and expansion’ of the water and sanitation systems (Johnstone and Wood, 2001: 1). From the point of view of the international private sector, the poor without access to water and sanitation services are considered an interesting and profitable market, because they often have to spend great part of their income to purchase water from private vendors. Therefore, ‘the high expenditures incurred by lower-income households are not only a reflection of social deprivation, but also of commercial opportunity’ (Wood in Hall and Lobina, 2004: 3).

On one hand, ‘multinational companies now run water systems for 7 per cent of the world’s population, and analysts say that figure could grow to 17 per cent by 2015’ (Luoma, 2004: 52). On the other hand, the public sector still manages approximately 90 per cent of the water and sanitation systems in developing countries, dominating this sector. Furthermore, ‘due to the political and economic high-risk operations, shrinking profit margins (in part due to currency instability), and increasing criticism affecting firms’

business image, many of the multinational private water companies have started to retreat from water services contracts and investments in developing countries' (UN, 2006: 70). In fact, changes in the policies and actions of governments can significantly affect the activities of the private sector: 'Where a permanent infrastructure is put in place, there is always a risk that government will nationalize or otherwise jeopardize the investment' (Lewis and Miller, 1987: 78).

3.2 Supporters of PPPs

The existing literature concerning the private sector involvement in the water and sanitation field and, in particular, the various forms of PPPs and their performance, is vast and includes a variety of estimations of the potentialities of this strategy. Many actors on the international development field have developed quite radical judgements on the role of PPPs in the water and sanitation sector. Many of these evaluations have been changing in the course of time and, in some cases, the positions have gone mitigating. In order to simplify the complexity of the spectrum of opinions on this issue, this dissertation analyses synthetically the literature on this topic grouping the range of positions in two categories: supporters and opponents of PPPs.

Supporters of PPPs, among those financial institutions and international organisations such as the World Bank (2004), the ECOSOC (2005) and the OECD (2006), sustain that PPPs are 'an effective means to establish cooperation between public and private actors and to bundle their financial resources, know-how and expertise to meet the challenges facing service provision' (ECOSOC, 2005: 16). The tendency of under-pricing water and sanitation services has made public management 'totally unable to finance expansion and also not able to rely on other sources to finance the expansion of infrastructure' (Dardenne, 2006: 21).

According to their supporters, PPPs can provide the necessary professional support to local authorities and communities to realise successfully their water and sanitation programmes (ECOSOC, 2005: 18). The application of PPPs presents some interesting advantages such as ability to fund further

works and services, the undertaking some or all of the risk by the private sector and the improvement of the business environment. Many specialists of the private sector argue that it is more 'innovative and results-oriented' and, therefore, able to 'deliver wider coverage more rapidly', providing 'good quality services at acceptable costs' (Hall and Lobina, 2004: 2). Scholars such as Clarke, Kosec and Wallstein (in Dardenne, 2006: 19), have arrived to the conclusion that 'private sector participation does not necessarily improve coverage but there is no evidence that the poor suffer as a result of private sector participation in water supply'. On the contrary, it is argued that there are several examples where privatisation has successfully increased the poor's access to water services (UN, 2006: 69). Furthermore, PPPs aim to the financial sustainability of the services provided by pursuing a full cost recovery policy. 'Increasing water prices through full cost recovery would, counter-intuitively, be of greater benefit to the poor', because it would create adequate funding to support the expansion of the water and sanitation services, providing them cheaper water than they were buying from private vendors (Hall and Lobina, 2004: 2).

In addition, PPPs supporters believe these partnerships can be successful only if governments establish an adequate legislation and regulatory systems that clarify the operational framework for the private sector guaranteeing fair competition, and they are politically committed to supervise water and sanitation service delivery (ECOSOC, 2005: 12-14). In other words, governments' responsibilities do not terminate once water and sanitations services provision has been assigned to the private sector: 'privatisation is not a substitute for responsible, re-distributive public welfare policies' (Dardenne, 2006: 19). The UN argues (2006: 69), in fact,

that ‘experience demonstrates, among other things, the need for a well-planned concession contract, enforcement of regulatory powers and strong commitment by political leaders and participation by communities’. Under these conditions, according to PPPs supporters, the private sector is more effective than government and local authorities in providing water and sanitation services to the poor (ECOSOC, 2005: 14). On the other hand, ‘the weaker the regulatory structure, the less likely the concerns of the poor will be accommodated’ (Dardenne, 2006: 19). Finally, PPPs supporters argue that governments should establish PPP contracts with a focus on the access of poor households living in disadvantaged and remote rural areas, defining adequate policies to reach this goal (ECOSOC, 2005: 18). As argued by the OECD (in Dardenne, 2006: 20), ‘if the private operator’s obligation is not expressly exposed in the contract, it would be optimistic to expect that a private company would do its best to implement unprofitable expansion to the semi-urban or rural areas, beyond the commitment it signed for’.

3.3 Opponents of PPPs

The opponents of private sector participation in water and sanitation service provision, represented by great part of the civil society, NGOs and some international organisations, believe that private providers 'have shown little capacity to work with the poor, preferring instead to meet their coverage targets first with the less risky, easier better-off customers' (Plummer, 2002a). Many critics accuse the private sector of 'not being responsive to ensure equality of access to the service for all segments of the civil society' (Dardenne, 2006: 17). The OECD (Dardenne, 2006: 7) recognises that multinational companies are not attracted by investments in peri-urban and rural areas because they are not considered profitable. As argued by the UN (2006: 70), 'experiences confirmed that very poor sections normally tend to be excluded from being a part of privatized service extension. To provide the poorest section of society with adequate water services is typically viewed as a high-risk enterprise that largely lacks opportunities for economic return'.

In addition, PPPs opponents believe that, as result of private sector involvement, tariffs of water and sanitation services have increased, marginalising and excluding from the access low-income sectors of society in many developing countries. There are, in fact, some cases 'where private operators have faced social protests against increasing user fees or private firms' performance. This has led to a situation where operations are handed back to public authorities' (UN, 2006: 69). According to the UNDP (2006: 22), as it often happens in developing countries, 'in the absence of a strong regulatory capacity to protect the public interest through the rules on pricing and investments, there are dangers of monopolistic abuse'. In

some cases, privatisation is simply imposed to communities, with the big private companies 'gradually driving out smaller competitors' from the civil society, allowing the creation of regional or national monopolies (Trawick, 2003: 994-996). Sohail and Cotton (in Hall and Lobina, 2004: 11) argue that 'the construction of contracts for private operators is a process in which the poor have relatively little to say and their interests are rarely addressed'. Furthermore, according to PPPs opponents, the idea that an accurate definition of the terms, beneficiaries and aims of the contract can avoid any problem is quite misleading (Hall and Lobina, 2004: 11). In fact, contracts, no matter how detailed they might be, cannot guarantee that the private sector will respect all its terms and conditions. 'There is no guarantee that the requirements for maximizing the number of extensions will prevail over the contractors' interests to target the optimal number of profitable connections' (Hall and Lobina, 2004: 12).

Evidences from several developing countries show the tendency of private companies to renegotiate the terms of the contract during the first years of provision. When a private company decides that, as a consequence of economic or political factors such as a government instability, or environmental calamities, a certain contract is not anymore profitable, it can easily choose to resign from the agreement (Hall and Lobina, 2004: 13). The public sector, on the contrary, has to face these situations and continue to guarantee at least minimum services. 'This alone makes a private company systematically less likely to create long-term sustainable connections for private populations' (Hall and Lobina, 2004: 13).

Furthermore, scholars such as Hall and Lobina (2004: 11), sustain the analysis of several case studies shows that the private sector is not more

efficient than public management, contrary to the common perception on this issue. PPPs management of water and sanitation systems has been frequently associated to 'chronically inadequate services' (Plummer, 2002a). In some cases 'network systems have deteriorated to a point where they function only in part, providing poor quality water at infrequently intervals' (Plummer, 2002a). On the other hand, 'it must be recognised that there are numerous examples of efficiently managed public water and sanitation utilities in developing countries' (Johnstone and Wood, 2001: 8-9). The World Bank has admitted that 'privatization is not a panacea': it is recognised that there has been too much emphasis on the idea that the private sector involvement would have guaranteed to all the sectors of society the access to water and sanitation services in an effective and affordable way (Dardenne, 2006: 21). However, 'From Argentina to Bolivia, and from the Philippines to the United States, the conviction that the private sector offers a magic bullet for unleashing the equity and efficiency needed to accelerate progress towards water for all has proven to be misplaced' (UNDP, 2006: 21).

In synthesis, several opponents to PPPs believe that there are several reasons for which the private sector for its own cannot manage alone the water service delivery sector.

> 'Given water's special characteristics, it is difficult to use unregulated markets to deliver water efficiently or to allocate it among sectors. Floods and droughts cause the availability of water to be highly variable, threatening life and incomes. This extreme variability is difficult to manage equitably using only pricing and market

mechanisms. Even more important, water moves through an intricate hydrological cycle of rainfall, absorption, runoff, and evapotranspiration that makes water activities highly interdependent and results in numerous externalities from various uses of surface and groundwater. Moreover, because of economies of scale and limited sources of water in many countries, the potential for monopoly control is high. Many of these problems of externalities and pricing can be corrected by appropriate government policies that use market forces and incentives (for example, taxes, regulations, and enhancement of competitive pressures). Other problems (for example, public goods and inadequate private investments) may warrant public sector ownership and control of specific activities' (World Bank, 1993: 27).

3.4 Case studies of Public - Private partnerships

This dissertation examines two case studies of public-private partnerships in order to highlight the features and potentialities of this type of partnership in the delivery of water and sanitation services in rural and peri-urban areas.

3.4.1 Bolivia

3.4.1.1 Introduction

At the end of the 1990s financial institutions such as the WB, the IMF and the Inter-American Development Bank forced the government of Bolivia to privatise the water system of the third largest city as a condition for debt relief and to fund a water system expansion in the country. The government followed the orders and privatised SEMAPA (Servicio Municipal de Agua Potable de Cochabamba), the municipal water company in Cochabamba.

3.4.1.2 Description

The Department of Cochabamba had seen a large increase in its population after the closing of the tin mines in 1985, and 'the rapid expansion of the urban population in a context of relative scarcity of water in the Central Valley set the stage for conflicts' (Assies 2003: 16). In August 1998 the government presented a draft law on privatising water resources which was opposed by social sectors that emphasised the cultural and ritual value of water for indigenous communities and the fact that water should not be

subjected to private appropriation or commercial disposal (Assies 2003: 16). In November 1999, the government presented a second law legalising a contract that had been signed two months earlier with Aguas del Tunari S.A. The contract granted a 40-year concession to the company, a majority-owned subsidiary of engineering giant Bechtel Enterprises of California, which was set up for that sole purpose and was the only bidder during the closed-door negotiations.

Soon after taking control of the water system, the company raised water rates by an average of more than 50% and in some cases far higher (TDC 2002). This represented a huge loss for families that were already extremely poor, and as a result widespread public protests began. Prior to the rate increases taking effect, people from very diverse backgrounds organised themselves around the *Coordinadora en Defensa del Agua y de la Vida* (Coordinator in Defence of Water and Life), a horizontal platform that called for a refusal to pay the bills. In response, Aguas del Tunari categorically stated that, in the event of non-payment, the water supply would be cut off.

After mobilisations in January and February 2000, the Coordinadora called for a *consulta popular* (referendum) throughout the Cochabamba Valley. Ninety percent of the participants voted for cancelling the contract with Aguas del Tunari, and this led to a general strike on April 4. Cochabamba was shut down for the third time in four months. The response of the government in order to protect the contract was the repression of the protesters, something for which Bolivia's president Banzer was well known. The government declared a state of emergency with the suspension of constitutional rights, and violently repressed the protesters, resulting in hundreds of people injured and the death of a seventeen-year-old boy. The

popular uprising continued despite the repression and in April 2000 the company abandoned its management of the water system and was forced to leave the country, so the contract was annulled. In November 2001, Bechtel decided to file a legal demand for US $25 million against Bolivia as compensation for its lost opportunity to make future profits through the ICSID (International Centre for the Settlement of Investment Disputes), an arm of the WB, not without several legal tricks. As a result of the protests, president Banzer proclaimed a modified law (Assies 2003: 32) and water supply in Cochabamba returned to SEMAPA. Its board now included representatives of the Coordinadora, who treated water as a social good and not as a commodity (Finnegan 2002). Protests in the cities of El Alto and La Paz also forced the President to cancel the contract with Aguas del Illimani, which belonged to the French corporation Suez.

Banzer, diagnosed with cancer in 2001, was succeeded by Vice-president Jorge Quiroga Ramírez, who called for presidential elections in 2002. These elections set an important precedent in Bolivia as, for the first time in history, a significant part of Bolivia's population mobilised to support indigenous candidates who explicitly opposed neoliberalism, thus indigenous political parties became the country's leading national opposition (Kohl 2006: 315). The experience of the Coordinadora during the Water War was crucial for the recovery of the popular forces, as the unity between the various participating social networks allowed for the 'utopic recovery' of a new plural political subject in Bolivia (Albro 2005).

Felipe Quispe, leader of the campesinos in the highlands and executive secretary of the CSUTCB (Confederación Sindical Única de Trabajadores Campesinos de Bolivia - Peasants' Union of Bolivia), was well known for his

radical Aymara-Quechua nationalist discourse. In November 2001 Quispe formed the MIP (Movimiento Indigenista Pachacuti - Indigenous Pachacuti Movement) to participate in the elections, in which he won 5% nationally – a better performance than the party of Banzer's outgoing administration. Evo Morales, the leader of the coca growers from Chapare region and of the MAS (Movimiento Al Socialismo - Movement towards Socialism), surprisingly came in second place, just 1.5% behind Sánchez de Lozada, who formed a weak-governing coalition. Despite being the leading opposition in Congress, 'MAS had little success in shaping national policy' which 'led Morales to promise to fight neoliberalism both in Congress and on the streets' (Kohl 2006: 319).

3.4.1.3 Conclusions

This episode can be defined as a modern day victory of a humble David against a giant corporate Goliath (Assies 2003), in which social movements showed a higher degree of maturity. Its most striking features were its unprecedented degree of unity and organisation alongside its divergence from established patterns of mobilisation. Historically excluded indigenous peoples appeared as the new key political actors and, by gaining the support of vast social sectors, for the first time in history they became the country's leading national opposition (Kohl 2006).

3.4.2 Rwanda

3.4.2.1 Introduction

In Rwanda, in the 1990s, the rural water supply and sanitation sector was of very poor quality, with a poor cost recovery and a low degree of sustainability: the infrastructures had been damaged during the civil war. Still in 2004, 'a field review commissioned by the World Bank found that half of the piped rural water supply systems in Rwanda were nonfunctional due to poor management and poor cost recovery' (Prevost, Mwanafunzi and Jain, 2010). 'As a response to this national assessment, the Government of Rwanda implemented a policy that promotes private sector participation in the management of almost 850 rural piped water schemes in 27 districts' (Lazarte, Boulenger, and Jain, 2011).

3.4.2.2 Description

In 2004, the Government of Rwanda decided to promote local private sector participation in the management of water service delivery (Lazarte, Boulenger, and Jain, 2011).

> 'Since then, the rural water sector has made outstanding progress and successfully scaled up investment and reforms. Rwanda is on track to achieve the Millennium Development Goal and should achieve its target to increase access to potable water from 40 percent of the population in 2002 to 85 percent in 2015. In 2009, 74 percent of the rural people have access to a safe drinking water source. The number of functioning rural water supply systems has also

> increased from 50 percent in 2004 to 85 percent in 2009' (Prevost, Mwanafunzi and Jain, 2010).

'By 2010, 31% of these systems were managed by private operators serving approximately 1 million people through management/lease contracts' while 'by 2009, 71% of rural people have access to a safe drinking water source' (Lazarte, Boulenger, and Jain, 2011). Therefore, it can be argued that the introduction of PPPs in the rural water supply system of Rwanda has been a clear and huge success. The World Bank has given its support to Rwanda government strategy through a combination of loans.

The implementation of PPPs in the business of water services supply has been possible thanks to the commitment of the Rwanda government in favour of reforming the legal framework to support private-sector participation in the delivery of water services (Prevost, Mwanafunzi and Jain, 2010). 'The Water Law allowed various options for managing a rural water supply service, either through municipal management or delegation to a water users' association or a private operator' (Prevost, Mwanafunzi and Jain, 2010). Very recently the performance of the PPPs in the rural water supply services has been assessed and the results show that 'the majority of the customers interviewed declared themselves satisfied by the service provided and the quality of water distributed' (Prevost, Mwanafunzi and Jain, 2010). The implementation of PPPs has been a clear success in Rwanda even if 'there are still a number of issues that need to be addressed such as the regulatory oversight of PPP arrangements, including selection criteria, contract management, compliance monitoring, accounting practices, and tariffs' (Prevost, Mwanafunzi and Jain, 2010).

> 'A key issue for the success of the PPPs is to ensure financial viability by setting appropriate

> tariffs and regulating the amount and usage of the fees collected by the districts. Viable water tariffs in rural areas tend to be relatively high, particularly in pumped systems. This poses a challenge for rural households and encourages the use of alternative, unsafe sources of water supply' (Prevost, Mwanafunzi and Jain, 2010).

3.4.2.3 Conclusions

Rwanda is an example of successful implementation of public-private partnerships in the management of water resources. The coverage of population with access to water services has increased dramatically. Rwanda rural water services have improved tremendously with decentralization and the introduction of PPPs (Lazarte, Boulenger, and Jain, 2011). 'In conclusion, while a lot has been achieved in Rwanda, more remains to be done' (Lazarte, Boulenger, and Jain, 2011). Among these aspects, the financial sustainability in the long term of this model has still to be proved and consolidated in Rwanda.

Chapter 4

PuPs as alternative to PPPs

4.1 PuPs: Nature and evolution of the concept

PuPs are often considered an alternative to privatisation and PPPs. They can be defined as partnerships among public actors belonging to the same or different countries, where 'there is no for-profit private sector involvement' (Miranda in Warwick and Cann, 2007: 66). There are different types of PuPs that include a large variety of partners: national public authorities, local communities, NGOs, Trade Unions, international public authorities and international associations (Hall, Lethbridge and Lobina, 2005: 4). The variety of actors involved in these partnerships reflects and is consistent with the multiplicity of dimensions of the water and sanitation sector (Hall, Lethbridge and Lobina, 2005: 11).

Several cases of PuPs in the management of water and sanitation services have been already experienced in Europe, Africa, Asia and Latin America. An important step in the promotion of PuPs has been 'the UN Commission on Sustainable Development who at its 2005 summit embraced public-public partnerships as part of the list of measures to be implemented' to improve water and sanitation services in developing countries, contributing to reach the MDGs (Hoedman, 2006: 2). Further attention to PuPs was dedicated in 2006 by UNDESA during the World Water Forum in Mexico

City, while there was no reference to these partnerships in the previous water forums (Hoedman, 2006: 3). Finally, even international donors and aid organisations as the World Bank are gradually taking in consideration the possibility to invest and support these new partnerships, provided that the public utilities have gone through a process of reforms reaching financial strength and a good operational performance (World Bank, 2004: 15). So far, great attention has been given to this kind of partnerships between developed and developing countries (Miranda in Warwick and Cann, 2007: 64). However, PuPs do not have to be considered an instrument for water operators of developed countries to help operators in developing countries (Hoedman, 2006: 12). According to Miranda (in Warwick and Cann, 2007: 64), in fact, there can be a greater 'advantage and potential for south-south co-operation, mostly within the same continent, perhaps between close cultures and within a common language'.

The general goal of PuPs is to improve the quality and accessibility of public services, encouraging a wider public participation: 'this includes improving coverage and access, and ensuring greater equity in service delivery' (Hall, Lethbridge and Lobina, 2005: 6). Furthermore, PuPs aim to increase the efficiency of service provision as they represent 'a way of restructuring the public sector, which helps to overcome some of the current limitations of the public sector' (Hall, Lethbridge and Lobina, 2005: 26). Finally, according to Hall, Lethbridge and Lobina, 'a PuP can also be used as a capacity-building instrument, most notably in the international context, where an established public authority in one country may help a public authority in another country to train its staff and improve its service delivery' (Hall, Lethbridge and Lobina, 2005: 7). This aim can be successfully pursued even

through the cooperation among different actors of the same country (Hall, Lethbridge and Lobina, 2005: 7).

According to Lobina and Hall (2006: 11), the success of PuPs depends on the fact that, contrary to PPPs, they do not operate pursuing a profit. 'The absence of profit-seeking and treatment of knowledge as a public good allow for the concentration of available resources on knowledge transfer aimed at capacity building and local governance' (Lobina and Hall, 2006: 3). As argued by Lobina and Hall (2006: 11), the knowledge distribution among operators at national and international level can indeed favour significant and sustainable institutional reforms.

Nevertheless, so far PuPs have not yet received the necessary attention from donors and international financial institutions because they are not perceived as 'a viable conduct for inducing sustainable water sector reform' (Lobina and Hall, 2006: 11). In addition, 'there is a need for mechanisms that allow national and international agreements for PuPs that ensure support and practical assistance is available when needed in specific cases' (Hoedman, 2006: 12). In this context, the support of NGOs and other civil society organisations, together with the commitment of all the public water and sanitation operators involved, is crucial in order to promote the development of PuPs (Miranda in Warwick and Cann, 2007: 67). If the prejudice within donors and international financial institutions against the public sector is overcome, it is believed that 'with sufficient political and financial support, PuPs have a great potential to speed up improvements in public water delivery' (Miranda in Warwick and Cann, 2007: 65-67).

4.2 Government-communities partnership

This dissertation focuses in particular on government-communities partnerships. Government-communities partnerships identify forms of cooperation where the responsibility for water and sanitation service provision is transferred from national government to local communities. Usually, governments still retain the ownership of the water and sanitation systems but communities take 'the final decision on all the important aspects in the planning and implementation of the water supply' and sanitation systems, including technologies used, rules to apply, type of management organisation and financing mechanism (Wegeln-Schuringa, 1998: 4). In addition, local communities develop the capability to manage independently the operation and maintenance of the water and sanitation systems, including the tariffs planning and payment collection. In this kind of partnerships, the role of the private sector is practically non-existent or limited to collateral activities such as the provision of spare parts. By no means, the private sector is involved in the operation and maintenance of the water and sanitation services.

'The community involvement paradigm was officially adopted by the international community during the 1977 World Water conference in Mar del Plata, Argentina' (IRC, 2007). In this occasion the International Drinking Water Supply and Sanitation Decade (IDWSSD) was launched. The new approach based on community participation was emerging in opposition to existing water and sanitation systems that were accessible only to the elites while they excluded the majority of poor people (IRC, 2007). The awareness that 'development should come from the roots of a society' was growing along with a focus in 'small NGO led projects' aiming to develop

'simple and low cost systems' and involving communities at all levels of the project cycle (IRC, 2007). At the beginning of the Decade, big donors such as the World Bank and USAID 'were already taking steps to transform the precepts of community participation into policy and policy recommendations' (Kleemeier, 2000: 930).

The IDWSSD ended in 1990 with a conference in New Delhi, the Global Consultation Safe Water 2000. The coverage of water delivery service had considerably increased, 'from 75% in 1980 to 85% in 1990', but the water an sanitation systems implemented were failing in terms of sustainability (IRC, 2007). Community management was reaffirmed as a necessity: 'community should not just be involved in system inception, but should accept ultimate responsibility for and ownership of the entire lifecycle of the system' (IRC, 2007). The Nordic Fresh Water Initiative in 1991, and the Dublin Statement on Water and Sustainable Development during the following year in Dublin, stressed the need to decentralise water management to the community level (IRC, 2007). 'Decentralization and strengthening local organizations were related aspects of bringing power and responsibility down to the community' (Kleemeier, 2000: 930). Agenda 21, adopted by the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992, expressed in favour of supporting local communities in the sustainable management of their water systems integrating community management within the national planning (IRC, 2007). 'Getting beneficiaries involved would lower costs, better target people's needs, incorporate local knowledge, ensure that benefits were equitably distributed, and create grassroots capacity to undertake other development projects and to maintain benefits' (Kleemeier, 2000: 930).

In the course of the time, several development actors started to support the concept of community management for different reasons. In particular, 'governments saw community involvement as a way of reducing demands on over-stretched resources' while 'multilateral donors such as the World Bank saw community management as an ideal vehicle for their messages about reduced government involvement, and increased private sector and civil society roles' (IRC, 2007). On the other side, 'NGOs became the voice of the community and happily seized an opportunity to increase their role, becoming in many countries a sort of parallel government' while donors considered community management a way to implement efficiently 'water supply and sanitation facilities, and to bypass the problems posed by corrupt and inefficient governments' (IRC, 2007).

As argued by the International Development Research Centre (Conway, n.d.), it is at the local level that 'the effects of water scarcity are most keenly felt and it is here that solutions must be implemented'. Nevertheless, in spite of the formal acceptance of the concept of community management, 'a supply-side approach, in combination with weak and fragmented institutional structures, still prevails in many countries' together with a persistent lack of sustainability of many of the water and sanitation systems implemented.

'Forms of community management vary according to the size of the community, the technology used, the local context and national legislation' (Wegeln-Schuringa, 1998: 8). Partnership between government and communities have to be considered as a 'flexible and evolutionary process', that 'continues through vary stages of the project from feasibility to construction to the management of operation and maintenance' (Wegeln-

Schuringa, 1998: 11). The distribution of responsibility between the partners will depend on the type and stage of the partnership (Wegeln-Schuringa, 1998: 11). 'Some communities will want and be able to manage a major share of responsibilities from the outset, others will need to start with a low level of responsibility and gradually build up experience and confidence' (Wegeln-Schuringa, 1998: 11). Usually, 'the actual management is undertaken by a representative group of community people, often called a water committee, chosen to take up this task': in the majority of the cases, the committee 'remains in charge of ensuring a sustainable service and is accountable to the community at large' (Bold and de Graaf, 2001).

It is important to recognise that there are many differences both between and within rural communities. Communities can 'vary enormously according to country context, culture, religion, history and population' (Lockwood, 2004: 9). Agrawal and Gibson (1999: 640) suggest to reject the idea of a 'mythic community': small, integrate and homogeneous groups 'using locally evolved norms to manage resources sustainably and equitably'. This idea, in fact, 'fails to attend to differences within communities, and ignores how these differences affect resource management outcomes, local politics and strategic interactions within communities' (Agrawal and Gibson, 1999: 633). As argued by Bold and de Graaf (2001), 'community management takes into account that communities are groups of men, women and children of different socio-economic and cultural backgrounds, with often common, but sometimes also conflicting interests and ideas'. A community-based water and sanitation management inevitably reflects the variety of interests and the distribution of power within the community and the external pressure of

local and national institutions: all these factors influence the sustainability and efficiency of the management (Agrawal and Gibson, 1999: 640). Thus, 'A clear understanding of a community and its customs is needed to avoid conflict and promote cooperation' (Davis, Garvey and Wood, 1993: 35).

On the other hand, 'the relatively egalitarian structure of the community' can represent an important element in sustaining and enforcing the partnership with the government (Bardhan, 1993: 637). In other words, the distribution of power inside the community is crucial. An egalitarian distribution of power favours the community's capability of organising and managing its water supplies and sanitation services. In communities with a significant variation in the wealth of the farmers, those members who are able to develop their own private water implants can oppose the creation of a water committee that would limit their access to water and increase their expenses (Bardhan, 1993: 637).

4.3 Strengths of government-communities partnership

Over the course of many years, several water operators have provided water and sanitation services without involving local communities. 'This has meant that the majority of decisions concerning the improvement of a community's water supply have been taken from outsiders' (Davis, Garvey and Wood, 1993: 33). Many specialists of the water and sanitation sector consider government-communities partnerships as organisations able to overcome the limits associated to both government and private sector management while increasing efficiency, sustainability and equity in the provision (Bardhan, 1993: 633).

First of all, compared to PPPs, government-community partnerships do not focus 'on a direct monetary profit and can often mobilize voluntary labour' (Dardenne, 2006: 29). Furthermore, as it emerges from the case studies, government-community partnerships bring 'different areas of expertise together and support capacity-building', allowing communities to use their traditional knowledge and, at the same time, be more independent from outsiders (Hall, Lethbridge and Lobina, 2005: 19). Communities can choose 'the type of technology, which they can afford, manage, maintain and is appropriate to their environment' (Kwadzokpo in Pickford, 1998: 40). This guarantees a higher level of acceptance and sustainability of the facilities adopted.

As argued by Wegeln-Schuringa (1998: 6), further advantages are represented by the fact that 'the level of service is based on community demand and community willingness to pay' and 'the cost recovery and payments system will be adapted to community conditions'. People will be

more available to pay for reliable and improved water and sanitation services, which are locally managed and not perceived anymore as inefficient government services (Wegeln-Schuringa, 1998: 9). In addition, the community can establish a more effective and flexible tariff system, based on its better knowledge of the living conditions of its members. Therefore, as showed by the case studies, the community can decide to adopt subsidies or apply special repayment conditions to the poorest. As the cost recovery, operation and maintenance of the services are responsibilities of the community, 'the burden to the agency of routine servicing and maintenance and repairs is reduced' (Wegeln-Schuringa, 1998: 9). The funds that government should have invested for payment collection, operation and maintenance 'can now be used for extension and/or rehabilitation of existing supplies or for assisting communities in the development of new supplies' (Wegeln-Schuringa, 1998: 10). Finally, the community can acquire enough confidence and management capabilities to engage autonomously in further development projects and initiatives (Wegeln-Schuringa, 1998: 6).

4.4 Weaknesses of government-communities partnership

As argued by Khroda (in Rached *et al.*, 1996: 147) there could be some important obstacles to the successful implementation of a government-community partnership. 'A central unit is essential for coordination of water policies, formulation of rules and regulations, and overall national planning, but this sometimes negatively affects the management of water resources at the grass-roots level' (Khroda in Rached *et al.*, 1996: 147). In fact, sometimes governments have difficulties in 'devolving sufficient responsibilities for water management' to water communities and recognising them as partners in service delivery (Khroda in Rached *et al.*, 1996: 147). This can mean 'loss of power, status and influence' and 'loss of chance of making some extra money through tendering procedures' (Wegeln-Schuringa, 1998: 10). In addition, 'the public operators might be sensitive to elections: a new political leader may make deep changes to the way the operator is governed' (Miranda in Warwick and Cann, 2007: 66). This, as underlined by Karikari (in Rached *et al.*, 1996: 239), could mean to sanction the full and independent control of the service provision by the community. From this point of view, the degree of community participation can vary on a case-to-case basis depending on the local political conditions (Hall, Lethbridge and Lobina, 2005: 26).

Other obstacles could derive from the nature of community-based management. To begin with, the charge of responsibilities that communities have to accomplish can be quite challenging. Among those responsibilities, communities should be capable of structuring their organisation to ensure the 'operation and maintenance of the water systems, including collection, management, and safekeeping of funds and

purchasing the goods and services required for maintaining the system' (Karikari in Rached *et al.*, 1996: 239). First of all, the successful realisation of these tasks is often limited by the lack of technical training, low revenue from tariffs and political and legal constraints. As observed by the OECD (Dardenne, 2006: 29), 'the actual management is often monopolized in the hands of a small group that may not be representative of all the users': this, in turn, may not guarantee transparency and respect of the rules. In addition, these committees might get in conflict with traditional authorities and not be able to continue their regular activities after the initial phases (Wegeln-Schuringa, 1998: 7).

The OECD (Dardenne, 2006: 29) argues that 'social willingness is not always synonymous to technical experience and long term vision': community-based management tends to 'minimise expenditure, frequently even at the expense of preventive maintenance'. This is also observed by Kleemeier (2000: 942), who argues that a weaker point in community participation to water and sanitation services management can be represented by the long term 'preventative maintenance and repairs' of the water and sanitation systems. The committees may activate only in occasion of breakdowns: it might happen that 'in the time between breakdowns committees feel there is no need to meet or even collect maintenance fees' (Wegeln-Schuringa, 1998: 7). In addition, even if communities can count on voluntary work, 'free voluntarism or minimal salaries are conceivable for short term actions', not for permanent jobs (Dardenne, 2006: 30).

Finally, 'beyond these limitations, community-based operation requires a pre-existing social cohesion, which is more likely to be found in rural societies than in peri-urban slums' (Dardenne, 2006: 30). The result of all these factors, according to the OECD (Dardenne, 2006: 30), is that

‘community participation is frequently successful in short-term inputs (participatory planning and implementation), but is less successful and unlikely to be sustainable for long-term operation, particularly in peri-urban areas’. In these contexts, the OECD sustains that after the implementation of the project PPPs might appear to be more suitable (Dardenne, 2006: 30).

4.5 Financial sustainability of government-communities partnerships

Both in the case of PPPs and government-communities partnerships, 'financial issues can have a negative effect on a partnership because there may be a lack of clarity about what resources partners can contribute or insufficient joint action to look for additional resources' (Hall, Lethbridge and Lobina, 2005: 19). Many experts on the sector believe that the establishment and creation of government-community partnerships do not require as much funds as the PPPs, thanks to the economic contribution deriving from the communities and their capability to encourage the voluntary work of their members. On the other hand, some scholars estimate that the cost of funding government-community partnerships could be higher than restructuring through PPPs.

Governments should be able to raise enough funds to develop water and sanitation services in disadvantaged and deprived rural areas. Given some of the characteristics of these areas, as it has been showed above, this task can be particularly difficult and expensive for the central government. Usually 'external support agencies, such as bi-lateral donors, multi-lateral organisations and development banks, assist governments in the provision of water supply systems to communities' (Bold and de Graaf, 2001).

Local communities, as suggested by Karikari (in Rached *et al.*, 1996: 239), should be able to contribute around 5-10 per cent of the total cost of the services. This financial obligation might be quite hard to accomplish, particularly in the case of minor communities with very small and poor populations. In fact, as argued by the OECD (Dardenne, 2006: 30), tariffs collection can be quite difficult in a context where managers and

beneficiaries of the services have close relationships as in the case of small communities. If tariff collection does not provide enough funds, the community will have to ask for a loan. Unfortunately, communities often do not have access to institutional finance, apart from some microfinance institutions that work in peri-urban and rural areas. On one hand, 'banks are generally reluctant to lend to poor communities as they cannot offer sufficient land/buildings as collateral' (Wegelin-Schuringa, 1998: 15). In addition, communities are not formally recognised as legal entities and 'it is therefore difficult for formal sources of credit such as banks to transact with them' (Wegelin-Schuringa, 1998: 15). On the other hand, these obstacles can be overcome through 'the commitment of the government in creating the enabling environment, for example the provision of credit facilities with favourable repayment conditions' (Kwadzokpo in Pickford, 1998: 43). Finally, microfinance institutions can grant loans to single individuals or to the entire community, provided the financed infrastructure will benefit the community as a whole (Wegelin-Schuringa, 1998: 15).

4.6 Community-government management as alternative to Private sector involvement

In spite of the obstacles described above, government-community partnerships can represent a valid alternative to PPPs in the rural water and sanitation management. According to Apoya (2003: 20), 'the Savelugu model has been very successful in showing that community participation in service delivery can bring benefits to both the utility and community members'. How can the Savelugu's example be successfully applied to other national contexts and cultural backgrounds? There are many case studies of communities that have successfully and efficiently managed their water and sanitation services, even for a long period (Schouten *et al*, 2003: 288). On the other hand, 'there are also numerous communities that in the years after "handing over" in one way or another got into problems with managing their water systems' (Schouten *et al*, 2003: 288). In the past, many communities, after taking in charge the service management, have been left to themselves, almost as if governments were suddenly free from any responsibility. House (2004) sustains that 'local communities are often involved at the implementation rather than the planning stages of development initiatives, and many communities have become over-reliant on governments and others to provide assistance that then fails to materialize'. Government-community management, so far, has mainly worked putting 'too much of the responsibility in the hands of one stakeholders: the community' (Schouten *et al*, 2003: 289). Many of the obstacles that communities have to face could be solved through a greater government support. 'The efforts and capacities of communities are crucial, but they must be supplemented with the efforts and capacities of

governments' (Schouten *et al*, 2003: 289). This is essential for the success of government-community partnerships.

Governments' support to local communities should be multidimensional. First of all, governments should implement national legislation and policies in order to sustain the attribution of power and responsibilities to communities. For this purpose, it is very important that governments recognise the legitimacy of indigenous institutions and encourage their involvement in the management of the water and sanitation services (Mwami in Pickford, 1996: 102). At the same time, governments can promote water conservation and hygiene education programmes in order to raise community awareness and create 'a market for sanitation facilities' (World Bank, 2002: 5). Secondly, governments should provide long-term financial and technical assistance, identifying and implementing 'cost-effective support structures that build on the management capacities of communities' (Schouten *et al*, 2003: 290). In fact, communities should be helped in the choice of the technologies that are more appropriate to the context and easier to maintain, so they can represent long term and sustainable solutions (Mwami in Pickford, 1996: 102). Furthermore, communities require support from local authorities in terms of training and assistance in the creation of strategic local partnerships. It is crucial that governments help communities 'to establish linkages between community management structures and external entities', such as local authorities or other communities (Lockwood, 2004: 14). Finally, governments should support communities in the 'regular monitoring of system performance and feedback of information for remedial action' (Lockwood, 2004: 14). 'Monitoring of operation and maintenance activities should be recorded and analyzed periodically. The records could facilitate a transparent

structure, and ensure a more controllable operation and maintenance committee' (Wobusobozi *et al* in Pickford, 1996: 111). Community involvement 'can be at the basis of a sustainable rural water supply service, but only if it is framed in national policies and an effective institutional support structure' (Schouten *et al*, 2003: 289).

4.7 Case studies of government-community partnerships

This dissertation examines two case studies of government-community partnerships in order to highlight the features and potentialities of this type of partnership in the delivery of water and sanitation services in rural and peri-urban areas.

4.7.1 Ghana

4.7.1.1 Introduction

The first case study is Savelugu, Ghana. 'Ghana is a country in West Africa, populated by about 20 million people' (Al-Hassam in Balanya *et al*, 2005: 139). Water shortage is quite a significant feature of this country. It is estimated that approximately 60-70 per cent of its urban population and only 35-40 per cent of the people living in rural areas can have access to clean water (Apoya, 2003: 2). In addition, 'the percentage with access to improved sanitation facilities is approximately 40 per cent in urban areas and 35 per cent in rural areas' (Apoya, 2003: 2). People without access to piped water have to rely on insecure and often expensive sources such as small local vendors (Apoya, 2003: 2). The lack of access to clean water is considered responsible for approximately 70 per cent of the diseases that afflict the country, including guinea worm, diarrhoea and cholera.

Savelugu is a rural community with a population of about 25.000 people, mainly composed of 'farmers and middle men and women who sell farm produce' (Al-Hassam in Balanya *et al*, 2005: 145). The partnership between this community and the Ghana Water Company Ltd, the national public water company, was established in 1999. In the previous years, the main source of water of the community had been represented by 'dug-outs' (Apoya, 2003: 2). This had increased the spread of water-related diseases, in particular the guinea worm disease, making of Savelugu one of the communities with the highest level of infection in the country (Al-Hassam in Balanya *et al*, 2005: 145). The attempt to face this situation represented an important incentive for the creation of a government-community partnership.

4.7.1.2 Description

In Savelugu, Ghana, 'the terms of the partnership were negotiated' and the role of the parties clearly defined (Apoya, 2003: 5). The agreement established that the national public water company supplies bulk water to the community, which, in turn, 'takes care of all further steps in water delivery, from planning and tariff setting, new connections and maintenance to billing the users' (Hoedman, 2006: 16). The water company 'also provides consultancy and on-site technical advice from time to time on matters related to the distribution of water', and 'maintenance of electro-mechanical equipment when the need arises' (Apoya, 2003: 6). The community has to pay the water company in proportion to the amount of water delivered. The price is agreed between the partners on the basis of the domestic and commercial use of the water (Apoya, 2003: 5). 'There is a project management committee that is responsible for the day-to-day

management of the system. It oversees the technical operations of the system and directly controls the operations of the commissioned agents' (Apoya, 2003: 10). UNICEF and other international organisations supported financially the government for the establishment of this partnership through the Guinea Worm Eradication Programme (Apoya, 2003: 8). In particular, UNICEF help contributed to finance the replacement of the pipelines connecting the Savelugu community and other construction works that were necessary to guarantee a successful provision of water and sanitation services (Apoya, 2003: 8).

As result of this partnership, the community has been able to 'drastically reduce unaccounted for water, set lower tariff rates and also do routine maintenance and some expansion of connections' (Al-Hassam in Balanya *et al*, 2005: 145). The community has also managed to guarantee an equitable access to water and sanitation services by all its members. In fact, even the poorest members, incapable to pay for the supply, can have access to the services as a system of cross-subsidies exempts them from paying any cost (Al-Hassam in Balanya *et al*, 2005: 146). 'Access to potable water has increased to 74,4% compared to the national average of 36% access for the rural population' (Al-Hassam in Balanya *et al*, 2005: 146). At the same time, 'cases of water-born disease guinea worm have been reduced by 98 per cent, whilst rising in the rest of the country' (WDM).

On the other hand, the system has proved to be financially self-sustainable, as the Ghana Water Company Ltd has improved its tariff recovery rate while reducing the cost of tariffs collection. Since the establishment of the partnership, the national water company has accomplished almost 100 per cent tariff collection for the water delivered to Savelugu in contrast with

the lower tariff recover rate registered in the other areas of provision (Nijhuis, 2004). This result has been obtained thanks to a series of mechanisms of control that the community has developed in order to 'minimise losses and improve tariff recovery' (Apoya, 2003: 8).

According to the members of the community, this kind of management promotes grassroots democracy. According to Rudolf Amenga-Etego, leader of the Ghana National Coalition Against the Privatisation of Water, Savelugu represents an example of effective alternative to privatisation (Nijhuis, 2004). As argued by Hoedman (2006: 16), 'the main threat to the sustainability of this model seems to be external: Ghana Water Company has problems delivering the promised amount of bulk water'. In fact, due to shortage of funds, the national water company has started a process of rationalisation of its water supplies, significantly affecting the management of water and sanitation services in Savelugu (Al-Hassam in Balanya *et al*, 2005: 147). 'This was a fear that the community had expressed during the feasibility study about an option that would make their water supply' totally dependent on the Ghana Water Company Ltd (Apoya, 2003: 18). The community is trying to solve the problem by collecting funds to finance mechanisms for ground water extraction. This will allow the community of Savelugu to complement the inadequate supply of water from the national water company (Apoya, 2003: 19). Another problem the community has had to face is the increase of tariffs by the national water company in 2001. As result, some people could not afford anymore the price of the piped water in spite of the subsidies, and they depended on unsafe sources, which, in turn, increased the risk of diseases such as the guinea worm (Apoya, 2003: 19).

4.7.1.3 Conclusions

In conclusion, the public-public partnership in Salvegu has been extremely positive in terms of water access and population coverage, quality of the services and financial sustainability. As result of this partnership, the community has been able to dramatically reduce the number of people without access to sufficient water and sanitation services, including the poorest members, incapable to pay for the supply. Also the local community compliance with the water tariff payment has increased, guaranteeing, in this way, the financial sustainability of the water supply system.

4.7.2 India

4.7.2.1 Introduction

The second case study is Karnataka, India. In the late years, India has assisted to a massive development of its water and sanitation infrastructures both in urban and rural areas (Subramanian, 2002: 8). In spite of the investments in the water and sanitation sector, the Indian 'government's performance in terms of delivery, operation and maintenance has not been very encouraging' (Kurup, n. d.: 2). Despite the improvements, 'only between 18 to 19 per cent of all rural households have a toilet', while 'between 69 to 74 per cent of India's rural population take their drinking water from protected sources, leaving an unserved population of 26 to 31 per cent' (Subramanian, 2002: 8). In line with the rest of the country, 'in the Karnataka state, 'only 18 per cent of the households have access to latrines' (Veerashekharappa, 2005: 2).

4.7.2.2 Description

Between 1994 and 2002, the government of Karnataka, with the financial support of the World Bank, implemented a project called the Karnataka Integrated Rural Water Supply and Sanitation Services, which involved 1,104 rural villages with a population of approximately 5 million people (Veerashekharappa, 2005: 2). The project aimed to improve the access of a rural and disadvantaged area to safe water and sanitation services, increasing the level of people's awareness about the correlation between infective diseases and water and hygienic conditions. For this purpose, the project entailed the creation of a government-community partnership where the community was responsible for the 'planning, implementation

and management' of the water and sanitation services delivery and the 'effective operation and maintenance' of the utilities (Kurup, n. d.: 3). Among the activities delegated to the community, the project also included rainwater harvesting 'to maintain constant ground water recharge at source for sustainable water supply' (Sivaram and Mohan Rao, n. d.). In addition, the community was accountable for 30 per cent of the cost of the sanitation facilities and the entire cost of operation and maintenance of the utilities (Kurup, n. d.: 3).

On the other hand, 'the government has a facilitating role in mobilizing all available resources towards achieving the objectives set by the community' and providing the necessary support in order to develop community's 'competence, skills and institutional capabilities to manage the facilities' (Kurup, n. d.: 3). A Village Water and Sanitation Committee was established in each village with the purpose of accomplishing the community's activities, including the decision and collection of the water supply and sanitation tariffs. Village Committees have received the official recognition by the government of Karnataka and are mainly composed of all the members of the village government, the *Gram panchayats*.

The partnership between the government of Karnataka and the community has produced many positive results. First of all, the government-community partnership has significantly increased the access to water by the members of the community. At the same time, the participation of the community in the project and local management of the facilities have increased people's willingness to pay for the water and sanitation services (Kurup, n. d.: 9). In addition, the Village Committees have been 'generally successful in mobilizing the resources they need to operate and maintain

the […] facilities and take the leadership in the management and monitoring. This is particularly true in villages with a high proportion of house connections and improved service level' (Kurup, n. d.: 10). Furthermore, the government-community partnership has also improved the general hygiene standards thanks to the construction of '90,000 household latrine and 1,200 kilometers of drainage' (Kurup, n. d.: 10). The project promoted the implementation and use of individual sanitary latrines by introducing subsidies (Sivaram and Mohan Rao, n. d.). 'The use and maintenance of household latrines, personal hygiene and community hygiene was indeed satisfactory in the project villages. More overdue to the greater involvement, the unit costs of facilities were brought down' (Kurup, n. d.: 10).

On the other hand, not enough has been done to make the members of the community aware of their duties, including the financial ones, nor the benefits of the project (Veerashekharappa, 2005: 3). People's opinions and perceptions have not been adequately taken in consideration in the project design. In consequence, in several cases people have showed 'lack of interest and support and hence little sense of ownership', which is one of the most important factors of a project based on community participation (Kurup, n. d.: 10). In addition, the partnership has not managed to guarantee an equitable access to the water and sanitation services by all the community's members, because they 'were biased towards wealthy localities in terms of accessibility and adequacy' (Veerashekharappa, 2005: 4). The Village Committees were often a mere reflection of the *Gram panchayats*, which were maintaining the existing social inequalities - deriving by the caste system - in the access to water and sanitation services. Hence, they were more engaged in protecting the interests of the

existing elites than representing the interests of the entire community. 'As result, neither the beneficiary shared the capital cost nor user charges were paid in many villages. In fact, the project helped the key persons in the village to capture benefits, without accountability' (Veerashekharappa, 2005: 5).

4.7.2.3 Conclusions

In conclusion, we can argue that, for many aspects, the public-public partnership implemented in Karnataka has been successful. It has allowed to increase the population coverage, guaranteeing the water access to a larger portion of the population. In parallel, it has also showed financial sustainability as the compliance to the payment of the water tariffs has increased. Nevertheless, there are still a number of aspects that need to be improved: the sense of ownership, involvement and participation of the whole community has to be improved, while the access to water and sanitation services has to be more equitable.

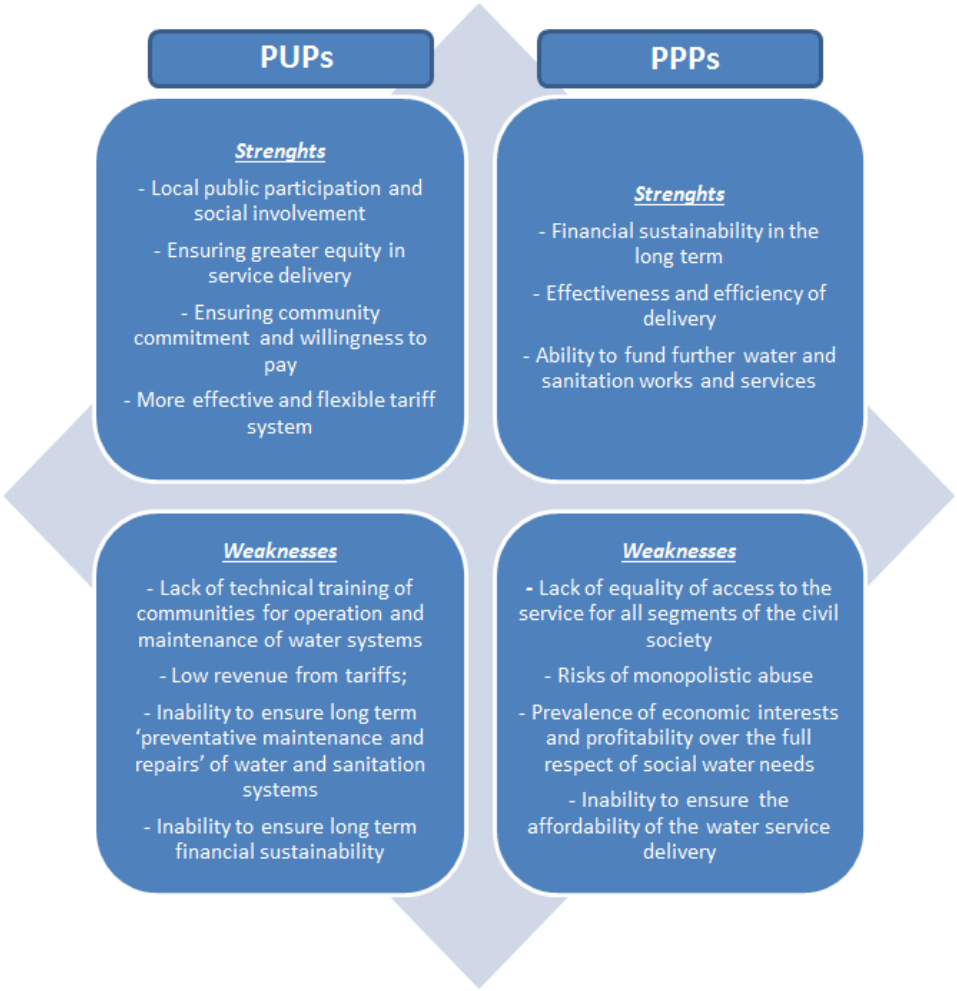
Chapter 5

The way forward: the Local Water Partnership

5.1 Private sectors constraints and strategies for a sustainable, efficient and cost effective water delivery in rural areas: how the private sector-community partnership can help.

Can Private sector and local communities work together in rural water services delivery?

So far we have just considered either a government-local community or a government-private sector partnership: one as alternative to the other. We have observed that both models have been successful in some cases and they have failed in other cases. All these cases of the two water management models have provided enough indications on how to improve their implementation. Nevertheless, they have also showed that both models have their weaknesses. In particular, please see below a simplified SWOT analysis of the two models, based on the conclusions of the previous chapters.



As already seen, Private Operators can encounter several constraints to their interventions in rural areas that are potentially able to undermine their sustainability. It appears, therefore, necessary that Private Operators develop careful planning and adapt their strategies to the rural context and its specificities.

According to the author of this dissertation, we could establish a comparison between Private water Operators and Microfinance Institutions that decide to focus their action on rural areas. This comparison could help to define some best practices and successful strategies that Private water operator could adopt on the example of Microfinance Institutions, in particular those strategies aiming to overcome

the specific constraints of rural areas based on concepts of flexibility and local community partnerships.

In fact, adequate strategies could allow Private Operators to gradually reach complete financial self-sustainability, becoming progressively independent from the support of donors, government aids and any kind of subsidies. As shown in the study by Christen et al (in Malhotra, 1995: 2), 'efficient, financially viable institutions can develop the scale and financial leverage to reach large numbers of poor people'. Private sector can act along two directions, pursuing an increase in revenue or a reduction of costs and risks. This dissertation presents some of the measures that can be adopted along both the directions.

Private Operators can increase their revenue mainly by increasing the cost of the delivered water services. The rise in revenue rates is an approach which produces an immediate increase of earnings without the need of previous investments and, therefore, further costs. Nevertheless the rise of the interest rates, and therefore of the water services costs, can lead to a reduction in the number of the clients, and an increase in the number of poor without access to water. From an economic point of view, the rise of revenue rates and cost of the services can ultimately reduce private operators' revenue.

The strategies that go in the direction of cost reduction, and, therefore, towards an increasing efficiency, can be various and very different. A thorough analysis of the new area where Private Operators intend to invest appears fundamental before investing. Some Private Operators may prefer to first evaluate the dimension of the potential clients' portfolio and the characteristics of their water resources. Sometimes these small rural villages, even if remote and disadvantaged, can have access to private

vendors, wells, artisanal systems for rain water collection, or previously existing water infrastructures. Depending on the results of the analysis of the rural area, Private Operators can decrease the amount of the required investments.

A crucial approach which can be adopted by some Private Operators is to coordinate the repayment of water services with the agricultural production cycles. The idea is to guarantee to farmers a continuous access to water services in the required quantities and qualities, above all when they most need water in relation to the agricultural cycles, and to settle the repayments in correspondence with agricultural schedules (Pearce et al, 2004: 314). 'With regular bimonthly, trimester, semester, annual or even end-of-crop-cycle and irregular payment options, repayment schedules are sufficiently flexible to be attractive to a range of agricultural activities' (Pearce et al, 2004: 314). Water services tailored to the requirements of the rural poor will increase the acceptance of the role of the Private Operator, of the established costs, and the collection of services payment. Flexibility in the sense of tailoring the repayment deadlines on the clients' necessities can be, therefore, a successful strategy, even if it 'may increase default risks and present liquidity' and administrative management challenges for Private Operators (Pearce et al, 2004: 317).

Another important strategy implies the adoption of technological improvements that can foster the efficiency and decrease the operational costs in rural areas (Pearce et al, 2004: 315). New technologies can contribute to reduce risk and cut delivery costs as well. In spite of the potential improvements that can derive from technological innovations, it is important to carefully assess the implementation costs of the new

technologies and compare these with the expected benefits (Pearce et al, 2004: 315).

Like in the case of Microfinance Institutions acting in rural areas, Private operators in water services delivery can take advantage of the power and internal mechanisms of the local communities. The most important asset that each member of the community pledges towards the community itself is his own prestige and reputation.

Moral and cultural values together with the existence of a social and religious cohesion that can be found in rural societies have a certain importance in the successful implementation of private sector water delivery as well as microfinance projects (Chao-Beroff, 1999: 41). These elements, in fact, can make 'foresee strong mobilization and commitment, which are factors in reducing costs' (Chao-Beroff, 1999: 40). Private operators, as well as Microfinance Institutions, can actually innovate their approaches trying to incorporate, as much as possible, the strengths of these rural communities' mechanisms and aspects. Private water operators acting in rural areas can tie access to future water services for all members of the community to good repayment by each member. These kinds of agreements with local communities represent a valid strategy that formal Private Operators can adopt to reduce the risks of defaulters: through a reinforced social control, they allow, in fact, spreading the sense of responsibility among the clients and enhancing discipline and agreements' compliance. Furthermore, they can dilute the risks deriving from the lack of information on the potentialities of each single client and reduce the costs of monitoring which can be mainly exercised by the local community (Schreiner, 2001: 8).

The partnership with local communities can give to the private sector the possibility to decentralize, at the community level, the clients' monitoring and the eventual recovery of water services payments. The Private operators can, in fact, appoint some local community representatives, or address directly traditional authorities of the communities, to who delegate the control of the payment compliance (Chao-Beroff, 1999: 8). This kind of partnership with the local community can improve rural water private operators' outreach and their potential impact on rural areas (Chao-Beroff, 1999: 8). Furthermore, these private operators-local communities partnerships strength the social pressure that is exercised within and by the entire community, improving both water services delivery and private operators' performance, and they can potentially foster the spirit of solidarity among the community members (Chao-Beroff, 1999: 8).

In addition, private operators' partnership with local communities appears to have a strong impact in terms of a sustainable use of water resources, their conservation and protection as consequence of the development of a sense of ownership of the community for these resources and the high level of commitment towards the quality and effectiveness of the services. Maybe local communities are not that strong, as argued by some critics, in the operation and maintenance of the water infrastructures, but, as their private and working life depend so strictly on water, they might be very keen in signaling eventual failures in the infrastructures, leakage problems or other issues affecting the water systems, that ultimately can affect the quality and effectiveness of water provision. To increase the effectiveness of the implemented water management system, it is necessary that local communities understand the need to manage environment in a sustainable way and the importance of its role in the cycle of water management and

use. In this sense, training activities with local community about the water cycle and appropriate strategies for the water management and use are an important step to increase the effectiveness of the water management system.

The partnership Local communities-Private operators can represent a real guarantee in favor of sustainability of water resources management, as, for private sector, sustainable management means economically efficient and financially sounding investments, while, for local communities, sustainable management means more continuous and effective water provision services.

Finally, it appears fundamental that rural water private operators give a strong local community dimension to their activity. The possibility to provide rural water services as close and adapted as possible to the customers and their needs and characteristics can, in fact, increase the number of potential reliable clients and the effectiveness of the private water delivery (Chao-Beroff, 1999: 29). 'In order to reach these populations, there is a need to enter their universe, both from a physical and a socio-cultural perspective' (Chao-Beroff, 1999: 29).

Poor people need and use water services all the time. They need water services to survive, take advantage of business opportunities and improve their way of living (Littlefield and Rosenberg, 2004: 2). 'The majority of the world's poor is rural, and will remain so for several decades. Poverty-reduction programmes must therefore be refocused on rural people if they are to succeed' (IFAD, 2001: 15). In Africa, with a population that is 80% rural, water services delivery cannot make a significant impact on the problem of poverty unless it expands in rural areas (Chao-Beroff, 1999: 29).

There could be a 'potentially positive impact of Private operators in rural water services delivery on rural economic life. Nevertheless, 'rural areas that are not densely populated are often out of the interest of Private operators, because of higher investments and transaction costs, price and yield risks, seasonality, and collateral limitations in agricultural sector' (Pearce et al, 2004: 314).

This dissertation argues that, as claimed by Matin (in CGAP, 2004: 77), reaching a 'significant number of the poorest requires constant learning' from practical field experience and a process of innovation that involves continuous adaptations to water services and their mechanisms of provision. The strategic goal of reaching the rural poor and the necessity of sustainable, efficient and effective water services can represent a limit for the involvement of Private sector in the field of rural water supply, and in many cases has meant the failure of private initiatives, above all those coming from multinational water companies. This dissertation has argued that this constraint can be solved thanks to a strong partnership with local communities. The way to reach this goal can be economically risky and potentially dangerous for the private operators and highly demanding in terms of commitment for the local communities but it is worth pursuing.

From this analysis, we can observe that the weaknesses of one model meet their answers in the strengths of the other model, and vice versa. Therefore, why not to consider a merge between the two models? Why do not consider a partnership between local communities and local private sector in rural water supply?

5.2 What about a trilateral partnership?

In developing countries, water management is not a marginal issue. The lack of sanitation and drinking water still threatens the survival and development of millions of poor. One of the major challenges facing water management is the increasing pressure on scarce water resources in the context of climate change and a growing population. Water quality in developing countries is another major challenge: pollution represents a huge problem for all water users and the target of providing clean water in sufficient quantity and at an acceptable cost remains an important world concern.

Ageing water infrastructure creates more problems in terms of sustainable water provision as huge amount of water get lost from the network or is contaminated. Moreover, wastewater leakages and uncontrolled discharges of untreated wastewater produce pollution of water sources with potential risks for public health. A truly proper management of water services and infrastructures is necessary to address these issues in a cost effective and sustainable way. There is a strategic need to create capacity and good governance partnerships and to improve water resources management to guarantee environmental sustainability.

In the previous section, we have seen that a partnership between local communities and local private sector in rural water supply is envisaged.

Nevertheless, legislation and policies support from governments is essential in both private sectors and local communities based water management models. Local communities and private sector participation provide promising solutions to sustainable management of water services, but it is necessary to emphasize the role of central and local governmental

authorities. The active presence and continuous leadership of a strong public sector, mainly a local government, in the partnership will bring 'citizens at the center of the process' and it will be 'the critical success factor in the future' (Lazarte, Boulenger, and Jain, 2011).

Governments have a crucial role in ensuring the sustainability, reliability, and affordability of the water services, and the wider issues of managing and protecting scarce water resources (Prevost, Mwanafunzi and Jain, 2010). Local government are crucial, among the other things, for implementing measures for the protection of water resources which may include the establishment of monitoring networks with water quality indicators and the enforcement of laws.

In light of the fact that decentralization of provision of public services is prevailing, a partnership among key water actors at local level is envisaged. Therefore, we should consider if local private sector, local communities and local government can actually work together in rural water services delivery. Should we think about a ***trilateral partnership***?

To face the water challenge, a new partnership, a new model of collaboration among the key players of the water sector must be established to enable more efficient water use, good water quality, a sustainable water management and availability.

From the analysis of the strengthen and weaknesses of private sector and local communities water management models, this dissertation supports the creation of partnerships among regional government, small scale private sector and local communities, in the form of a trilateral water partnership to be implemented at local level. This partnership can be called ***Local Water Partnership***, in short LWP.

5.3 The Local Water Partnership

As explained in the previous section, the Local Water Partnership, proposed by the author of this dissertation, would represent a trilateral partnership among local government, local community and local private sector, where the local dimension and the local interest is a unifying and common factor among these three key stakeholders.

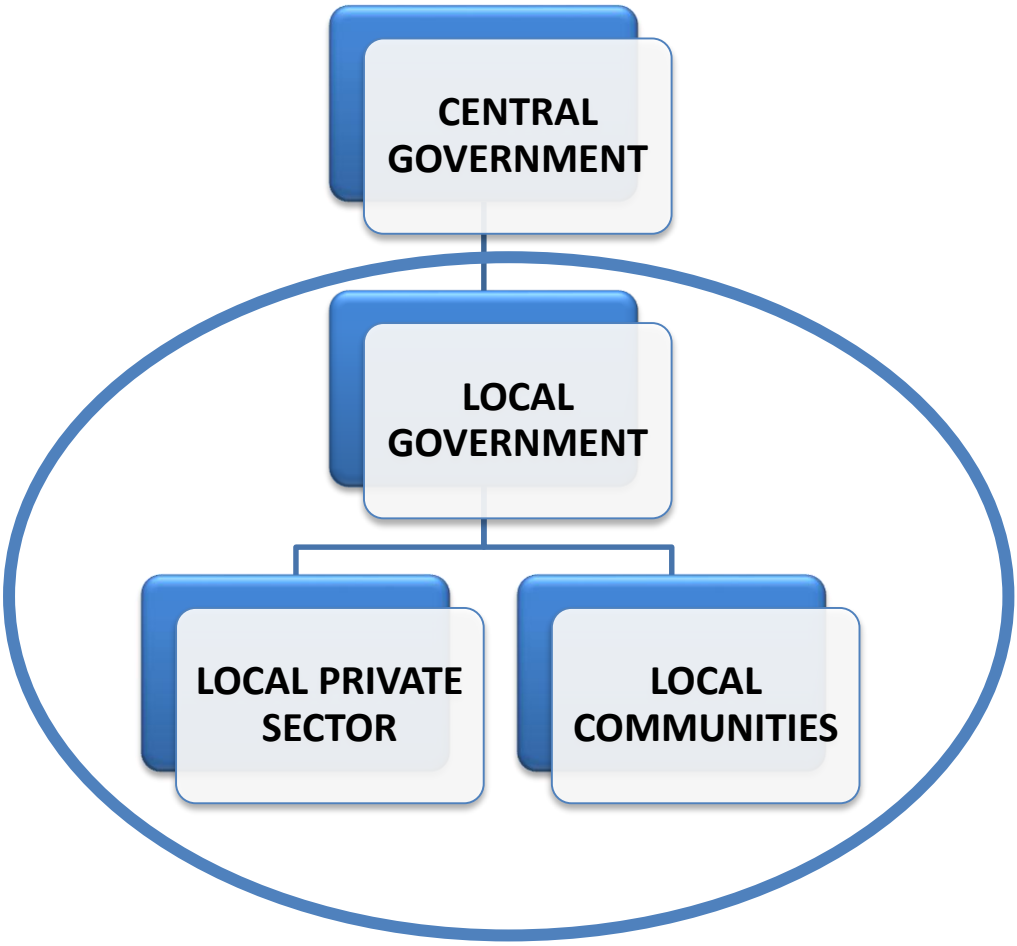


Fig 1. The figure above represent the concept of Local Water Partnership, where local government, local private sector and local communities

cooperate in the management of rural water supply services, with the support of the Central Government, which can guarantee and enabling legislative framework.

The partnership would contribute to unify all actors around a common goal: a more sustainable, effective and efficient water and water services provision. Local communities' participation would ensure a more environmental sustainable and responsible water management. The private sector involvement would ensure financial sustainability of the system and its endurance, together with the implementation of adequate technical and technological solutions. The local governments would have an important role in the partnership as regulators and procurers.

The LWP would aim to bring together public and private actors at local level, combining supply and demand side actions and capability of intervention. The new partnership would bring together the capabilities and dynamism of public and private sectors by providing the right incentives and conditions to engage them as proactive players in achieving local water governance objectives. The LWP would ensure the maximum coordination among all relevant actors in the water provision frame at local level: by doing that the LWP will ensure a truly participatory approach towards the management of water resources. In fact, the LWP would make sure to involve the final users of water resources, through local communities' participation.

The local government would function as a point of reference and coordination, bringing together existing local actors and the demand and supply side. It could also represent a driver to define the agenda of both

public and private sectors. The partnership among local communities and private sector would only be effective if it is coordinated and supervised by government in order to gather resources, avoid duplication and define common objectives. This coordination role could be better done at local level. The local level is the only one that permits to take into account the dimensions, realities and specificities of the context.

5.3.1 LWP added value

The LWP would be able to ensure a ***multidisciplinary and multi-actor approach***, contributing in better identifying in which areas innovations are needed and provide the sufficient level of research, technology, governance, control, sustainability and finance. The LWP could allow to deal with the many water related challenges, the different water needs, while combining environmental and economic sustainability. The LWP would also help to provide solutions for other water world challenges, like fighting climate change, resource and energy efficiency and strengthening the water/energy interactions. In fact, energy consumption is a key element for a truly sustainable water management.

Water availability and water quality are essential for sustainable development and green economy. To achieve water resources protection and sustainable water management, a more sustained effort is necessary by all relevant actors at local level. The added value of the LWP would lie in a more ***holistic and integrated approach*** based on the strengths, weaknesses and complementarities of local governments, local private actors and local communities. In the rural area, land use management, biodiversity, spatial planning and agriculture influence each other and may compete with each other with regard to the available water resources. To achieve a sustainable management of water, all these factors need to be taken into consideration in a holistic manner.

Furthermore, the LWP would ensure a ***participatory approach,*** by bringing together all involved actors in water challenges, which, in turn, enables cross-fertilization. In the mind of the author, LWP would be highly valuable

for achieving a necessary critical mass and pooling together efforts of all relevant public and private stakeholders for the successful implementation of sustainable water management systems. LWP would bring together the ingenuity of local communities and dynamism of the private sector by providing the right incentives and conditions to engage them as proactive players in achieving local water policy objectives. No one entity can shoulder the cost burden of providing water services to rural communities. Therefore, the LWP would pursue a co-management model which implies the sharing of costs among local governments, communities and private sector. This would help to diffuse the cost burden and make water supply more stable in the long term (beyond the typical development project timespan) because not linked to just one source. In addition, LWP represents a means of improving water management through better planning and more informed decision-making. The involvement of all interested parties will facilitate the transparency, accessibility and acceptance of the implemented actions, increasing their success rate.

LWP could be considered, by the author of this study, as a ***good water governance model***, meaning a key management tool to address all crucial problems related to water management in terms of water availability, quality, quantity, efficiency and price. The LWP would promote, though the involvement of local government and local communities, a good water governance. This would "ensure that public resources and problems are managed effectively, efficiently and in response to critical needs of society. Effective governance relies on public participation, accountability, transparency, effectiveness and coherence" (Cedefop). The LWP could permit the necessary good governance in order to ensure equity in water allocation, sustainable water management and institutional reinforcement.

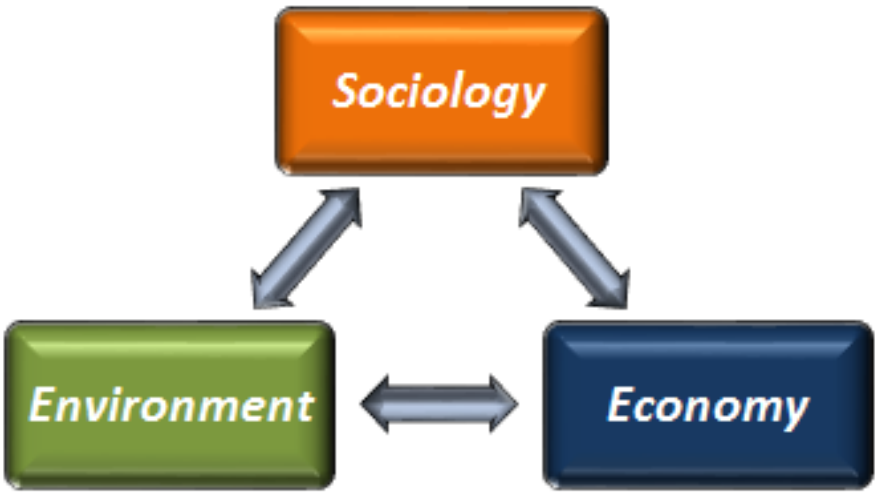
5.3.2 LWP conceptualization

The partnership would allow to create conditions for competitive water management and use efficiency, use of non-conventional waters and risk management. The governance model of the LWP should be flexible, simple and adaptable to the context in order to be truly effective. It needs to allow a bottom up approach through a strong participation of the local communities in order to identify real needs and constraints while ensuring commitment and a clear endorsement in the decision making process. This approach is more likely to succeed than top-down schemes, which local communities feel are imposed on them.

Water good governance and management is about finding the balance and compromise between different needs and users, between participation and financial sustainability, between environmental sustainability and sufficient water access to all, between environmental costs and financial costs.

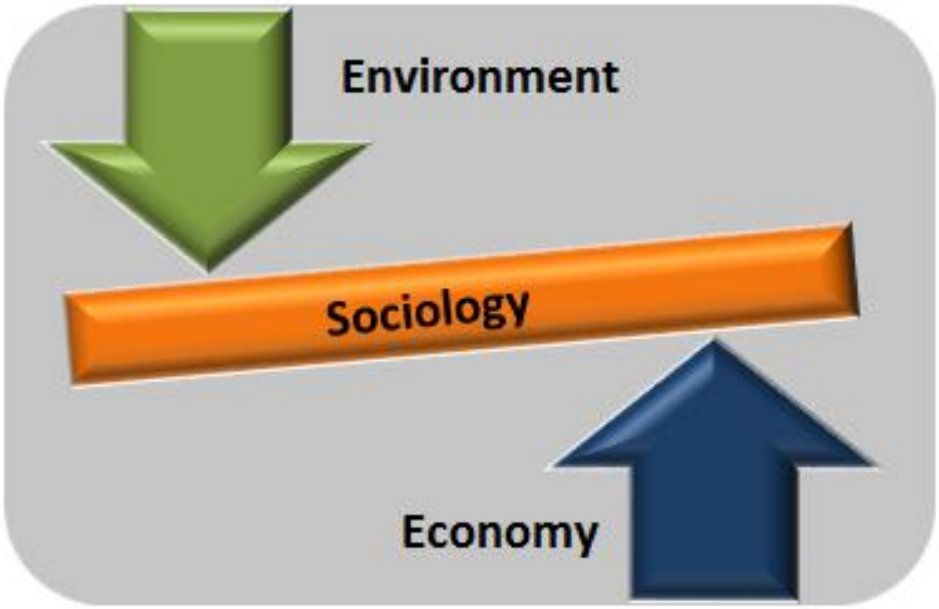
Sustainable water provision as well as water quality and quantity are a societal challenge that require the involvement of all relevant water actors. Therefore, the LWP should deliver economic as well as environmental benefits in the context of social acceptance.

LWP could be conceptualized as a sustainability triangle for water management in rural areas, as it takes into account economic, sociological and environmental aspects.

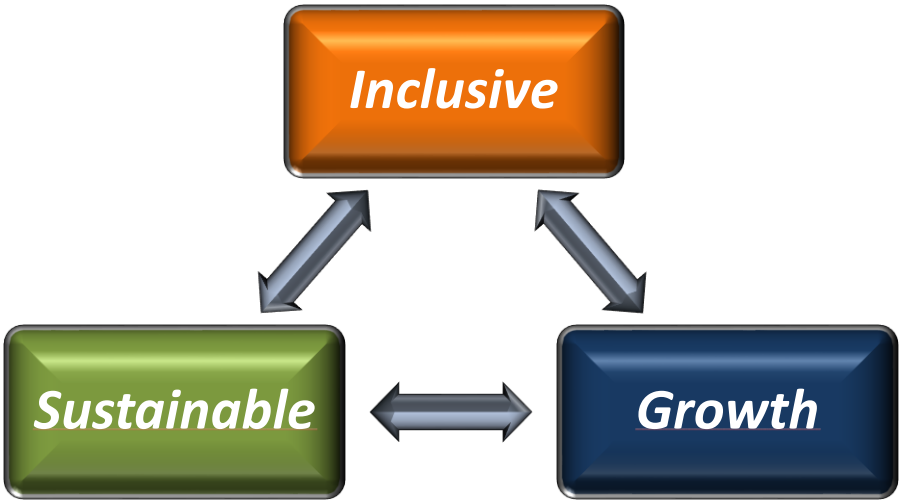


More specifically, LWP could be conceptualized as a sustainability-focused approach for water management in rural areas, as it addresses the

equilibrium of the main driving forces in relation with economical, sociological and environmental aspects.



Governments, along their entire chain (national, regional and local governments), are called to guarantee the sustainability, meaning the wellbeing and future water access of future generation. Local communities are called to guarantee inclusiveness, meaning the participation of current generations in the management and sharing of water resources. Local Companies are called to ensure economic growth, in terms of development of water resources, infrastructures and technologies.



'The three essential principles embodied in the concept of inclusive and sustainable growth (ISG) can be broadly defined as sustained growth that is consistent with the natural cycles that allow ecosystems to replenish resources, absorb waste, and maintain adequate conditions for life, while at the same time providing everybody the opportunity to participate in and enjoy the benefits of increased wealth for this and future generations' (ODI, ECDPM and GDI, 2012:4).

LWP could represent one of the winning recipes to achieve an inclusive and sustainable growth by making more sustainable and inclusive use of water resources. This is because economic growth is a critical part of development, and natural resources are likely to be a key source of such growth. Many of the world's poorer countries are not endowed with significant water resources, and this makes even more important to adopt wise and sustainable water management systems.

The government would play a facilitating role implementing the regulatory framework. On the other hand local private sector commitment is instrumental to mobilise the appropriate financial resources and guarantee the maintenance of the infrastructure and the relevant technological support.

Governments and local communities would have to deal with land use authorities, nature conservation organizations and farmers to optimize the management of water among all rural area's needs. Only through a strong coordination and cooperation in both the planning and operational rural water management, the LWP would ensure that the partnership actors will complement each other and will achieve synergies. Governments could implement an awareness-raising campaign to encourage water users to behave responsibly and sustainably.

Therefore, the LWP could represent the ideal partnership where an efficient leading local government is vigilantly overseeing a transparent responsible local private sector backed up by an empowered and committed local community.

LWP would help to pool expertise and resources by bringing together public and private actors at local level, combining supply-and-demand-side measures. The immediate effect will be to enhance knowledge exchange between all relevant water actors, and coordinate the development of the water services management and delivery.

The LWP could bring together all actors that are needed for a holistic and integrated approach based on the active involvement and participation in the decision making process of both water demand (local communities)

and supply (local private sector) side. By bringing together all relevant actors in water management, the LWP is expected to be able to address the main bottlenecks as commitment to pay, long-term infrastructure maintenance, financial risks and regulatory problems. In fact, the cross-fertilization of the main key players offers the opportunity to jointly work on solutions, bringing together all their experience and fostering better understanding of the interests and objectives of the various actors.
LWP should be developed involving, since the very first moment, all 3 stakeholders, and embedded in an institutional framework based on the rule of law that adheres to high standards of public governance and ensure predictable, efficient and transparent procedures for investors.

The involvement of local governments is essential as they have direct responsibilities in providing the enabling legislative environment and in the implementation of water policies. The private sector would need to be involved and will have also to show clear commitment through providing private funding and resources for the infrastructures maintenance and innovation. Local communities' participation would help to build awareness about water scarcity and quality, water foot printing and the public commitment to pay while developing the negotiation with the private sector for the renewal of aged infrastructures and the establishments of a fair pricing of water.

LWP would empower communities to manage water supply and sanitation methodologies that achieve long-term success. Sustainable management of water resources, community cooperation and education will contribute to halve the problem of water and will considerably contribute to achieve the MDGs.

The LWP would pay particular effort in bringing down barriers to innovation in water sector. This would have to be pursued by applying a multidisciplinary approach to address water challenges which will have to combine managerial, governance, financial and technological solutions. For this reason, the strong participation and commitment of all actors would be necessary.

Local Water Partnerships could be an excellent tool to make water service provision more efficient, more reliable and more sustainable. The LWP would have among its objectives the reduction of damages as result of water scarcity, droughts and floods, through improved water management in rural areas.

LWPs should be promoted as water management and innovation partnerships to be implemented at global scale. National governments are called to promote the implementation of LWPs in their own regions, taking into account the necessary adaptations due to the specific characteristics of the local context. LWPs, will provide recommendations to the national government on legislation and regulation improvements and facilitations that need to be implemented at national scale to guarantee a better working of the local partnerships. The formation of new LWPs could be hindered by financial concerns, incompatible governance structure, political obstacles and lack of trust of the motives of other units of government.

5.3.3 LWPs basic structure

LWP could be ruled and organized by a set of committees. The first could be an Executive Management Committee (EMC) composed by a political and technical representative from the Local Government (either regional or municipal government), plus one representative of the local community and one representative of the local private company.

Four committees could depend on and report to the EMC. The Stakeholders Committee could represent the public diverse interest and backgrounds, meaning members of the Local Community, Local NGOs and Environmental Associations, etc… This committee could provide a way for public to be heard directly.

In addition, there could be the:

- Technical Committee, responsible for the supervision of infrastructure operation and maintenance, as well as for the decision of new upgrading of the infrastructures.
- Water Pricing and Financial Committee
- Water Quality and Conservation Committee

In other words, this study suggests to set a specific committee for each of the aspects that are important to local water use planning and appear to be crucial for a good water governance.

5.3.4 Main Objectives of LWP in water management

The main objectives of the LWP in terms of water management are those reported in the table below (European Commission, 2015:148):

MAIN OBJECTIVES	Increasing the number of households connected to centralized drinking water supply and to wastewater networks
	Improving the quality of drinking water
	Increasing water access for the rural poor
	Improving the quality of the surface water bodies and preserving ecosystems and biodiversity dependent on these surface water bodies
	Improving the reliability of the water sources and the water supply services
	Increasing efficiency in water production and distribution, through detection, measurement and reduction of water losses or management asset measures aimed at reducing operating costs.
	Increasing efficiency in wastewater collection , removal, purification and elimination, e.g. with a strategy for disposal of sludge from rural wastewater treatment
	Controlling the use of water, preserving it from over-abstraction and providing for other efficient uses

5.3.5 Partners' role in the Local Water Partnership

Partner	Main tasks in the Local Water Partnership
Central Government	• Transfer of authority to local government • Fiscal and administrative decentralisation • Clear institutional and political frameworks and enabling environment • Ensure enabling legal and regulatory environment affecting investments • Coordination and facilitation
Local / Regional Government	• Clear definition of roles supported by policy and legislation • Asset management planning • Definition of clear water rights • Ensure water access to all citizens • Appropriate regulation of services and services providers • Development of systems to monitor both functionality and service delivery • Life-cycle cost analysis and impact evaluation • Encouragement and support of local private sector • Ensure investment in direct and indirect support • Promote harmonisation among water-sector approaches • Reducing the role of international donors as primary channels for financing
Local Community	• Promote high involvement of end-users in the water management system • Participatory decision making • Participatory monitoring and evaluation • Commitment to the long term environmental and financial sustainability of the water delivery system
Local Private Sector	• Investment in infrastructures development and maintenance • Consolidating service delivery while increasing coverage

	• Strategies to reach the last percentage of unserved • Differentiate 'rural market', allowing for different service levels • Reducing the role of international private companies as primary service providers • Providing information to communities for decision making • Ensuring transparency, accountability and timely information at all levels • Ensuring water rights and quality services to all

5.3.6 Factors influencing water demand and consumption in LWP management

The LWP will have to take into account and develop careful planning around all factors influencing water demand and consumption, as reported in the table below (European Commission, 2015:149):

Demographic dynamics	The total water demand is directly related to the size of the population. This means to take into account: • Historical and current annual total and average consumption by type of consumers, including: agricultural users, industrial users and household-commercial final consumers; • Variability of seasonal and daily level of consumption to identify peak and off-peak demand. The LWP should take into account the demographic forecasts and the migration flows for an estimate of the users.
Economic trend	Generally a growing economy demands a higher quantity of water in comparison to a shrinking economy.
Agricultural production trend	The demand depends upon the surfaces that are expected to be irrigated and the type of crops.
Industrial production trend	Demand forecasting usually requires a specific analysis of the water needs of the concerned production units.
Climate	Demand for water has a seasonal component and climate change will affect the availability of water in the long term.

Tariff system	It is important to estimate how the water demand is affected by the service price. It will be important to estimate the variability for different income groups and on a local basis. In fact, there can be huge differences in geographical areas that are otherwise similar.

5.3.7 Risks in LWP Water Management

The LWP will have to tackle all relevant risks in water management, as reported in the table below (European Commission, 2015:158):

Category	RISK
Regulatory	• Unexpected political or regulatory factors affecting the water price
Demand analysis	• Water consumption lower than predicted • Connection rate to public sewage system lower than predicted
Design	• Inadequate surveys and investigation e.g. inaccurate hydrological predictions • Inadequate design cost estimates
Administrative	• Building or other permits/ Utility approvals/ Legal proceedings
Construction	• Project cost overruns and/or delay in construction schedule
Operational	• Reliability of identified water sources (quantity/quality) • Maintenance and repair costs higher than predicted, accumulation of technical break downs
Financial	• Tariff collection lower than predicted

5.3.8 LWP strategic actions to improve water management

This dissertation argues that the scale and urgency of the problems require LWP strategic actions along four pillars. Therefore, LWP actors should adopt strategic approaches in conjunction with each of the following four pillars:

- 'Influencing Demand patterns to reflect scarcity values (e.g. sustainable consumption and production by cutting waste and changing lifestyles)
- Improving the quantity and quality of Supply (e.g. partnerships on renewable energy, soils, water storage through appropriate finance, regulation and knowledge sharing)
- Increasing Efficiency (e.g. technology transfer, national innovation systems)
- Increasing Resilience against shocks and benefits for the poorest (e.g. benefit-sharing, social protection, Corporate Social Responsibility, inclusive land policy)' (ODI, ECDPM and GDI, 2012:3).

<table>
<tr><th></th><th>Local Government</th><th>Local Community</th><th>Local Private Sector</th></tr>
<tr><td rowspan="2">Manage water demand</td><td colspan="3">Sustainable Consumption and Production
(education, pricing, recycling, inclusive and sustainable management models)</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td rowspan="2">Increase quantity and quality of water supply</td><td colspan="3">Improvements in coordination, user rights and access for the rural poor</td></tr>
<tr><td colspan="3">Improvements in the regulatory frame, monitoring and technology</td></tr>
<tr><td>Increase of efficiency</td><td colspan="3">Innovation and Technology</td></tr>
</table>

(water provision and use)	transfer
Improve resilience and focus on rural poor	Inclusive water policy
	Social protection and benefit sharing

5.3.9 Social, Environmental and Cost Benefits of LWP water management

The social, environmental and cost benefits of LWP water management are those reported in the table below (European Commission, 2015:153):

Social Benefits	
	Increased availability of drinking water supply and sewer services.
	Improved reliability of water sources and water supply services for all uses (irrigation, households, etc...).
	Improved water access for the rural poor.
	Improved quality of drinking water.
	Health impacts.
	Capacity-building
	Equity in service delivery and wider coverage
	Public participation
	Accountability
Environmental Benefits	
	Improved quality of surface water bodies and preservation of ecosystem services.
	Water resources conservation.
	Leakages management and avoidance.
	Improved water resources efficiency and more controlled or reduced water abstraction.
	Reduction in GHG emission.
Cost Benefits	
	Resource cost savings (water preserved for other uses).
	Reduced costs in infrastructures due to a sustained control and

	maintenance of existing ones.
	Congestion savings due to improved rainwater drainage.
	High cost recovery due to higher compliance in water tariff payments.

5.3.10 LWPs main advantages

In summary, among the ***main advantages*** of the implementation ***of LWP*** for the management and delivery of water services, it is possible to foresee the following:

- Application of innovative approaches and solutions adapted to local conditions. To face the water challenge, LWP should innovate to enable more efficient water use, good water quality and better water management and availability,
- Operational and effective application of integrated water management,
- Better identification of water vulnerability by policy makers,
- Implementation of advanced regulatory and economic instruments,
- Improved capacity building of local actors,
- Increase people acceptance of the rural water supply systems: the LWP can increase the acceptance that the implemented water management system is a locally developed approach that can be implemented locally through the intervention of local actors, under the supervision of the local community and the local authorities,
- Increased interest on collective management of water resources and introduction of environmental protection innovations,
- Consolidation of stakeholders' involvement in water management by promoting a participatory process and empowering water actors and users,
- Enhanced community capability for improving the sustainability of the environment and for evaluating management measures in terms of water saving, water availability and socio-economic impact,

- Final harmonization and regulation of water management policies to integrate management solutions into water governance models, facilitating then the final adoption of the proposed more efficient and cost-effective water management practices,
- Better-integrated, more sustainable solutions and substantial cost savings for local communities,
- Coupling of public and private capacity to monitoring water consumption and implement-promote appropriate operation and maintenance measures of the water delivery infrastructures,
- To prevent and mitigate the environmental risks by promoting a more efficient use and sustainable management of the water resources,
- Increased economic and social well-being at local and regional levels in developing countries,
- Increasing the environmental sustainability of existing water resource management systems,
- Integrating the know-how of different stakeholder groups, including end-users, civil society organisations and the private sector. Stakeholder involvement is not only an often neglected source of knowledge, but it also increases the outreach and impact of the water management plans,
- Overcoming the constraints of current water and sanitation systems by adopting both an interdisciplinary focus (considering technical, financial, social and institutional aspects) and a participatory approach involving all major stakeholder groups,
- LWP would help increase the stakeholders' awareness of the water resources concerns regarding the improvement of their management practices, promotion of sustainable water resources

and also prepare key actors to plan to manage effectively their water resources while adapting climate change impacts on the water. LWP would improve the local capacity of the personnel of public and private organizations and companies to manage their water resources sustainably,

- LWP would be a locally integrated network, capable of developing flexible and continuously evolving water management policies, strategies and plans development, through coordinated management, information exchange, financial viability, tariffs and usage regulation, compliance monitoring and weaknesses identification,
- LWP would become an important tool for the involved local authorities and communities to reduce vulnerability of freshwater systems not only to climate change but to poor sanitation and water management systems,
- LWP would become an important tool to help policy makers and stakeholders in the future design, implementation, monitoring and assessment of water resources management actions integrated in a more general natural resources management framework for poverty and vulnerability reduction.

Chapter 6: Final conclusion

The issue of water, in a context of sustainable development, remains a critical factor for development in developing countries. The lack of access to potable water, the inadequate sanitation management, the precarious hygiene conditions and behaviours, the lack of adequate methodologies and comprehensive hydro-geological studies, financial resources and therefore the lack of sustainability of the existing water supply and sanitation services are major problems that contribute towards populations living in the poverty, vulnerability and insecurity.

Sustainable water supply and sanitation is fundamental to the food security, health, survival, societal well-being and economic growth in developing countries. Developing countries are also particularly vulnerable to water-related problems which are expected to be exacerbated in the future by more frequent and severe floods and droughts due to climate change. To avoid a water crisis, many countries must conserve water, manage supply and demand, pollute less and reduce the environmental impacts of growing population. To tackle these challenges, sound approaches to water management, taking into consideration socio-economic factors, local communities' involvement and greater gender balance in decision making are necessary.

In the past years, international financial institutions and donors have strongly encouraged the development of PPPs in the water and sanitation sector. This focus on private operators' involvement has disguised other viable alternatives (Hoedman, 2006: 2). In this context, public water

operators require more attention and support. As more than 90 per cent of the water supply and sanitation services are globally managed by the public sector, it is important to promote political and financial improvements in the public management of these services (Hoedman, 2006: 2). In fact, the role of governments remains crucial in both PPPs and PuPs. On one hand, private providers require from the government a commitment in guaranteeing a clear regulatory framework and a competitive market. Due to the monopolistic nature of the water sector, governments need to guarantee that private providers respect the terms of the contract in order to defend the interests of the beneficiaries (UNDP, 2006: 23). On the other hand, community participation in the management of water and sanitation services can be crucial (UNDP, 2006: 25). Nevertheless, communities cannot replace governments and their contribution both in the financing of the water and sanitation systems and in part of the process of service provision (UNDP, 2006: 25).

> 'Governments and the public sector are increasingly being transformed from owners and managers of water infrastructure and sole provider of water services to facilitators, enablers, and regulators. As part of a growing trend, community based organizations, user groups, and autonomous water utilities are assuming a greater direct role in management, operation, and maintenance of these facilities. The private sector is playing a larger role, particularly in the case of management of water utilities. Nevertheless, the role of government

agencies in protecting the long-term interest of all by acting as the custodians for-and champions of-the environmental and social dimensions of water management remains important at both the national and the local level. An effective water sector, whether it is managed by the public sector or the private sector, needs to be complemented by an effective regulatory framework for managing water resources. (…) It is essential, however, to ensure that such reforms are complemented by an effective regulatory framework for managing water resources and safeguarding sustainability of the resource base. Globalization, new information technologies, and new interdisciplinary approaches provide opportunities to improve the management of water resources, but such interventions will be sustainable only if appropriate water resources management regulatory frameworks, economic regulators to protect the public and the private sector against monopolistic behavior and other factors, and safety nets to protect the poor are in place. Otherwise, the risks of creating unnecessary or marginal investments and increasing debt burden will be magnified' (Hirji and Ibrekk, 2001: 3).

Traditionally, water authorities have managed their water supply, sewerage and storm water drainage systems as separate entities. Integrated water planning is a structured planning process to evaluate concurrently the opportunities to improve the management of water, sewerage and drainage services within an area in ways which are consistent with broader catchments and river management objectives. The carry-on of an integrated water planning study is often a less costly process than traditional separate water and sewerage strategy studies, and it favours a more environmentally sustainable management of the overall water resources. The integrated water planning produces a rapid screening and short listing of potential opportunities in partnership with the community. The process can lead to significant savings in project investigation and development costs, as well as some capital and operating costs savings (Anderson and Iyadurai, 2003).

In conclusion, independently from the type of partnership which has been adopted and applied, it appears crucial for a sustainable and effective water management system that

1) 'appropriate institutional arrangements,
2) financing mechanisms,
3) subsidies and
4) policies, including for pro-poor service provision,

are in place. These underlying factors are stronger determinants of the success of partnerships than whether or not a private sector actor is involved. Involving a partner with

the right expertise and capacity, which includes not just technical aspects but an understanding of customer care and the particular needs of low-income areas and households, may be most important. This expertise may come from the public or private sector, and public sector providers and local private operators may offer a wealth of experience which has not yet been tapped.

The public/private question remains, however, relevant. Involvement of the private sector, particularly in relatively short-term flexible arrangements, can bring improvements in efficiency and management of services, but costs are high. In the ACP context PPPs require strong policies and regulation to ensure benefits reach poor households, so if a PPP is the chosen route governments are likely to require assistance in these areas. PuPs are likely to offer more capacity building and a greater focus on equity, and are less likely to be beset by tensions in design and implementation. They can also turn around municipal/utility performance as seen in Harrismith and Dar es Salaam. Because of greater trust and because no profit is sought by either party, they are cheaper. However, public or community-based partners may struggle with

> financial sustainability and require external support. The selection of appropriate partners depends on the particular aims of the partnership. PuPs are relatively untested but given the very mixed experience of PPPs and initial success of some PuP experiences, this alternative seems worthy of support. Forthcoming PuPs should be carefully followed for further lesson-learning' (Ecologic Institute EU).

In many developing countries, there is a growing tendency to promote government-community partnerships for the management of local water and sanitation systems. This tendency is often supported by a process of decentralisation in favour of local authorities, in order to improve the efficiency and sustainability of the services provided (Wegelin-Schuringa, 1998: 3). Many scholars believe that, in the next future, communities will continue to acquire an increasing importance in the management of rural water and sanitation services due to their capability of delivering in a sustainable and equitable way. In the past, far too many projects have been developed with a short-term perspective: many projects have failed because the technologies used were inappropriate for the context, too difficult to use or too expensive and complicated to maintain and repair for untrained personnel. Specialists of the sector believe that governments can solve these problems only if they create partnerships with local communities whose involvement is crucial for a sustainable development of the water and sanitation systems. Water management systems that

involve local beneficiaries are considered more effective and efficient than top-down approaches (Conway, n.d.).

In fact, community-based management can be a very successful approach conjugating environmental preservation and development. Often local institutions can keep certain communal resources productive because they implement rules based on the respect of natural cycles. At the same time, these local communities can represent valid structures on which to base participative development programmes. According to Wolvekamp, 'community organisation has proved effective in empowering indigenous communities and should be adopted as an inherent part of development work' (Wolvekamp, 1999: 89).

Community-based management appears, nevertheless, as a successful development approach difficult to export because it is very much linked to its specific context. Many of the conditions identified by Ostrom could be exported and used as general characteristics in order to facilitate the new establishment of PuPs. However, this dissertation argues that even more recently created PuPs require the development of a cultural component – an environmental consciousness, based on the sense of responsibility towards the environment and all the members of the community, typical of indigenous knowledge – together with the application of Ostrom's conditions.

Based on the analysis of the existing literature and case studies, this dissertation concludes that government-community partnerships can represent a valid alternative to PPPs in the rural water and sanitation management. In order to succeed, these partnerships require a high sense of responsibility and level of cooperation both between governmental

authorities and community and inside the community itself. After fulfilling these conditions they have a great potential to overcome the limits of a more centralistic public management and PPPs conjugating, on one hand, the targets of efficiency and financial sustainability and, on the other hand, those of equity and durability of the systems. Nevertheless, government-community partnerships are not panaceas, but they represent a fundamental approach to be integrated in wider national and international water and sanitation management strategies (Conway, n.d.). 'The absence of control measures to guarantee water quality, along with maintenance problems and the lack of sanitation, limit the success of solutions such as community management. (…) Making changes to the legal and institutional framework to enable community management and ensure that appropriate support is provided remains one of the sector's greatest challenges' (European Union 2010c: 29)

Therefore, the trilateral partnership seems to be the logical conclusion. It is logical for the complementarities that each of the three actors can bring in the partnership, as previously explained. Nevertheless, this does not imply that it would be an easy solution to implement.

The reason behind the creation of a LWP is the need to involve in the management of the water services all the relevant stakeholders working in the field, meaning local authorities, companies and local communities and the creation of a team to deal with the key steps of the implemented water management system. This is because the author recognizes as key aspect for the effectiveness of the implemented water management systems and for its future replicability that local actors could participate from the first phase of the definition of activities.

The LWP, as envisaged by the author of this dissertation, will be able to develop **water supply and sanitation systems and methodologies** to manage risks associated with water supply and sanitation and implement integrated water resources management systems for sustainable agriculture and food security, sustainable environment protection and economic growth. LWP, due to their local nature and the true involvement of participatory local communities in the decision making process, will be able to connect local knowledge, socio-economic development cultures, policy institutions and implementing bodies.

Ideally, Local Water Partnerships, as well as inclusive and sustainable growth, should lead to a 'triple win' solution, but in practice, the collaboration and balance among these three dimensions is likely to imply difficult trade-offs. There are bound to be trade-offs between the three components. Such trade-offs are always embedded in socio-political contexts, and they reflect relationships of power. As for other political issues, the choices between trade-offs tend to be motivated by short-term political terms, whereas the implementation of successful water management systems and local water partnerships requires a long-term perspective.

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