

Governance of Water and Sanitation Services for the Peri-urban Poor

This book is one of the main outputs of a three-year project which has gathered and synthesised knowledge from around the developing world not only on peri-urban water and sanitation but also on peri-urban areas of metropolitan regions and the people who live and work in them. This includes information collected specifically for the project in peri-urban localities of five metropolitan regions: Chennai (India), Dar es Salaam (Tanzania), Cairo (Egypt), Mexico City (Mexico) and Caracas (Venezuela). It also draws on a small number of experiences and innovative peri-urban interventions in different countries.

The content of the book is the result of close collaboration with the five project partners in the case study areas and consultation with a broad range of people in over twenty countries, ranging from urban professionals and practitioners to engineers, politicians, academics, staff from aid agencies and national and international non-governmental organisations and, perhaps most importantly, peri-urban poor women and men. The book offers a synthesis of scientific knowledge, institutional practices, people's aspirations and formal and informal norms and regulations that govern the supply and access to water and sanitation services by the peri-urban poor in metropolitan areas.

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A Framework for Understanding and Action in Metropolitan Regions

Adriana Allen
Julio D Dávila
Pascale Hofmann



In association with:
CENDES (Venezuela)
FLACSO (Mexico)
SUSTAIN (India)
UCLAS (Tanzania)
UTI (Egypt)

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Acronyms and Abbreviations

ADB	Asian Development Bank
CAESB	Water and Sewage Company in Brasilia
CBO	Community-based Organisation
CENDES	Centre for Development Studies
CMA	Chennai/Caracas Metropolitan Area
CMR	Caracas Metropolitan Region
CWS	City Water Services
CWSSP	Community Water Supply and Sanitation Programme
DAWASA	Dar es Salaam Water and Sanitation Authority
DAWASCO	Dar es Salaam Water and Sanitation Company
FLACSO	Latin American Faculty of Social Sciences
GCR	Greater Cairo Region
GDP	Gross Domestic Product
MLD	Millions of Litres per Day
NGO	Non-governmental Organisation
PGA	Public Granting Authority
PRWR	Public Registry of Water Rights
PUI	Peri-urban Interface
SPARC	Society for the Promotion of Area Resource Centres
SUSTAIN	Citizens' Alliance for Sustainable Living
TWF	Technical Water Forum
UCLAS	University College of Lands and Architectural Studies
UEBD	Executive Unit for Settlements in Development
UN	United Nations
UNICEF	United Nations Children's Fund
UTI	Urban Training and Studies Institute
VIP	Improved Ventilated Pit Latrine
WEDC	Water Engineering and Development Centre
WHO	World Health Organisation
WSS	Water Supply and Sanitation

Introduction

What is this document for?

This document offers a conceptual and practical tool for those involved directly or indirectly in the long-term planning and daily management of basic service provision in the metropolitan regions of developing countries. Its long-term aim is to contribute to a more reliable, affordable and sustainable access to water and sanitation services for the diverse and often-growing poor peri-urban populations in metropolitan regions.

The focus of this document is not on the technical aspects of designing and building infrastructure. Rather, it seeks to provide guidance to better comprehend the institutional and governance challenges of improving access to these basic services for poor peri-urban households and small-scale enterprises.

Without denying the crucial role played by municipal engineers and other technical water and sanitation staff, improved and reliable access to peri-urban water and sanitation services will not result from their isolated - and sometimes heroic - actions. Similarly, experience shows that access by poor residents and producers is unlikely to expand if left in the hands of private suppliers alone. Implementation of policies and plans that respond more effectively to peri-urban realities requires a better understanding of issues such as the inadequate peri-urban coverage of these services and the high presence of diverse formal and informal suppliers of basic services found in many cities. This challenge is all the more urgent in the context of the rapid pace that is a feature of peri-urban change, of the



Chennai

obvious fragmentation of government responsibilities for planning and supplying basic services to peri-urban areas and of the crucial environmental functions played by these areas.

Who is it for?

This document is aimed at a broad range of development and environmental professionals, civic society groups, staff in training institutions and aid agencies, politicians and other decision-makers at the local, metropolitan and national levels. This diverse range of actors reflects the complexity and scale of the problems associated with the interactions between urban and rural areas and the diversity of the people and productive activities in what is here described as the 'peri-urban interface'.

The document is, therefore, not intended as technical manual for engineers or planners

involved in designing or building infrastructure. There is plenty of excellent material in English that better meets this purpose, some of which is available on the Internet.[*] The document is, instead, designed to help users systematically examine the diversity of institutional, political, environmental, social and economic issues that influence access to these basic peri-urban services.

[*] See for example WELL (1998); and Cotton and Tayler (2000).

How was it produced?

This document is one of the main outputs of a three-year project which has gathered and synthesised knowledge from around the developing world not only on peri-urban water and sanitation issues but also on the peri-urban areas of metropolitan regions and the people (including the poor) who live and work in them. This includes information collected specifically for the project in five metropolitan areas on three continents: Chennai (India), Dar es Salaam (Tanzania), Cairo (Egypt), Mexico City (Mexico) and Caracas (Venezuela).** It also draws on a broader review of existing literature and on a small number of experiences and innovative peri-urban interventions in different countries.

** For more information, consult the project website: www.ucl.ac.uk/dpu/pui

The content of the document is the result of consultation and discussion with a broad range of people in over twenty countries. These range from urban professionals and practitioners to engineers, politicians, academics, staff from national and international non-governmental organisations (NGOs) and, perhaps most importantly, peri-urban poor women and men. Although it would be impossible to represent every viewpoint gathered, this document nonetheless offers a synthesis of present scientific knowledge, institutional practices, people's aspirations and formal and informal norms and regulations that govern the supply and access to water and sanitation services by the peri-urban poor in metropolitan areas.

How is it structured?

In the text that follows, the Executive Summary outlines the key messages contained in the document, followed by a Summary Table on page 16. Busy readers may want to restrict themselves to this section. The rest of the document is structured in three parts. Section 1 (Understanding the Issues) presents some background information on the basic concepts and definitions that support this work. This is based on a combination of information collected expressly for this project and research done in different countries of the developing world by other authors. Section 2 (Taking Action) uses the water cycle to highlight the specific issues that arise in the provision of water and sanitation services in the context of the peri-urban interface, paying particular attention to the actors involved in the process and their roles, strengths and weaknesses. This section also examines the challenges faced by peri-urban

dwellers, service providers and regulators to improve access to water and sanitation for the poor and to enhance the management of the natural resource base. Section 3 (Learning from Experience) summarises a number of initiatives from around the world which address the problems and illustrate some of the principles outlined earlier in the document.

The discussions in Sections 1 and 2 are supported with evidence from five case studies studied as part of the project and, where appropriate, with case study material from other sources. The intention of this document is to foster dialogue and debate among those concerned directly or indirectly with water and sanitation services by bringing into focus the specific challenges found in the peri-urban context, both in terms of integrated environmental approaches to natural resources and in relation to the reality and practices of the peri-urban poor.

Executive Summary

It is a well-documented fact that in many countries water supply and sanitation systems fall short of present and future requirements. Some of the world's poorest people lack adequate access to these most basic of services. The well-being and livelihoods of millions of households and home-based enterprises in urban and peri-urban areas are seriously impaired by the considerable time and money spent collecting water, buying it from private vendors or fighting diseases arising from deficient water supplies and poor or non-existent sanitation.

And yet, national and international initiatives and commitments to improve access to water and sanitation in the developing world tend to neglect the peri-urban context. This is all the more important since the conventional distinction between urban and rural areas is becoming more blurred and, therefore, less useful as a component of planning and other government attempts to guide physical expansion and promote economic growth. This distinction also fails to represent the daily reality of millions of people whose lives and income-earning activities straddle both the rural and the urban spheres. This document advances the argument that a specific institutional approach is needed to water and sanitation service provision that takes into account peri-urban realities.

The importance of considering water and sanitation in the peri-urban interface of metropolitan areas and regions arises from the fact that there are social, economic, environmental and institutional interactions between urban and rural areas which are captured in this interface. It is here where many of the processes of change in urban-rural flows take place, leading both to problems and to opportunities not only for peri-urban communities but also for the sustainable development of adjacent rural and urban systems. The peri-urban interface often acts as an 'environmental sink' for liquid and solid waste from the denser urban core. Thus, for example, urban wastewater can be used for peri-urban irrigation as well as for peri-urban industrial cooling systems. This calls for wider integrated water management interventions which build on these problems and opportunities.

The peri-urban interface is associated at the same time with both rural and urban features and consists of highly heterogeneous and rapidly changing socio-economic groups. This diversity means that the needs and demands of local populations and producers for water and sanitation services are also quite diverse and change over time. The identification of these needs is more complex than in either urban or rural areas due to the particular mix of newcomers and long-established dwellers, and also because farming, residential and industrial land uses often coexist. This calls for an institutional and technical set-up which responds to this diversity and to the changing needs of peri-urban residents and enterprises.

Peri-urban provision of basic services in a metropolitan context is also shaped by a wide range of spatial and non-spatial policies and a high variety of agencies operating with overlapping and sometimes contradictory remits. Some policies may point in the direction of controlling the peri-urban expansion of metropolitan areas, while others might aim in the

opposite direction (for example, encouraging the relocation of manufacturing industries from the urban core to the periphery). An adequate framework for intervention requires a better understanding of the impact of both spatial (for example, a 'green belt' around metropolitan areas) and non-spatial policies (for example, agricultural subsidies).

In many countries, peri-urban areas generally lie outside the coverage of formal networked water and sanitation systems, which are, in most cases, restricted to a relatively small metropolitan core. Part of the reason for this is that many peri-urban settlements develop outside existing formal regulations, affecting their formal right to these basic services. However, if adequate land policies and official control procedures are in place, the goal of improving access to water and sanitation by the peri-urban poor should not necessarily require formal land or housing tenure, but might instead focus on collective land rights and responsibilities for paying for these basic services.

One important conclusion arising from the case studies is that, in a context of rapid peri-urban population growth and environmental change, weak or inadequate official institutions, conventional supply-driven, centralised network systems for water supply and sanitation services may never become the norm in poor peri-urban settlements. In many countries, extension of these conventional systems will stretch official institutions beyond their capacities. In contrast with urban areas, the lower population densities and higher distance to centralised wastewater disposal systems that characterise peri-urban areas mean that such centralised solutions demand high investments for collection and disposal, which prevent economies of scale and are unaffordable by the poor. Planners and decision-makers should be prepared to consider instead decentralised approaches involving greater user involvement with less capital-intensive solutions. Similarly, small-scale commercial firms or not-for-profit operators (e.g. NGOs or community-based organisations) may provide, with minimum official control, adequate, affordable and more sustainable services such as water from local sources or latrine-emptying services. In a flexible and responsive regulatory environment, such non-centralised services may offer a solution that is more in keeping with the changing needs of local users.

Governance in the peri-urban interface tends to be severely fragmented, with a multitude of actors and no single organisation (either public or private) providing guidance or leadership. Institutional fragmentation tends to be even more severe in the metropolitan context, where multiple agencies often coexist with overlapping remits. In the specific case of water and sanitation services, the extent of service provision, the range and number of actors involved and the strategies they adopt vary significantly in relation to the different stages of the 'water cycle' (the water cycle describes the route taken by water in its different stages from extraction to disposal). Recent trends to 'unbundle' the different stages of the water cycle by allocating them to different actors (be they public, private, community or a combination of these) tend to exacerbate this institutional fragmentation. This is particularly true in peri-urban areas.

The goals of improving peri-urban water and sanitation require diverse technical and political strategies at each stage of the cycle, which may involve supporting multiple local agents. In practice, peri-urban water supply and, to a lesser extent, sanitation services are in the hands of a range of formal and informal agents. This diversity of practices is higher in the stages of distribution and access. Peri-urban poor communities often lack the resources and incentives to become involved in (large-scale) extraction, treatment and storage of water. However, large-scale, formal, private agents alone are unlikely to serve the needs of the peri-urban poor at the different stages of the water cycle. Therefore, greater official recognition is needed of unconventional service providers and the efforts of local residents and enterprises to secure stable and affordable services. This involves the active support of 'non-hierarchical' and 'cooperative' relations of production and provision of water and sanitation services.

The peri-urban poor rely mainly on a wide spectrum of informal practices to access water and sanitation which often remain 'invisible' to policy makers and lie outside formal support strategies and mechanisms. Whilst 'policy-driven' mechanisms are currently unable to address the needs of the peri-urban poor, their 'needs-driven' coping strategies appear to be more effective means of improving their access to these services. Addressing the needs of the peri-urban poor, therefore, demands a better understanding of the rationale and rules that govern informal practices and of the ways in which these could be articulated to the formal water supply and sanitation system.

Peri-urban residents and producers are exposed to a combination of rural and urban health hazards associated with water consumption and waterborne pathogens. Household and surface drainage systems are generally combined and this increases the risk of exposure to waterborne and water-washed diseases. When competition for limited water resources is high, it is common for peri-urban farmers to reuse untreated wastewater for irrigation, thereby posing potentially serious health hazards for agricultural workers and consumers of food produced using wastewater. The health and livelihoods of the peri-urban poor bear the brunt of these risks because they often inhabit low lying and marginal lands, which are more susceptible to flooding by contaminated water and other wastewater forms of pollution. A possible response may be to adopt decentralised wastewater management techniques to increase opportunities for wastewater re-use, resource recovery and improvements in local environmental health conditions. Similarly, many water-related diseases can be prevented by improving hygiene practices and awareness-raising.

Key Messages: A Summary Table

Understanding the issues	Taking action	Learning from experience
Current national and international initiatives and commitments to improve access to water and sanitation in the developing world tend to neglect the peri-urban context.		
The traditional distinction between urban and rural areas is becoming increasingly blurred and insufficient to capture the reality of a large number of dwellers that live between those areas (see Sub-section 1.1).	Enhanced water supply and sanitation services in the peri-urban interface demands specific and different approaches from those usually applied to urban and rural areas. The PUI is the product of a specific set of conditions which exist in a much wider context than one community or one geographical space.	When properly taken into account, peri-urban potentials can serve as opportunities for whole metropolitan regions.
In the metropolitan context, peri-urban water supply and sanitation provision is affected by a wide range of spatial and non-spatial policies and a high variety of agencies operating with overlapping and/or contradictory remits (see Section 1.1).		
Spatial and non-spatial policies often promote unintended contradictory outcomes and competing demands on water resources for various uses. (See Sub-sections 1.1 and 1.3) Institutional arrangements and jurisdictions are frequently too urban or too rural in their orientation to provide an effective and integrated framework for water supply and sanitation services (see Sub-section 1.1).	Understanding trends in the development of the peri-urban interface requires an examination of spatial (e.g. green belt) and non-spatial policies (e.g. agricultural subsidies). (see Box 9)	Compatibility policy analysis can help reducing negative policy outcomes (for instance reinforcing unequal access to services). (See Box 7 And Box 14)
The peri-urban interface often plays a key role in the extraction and replenishment of water resources or as an 'environmental sink' for liquid and solid waste from the urban core (see Sub-section 1.2).		
The peri-urban interface is the context where many of the changes in urban-rural flows take place, leading to problems and opportunities not only for peri-urban communities but also for the sustainable development of adjacent rural and urban systems.	Interventions need to be framed in an integrated water management approach and to build on the opportunities offered by urban-rural flows for resource recovery and reuse. (see Sub-section 2.4) Urban wastewater can be a resource for production systems and practices typically located in the PUI. For example, reusing	Building responsible citizenship and political commitment are essential for integrated water management (see Box 5, Box 16 and Section 3, Tegucigalpa case study).

Understanding the issues	Taking action	Learning from experience
	wastewater for irrigation in agricultural production or for cooling systems in industrial production (see Sub-section 2.4).	
The PUI is associated with both rural and urban features and composed of highly heterogeneous and rapidly changing socio-economic groups. Thus, WSS needs and demands are highly diverse and subject to changes over time (see Sub-sections 1.1 and 1.2).		
The identification of water supply and sanitation needs in the PUI is more complex than in urban and rural areas because of the particular mix of newcomers and long-established dwellers and also of farming, residential and industrial land uses that often coexist in peri-urban areas. Socio-economic and cultural diversity might present particular challenges to the formation of social capital and the instigation of collective action (see Sub-section 1.2).	Changing needs and demands in the PUI need to be examined in the context of rural-urban links and broader trends in land use, migration, etc. WSS improvements for many peri-urban water poor require addressing not only personal consumption but also the water needed for productive processes to improve their livelihoods (see Sub-section 2.3).	Progressive WSS schemes are able to respond and adjust to the dynamics of the peri-urban interface (see Section 3, La Sirena case study). Better water services with an emphasis on productive use are a means to alleviate poverty (see Box 17).
In relation to water and sanitation the rights and entitlements of the peri-urban poor are usually ill-defined.		
Constitutionally access to water is a human right, which at policy level is often restricted to 'those in need'. The coverage of formal WSS systems is in most cases restricted to a relatively small urban core whilst peri-urban settlements develop outside existing formal regulations, which in turns affects their formal right and entitlement to WSS (see Sub-section 1.4).	Improved access to WSS for the peri-urban poor requires a combination of strategies. The spectrum of possible solutions goes well beyond market mechanisms vs. subsidised public provision. Better entitlements to WSS by informal communities do not necessarily require individual regularised land or housing tenure (see Sub-section 1.3).	Informal communities can be reliable partners of water authorities (see Section 3, Dhaka case study) Peri-urban poor can benefit from the provision of collective land rights and responsibility for services payment.
Governance in the peri-urban interface is severely fragmented, with a multitude of actors and no single organisation (public or private) providing guidance or leadership (see Sub-sections 1.1 and 1.4).		
In the case of water supply and sanitation, the extent of service provision, the actors involved and strategies adopted by them	An unbundled approach to service provision can exacerbate fragmentation and lack of coordination among the various	Where private contractors are reluctant to extend WSS to peri-urban poor communities, public-private-civil society

Understanding the issues	Taking action	Learning from experience
<p>vary significantly in relation to the different stages of the water cycle (see Sub-section 2.1).</p> <p>The highest diversity of agents can be found at the stages of distribution and access. Sanitation in the PUI receives less official and even household attention than water supply and is subjected to a smaller spectrum of practices and agents (see Sub-section 1.4 and Section 2).</p>	<p>agents involved throughout the water and sanitation cycle. However, unbundled service provision can refer not only to financial and technical aspects but also to a combination of formal and informal agents (See Sub-section 2.1).</p> <p>Improved WSS requires diverse technical and political strategies at each stage of the WSS cycle supporting multiple local agents. Involving greater official recognition of unconventional service providers and the efforts of local residents and enterprises can be beneficial (see Sub-section 2.3).</p>	<p>partnerships are capable of providing WSS solutions that simultaneously contribute to poverty reduction and environmental protection (see Section 3, Moreno case study).</p> <p>Improvements can be made through active support for non-hierarchical and cooperative relations of production and provision of water supply and sanitation. This can additionally be done through emphasising the role of women and children, as they are currently paying a 'higher cost' when water supply and sanitation facilities are lacking (see Section 2.3 and Section 3, Tshwane case study).</p>
<p>Conventional supply-driven, centralised network systems for water supply and sanitation services will not soon, if ever, become the norm in the peri-urban interface.</p>		
<p>Poor physical accessibility of peri-urban areas limits the provision of water supply by the formal system (see Sub-section 2.3).</p> <p>In contrast with urban areas, the lower population densities and higher distance to centralised wastewater disposal systems that characterise the PUI mean that such centralised solutions demand high investments for collection and disposal, which prevent economies of scale and are unaffordable by the poor (see Sub-section 2.4).</p>	<p>Decentralised approaches involving greater user involvement with less capital-intensive solutions and small-scale commercial or not-for-profit operators may provide more economically and environmentally sustainable water supply and sanitation services for peri-urban areas (see Sub-section 2.3).</p> <p>Decentralised approaches to water distribution and wastewater management can be more responsive to the changing local needs of peri-urban dwellers. (see Sub-section 2.3 and 2.4).</p>	<p>Affordable water supply and sanitation schemes through public standpipes can be supported by multi-stakeholder partnerships (see Section 3, Luanda case study).</p> <p>Cooperation between the public water supply utility and community water committees can meet the needs of the poor and be financially viable (see Section 3, Port-au Prince case study).</p>
<p>The peri-urban poor rely on a wide spectrum of informal practices to access water supply and sanitation that often remain 'invisible' to policy makers and lie outside formal supportive strategies.</p>		
<p>Whilst policy-driven mechanisms are currently unable to address the needs of</p>	<p>Needs-driven practices in water supply and sanitation are best examined and</p>	<p>Approaches to improve water supply and sanitation can start off as needs-driven</p>

Understanding the issues	Taking action	Learning from experience
the peri-urban poor, their needs-driven coping strategies appear to be more effective means to improve their access to WSS (see Sub-section 1.4).	understood from the perspective of access (see Sub-section 2.3). Too meet the needs of the peri-urban poor it is essential to gain a better understanding of the rationale that govern the informal system, including gender roles and also of the ways this system could be articulated to the formal one.	practices and, over time, become incorporated into and supported by the formal system (see Box 10).
In the peri-urban interface, the gap in coverage between water supply and sanitation is larger than in urban areas.		
Lack of effective wastewater management solutions leads to widespread pollution of surface and groundwater (see Sub-section 2.4).	Wastewater management needs to be incorporated in the integrated framework of water resource management (See Sub-section 2.4).	Collective initiatives in wastewater collection, treatment, recycling and disposal can solve local wastewater problems and refuse problems and make people aware of the links between them (see Section 3, Dakar case study).
Peri-urban dwellers are exposed to a combination of rural and urban health hazards associated with water consumption and waterborne sanitation' (see Section 1.2).		
Household and surface drainage systems are generally combined, increasing health risks. When competition for limited water resources is high, it is common for peri-urban farmers to reuse untreated wastewater for irrigation and this poses potentially serious health hazards for agricultural workers and consumers of food produced using wastewater (see Sub-section 2.4). The peri-urban poor experience the greatest impacts upon their health and livelihoods because they often inhabit low lying and marginal lands that are more exposed to excreta and other wastewater forms of pollution (see Sub-section 1.2).	Adopting decentralised wastewater management techniques aiming at increasing opportunities for wastewater reuse, resource recovery and improvements can improve local environmental health conditions (see Sub-section 2.4). Many of the water-related diseases in the PUI can be prevented by improving hygiene practices and awareness-raising (see Sub-section 1.2, 2.4 and 2.5). Disaggregation of the peri-urban poor and gender mainstreaming are crucial because women and children are frequently more affected by the failure to do so (see Sub-section 1.2 and 2.3).	Community-based schemes can provide low-cost solutions to wastewater collection, treatment, reuse and disposal (see Section 3, Dakar case study). Women play important roles in mobilising and organising the community and are often involved in the financial management of water supply and sanitation schemes. (see Section 3, Tegucigalpa case study).

1. Understanding the Issues

Water and Sanitation in the Peri-urban Context: A Technical or Governance Crisis?

One of the main challenges embodied in the United Nations Millennium Development Goals is to halve the proportion of population without access to clean water and sanitation by 2015. Meeting this target will tax the resources of many national governments enormously and require continued commitment from donor governments and agencies. The summary statement of the Third World Water Forum held in Tokyo in 2003 argues that to ensure water security in the next 25 years developing and transitional countries will require an annual investment of US\$80 billion. [1] By common consent, neither governments nor the private sector alone will be capable of bridging the funding gap that currently exists to meet goals such as this one.

[1] See 3 World Water Forum. Forum Statement accessible at www.worldwatercouncil.org/

In addition, policies and initiatives that focus exclusively on technical and formal means of delivering these services are not only bound to fail, but will also negatively affect a significant proportion of both households and producers in metropolitan regions who rely on non-formal means of access. According to the Third World Water Forum, governance is one of the key issues in addressing the challenge of providing water and sanitation to the world:

"Many countries face a governance crisis rather than a water crisis. Good water governance requires effective and accountable socio political and administrative systems adopting an integrated water resources approach with transparent and participatory processes that address ecological and human needs". [2]

[2] Ibidem

In the peri-urban context, the aspects of the 'water and sanitation challenge' outlined above present particular characteristics which often remain 'invisible' or undifferentiated. These refer to the specific forms of deprivation affecting the peri-urban poor, but also to the crucial role that peri-urban ecosystems play in supplying water and in absorbing and assimilating liquid wastes and effluents from adjacent urban and rural areas.

1.1 Why Be Concerned with the Peri-urban Interface?

Over time, the term 'peri-urban' has been the subject of different interpretations and meanings. However, what clearly emerges from the current debate is that there is growing recognition among development professionals and institutions of the fact that rural and urban features tend to increasingly coexist within cities and beyond their limits, and that an urban-rural dichotomy deeply ingrained in most planning systems is inadequate to deal with processes of environmental and development change in the peri-urban context. [3]

[3] Tacoli (1998); Allen (2005a); and Allen and Dávila (2002), accessible at www.id21.org/urban/

The peri-urban interface (PUI) is the location, on the one hand, of a mixed population

which often disproportionately comprises poor households and producers, and on the other of important environmental services and natural resources consumed in towns and cities. Many of the localities in the PUI of metropolitan areas can be described as in transition from being predominantly rural to acquiring urban features. This process is often accompanied by substantial pressures over natural resources (such as land and water) due to their increased marketability and greater volumes of pollution generated by higher concentrations of population and enterprises.

The working definition adopted in this document makes reference to three particular characteristics of the PUI. This term refers not just to the fringe of the city but to a context where both rural and urban features tend to coexist, in environmental, socio-economic and institutional terms. [4]

From an environmental perspective, the PUI can be characterised as a heterogeneous mosaic of 'natural' ecosystems, 'productive' or 'agro-ecosystems' and 'urban' ecosystems, affected by material and energy flows demanded by urban and rural areas. Each of these subsystems conditions each other. From the point of view of water supply, the management of natural resources in the PUI often plays an essential role in the provision of water to nearby urban and rural areas. This is because the peri-urban interface is often the location of water supply facilities, such as reservoirs, and the area where underground water sources might be replenished. This is due to the higher infiltration capacity that in many cases characterises peri-urban areas in comparison with urban areas where infiltration is significantly reduced due to the high presence of impermeable surfaces such as buildings, roads and pavements. In regions depending on underground water, a large deficit balance between water extraction and replenishment can lead to serious problems of water depletion.

In and around cities, water is commonly in short supply and in increasing demand by different users. Urban growth leads to higher consumption by industrial and domestic users leading to conflict with agricultural demands which are often intensified by irrigation practices. Very frequently, urban-based demands co-opt resources which were previously used by peri-urban dwellers or were essential to the health of valuable ecosystems. Water scarcity impacts urban, peri-urban and surrounding rural areas, particularly for the poor with little or no access to infrastructure for water provision and water to be used for irrigation. This problem is aggravated by contamination from combined sources (for agricultural, domestic and industrial uses).

From a socio-economic viewpoint, the PUI also presents several peculiarities. [5] The uneven process of urbanisation taking place in these areas is generally accompanied (or in many cases produced) by land speculation, shifting economic activities of higher productivity and the emergence of informal and often illegal activities such as clandestine abattoirs, intensive use of agro-chemicals and fertilisers for horticulture production, and mining activities for the supply of building materials. As a result, the social composition of peri-urban systems is highly heterogeneous and subject to fast changes over time. Small farmers, informal

[4] For a detailed discussion of this definition see: Allen (2003); and Allen et al. (2001), accessible at www.ucl.ac.uk/dpu/pui

[5] For detailed case studies and discussions on the peri-urban interface in a range of geographical settings see Brook and Dávila (2000); McGregor, Simon and Thompson (2005); Mattingly (1999); Dávila (2003 and 2005); and Aguilar and Ward (2003).

settlers, industrial entrepreneurs and urban middle class commuters may all coexist in the same territory but with different and often competing interests, practices and perceptions.



Rapid land use changes witnessed in the PUI result in scarcity of land and consequently a dearth of agricultural by-products such as fuel and fodder, making them less available to the peri-urban poor. These processes result in a certain unpredictability of livelihoods particularly amongst the poor, who often have little resilience and less room to manoeuvre in the face of rapid changes. Peri-urban poverty is multi-dimensional in nature in that in the PUI, the poor are subject to more shocks and stresses caused by rapid urbanization, changes in agricultural production and marketing or in the quality and availability of common natural resources. Poor peri-urban households in many metropolitan regions are

characterised by a lack of regular incomes and adequate access to natural resources, high numbers of dependants, semi skilled or unskilled members, high incidence of female headed households, and livelihood strategies involving circular or temporary migration. In the peri-urban context, what often distinguishes the poor from the very poor is their ability to utilize urban opportunities. Peri-urban livelihood strategies are strongly driven by markets and are more diversified than in rural areas.

Last but not least, from an institutional perspective, the PUI is characterised by the convergence of sectoral and overlapping institutions with different spatial and physical remits. Thus, institutional arrangements and jurisdictions are often too small or too large or are too urban or too rural in their orientation to effectively address sustainability and poverty concerns. Private sector bodies as well as non-governmental and community based organisations also intervene in the management of peri-urban areas, but often without clear articulation or leadership from government structures.

The problem of institutional fragmentation is particularly relevant in the metropolitan context, where often different administrative units are subjected to the policy decisions of a large number of public agencies. Weak links and limited municipal power in sectors such as transport, water, energy, solid and liquid waste management and land use planning often result in uncertainty as to which institution administers which specific area or activity. This has significant policy implications in the case of water supply and sanitation. As highlighted before, the fact that the PUI often corresponds with the location of key sources of water provision for entire metropolitan areas means that as far as water management is concerned, these areas are commonly under the jurisdiction of sectoral public agencies that are highly centralised and are responsible for overseeing the protection and administration of watershed

systems. At the same time, it is somewhat paradoxical that even when, as in Mexico City, Chennai and Caracas, they live in jurisdictions which are the main source of water or, at the very least, are net exporters of water to other metropolitan localities, peri-urban dwellers often face significant deficits in water supply and sanitation.

The nature, speed and intensity of the processes of change taking place in the PUI might entail problems and opportunities for the poor; the extent to which they are negatively or positively affected depends on their sources of livelihood and their location relative to the city. However, it is not just the absolute availability of natural resources in relation to population and density that helps to explain the emergence of environmental problems and opportunities for the poor, but the conditions regulating their access to and control over such resources. [6] In general terms, the peri-urban poor are usually more heavily dependent for their livelihoods on access to natural resources than wealthier, more urban-based groups. This demands a detailed consideration of land tenure systems and of the regulatory framework which might safeguard or threaten the needs and interests of the peri-urban poor. Thus, land ownership patterns and exploitative landlord-tenant relations as well as government support for cash crops might all be crucial factors that help to understand who loses and who wins from environmental changes in the PUI.

[6] Tacoli (2003); Allen (2005b)

Peri-urban change in the metropolitan context: Overview of the five case studies

The definition of what constitutes an urban area is highly contested and varies between countries, making international comparisons difficult and in many cases misleading. The statistical definition of rural is no less problematic, as it often constitutes a residual category comprising all settlements that are not urban. [7] Metropolitan areas are subjected to similar problems and divergences in terms of technical definitions and statistical records.

[7] Walls (2004)

Tables 1 and 2 provide a general overview of the main characteristics of the five metropolitan areas and of the peri-urban localities studied as part of the project of which this document is an output. The selection of the five metropolitan case studies sought to cover a wide diversity of institutional arrangements both in the current structure of metropolitan WSS systems and on on-going or planned policy changes to reshape these systems.

As highlighted before, the issue of institutional complexity and fragmentation is a particular characteristic of the metropolitan context. Metropolitan areas are comprised of different administrative units within their territories. In some cases, there is no single political or administrative authority, resulting in overlapping agencies, like in Chennai and Cairo. There is institutional fragmentation and a lack of communication between different administrative units operating in the metropolitan area. In the case of Dar es Salaam there is a weak link between the municipal council and its institutions at Subward and Ward level. The Metropolitan District in Caracas, created in 1999, is an attempt to coordinate the actions of

the five municipalities that comprise the Caracas Metropolitan Area whilst seeking to promote a unified vision of the city.

Table 1: Overview of the five metropolitan areas/regions under study

	Population 2000 (millions)	Area (km ²)	Annual population growth rate	Metropolitan administrative structure	WSS metropolitan formal system
Chennai	7	1,177	2.18 %	Chennai Metropolitan Area: Chennai city, 8 municipal towns, 27 town panchayats, 18 census towns and 1 cantonment area	Public agencies at state, metropolitan and local level
Dar es Salaam	2.5	1,350	7.2 %	Metropolitan Dar es Salaam: three semi-autonomous munici- palities under the Greater Dar es Salaam Council	Public-private partnership with a community component
Greater Cairo Region	17	3,400	2%	Greater Cairo Region (GCR): Governorate of Cairo and parts of the Governorates of Giza and Qualiobia	Two separate public agencies for water and sanitation at metropolitan level to be fully reformed
Mexico D.F.	8.6	7,622	1.8 %	Federal District of Mexico City: 16 delegations	Increasingly-decentralised metropolitan public system with private concessions
Caracas	4.2	6,207	N/A	Caracas Metropolitan Region: 17 municipalities belonging to 3 political-administrative entities (states)	Regional public agency to be devolved/transferred by 2007

N/A: Information not available

Source: Based on SUSTAIN (2004a), El-Hefnawi and Aref (2004), Cariola and Lacabana (2004a), Kombe and Lupala (2004a) and Torregrosa et al. (2004a).

Metropolitan areas have a decisive role in the national economy. Cairo contributes to more than 50% of Egypt's national economy. In addition to their national importance in economic terms, the labour markets of all case studies are marked by high levels of informality and spatial concentration. The informal sector comprises 50% of the labour force in Cairo, 33% in Caracas and 30% in Chennai. Most job opportunities in the formal and informal sectors are concentrated in the inner city.

Another feature that characterises these metropolitan areas is that of territorial differentiation. In Cairo, this has been the result of the strategies adopted by the economic elite preserving for itself a particular physical space. The creation of several five-star hotels in Giza City and on the Markaz periphery is an example of this as are several villas built legally or

Table 2: Characteristics of Peri-urban Localities Examined in the Five Case Studies					
	Peri-urban localities	Population (inhabitants)	Area (km ²)	Location/Distance to city centre	Annual population growth rate (%)
Chennai	Valasaravakkam & surroundings	112,479	16.75	West of Chennai city centre	5.3
	Kotivakkam & surroundings	54,055	12.52	South of Chennai city centre	4.4
Dar es Salaam	Tungi	17,500	0.84	5 km south-west of city centre	N/A
	Stakishari	15,000	1	10 km west of the city centre	N/A
Greater Cairo Region	Abou El-Noumrus City	41,212	7.99	South of Giza Governorate, 7km from Giza City	2.4
	Abou-El-Geitt	92,900	15.93	South-West of Qualiobia Governorate	1.1
Mexico D.F.	San Bartolomé Xicomulco	3,423	N/A	South-east of the city centre, in Milpa Alta Delegation	N/A
	San Salvador Cuauhtenco	10,323	N/A	South-east of the city centre, in Milpa Alta Delegation	N/A
Caracas	Bachaquero	3,664	N/A	38 km south of Caracas centre	3.5
	Paso Real 2000	4,122	N/A	25 km south of Caracas centre	3.5

N/A: Information not available

Source: based on SUSTAIN (2004a), El-Hefnawi and Aref (2004), Cariola and Lacabana (2004b), Kombe and Lupala (2004a) and Torregrosa et al. (2004b).

illegally over prime agricultural land stretching towards the western and south western parts of GCR. Similarly, in the case of Caracas, large socio-economic transformations related to the globalisation process have produced changes in the urban configuration and lifestyles due to the expansion of the metropolis to the periphery with high levels of socio-territorial inequalities. As shown in Box 1, this has given rise to a complex and diverse processes of spatial development.

There are significant differences between the five metropolitan areas and their peri-urban localities in population size and growth rates, surface and density, as well as with regards to other factors such as predominant land use and land tenure regimes (Box 2). However, they all show a marked gap in access to water and sanitation between metropolitan averages and peri-urban localities, with the latter suffering significant deprivation (often masked by aggregate statistics) and reliance of peri-urban dwellers on alternative systems of water supply and sanitation other than piped water and flush toilets.

Box 1: Metropolitan Expansion, Territorial Differentiation and Water Demand in the Caracas Valley

Caracas exemplifies much of the features of Latin America's metropolises at the beginning of the 21st Century. The Caracas Metropolitan Region (CMR) comprises the Caracas Valley and the main urban centre connected through mountain areas, with four peri-urban segments: Altos Mirandinos, Litoral Central, Guarenas-Guatire and Tuy Valley. The Tuy Valley attracts a significant number of people excluded from the housing market in the metropolitan centre and reflects processes of territorial differentiation.

Metropolitan expansion follows, on the one hand, the dictates of capital accumulation through property development and housing sector dynamics. There are new housing options in the periphery for vulnerable or impoverished middle-income groups who cannot afford central locations. This process has been accompanied by the emergence of new suburban centralities and promoted by the development of a transport and road infrastructure system allowing greater mobility within the metropolitan area. On the other hand, metropolitan expansion is related to housing policies, including the relocation of certain groups and survival strategies of the poor, for whom land invasions in the periphery constitute a common practice.



In this process of expansion towards peri-urban sub-regions, the centre of the CMR consolidates the main job market operating for the whole CMR, providing job opportunities not only in the most specialised and globalised activities, but also in informal activities. Economic and spatial fragmentation appear whereby the core city specialises in the more dynamic and competitive activities such as finance and other specialised services mainly serving the Caribbean region, whereas the periphery takes on functions related to material production as well as residential activities.

The expansion of the metropolis towards the periphery creates a demand for basic services, water and sanitation being the most important. These services have to be reconditioned to overcome their limited capacities in the Tuy valley. In fact, there is a 'water paradox' because whilst this area is the site of most of the collection, production and distribution of pure drinking water for the whole CMR, it suffers from serious deficits.

Despite the particular features of each case study, in all cases physical accessibility (i.e. travel time to the metropolitan core) of peri-urban localities appears to diminish as the distance to the main roads connecting these areas to the core city increases. In the cases of Mexico City and Chennai, this distance also significantly limits the provision of WSS services not only by means of network systems, but also through alternative means, such as water tankers. The two localities examined in the case of Mexico City belong to the Delegación (district) of Milpa Alta, which was only incorporated into the Federal District of Mexico City in the late 1980s. Milpa Alta is the most rural district in the Federal District and the location of strategic environmental resources to the city, particularly due to its role in the recharge of the aquifers that supply the whole metropolitan area. Although it still shows significant rural features, both in physical and socio-economic terms, the localities examined are experiencing

significant population growth, not least from migrant households relocating there from other parts of the metropolitan area.

Box 2: Key Features of the Peri-urban Interface (PUI)

The selected case studies illustrate the key features of the PUI. For instance, Valasaravakkam (Chennai) comprises different land uses: whilst 32% of the area is still used for agricultural activities (paddies, orchards and gardens) and 10% for water bodies and non-urban uses, 30% of the area is residential, 15% is vacant land, 7% in institutional use, 5% in industrial use and 1% in commercial use. Milpa Alta (Mexico City) is an ecological reserve, considered to be the first national producer of nopal (a cactus with multiple uses), with 95% of land in agriculture and 3.5% in residential use.

Rapid change due to population growth also characterises the PUI. The growth rate in 1991-2001 in the Kottivakkam group (Chennai) was 54%, increasing from 35,110 to 54,055 residents. Tungi, a peri-urban location in Dar es Salaam, comprised hardly 40 households engaged in subsistence farming and fishing in the early 1940s whereas five decades later, it contained 1,180 houses in 1992 and 1,680 in 1999, accommodating 17,500 people.

Unplanned population growth negatively impacts the PUI environment, which suffers from degradation as a consequence of inadequate solid waste collection and disposal (like Abu El-Numrous in Cairo) and bush clearance (Dar es Salaam); soil erosion and landslides due to deforestation and illegal land occupation (Caracas); as well as decline in agricultural lands (Cairo). In addition, there is a decline in plot sizes and intensification of housing construction activities advancing over farming lands (Tungi, Dar es Salaam).

However, the PUI possesses extremely valuable environmental resources for the city, like the Tuy Valley in Caracas which has protected natural areas and some of the most important water catchments of the region. Despite this richness, water access for people living

there is precarious. The Tuy River supplies approximately 50% of the drinking water not only for the PUI-Tuy zone, but also for the CMR as a whole. Its tributaries are used both directly and indirectly as sewers or collectors of wastewater from cities and industries.

The PUI accommodates diverse socio-economic groups. In the case of Kottivakkam (Chennai), its population includes affluent citizens living in farmhouses, medium-income city commuters and low-wage earners in fishing and non-farming occupations. Abu El-Numrous (Cairo) features luxurious houses for holidays or weekend use as well as Beduin migrants from the desert in addition to the original population currently facing high unemployment and under-employment rates.



Distance to the city core alone does not always explain the particular challenges faced in peri-urban localities or their physiognomy in terms of rural and urban features. The locality of Tungi is only five kilometres away from Dar es Salaam's central business district, but still presents a mix of rural and urban characteristics in terms of land use, housing and livelihoods. Urbanisation of the area has been restricted due to poor transportation links with the city, to which the area is connected only by ferry. However, it plans to build a bridge linking Tungi

directly to the city materialise, the area is certain to experience dramatic physical and socio-economic changes, a fact that land speculators have already foreseen by acquiring land in the area.

Rapid urbanisation is not a rarity in the PUI. In all cases, the growth rate in the PUI is much higher than in the city as a whole (see Tables 1 and 2). In the Greater Cairo Region this has led to the loss of approximately 24 ha of valuable agricultural land every year. The emergence of peri-urban areas around Chennai is not a new phenomenon. The core city extended over 68.2 km² from 1871 to 1931 and, after absorbing neighbouring villages, the City Corporation today covers an area of 172 km². With rapid expansion of economic activity, there has been a spontaneous transition in the character of rural areas surrounding the city.

Chennai PUI today covers 8 municipalities, 28 town panchayats (local authorities) and 18 census towns/village panchayats with an area of 418 km², which had a population of 1.7 million in 2001. [8] But, in reality, it encompasses the 196 village panchayats (area 588 sq.km) of Chennai Metropolitan Area and extends even beyond. Further differences can be noted among peri-urban panchayats, partially as a result of the availability of land suitable for urban uses. For instance, in Ramapuram, the population nearly tripled between 1991 and 2001. Although access to WSS is especially poor, low-income households only account for 13% of all households, a comparatively low proportion compared to the metropolitan average. In the two peri-urban localities studied in Chennai, the percentage of the poor is linked to the proportion of inhabitants belonging to 'scheduled castes', considered socially and economically disadvantaged, as well as to the number of agricultural labourers in the locality.

An international comparison of access to basic services by city size suggests some broad trends but also some significant variety. [9] For instance, access to piped water in Sub-Saharan Africa appears to increase with city size, whilst in South, Central and West Asia the same data shows that households in the largest cities (with over five million people) tend to be more poorly provided. A similar trend can be observed in Southeast Asia, where the percentage of households with access to a flush toilet decreases for the larger cities (one to five million). In all three regions, rural areas have the highest levels of basic service deprivation.

When examining the peri-urban context, data on access need to be taken with caution, as residents in peri-urban areas may either be recorded as rural or urban depending on the jurisdictional delineation adopted by national censuses as well as on the population density and distance to core built-up areas. In addition, national statistics do not shed light on the different health or socio-economic effects resulting from accessing different water supply and sanitation systems.

Box 3 presents a qualitative picture of the experience and perception of water and sanitation in the PUI in the eyes of peri-urban dwellers.

A specific feature of the peri-urban context in metropolitan areas is that the rapidly shifting and growing fringes of these areas have not only historically provided land (and often livelihoods) to a changing and highly heterogeneous population, including a disproportionate

[8] India has three categories of local government ranging from 'urban' to 'rural'. For more details see Allen and Purushothaman (2005).

[9] Montgomery et al. (2004), cited in Walls (2004:13).

Box 3: Water and Sanitation in the PUI: Experience and Perception of Peri-urban Dwellers

The PUI is a highly valuable area for the whole metropolitan area in terms of the environmental resources it provides. However, its sustainability is put at risk by the growth of demand stemming from the rapid expansion of the PUI of Tuy Valley and the growth of Caracas itself (Lacabana and Cariola, 2004b).

The socio-economic heterogeneity of the PUI often leads to conflicts or confrontations between different groups like in Tungi (Dar es Salaam) where there have been clashing interests between middle class and low-income groups. Most boreholes and deep well proprietors and water vendors alike were motivated to invest in water supply businesses because they consider it a profitable income generation activity (Kombe and Lupala, 2004b).

Overwhelmed services are associated with sudden population growth in the PUI, as the situation of Caracas illustrates, "The pipe network is overburdened at present, and the most prevalent perception is that the current state of service is worse than before as a result of population growth in the area (due to subdivision of plots and new land occupations) and the expansion of the diameter of the mains serving the neighbouring community, Brisas del Cartanal, which took volume and water pressure away from Bachaquero" (Lacabana and Cariola, 2004b: 13).

Service improvements in the area are often delayed. This has created a decline in community participation due to "a lack of confidence in officials" in the case of Cairo. "Formerly, the communities have contributed with money to the sanitation project which is still under construction. The community in Abu El-Numrous claims they had contributed financially to the sanitation plant, and yet the project is on hold". In addition, "the equipments brought for the plant were stolen, and then the new ones were not functioning. On the other hand, officials present the problem differently, as they argue that there are construction problems in digging for the pipes due to soil erosion. According to the executive officials "this technical problem is the cause of delays; they claimed it is under restructuring" (El-Hefnawi and El Gohary, 2004: 25).

Population growth and residential expansion have deteriorated agricultural lands and, consequently, produced a price rise in the vegetables, as expressed by this resident from Dar es Salaam: "Because most of the good farming land including valleys have been built on, the production of vegetables and fruits has remarkably declined, leading to scarcity and high prices for vegetables such as potatoes, amaranth, okra, sweet potatoes and egg plants. In the past one could walk to his neighbour and gather green vegetables without paying. Now this is not possible, everything is sold" (Kombe and Lupala, 2004b: 19).

number of poor households and producers, but frequently also provide essential environmental services to the metropolis, including aquifer replenishment, other sources of water and 'environmental sinks' for liquid and solid waste from the urban core. And yet, much of the official data about cities tends to exclude these areas, largely because they do not fall within the jurisdiction of the larger, more central and urbanised municipalities. There is also a time lag between cities expanding and peri-urban settlements being included in the official statistics. In the meantime, these areas tend to exist in a sort of statistical and administrative limbo, a conceptual and spatial 'penumbra'. [10] Governance in the peri-urban interface is therefore severely fragmented, with a multitude of actors present and no single government body providing guidance or leadership.

10] Aguilar and Ward (2003).

1.2 The 'Water Poor' in the Peri-urban Interface

Who are the peri-urban 'water poor'?

The last section discussed some of the limitations of the basic definitions often applied to statistical records used to quantify deficits in service provision in urban and rural areas. These limitations mean that it is difficult to define how many people living in the peri-urban interface currently lack water and sanitation services, as the PUI is not a geographically-fixed area and, at best, statistics only distinguish between urban and rural areas.

Furthermore, while many peri-urban inhabitants could be described as being 'water poor' as they do lack access to sufficient water and adequate sanitation facilities to meet their needs, the absence of reliable and detailed data makes it impossible to present valid numbers for 'adequate' provision. Most of the statistical sources, for instance the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) Global Water Supply and Sanitation Assessment 2000 Report, only provide figures for 'improved' water supply and 'improved' sanitation. According to the WHO, 'improved water supply' implies access to a household connection or to public standpipes, boreholes, protected wells, protected springs or rainwater collection within 1 km of the home, while 'improved sanitation' entails a domestic connection to a public sewer or access to a septic tank, pour-flash latrine, simple pit latrine or ventilated improved pit latrine within 1 km of the home. [11] This approach, however, only provides information regarding the existence of facilities - but says little about how adequate and in what condition of maintenance these services are. Furthermore, especially in the case of sanitation, even if those facilities were kept in good condition, a walk of up to 1 km to a public toilet cannot be considered acceptable. [12]

The water poor in peri-urban areas are not necessarily restricted to low-income households, as there might be members of other income groups lacking access to adequate WSS. However, although there are frequent instances of neighbourly solidarity and collective efforts, low-income peri-urban dwellers and home-workers generally lack the political means to improve their access to WSS services in a way that is affordable for them and therefore tend to be more vulnerable than higher income ones.

Standards about what the minimum amount of water a person needs range from 15 to 50 litres per capita per day (lpcd), but in emergency situations this might even drop to 7 lpcd. [13] The standard applied in specific circumstances has an enormous impact on who and how many can be regarded as being water poor. A further problem with such standards is that the water poor in the PUI cannot be considered a homogeneous group. The only feature they might have in common is their lack of access to adequate WSS, but behind this label are people with differing needs, perceptions, abilities and tasks. This is true not only for different households but especially for different members within households. For example, women and children are often more affected by the lack of services, as it is mainly they who are

[11] See WHO (2003) and UN-HABITAT (2003a).

[12] For a more detailed discussion of these standards see Sections 2.3 and 2.5.

[13] For more information on how different sources have identified these standards, see Gleick (1996); The Sphere Project (2004); UNHCR (1992); WELL (1998); and WHO and UNICEF (2000).

responsible for fetching water and performing water-dependent household tasks (such as cooking, cleaning, childcare and hygiene), which means they are much more exposed to water-related diseases and stress.

The options available to cover the deficit of basic services rarely rely exclusively on the extension of formal infrastructural networks but on more decentralised forms of service provision. Failure on the side of the public and private sectors to support such forms of WSS provision often means that peri-urban dwellers, in particular the poor, are left to their own devices to access these essential services. Furthermore, as their needs and practices often remain 'invisible' to the public sector, policy changes aimed at improving the efficiency of the formal WSS frequently do little to ensure better access by the peri-urban poor and often even constitute an obstacle. [14]

[14] Hofmann (2004)

Box 4: The 'Water Poor' in the Peri-urban Context

The testimonies below from peri-urban dwellers in the five case studies help to understand their perceptions and experiences of water poverty.

The insecurity associated with practices such as 'illegal' connections is a recurrent factor highlighted by most interviewees, as illustrated by a peri-urban resident in Caracas: "... here is where the water problem is most visible, on Terrace 11. We have the connection to the pipe furthest away, on the main highway ... we make a small illegal tap, but it doesn't meet our needs. Water doesn't reach my house at least, no water arrives.... We have no responsibility, some people waste a lot of water, there are broken pipes and they aren't repaired" (Lacabana and Cariola, 2004b: 16).

Whilst in some areas, like Cairo, the poor quality of water is a central concern (El-Hefnawi and El Gohary, 2004), in other places the main problem affecting peri-urban communities is related to its irregular and scanty supply. A woman in Caracas explains how this affects her life: "When they give me water here every fourth day, I don't do any other chores, I just get water.... The next day I do all my chores, because water takes a lot of your time, fetching water, filling bottles, checking that there are no leaks...." (Lacabana and Cariola, 2004b: 19)

Peri-urban poor residents develop different adaptive strategies to cope with the lack of water. A woman from Milpa Alta (Mexico) explains: "They give us water every third day at the tap, by hour. They give us three or four hours a day and we organize by number on a list of families. There are 17 families in this area, around 80 people including children. We get half an hour of water each. We have to connect hoses and when a person's turn comes, they grab their hose and connect it to their barrel" (Torregrosa et al., 2004b, p. 18). Street taps are the only means for water supply in some of Chennai's peri-urban areas. The number of street taps varies from one tap serving 258 persons in Valasaravakkam to one tap for 41 people in Manapakkam (SUSTAIN, 2004b).

The water and sanitation services deficiency suffered by peri-urban poor residents brings about several diseases including diarrhoea, intestinal worms, typhoid, cholera and dysentery. In Tungi, the peri-urban locality in Dar es Salaam, the number of diarrhoea cases almost tripled between 2001 and 2003. In 2002, 299 cases of diarrhoea were reported, the consequences of which led to 13 deaths (Kombe and Lupala 2004b).

15] See Section 1.3

Field interviews with peri-urban dwellers provide some hints to advance a definition of the peri-urban 'water poor', in which the key features are informal/illegal access to water; access to poor-quality water and scanty access to water (Box 4). Informal and/or illegal access to water is often linked to insecure tenure of land and housing rights, and this is particularly crucial in the peri-urban context, where customary and statutory systems coexist or overlap with each other. [15]

Another key feature of the water poor in the peri-urban context is the fact that almost invariably they are forced to spend a significant proportion of their income in water - an issue discussed in more detail in Section 2.3. In the case of sanitation the personal safety and cultural acceptability of facilities are crucial in understanding not only the needs of the peri-urban poor but also their perception about what does or does not constitute an adequate solution.

Citizens or consumers?

More than a billion poor people in the world today lack access to safe drinking water and 12 million of them die each year from drinking contaminated water. The magnitude and impending consequences of the so-called water and sanitation crisis have led human rights activists and development theorists to emphasise that water and sanitation play a vital role in the fight against poverty. As such, the right to water and sanitation is seen as indivisible from other human rights, such as the rights to health, work, shelter and, more fundamentally, the right to participate in the decision-making process. In this context, water is regarded as a public good and its availability is a basic human right best administered by the public sector in direct dialogue and cooperation with civic society. The definition of water as a human right means that "fresh water is a legal entitlement, rather than a commodity or service provided on a charitable basis" [16]

16] WHO (2003) page 9, accessible at www.who.int/water_sanitation_health/rightowater/en/

However, the inability or incapacity of governments in developing countries to guarantee their citizens' supposed right to water has given rise to increasing scepticism among many who claim that business and the market can resolve the world's water crisis. This claim is well-represented by the work of Swedish analyst Fredrik Segerfeldt, who argues that given that the majority of the poor in developing countries are not hooked up to water mains, in practice the urban and peri-urban poor are already exposed to market forces but on very unfair terms, as they pay on average up to twelve times more to obtain water than those connected to regular water mains. [17] In the context of this broader debate, a fundamental question to ask is: Are the peri-urban poor citizens or consumers? In other words, what is their status at the constitutional level and within current policy frameworks regulating the provision of basic services? But also, what is their reality in terms of the practices by which they effectively access water and sanitation?

[17] Segerfeldt (2005)

The answer to the first question is that in the peri-urban context the poor are both citizens and consumers. In all the five case studies examined under this project, there are constitutional provisions in place that frame water as a human right that should be guaranteed to all people - rural, urban and peri-urban dwellers. However in recent years, this definition of 'right' has been subjected to fundamental changes prompted by the introduction of water tariffs. In some cases this process has been linked to the total or partial privatisation of basic service provision, while in other cases water tariffs have been introduced as a means of improving the financial capacity and cost recovery of public agencies, as in the case of Caracas. A common aspect to all such reforms has been the reformulation of the universal right to water. At the policy level, this right is often restricted to 'those in need'. This means that reformed regulatory frameworks focus on creating special measures and mechanisms to provide water for the poor, while introducing full or partial economic costing practices for the large majority. In this context, it is relevant to examine how 'those in need' are defined and, in particular, how these definitions affect the peri-urban poor. In some cases, need is defined by applying conventional poverty measures, whilst in other cases, significant differences are introduced between the rural and urban poor.

In the case of India, the 2002 National Water Policy asserts that "adequate safe drinking water facilities should be provided to the entire population both in rural and in urban areas. Irrigation and multipurpose projects should invariably include a drinking water component wherever there is no alternative source of drinking water. Drinking water needs of human beings should be the first charge on any available water." [18] Though the policy does not clearly lay down whether drinking water is a right or a good, the message is clear. Both the current policy reforms and established practices do not contemplate treating water and sanitation services as goods, which would depend upon market mechanism for access and delivery.

The prime responsibility for providing WSS services in India has traditionally been with local government institutions funded by public money. This responsibility has been strengthened through enactments under the 73rd and 74th amendments to the Constitution of India. These amendments deal respectively with urban and rural local government structures and reconfirm the status of the poor as citizens, giving these institutions the responsibility of providing basic services. However in practice there are significant incentives



[18] <http://wrmin.nic.in/policy/nwp2002.pdf>

for peri-urban dwellers to remain under the jurisdiction of rural local bodies. First, funds from the central government Ministry of Rural Development are considerably larger than those available through programmes administered by the Ministry of Urban Developments, with the former including grants to gram panchayats (self-governing local authorities) and various programmes funding water supply, roads, education and health. Second, under rural jurisdictions, water is free and charges for other services like electricity are lower than in municipal areas.

In Tanzania, according to the Water Utilisation Act (1974) - amended in 1991 and 1997 - and Water Policy (2002), water is regarded as a 'social good'. However, owing to the high cost of potable water supply, peri-urban communities are forced to pay for water though at a subsidised rate; this payment covers only maintenance and running costs. In this respect, the state pays for capital investment in community water supply systems. Private water vendors charge commercial rates (usually leading to small profits). Therefore, from policy and statutory provisions, water remains a social good only in so far as public (state) provided systems are concerned. However, only a few communities in the PUI have access to potable water supplied by the state as a social service, largely because of the limited resource capacity of the state to provide potable water to the sprawling peri-urban settlements.

Similarly, in the case of Mexico, access to water is a universal right guaranteed by the national Constitution. Article 27 establishes the sovereignty of the state over all water resources within the national territory and treats water as a common good. Moreover, Mexico has signed international treaties agreeing to guarantee access to water as a human right. However, there are differences in the status of different water users. In theory, all inhabitants have rights to water for domestic consumption. Agricultural producers have water rights registered in the Public Registry of Water Rights, whilst industrial users are under a different regime and considered 'operating water bodies'. [19]

[19] Torregrosa et al,
(2004a)

In the case of water for human consumption in Mexico City, in which all or part of the management production has been transferred to private hands, the only paid fee becomes a fare that intends to show transparently the real value of water production, guaranteeing the payment with meter installation. This has partially been achieved and it has not become the dominant modality in the territories where it has been installed. In the context of Milpa Alta, the status of domestic users falls in reality under four different practices. While some peri-urban dwellers (not necessarily the poorest) receive free water delivered by public tanks through the municipal delegation, those who live in small towns pay a flat tariff for the service or even metered charges, whilst a fourth group relies almost exclusively on buying water from private tankers.

The Egyptian government treats access to water and sanitation as a right of all its citizens. However, this does not specify the type and quality of service guaranteed by the state. Potable water and sanitation are heavily subsidized by the Egyptian government. In recent years, several foreign donor agencies pushed the government to perform a gradual

increase in the water and sanitation tariff as part of the changes recommended to improve the performance of the WSS sector. However this measure has been resisted by the large majority, for whom the sole and main responsibility in the WSS sector lies upon government bodies. Water and sanitation are sensitive issues, largely perceived by Egyptian citizens as public goods.

Box 5: Building Responsible Citizenship in Metropolitan Caracas

Access to water has always been considered a right in Venezuela and in poor areas the norm has been that this service is not charged. This is related to the deficiency of service, illegal taps and the lack over a long time of a policy aimed at improving the access to water of the poorest.

The 1999 national Constitution and the 2001 Drinking Water and Sanitation Service Act establish clear guidelines on the right to water access and participation to improve this access (see Box 12). This process has been very successful since it is based on a joint responsibility principle according to which Hidrocapital, the state water company, carries out projects, the community participates more intensely, and vice-versa, where the community participates, the company commits itself to carry out projects.

The principle of 'Community that participates - community that achieves results' implies the exercise of rights and duties whereby citizenship is created. However, payment for service is within these obligations. Thus, Hidrocapital seeks to develop consumers responsible for the payment of a 'social rate' (US\$1 monthly) and, in some cases, collective payments, since community water meters connected to the mains are being tested in new projects.

However, the culture of non-payment associated with old clientelist practices as well as the lack of attention paid to these groups currently creates difficulties and, in some cases, conflicts in the communities for the payment of the 'social rate' established for poor areas. The establishment of Technical Water Fora ensures the participation of peri-urban communities in the decision making process. These are CBOs that foster collaboration between citizens and technical personnel in the WSS and have become a key mechanism for community mobilisation and improved service provision.

The Fora have been essential to address the problems highlighted above, as they are a means of raising awareness among the population on the costs associated with the production of water - treatment, transportation and distribution. This not only creates a sense of responsibility about water consumption, but helps people understand what is being charged and why.



Caracas

As highlighted before, sceptics see free drinking water and sanitation as a myth, as it costs money to provide these services and whichever agency provides them has to bear a cost which must be eventually paid by all citizens. Furthermore, market advocates argue that public systems, which in most developing countries make up the bulk of water provision,

often suffer from inadequate financing and poor maintenance, while unregulated vendors continue to charge exorbitant rates in poorly serviced areas. Despite this, creating a market mechanism for the 'water poor' on a cost recovery basis is wrought with serious socio-economic consequences that need to be into account.

An important consideration refers to what is defined and guaranteed as a 'right'. While in some cases this refers exclusively to the provision of safe water, in other cases like in Venezuela, the definition of rights is far more encompassing. Here, recent reforms sought the revitalisation and reform of public systems which focus on enhancing poor people's entitlements and rights to water rather than emphasising profits. This experience shows that the peri-urban poor can be at the same time responsible consumers and empowered citizens, as rights and responsibilities go hand in hand (Box 5).

Furthermore, the case of Caracas shows that having a 'right' to water does not necessarily mean that the service is provided for free, but rather, that mechanisms to guarantee that such right is exercised are put in place.

It is worth highlighting that the right to sanitation as an entitlement provided for at the constitutional level is generally less explicit. Many argue that this is implicit in the right to water, as access to basic sanitation is a prerequisite for clean water. However, there are few cases in the developing world where such provisions are in place. In practice, access to sanitation by peri-urban dwellers in the five case studies examined is highly deficient, running from the lack of any facilities to inadequate collective facilities provided by the government. These will be discussed in more detail later under sections 1.4 and 2.5.

The right to water and sanitation is, in fact, not just a right to subsidised services but a means to ensure that water and sanitation fulfil a social and environmental collective function and that the most disadvantaged groups in society are effectively empowered to have a say in the decision-making process. In 2001, the Brazilian government enacted a groundbreaking Federal Law entitled 'City Statute' which explicitly recognises the right to the city as a collective right and establishes a new legal premise and political framework based on urban land use and development control. Within this framework, municipalities are entrusted with the responsibility of formulating territorial and land use policies that seek a balance between individual property rights and collective social and environmental rights. In so far as the City Statute guarantees the 'right to a place' not only of urban dwellers but also peri-urban communities, the Statute constitutes a useful example of the type of innovations required to improve the rights and entitlements of the peri-urban poor who, more often than not, remain invisible to the eyes of urban and rural local authorities. Another important aspect of the City Statute is that it provides municipalities with legal instruments and authority to regularise land tenure. This is also a relevant provision to improve access to water and sanitation in the peri-urban context, as insecure access to these services is in most cases associated with various degrees of land and housing informality. [20]

[20] See Sub-section 1.3.

Living between two worlds: Health impacts and livelihood links

The health implications of deficient access to water and sanitation are well known. It is estimated that water shortages account for approximately 12 million deaths annually throughout the less-developed world. Every year, more than a billion people contract water-related diseases and nearly half the urban population in Africa, Asia and Latin America suffer from one or more diseases associated with inadequate water and sanitation.

Health impacts are correlated with both the exposure to environmental hazards and risks and infrastructure deficiencies. Uncollected garbage, inadequate water supply and sanitation, overcrowded housing and air pollution are common problems affecting peri-urban communities. The poorest in the PUI face greater exposure to biological and physical threats and also more restrictions in their access to protective services and infrastructure than more centrally located poor urbanites. The breakdown of traditional environmental management practices appears to be largely associated with increasing exposure to health hazards and environmental degradation (e.g. increasing use of non-organic fertilisers in peri-urban farming). [21]

[21] Allen (1999)

Although there is little specific research on the health risks and impacts experienced by peri-urban dwellers, it could be argued that in comparison to the urban or the rural poor, the peri-urban poor may live in the 'worst of both worlds'. [22] This situation would be the result of their exposure to health hazards, both of a 'modern' type (related to urban societies, mostly non-communicable or associated with injury, over-weight but under-nourished or psycho-social disorders) and a 'traditional' type (related to rural areas, mostly communicable, or associated with under-nutrition).

[22] Birley and Lock (1998)

The peri-urban interface generates a particularly high risk of exposure to vector-borne diseases such as malaria as a result of certain productive activities which are characteristic of peri-urban areas. The peri-urban context combines rural and urban characteristics and thus attracts vectors that would usually appear in either rural or urban areas. [23] When it comes to preventing water-related diseases, the amount of water consumed is often as important as, or sometimes even more so than, its quality; the exception is children under the age of three, for whom the quality of water is even more significant than the quantity. This is confirmed by the types of diseases recorded in the localities of the five case studies examined as part of this project and shown in Table 3. Many of them arise through human contact with faecal matter, either through the consumption of contaminated water or through person-to-person contact. Diarrhoeal diseases (which frequently affect low-income groups and especially children), several skin infections and other endemic hygiene-related diseases (e.g. some forms of typhoid) can be prevented by making sufficient water available when combined with appropriate hygiene behaviour, starting with practices as simple as regular hand-washing. In addition, there might be other faeco-oral diseases present, such as ascaris, without people being aware of them.

[23] For some examples see Hofmann (2004).

Table 3: Water and Sanitation Related Diseases and Infections in the Peri-urban Areas Studied by the Project

City	Faeco-oral (water-washed and water-borne)*	Water-washed*	Vector-borne*
Cairo	Diarrhoeal diseases Hepatitis A Typhoid		
Caracas	Diarrhoeal diseases Hepatitis A Amoebiasis Gastroenteritis	Skin infections	
Chennai	Diarrhoeal diseases Cholera	Skin infections	Malaria
Dar es Salaam	Diarrhoeal diseases Cholera Intestinal worms		Malaria
Mexico	Diarrhoeal diseases Cholera		

* Water-washed: person-to-person transmission due to inadequate personal and domestic hygiene; water-borne: transmission through consumption of contaminated water and food; vector-borne: transmission by insects which breed in or bite near water

Source: Based on SUSTAIN (2004b), El-Hefnawi and El Gohary (2004), Cariola and Lacabana (2004b), Kombe and Lupala (2004b) and Torregrosa et al. (2004b).

When exploring the determinants and consequences of access to WSS, it appears that specific problems arise in low-income areas with evidence of a strong link to particular patterns of life and livelihoods prevalent in peri-urban areas, as illustrated in Box 6 for Greater Cairo.

Reference was made before to the fact that when it comes to health impacts and risks, peri-urban dwellers may experience the worst of both worlds. Conversely, it could be argued that in terms of livelihood, the peri-urban poor may be able to draw on both rural and urban opportunities. Livelihoods in the PUI tend to be more diversified than in the rural and urban context, as poor households are more likely to depend on both natural and non-natural resource based productive activities. Many income activities in the PUI are water intensive, such as agriculture and horticulture (e.g. Mexico and Chennai), animal husbandry and tanning, brick-making and building. For those involved in these activities, lack of water not only constrains personal consumption and hygiene, but poses a serious threat to livelihoods.

In peri-urban Dar es Salaam, water is extensively used in income and employment generation activities such as food vending, poultry and cattle keeping, concrete block making and 'tie and dye' textile production. Water for vegetable gardening is drawn mainly from shallow wells in low-lying areas.

Box 6: Links between Water and Sanitation, Health and Livelihoods in Greater Cairo

Deficient access to water and sanitation faced by peri-urban communities in the metropolitan region of Greater Cairo makes these communities highly vulnerable to a wide range of environmental and health hazards. They suffer from diseases resulting from waste accumulation, lack of safe sanitation and clean water, air and noise pollution and the spread of insects. They are particularly vulnerable to diarrhoea, infections, intestinal worms, kidney and liver diseases from contaminated water and food and improper drainage and garbage collection. Moreover, some diseases are associated with water pollution since underground water is mixed up with discharged water. Among these diseases are kidney failure, leukaemia and nephritis.



Cairo

A 1998 Giza environmental profile identified the following reasons for water-related health risks in urban and peri-urban areas: direct contamination by industrial waste discharge, deficiencies in primary treated sewage resulting in contamination of potable water and the inadequate coverage and deterioration of wastewater sub-networks in some areas. According to the profile, inhabitants of informal settlements suffer several faeco-oral diseases including hepatitis A, typhoid and diarrhoeal disorders. In the peri-urban context of Giza, 27.3% of the children below five years of age are affected by diarrhoea, a higher rate than the national urban average (20.7%). In peri-urban areas, the incidence rate of hepatitis A - transmitted both by water and food - ranges between 15 and 60 per 100,000 inhabitants.

The impact on the health of the poor is severe, as they cannot afford safe drinking water and, when they get sick, they cannot afford health care. Another health impact is related to the physical overload of carrying water containers to upper storeys. Women who cannot afford the standard fee for water delivery (25 piastres or US\$ 0.04 per storey) have to carry it themselves and they often complained of "severe back pain". The impact on financial assets also reaches every household in peri-urban areas, as they have to buy private water. Financial impacts of health problems (caused by water pollution) may vary between poor and rich households. The poor still pay much for lower levels of health care and might lose their livelihood if they lose energy and capacity to work due to serious diseases, while richer households would pay more but can access the best health care. In poorer areas with less reliable sanitation systems and higher probability of blockage and overflow, health risks and hazards are higher where adaptive and preventive strategies are lower. This is more drastic when excreta removal is done manually. Manual removal using iron wires and buckets can lead to skin infections, not to mention the social stigma and unpleasantness associated with this activity.

Psychological and social stress causes more disputes among people in poorer areas, even when collecting money to share removal costs. Impacts on natural assets affect livelihoods directly especially for those who make their living from farming. Quality degradation and food contamination affect the demand on their deliverables in the market. Poor households pay more for less secure adaptive strategies. On average, for poor and rich in villages and cities, the financial cost of pumping sanitary blockage and overflow is estimated to be 20-40 Egyptian Pounds (US\$ 3.5-7) per overflow or per month.

In the case of Milpa Alta in Mexico, water for productive activities is obtained through home or public taps and when this is not enough, through the local authority (delegación) or

buying from private tankers. Agriculture in the area is basically seasonal and rain-fed and there are no irrigation systems. The share of land devoted to growing vegetables is very small and residential water is used in some family orchards. The commercial production of nopal (a cactus with multiple uses in gastronomy, medicine, industry and farming), a main product for export to the national and international markets, requires little water other than occasional rain water.

Even where a household's main income-generating activity is not dependent on the availability of water, livelihoods can be compromised due to the time spent on collecting water (up to two hours in some cases reported in Chennai) that must be taken away from other tasks, such as household duties and income generation. As mentioned above, this is particularly stressful for women, and where children are involved, their school education can be at serious risk. This problem appears to be aggravated in peri-urban areas as they are populated by a high percentage of households of nuclear families and female single heads. This means that they can only rely on a very limited number of family members to fulfil daily tasks and to diversify household income - for example, in Caracas nuclear families account for more than 60 per cent of the total and between 50 and 59 per cent of Chennai's peri-urban population. This phenomenon is a result of the migration patterns that characterise demographic influx to and from the peri-urban interface.

In this light, when calculating the minimum amount of water a person requires per day, it is crucial not to identify needs only on the basis of universal standards. These might be useful to provide an initial indication, but further disaggregation of men and women and girls and boys concerned would be desirable to take into account gender roles, age and ethnicity, with a particular focus on the disadvantaged. All the underlying structural conditions that mean that poor people lack access to services need to be understood if workable solutions are to be developed. Disaggregation is also required to understand the composition of peri-urban water demands and the extent to which productive uses of water are linked to livelihood strategies of the poor.

1.3 Water supply and sanitation and informal land and housing delivery systems

Regulatory frameworks that guide planning in metropolitan contexts are important for the access to water and sanitation services of low-income peri-urban residents. A framework that defines a peri-urban settlement as illegal or irregular can be used to restrict official legal supply of these services to the settlement. The 'Zero Growth Pact' implemented in metropolitan Mexico City is a good example of how policies designed to control metropolitan expansion in environmentally protected areas can reinforce unequal access to services (Box 7). Planning regulations guiding the development of new land for residential use - including peri-

urban land - are often unrealistically high. However, some countries have lower and more flexible service standards than others, and there is evidence to show that flexibility helps the poor. [24]

[24] Some are based on foreign norms. See Payne and Majale (2004).

Box 7: The Zero Growth Pact in the Peri-urban Interface of Mexico D.F.

The Metropolitan Area of Mexico (ZMCM in its Spanish acronym) comprises 38 natural protected areas occupying 76,714 hectares. Urban expansion pressures constantly put at risk these areas, which are strategic for the sustainability of the metropolitan zone since they provide it with indispensable environmental services. Within this context, Milpa Alta is the most rural district in the metropolitan area of Mexico City, considered a natural protected area due to the location of strategic environmental resources for the city, particularly its role in the recharge of the aquifers that supply the whole metropolitan area. Although it still shows significant rural features, both in physical and socio-economic terms, the area is experiencing high population growth, not least from migrant households relocating there from other parts of the metropolitan area.

In order to control the process of metropolitan expansion over Milpa Alta, the Federal District Government has implemented several mechanisms to halt population growth in the area.

Firstly, the territory has been divided into two zones: the towns (or urban areas) and the area outside them, the *parajes*. This creates a stratification of the population on a socio-economic level since a dweller from outside the towns cannot, in theory, have access to water and sanitation networks. Secondly, a census carried out in the *parajes* in 1997 was used to divide the population into two groups: those recorded in the census and those who have settled after the census. The Zero Growth Pact is meant as an agreement between the delegation authorities and the *paraje* dwellers recorded in the census to stop new settlements. The pact establishes that only the registered population can have access to water provided by public tankers and taps. In return, those peri-urban dwellers included in the Pact have to police the area and denounce any new settlers, who are not allowed to receive any public water supply.

This constitutes a contradictory situation for several reasons: on the one hand, the economic crisis of the former way of peasant subsistence in the area has led long-term settlers to divide land formerly used for cultivation, selling it to individuals or real estate speculators. On the other hand, politicians, seeking clientelistic relations, intervene discretionally to ensure the supply of free water to those who are outside the Zero Growth Pact. This creates a situation in which "law is not always applied for all cases". Consequently, informal settlements continue to be established in this area and their dwellers access water through different mechanisms, often being forced to resort to different forms of illegality and at higher unit costs.



Mexico

As discussed in Section 1.1, it should not be automatically assumed that land changes in the peri-urban interface are always associated with the emergence of low-income settlements. In Chennai the fast growth of the PUI south of the city centre has been mainly triggered by an IT corridor policy adopted by the government of Tamil Nadu. This is starting to

attract large multinationals to the PUI, where land costs are still low and local infrastructure needs to be developed. This type of growth has a double edge - planned high-tech world class development on one side and sprawl of poor informal settlements on the other. Many of these settlements develop outside existing formal regulations, often because they lie outside the jurisdiction of the better-resourced core urban districts. Governments are not compelled to provide services to irregular or illegal settlements, so residents must resort to informal service providers at much higher unit costs than conventional systems or to inadequate clandestine connections or unprotected, polluted water sources.

A use of land or housing that does not fully comply with the laws of government can be held as reason to refuse the provision of WSS, even where this is a public responsibility. Providers need formal records that allow them to assign service costs to specific parcels of land and named users. Moreover, some governments have favoured the refusal of WSS as a threat to increase compliance with land planning and building regulations. In developing countries, a peri-urban interface produces conditions in which there is likely to be an abundance of land claims that are not recognised by government, uses of land and buildings that violate policies enshrined in law, and buildings that violate construction regulations.

The existence of rural or peri-urban land that is close to city jobs, city services and city life gives rise to land market prices that are low compared with land currently in urban use. The low price partly reflects the lack of service infrastructure which can add market value to land in excess of its installation costs. Consequently, this low-priced rural or peri-urban land is attractive to individuals, groups, entrepreneurs and even government agencies. The demand fuelling this attraction is mostly for residential use in a range of income levels.

To meet the demand for low-income land and housing, informal land delivery systems are favoured because they are cheaper and they deliver land more quickly than those that fully satisfy local laws and regulations. Land may be allocated using vestiges of customary or traditional systems of land management that were established in rural areas, systems that are not fully recognised - or not recognised at all - by the state, as in the case of Dar es Salaam illustrated in Box 8 . Squatters may claim rights to occupy areas. Official procedures and laws are not followed. This is not just because they may be unknown to rural residents, but also because they can significantly hinder the satisfaction of crucial housing needs, and yet they cannot be enforced well in the institutional environment of a peri-urban interface. In Milpa Alta and other cases, farms are often divided into many small parcels without government permission. Simply using it for urban housing without asking the government may be illegal. In many cases, the parcels created are not professionally surveyed and described in a government register along with the names of those holding user rights.

This informality extends to the buildings on the land. The density of the houses constructed may violate policies fixed in laws and so may the materials used to build. The absence of a particular quality of WSS is itself an extremely common breach of legal requirements.

All of these infringements on land and construction formalities - and others like them - attach a risk to the rights enjoyed by the users. The risk is that another entity claiming the right to use will have the backing of law of the state, or that government will act to terminate illegal land use or construction. This risk tends to further reduce land and housing prices.

Box 8: Urban Expansion, Land Tenure and Water Supply and Sanitation in Peri-urban Dar es Salaam



Informal urbanisation is the dominant feature that characterises urban growth in Dar es Salaam. One of the main causes of this phenomenon is the conflicting land tenure regimes and particularly of customary and quasi-customary land tenure systems in peri-urban areas. The two systems are facilitating access to unplanned and unsurveyed land for housing. The latter has given rise to crowding and dysfunctional spatial urban growth, especially in peri-urban areas. Some of the major adverse effects of informal urban growth in Dar es Salaam include over-densification in low-income housing areas, pollution and faecal contamination of ground water sources as housing density increases. Excessive housing density is mainly a problem associated with the lack of a regulatory framework for informal housing land development coupled with the absence of coordination between land use and WSS development processes. Subsequently, sustainability of the current ground water supply sources and the public health of settlers in the PUI are increasingly being threatened as unregulated informal housing densification takes a toll in the PUI.

Is formal regularisation the answer?

A common governmental response to all of these conditions of informality is to regularise the failure of compliance by altering what exists so that it meets the conditions imposed by law, or by changing laws so that there is more compliance in what has been done. The first of these predominates in what is usually an expensive and elaborate exercise involving at least the surveying and registration of plots, if not also the purchase of land rights and subsidised resale to the occupants. The formalisation of group claims rather than those of individuals, as an intermediate step, can reduce enormously the initial time and costs of surveying and registration. For example, the Government of Namibia is experimenting with the provision of land rights to groups settling on peri-urban land, leaving their members the option to obtain individual titles later on. In the meantime, payment for services to the whole of a group-held compound remains the responsibility of the collective. [25]

[25] Christensen (1999).

Even so, the expenses of tenure regularisation that eliminate any significant questions

of rights are usually so substantial that they are better diverted to the tasks of improving WSS. As a prerequisite, regularisation can burden a poor household to the extent that it - or the government that is subsidising the regularisation - is delayed or prevented from taking on the subsequent expenses of better WSS. Moreover, land regularisation can be a time-consuming procedure that further holds back the realisation of WSS improvements.

In any event, lack of compliance can be brushed aside if that is the wish of a government. This may be in answer to a greater awareness of the needs of citizens or it may be in order to secure votes - as in Milpa Alta - or to reduce threats to the general health or to social or economic stability. For example, since 1972 in India, once an area has been officially declared a 'slum - unfit for human habitation' it becomes legally entitled to environmental improvements, including basic water and sanitation. [26] In Brazil, undisputed land occupation for more than five years will officially give settlers the right to settle and subsequently gain access to basic services.

However, this does not treat the difficulties of charging and recovering costs. To provide a practical and legal basis for billing and the correct allocation of responsibility for user charges to individual dwellings, a government can recognise some land or housing rights. For example, this might be a right of occupancy that does not require the definition of plot

boundaries or the registration - or even the name - of the landlord. Disaggregation of systems and decentralisation of provision management provides another answer. Informal housing areas in cities are already serviced by small, local private sector and government enterprises or community groups selling to individuals through a variety of arrangements.

All of this suggests that informal land or housing tenure is not likely to be at the root of the problems. Rather, it is more like a veil that helps to obscure the more solid obstacles to improving WSS in the PUI. The first of these is that poor people find the conditions of a PUI advantageous for housing themselves. Land

and housing construction costs can be low to start with and so can water and sanitation costs. This allows households to begin cheaply and to improve housing and WSS as they are able. The edge of the city offers poor people a foothold which they can in time develop into a firm presence as this edge eventually moves outward and past them.

However, improvements can be made that do not necessarily run counter to this strategy for affordability, and these do not require formal land or housing tenure. Research [27] has shown that informal land and housing delivery and government management of land are moving towards each other. In exchange for greater acknowledgement of informal land claims, informal land developers may let governments suggest site layouts that will allow more efficient WSS installation someday. Households with sufficient income may be helped to create schemes - for water especially - that are economically viable and perform satisfactorily

[26] Bapat (2004).



[27] Durand-Lasserve (2004); Rakodi (2005).

because they are integrated with urban ones. Technical assistance and the mobilisation of a community may be all that is needed, aside from creating lines of cooperation between urban and rural governments. Community management, better layouts, financing arrangements for small step-wise improvements leading toward integration in formal networks, and billing that is not based upon land registration are all possible. The case of Dhaka in Bangladesh shows the role that local NGOs can play in establishing a relationship between slum communities and public water authorities. [28]

[28] See Section 3.

Then a second substantial issue appears. Who can initiate and support improvements of these sorts for locations under the impact of a PUI? This is the most challenging obstacle; it arises from the fragmented responsibility and perception of needs held by public bodies and from the limits of their capacities to respond to urban needs, especially when they are rural institutions. In relation to this, the informality of land and housing rights presents minor challenges to peri-urban WSS provision that can be - and clearly are - moved aside when there is sufficient public initiative.

1.4 Bringing Governance into Focus

Over time, the concept of 'governance' has been given many different meanings and interpretations, but perhaps the more established definition is one that refers to the capacity of a political system to govern efficiently and to provide the necessary political conditions for the public good.

In the 1990s, the concept was given a new connotation when it was re-assessed in a context characterised by significant transformations. These include the dominance of 'neo-liberal' politics and the consequent withdrawal of the welfare state, economic globalisation and the emergence of multi-national corporations as agents wielding considerable power and influence at a supra-national scale. Other equally significant developments were a wide recognition of the ecological crisis, the emergence of new social movements acting through local and global networks and a reappraisal of the role of local authorities in the development process.

The debate on governance has expanded significantly in the last 15 years. This has been associated with an increased focus on the responsibility of the international community to both understand and to improve the general conditions for policy-making through adopting the values of participatory democracy, social justice and environmental sustainability. This preoccupation has resulted in an often prescriptive debate about the most appropriate governing practices to promote co-operation and co-responsibility among different social actors. In some cases, the outcomes of this debate have even become organised as conditionality prescribed by international institutions, as in the debate surrounding the concept of 'good governance'.

[29] Pierre (2000); Pierre and Peters (2000).

The current governance debate is dominated by two contrasting definitions and sets of concerns. On the one hand, part of the literature on governance still focuses mainly on the institutional capacity and performance of the state and the way it has adapted to recent developments. On the other hand, governance is increasingly being deployed as a notion that refers to a new process of governing. These two approaches are referred to as 'state-centric' and 'society-centred' respectively. [29]

The first approach is concerned with assessing the political and institutional capacity of the state to 'steer' society towards certain goals associated with the 'public good' and also with examining the relationship between the role of the state and the interests of other, powerful actors. By contrast, the so-called 'society-centred' approach is primarily concerned with the role of civil society in the governing process and its relation with the state through a variety of institutional arrangements. From this approach, 'governance' refers to emerging 'governing practices' that seek to build greater capacity for collective action through new relations between diverse social actors. Not surprisingly, the focus of this approach is on multi-agency ensembles, such as partnerships and networks devised for creating synergy among different social actors in the pursuit of public policy goals.

This document is particularly concerned with a society-centred approach to governance, as the aim is to contribute to an understanding of the 'governance regimes' that underlie the provision of water and sanitation services to the poor, particularly in the peri-urban context of metropolitan areas and regions. A society-centred approach is relevant to this purpose because it allows the examination of alternative modes of governance to those that mainly focus either on the role of hierarchical structures (such as the state) or on the market. These alternative modes are less reliant on top down policy instruments and are instead concerned with the need to find more accountable, democratic and interactive means of social organisation in which responsibility and accountability for interventions are shared between public, community and private actors.

Service provision: State, private sector or civil society?

The debate outlined above regarding governance can be applied to the examination of competing approaches to service provision. Central to this debate is the question of who should do what and, in particular, whether the public sector or the private or the civic sector should deliver these services.

Table 4 presents a summary of the main arguments that characterise this debate in favour of a significant role by either the state or the private sector. It should be highlighted that the arguments for private sector involvement are grounded almost exclusively on the principles of efficiency and effectiveness, relegating concerns about social fairness and environmental sustainability to the background. Although the evidence supporting these

arguments remains slim in practice, in the last two decades developing countries have experienced a push towards the increased involvement of the private sector in the delivery of services. [30]

The above processes can only be understood in the light of specific contexts and even within the same context there are significant variations among different services and areas. Within sanitation, piped sewerage systems are frequently located at the 'public goods' end of the services spectrum. They are excludable but non-rivalrous, monopolistic and typically

[30] Cook and Kirkpatrick (1988); Adam, Cavendis hand Mistry (1992); World Bank (1994); Batley (1996).

Table 4: Arguments for State Intervention and for Private Sector Involvement in the Provision of Basic Services	
For state intervention	For private involvement
<p>The public goods argument</p> <p>There are public goods where benefits are collective, for which there are no means of charging consumers (non-payers are non-excludable) and for which consumers do not have to compete (e.g. street-lighting)</p>	<p>The competitive allocation argument</p> <p>Under non-competitive provision, resources are not used economically to produce a given output or existing resources are not used optimally to maximise outputs.</p>
<p>The market failure argument</p> <p>Private enterprise may fail because (a) the nature of the service leads to monopoly (e.g. water supply); (b) the necessary investments are so large or returns so uncertain that the private sector might not undertake them; (c) positive externalities are likely to reach those who are unwilling or unable to pay; (d) consumers may have little knowledge to make informed choices.</p>	<p>The state failure argument</p> <p>State provision often fails to address consumers' preferences, or leads to charges that do not reflect producers' real costs, therefore making further investments unsustainable.</p> <p>In response to the failure of public services, enterprises and households often find their own market solutions.</p>
<p>The equity or 'merit good' argument</p> <p>Everybody should have access to certain goods and services, regardless of their ability and willingness to pay (e.g. education and health).</p> <p>Environmental considerations may not be considered if service provision is left to market mechanisms.</p>	<p>The poor pay the most anyway</p> <p>State service provision often benefits the better off and fails to provide for the poor.</p>

Source: Own elaboration, based on Batley (1996)

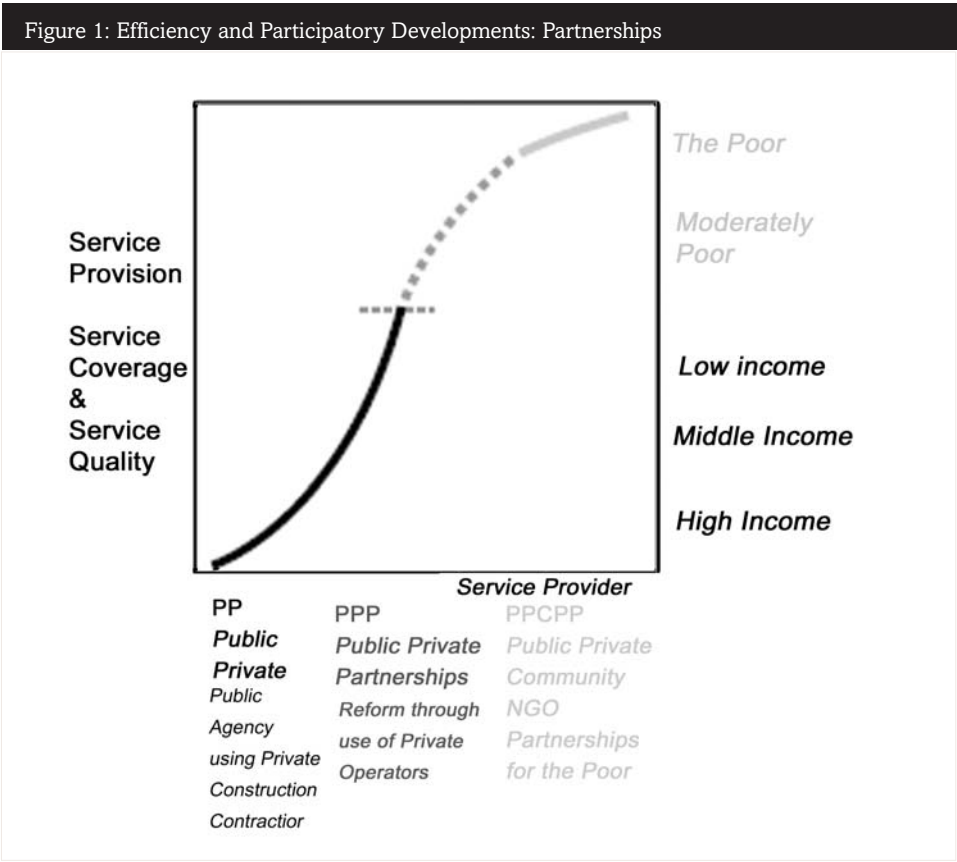
associated with high positive and negative externalities, which refer to health benefits and pollution respectively. These characteristics make this service suitable for direct public provision, although private contractors might be involved in specific works. Within water supply, given its characteristics as an excludable and rivalrous good, piped water can be operated as a commercial enterprise. However, its characteristics as a natural monopoly, the large scale of necessary investments and significant social benefits all make a case for government involvement, either as a direct or indirect provider. Other forms of water supply like wells and street standposts, where charging systems are difficult to introduce, are often

seen as ideally organised under direct provision of public agencies and direct community control.

In practice, there is a fault line between the idea of the state as guarantor of basic service delivery, which encompasses the notions of social equity and basic rights to resources, and market based approaches that focus almost exclusively on cost recovery and the financial sustainability of service supply. Figure 1 presents a model set out by the Asian Development

Bank which indicates that, very often, the poor and moderately poor are best serviced by public/private community partnerships. The model suggests that because of pricing issues, public-private partnerships are less effective in serving the urban and peri-urban poor.

The discussion above suggests that service provision can involve a variety of different (public-private) organisational arrangements. For instance, governments might assume different responsibilities in the provision of these services. Direct provision or 'production' of a service involves the physical act of constructing, maintaining and delivering. Whilst indirect provision involves the role of ensuring that the service is available through decisions about policy and standards of service.



Source: Banyard (2004: 24)

In this case, governments may be responsible for coordinating, financing, enabling and regulating producers. Reference is often made to the 'regulator-provider-consumer triangle' as a means of explaining the basic roles and relations performed in the delivery of water and sanitation. However, as shown in the following section, there are significant differences in the configuration of this triangle between the arrangements prescribed and supported at the policy level and the concrete practices deployed by the peri-urban poor to access water and sanitation.

The wider spectrum of service providers in the peri-urban interface

As highlighted in the introduction, when looking at the specific ways in which the peri-urban poor gain access to water and sanitation services, it is possible to identify a diversity of practices and arrangements. Some of these are formal, 'policy-driven' mechanisms supported by institutional arrangements of the state. Examples of this include, for instance, the operation of private tanks licensed to sell water. In addition to these mechanisms, there is a wide set of arrangements that operate on the basis of solidarity, reciprocity or need, such as those cases in which water is provided as a 'gift' by some members of the community to others in need, as well as cases of water push cart vendors who might access water through different means and sell it to other members of their own community. These mechanisms can be characterised as being 'needs-driven' and correspond to the wide spectrum of arrangements by which the poor gain access to water, often with little or no support from the state, its policies and resources.

The 'water supply wheel' in Figure 2 outlines a continuous spectrum of policy and needs-driven practices characteristic of water provision in the peri-urban interface. It provides a schematic and comprehensive (although not exhaustive) representation of the universe of existing practices in water and sanitation found in the peri-urban context. To a certain extent, the two sides of the wheel correspond to what are usually referred to as 'formal' and 'informal' practices (respectively on the left and the right of the wheel). However, these terms can be at times misleading, as some of the strategies in the wheel defy this distinction. This is because often the limits between what is formal and informal are blurred.

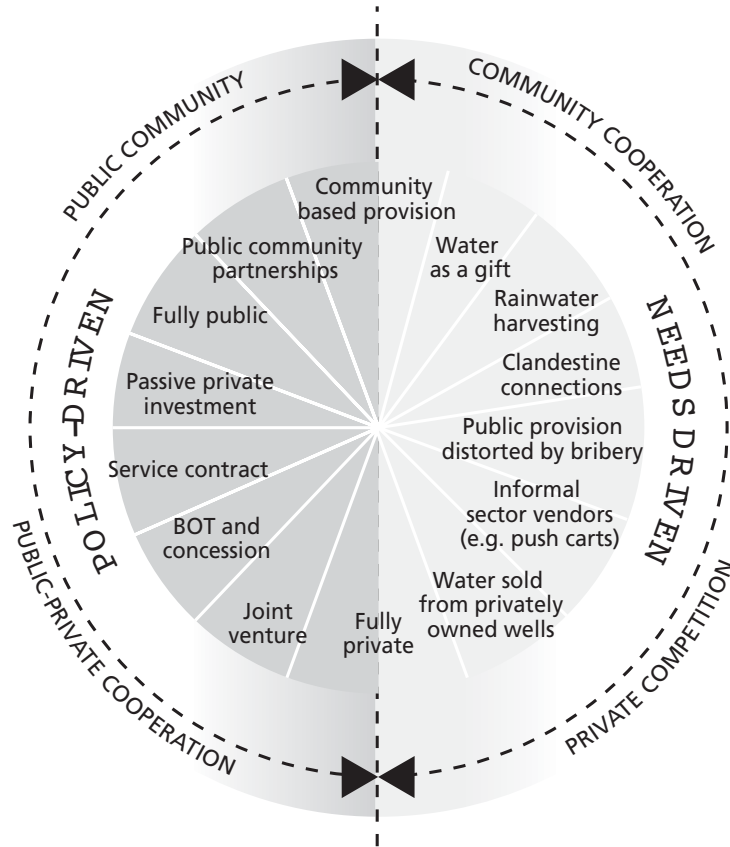
Whilst policy-driven mechanisms can be clearly identified from the perspective of production and provision, the arrangements identified on the right hand side of the wheel are best examined and understood from the perspective of access and, in particular, from the viewpoint of highly localised strategies adopted by the peri-urban poor.

The 'water supply wheel', also shows the role of the public, private and community sectors in the provision of water and the extent to which these roles are based on cooperative arrangements across two or three of these sectors and at different scales. The three sectors are far from homogeneous, as the public sector might be present in the form of highly centralised state agencies or of decentralised bodies. In the same way, the private sector might involve large companies operating under the formal sector, medium-sized licensed water tanker firms operating at the city level, or informal vendors operating exclusively at the local level. The community sector is not homogeneous either, as it might involve arrangements characterised by a certain degree of formalisation, such as community schemes actively supported by the public sector or external NGOs, but also more informal relations of cooperation established among members of the community exclusively on the basis of solidarity ties.

In addition, strategies and practices identified are not static. For instance, in the peri-

urban context of Dar es Salaam, community-based provision based on the development of piped network kiosks and taps run by the community with NGO support originated as a needs-driven practice but over time became institutionalised and supported by the state (Box 10).

Figure 2: Policy-driven and Needs-driven Practices in the 'Water Supply Wheel'



Source: Allen (2005c)

The sanitation wheel in Figure 3 also presents a broad spectrum of arrangements, although the diversity of practices by which the peri-urban poor deal with sanitation is less than in the case of water. The five case studies analysed show the most common and extended practices in the peri-urban context are those identified on the right side of the wheel as 'needs-driven'. In other words, the peri-urban poor rarely have access to formal facilities operated by the public or formal private sector, such as waterborne sewerage or licensed pit emptying services. A large part of the peri-urban poor still lack any form of hygienic disposal for human excreta or rely on septic tanks, individual or shared pit latrines and/or public toilet

facilities, which often involve an admission charge. [31]

In all the five case studies, discussions with peri-urban dwellers revealed that sanitation is seen as being less of a priority than access to drinkable water, though there are different perceptions between women and men. This is confirmed by other studies which found that women often have a better appreciation of the health implications of lack of sanitation than men who prioritise other services and facilities at the time of making investment decisions.

[32] In some cases, the lack of investment on individual facilities is due to the reluctance of landlords to spend money on sanitation or the fear of informal settlers of losing their investment due to the insecurity of land and housing tenure.

Different studies help to understand the potentials and limitations of each of these arrangements to reach the peri-urban poor. Common problems affecting many public utilities and municipal services in developing and transitional countries include poor financial management, low funding priority, political interference, little or no independent regulation and poor engagement with civil society groups, as a WaterAid report argues. [33] The same report challenges the role of the multi-national private sector in contributing towards the achievement of the Millennium Development Goals and highlights four key areas where this sector fails to serve the poor: capacity building, community participation, finance and institutional reform. The report concludes that local private agents, reformed public utilities and community-managed schemes are more likely to reach the poor, although not always with a sustainable service. These arguments are particularly relevant in peri-urban areas.

The governance of WSS in the peri-urban context presents a number of peculiarities, particularly when compared with the provision of the same services in either urban or rural areas.

First, peri-urban WSS typically takes place through a high diversity of practices, many of which are often labelled as 'informal'. These practices are at best overlooked and at worst resisted by the regulations, policies and practices that guide and support the formal system. In a developing country context, peri-urban areas generally lie outside the coverage of formal WSS systems, which are, in most cases restricted to a relatively small metropolitan core, as is the case in Chennai. Examples of the lack of consideration of the role played by the informal private sector (e.g. push cart vendors) in any policy attempts to reshape current WSS systems are to be found in Cairo and other cases. Although informal water vendors are usually perceived negatively, a study by the Water Engineering and Development Centre (WEDC) of

[31] For more information on the role of informal operators in wastewater management in Greater Cairo see Box 18 in Section 2.4.

[32] WSP (2004).

[33] Gutierrez et al. (2003); see also WUP (2003).

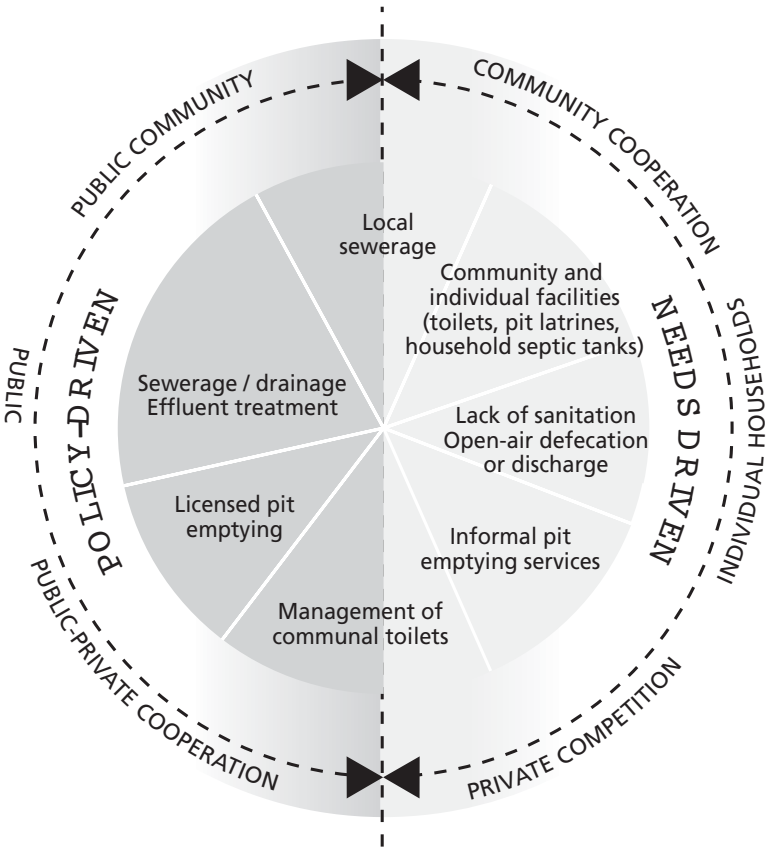


[34] WEDC (2002).

Loughborough University shows that they can be effective in servicing peri-urban dwellers who lack alternative means of water supply, while their role might be enhanced if appropriate cost and quality controls were put in place. [34]

Secondly, there is a high degree of fragmentation in terms of the agents involved in the different stages of water supply and sanitation in peri-urban areas. The highest diversity of agents is to be found in the stages of water distribution and access. For instance, to a large extent, water extraction continues to be the responsibility of the public sector, although cases

Figure 3: Policy-driven and Needs-driven Practices in the 'Sanitation Wheel'



Source: Based on Tayler (2005b)

can be found where extraction is performed by the private sector (e.g. individual private well owners or illegal aquifer extraction). But it is at the stage of distribution where, by a long way, the highest diversity of actors operate, either within the formal system and thus under the

regulation and supervision of the state, or in the interstices left by such system. Whilst some WSS arrangements are hierarchically organised, others are market driven, whilst a third group facilitates cooperation among agents. This last group has a greater potential for promoting governance regimes that support a mixed pool of agents.

Bridging the gap between policies and practices in the peri-urban interface

Reference was made in the introduction to the fact that the so-called 'water (and sanitation) crisis' is fundamentally a governance crisis. In other words, it refers not only to the technical or economic-financial measures necessary to deal with current deficits and to enhance the sustainable management of natural resources, but to wider political processes required to achieve consensus and foster cooperation about decisions and institutional arrangements. In this sense, water and sanitation is subjected to rival political projects grounded on alternative principles and value systems. Such rival positions are exemplified, for instance, by the debate on whether water and sanitation should be a human right and universal entitlement or a commodity provided through the market. To a large extent, ongoing debates about the most appropriate institutional arrangements to deal with water and sanitation have little to do with ecological processes or with social practices.

In the water and sanitation sector there are plenty of examples of top-down attempts to reorganise the relationship between basic services regulators, providers and users along these lines. These attempts have neither been universal nor have they been unchallenged. The following paragraphs examine the institutional arrangements and reforms adopted in the five case studies in relation to water and sanitation, looking in particular at the way in which these reinforce or bridge the gap between wider policies and peri-urban practices in WSS.

A look at the institutions formally involved in the WSS system shows a broad spectrum across the five cases. In Chennai Metrowater, a statutory authority, should be in charge of providing WSS services for the metropolitan area as defined in the Town and Country Planning Act of 1971. However, as illustrated in Box 9, this has not been enforced in practice. Only recently, the jurisdiction of Metrowater has been extended beyond the City of Chennai to include areas designated as 'Adjacent Urban Areas', including some peri-urban localities. In the remaining peri-urban areas water supply systems have been designed and executed at the state level by the Tamil Nadu Water Supply and Drainage Board as part of rural water supply schemes. This system is operated and maintained by the local authorities, which generally lack the human and financial resources for effective maintenance and delivery of services. As the public supply of water is grossly inadequate and unreliable for users' needs, the number of small-scale water tankers drawing water from a range of sources including peri-urban aquifers is increasing to alarming levels, as most are poorly regulated.

In the case of Tanzania, for decades, the provision of water and sanitation has been the

Box 9: Institutional Weaknesses and Rural-Urban Fragmentation in Chennai

The peri-urban areas - Valasaravakkam and Kotivakkam - studied in the case of Chennai, are town/village panchayats that fall within the Chennai Metropolitan Area (CMA). Under the Chennai Metropolitan Water Supply and Sewerage Act 1978, the legal mandate for supplying water and providing sewerage and drainage services in the CMA is with the Chennai Metropolitan Water Supply and Sewerage Board (Metrowater).

The Board's Mission is to enhance the health and quality of life for citizens in Chennai City and Metropolitan Area by providing them with adequate supply of clean and good quality water and safe disposal of sewage/wastewater at reasonable prices. Though

infrastructure is available, due to severe policy, technical, financial and functional constraints, the Board is far from achieving this mission even within the urban core of Chennai City, let alone the peri-urban areas covered in the study.

The 73rd Constitutional Amendment (1992) confers new powers and responsibilities to the panchayats and the Tamil Nadu Panchayats Act (1994) advocates greater participation as a means to enhance self-government institutions and to effectively implement rural development programmes. Village panchayats are elected local bodies headed by a president. The duties and responsibilities vested with panchayats include provision of drinking, washing and bathing water as well as sanitary and drainage services to the inhabitants. Among the important tasks assigned to village panchayats under the Act are "the sinking and repairing of wells, the excavation, repair and maintenance of ponds or tanks and the construction and maintenance of water-works for the supply of water for drinking, washing and bathing purposes."

This duplicity of agencies for the provision of WSS services in the peri-urban areas of Chennai has resulted in confusion, with the worst sufferers being the poor, particularly women and children. Though elected bodies with a 'mission' to serve the poor and the oppressed, village panchayats lack infrastructure, technical competence and financial resources to undertake the tasks assigned to them in the Panchayats Act.

With the state government institution and elected local bodies virtually failing to deliver the most basic WSS services in the PUI, the alternative is to look at community, private sector or household initiatives. These initiatives are presently faced with several political, policy, legal and administrative restrictions and constraints. These need to be proactively addressed and an appropriate WSS regulatory mechanism evolved and implemented if the poor in the peri-urban areas are to gain access to at least a minimum level of WSS services. Given the critical supply position of potable water in the CMA, regulatory emphasis should also focus on demand management and conservation as well as alternative sources through recycling.



responsibility of the Dar es Salaam Water and Sanitation Authority (DAWASA), a public utility company. Historically, services were provided almost for free, with a minimum flat rate charge that did not cover supply, operation and maintenance costs, thus severely limiting the coverage and quality of services. Over the last decade, the role of DAWASA has been the subject of significant reforms, shifting from direct provider to enabler and regulator. In 2003,

following the conditions imposed by the African Development Bank (ADB) to support the rehabilitation and operations of the city water facilities, DAWASA was transformed into a holding company, DAWASA Public Granting Authority (PGA), charged with responsibility for managing the Community Water Supply and Sanitation Programme (CWSSP) and monitoring the performance of City Water Services (CWS), a private operator responsible for installing new connections and customer meters, operating and maintaining the assets, issuing water and sewerage bills, collecting revenues and also undertaking the rehabilitation of selected works. Initially CWS was granted a 10-year contract. However, in 2005, the company was forced to withdraw as the government terminated the contract on grounds of failure to abide. A new public company (DAWASCO) was established to take over the role of CWS. According to the Tanzanian government, the WSS system in the metropolitan area of Dar es Salaam, and particularly service provision in lower-income areas, deteriorated further during the operation of CWS. This case illustrates the difficulties of transition from a public to a private service provider, especially when the process is triggered by external pressures. It also shows how needs-driven practices emerging in the peri-urban context can be institutionalised and scaled up as elaborated in Box 10.

The case of Mexico D.F. represents a different institutional setting. Since the 1980s, the provision of WSS, historically under the jurisdiction of a highly centralised public agency, has decentralised from the federal government to the states (federal provinces) and later from the states to the municipalities. This process has been accompanied by an attempt to democratise

Box 10: Scaling-up of Community Water Managed Schemes in Dar es Salaam

In an attempt to address the chronic problem of potable water supply for low income communities in Dar es Salaam including inhabitants in the PUI, the government of Tanzania, with support from the World Bank, the African Development Bank and other financiers, has embarked on a programme to reform water supply in metropolitan Dar es Salaam. This programme includes restruc-



turing of WSS of DAWASA by privatising some of the roles and responsibilities, including the management of the piped water supply in settlements occupied by high and middle-income earners.

In order to improve water supply in low-income settlements, including peri urban areas, DAWASA is executing a new programme called Community Water Supply and Sanitation Programme (CWSSP). This programme is an institutionalisation and scaling-up of the community managed water supply schemes such as the Tungi and Sitakishari projects. Under the CWSSP, DAWASA has appointed NGOs to work together with local communities. The role of these NGOs is to assist communities to identify water needs, design and implement projects and train the community groups

to manage WSS services. So far, the international NGOs PLAN International and Water Aid have been appointed to take CWSSP to various communities in Dar es Salaam. Management of community water schemes is by water committees elected by the community or by community-based organisations (CBOs).

decision-making processes through the creation of river basin organisations and groundwater technical committees which are responsible for preparing management plans through public deliberation. The legal reforms introduced in the early 1990s reinforced the process of WSS decentralisation and, in particular, paved the way for the participation of the private sector through phased contracts for the operation, maintenance and service provision. However, progress has been slow and - especially in the peri-urban context - local government is still expected to play a key role in providing water to the most remote locations through the use of public tankers.

In the Greater Cairo Region (GCR) the central government has reformed WSS services (Box 11). The public sector is still and will in the foreseeable future be responsible for formal provision. Two separate central government institutions operating at the metropolitan level are in charge of water supply and sanitation, respectively. The Egyptian government further established two national bodies affiliated with the Ministry of Housing, Utilities and Urban Communities which are in charge of regulating and monitoring the role of the metropolitan institutions. At the peri-urban level, local authorities (markaz) are officially in charge of some operation and maintenance functions but, in practice, often lack the capacity - especially of trained personnel - to fulfil their responsibilities. The informal private sector fills the gap left by the state. In a context of emerging political reform that seeks to incorporate more democratic and transparent processes in the execution of state power, and given the negative record of international experiences in water privatisation, in 2004 the Egyptian government abandoned its plans to privatise WSS. Consequently, in future the involvement of the formal private sector will be limited to competition over concession and management contracts. The state perceives peri-urban poor communities more as consumers than potential stakeholders who could co-manage these basic services. At the same time, communities perceive the state as inefficient and distant and therefore prefer not to become involved in partnership schemes. Other local agents such as NGOs have traditionally not been favoured by the Egyptian government so they cannot realistically be expected to become involved in partnership arrangements. However, local mosques have sometimes helped improve the local water and sanitation system.

In the Caracas metropolitan region, WSS is the responsibility of Hidrocapital, a public sector regional water supply company operating in six sub-regions. Under a new national constitution marking a shift from representative to participatory democracy, there is potential to implement a form of society-centred governance particularly among the low-income population. Together with the new law that regulates WSS (Ley Orgánica para el Servicio de Agua Potable y Saneamiento) a process of decentralisation will devolve WSS responsibilities to the municipal level by 2007, while the service will, in theory, be provided by any of a number of agents or partnerships among them: private, public, community or NGO. In practice, recent political reforms and the creation of a Community Affairs department within Hidrocapital have boosted participation by poor peri-urban communities in the WSS system, as they can now

Box 11: Institutional Reforms in the Water and Sanitation Sector in Egypt

After several changes in the institutional setting of water and sanitation in Egypt, it is now difficult to know whether the Egyptian government is decentralising or centralising WSS and whether it is supporting the involvement of the private sector. The present legislative and regulatory framework, as well as the nature of interventions and responsibilities in WSS covers a mix of centralised and decentralised systems. It is important to note also that most of the regulatory reforms do not logically move in the direction of decentralisation for better governance. Instead, there appears to be a less favourable atmosphere to cooperate with communities, the informal private sector and other actors. Thus, although Egypt is formulating regulations to decentralise certain services such as education and health services, in the water and sanitation sector the trend seems to be towards centralisation. The core argument of central government is that they are better positioned to ensure the proper monitoring and supervision of inadequately resourced local governments.

The substantial support previously given to the Central Department for Private Sector Involvement has recently decreased. This coincided with the creation of two central organisations. First, a Holding Company for Drinking Water and Sanitation managing public water and sanitation companies in the Governorates. The company was entitled to establish new companies or to work with existing ones. Second, the Authority for the Drinking Water and Sanitation Sector and the Protection of the Consumer is responsible for setting performance standards for utilities based on the recommendations of a ministerial coordinating committee. The Authority is the main actor in setting a new tariff structure aimed at improving cost recovery.

The Authority's mandate is to protect consumers against sudden increases in the tariff levied by the holding company or one of its affiliate companies. The central role played by the above two institutions coincided with the strategic role played by the new ministerial 'Infrastructure Committee' jointly formed by the ministries involved in directly or indirectly in infrastructure (Ministries of Housing, Planning, Finance, Irrigation, Local Development, Environmental Affairs). The Committee works at a strategic level to coordinate different sectoral policies in a coherent WSS policy.

The prevailing focus of the above reforms is on urban areas rather than rural or peri-urban areas and there is a lack of recognition of a wide set of actors involved in developing and servicing this sector such as the CBOs and local contractors or informal private operators.



negotiate with impressively trained and sympathetic agency staff, mainly through Technical Water Fora (mesas técnicas de agua). These have helped improve coverage of WSS services and strengthened community solidarity ties, while providing examples of participatory democracy where not only rights, but also duties of community members are stressed. They have arguably helped reduce the impact of patronage politics which has been historically

facilitated by the high revenues of the oil-rich Venezuelan state to which local and national politicians have had access as means of providing infrastructure in exchange for votes (Boxes 5 and 12).

Box 12: Participatory Democracy in Caracas

To understand how WSS works in the Caracas Metropolitan Region and Tuy Valley, it is necessary to refer to the current framework regulating this system. This is a recent framework based on the 1999 national Constitution and the 2001 Drinking Water and Sanitation Service Act. The new institutional model implies a radical change in the vision and management of the water system where the presence of the State in some of stages of the water and sanitation cycle and the participation of the community are seen as essential elements.



The 1999 Constitution establishes three key principles concerning water and sanitation services. Firstly, the principle of participatory democracy (preamble, articles 70 and 182); secondly, environmental protection and sustainable development as key state policy premises (articles 127 and 128); and thirdly, article 304 establishes that "Water is a public good belonging to the Nation and is indispensable to life and development. The law will take the necessary measures to guarantee its protection, use and recovery, whilst respecting the stages of the water cycle and good spatial planning principles".

The 2001 Act established a coherent, stable and permanent regulatory framework to redress an organisational crisis that affected the water system during the 1990s. More than 100

regulatory instruments for the water system had been created in that period, creating confusion and leading to clashes between municipal, regional and national authorities. The 2001 Act established a new institutional scheme separating policy, regulation and management functions, transferring the service to the municipalities and allowing the organisation of Technical Water Fora (see Box 5). The application of the aforementioned principles to water and sanitation has produced significant changes resulting in two ongoing processes and a third one that will start in 2007. The first two processes refer to the expansion of the service on a more equitable basis; the adoption of a new vision and mission by the state water company covering the Caracas region (including the creation of a Community Affairs department) as well as the incorporation of community participation in the service management and the development of a new water culture.

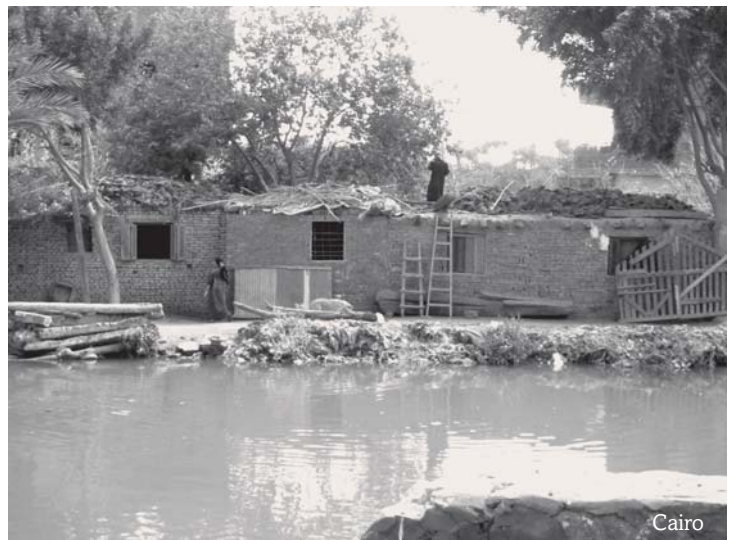
The third process refers to the transfer of water and sanitation supply services to the municipalities through a concessionary regime in which municipalities, the private sector and communities can participate individually or in association. However, there are a number of obstacles to this initiative. Firstly, the service cannot be divided according to municipal jurisdictions since most of the management units often comprise more than one political administrative unit. Secondly, most of the municipalities regard the transfer of these services as an additional administrative and financial burden. Also, the principle of co-management with users is seen as a potential source of conflict rather than a solution to WSS problems.

As shown earlier, in the peri-urban context water and sanitation services are characterised by a significant gap between policy-driven and needs-driven practices. However, the WSS practices found on the ground are slowly leading to changes in debates among influential actors and commentators about the different roles that the state and other actors play or ought to play in the supply of basic infrastructure. For example, the World Bank's earlier broad support for privatisation of infrastructure, introduction of competition and a much reduced role for the state away from production and towards regulation has subtly shifted towards a greater and explicit acceptance of the state not only as regulator but also as another producer of services, be this at the central or local government level. It has also shifted to an explicit recognition that a range of formal and informal producers (such as independent water providers) should not merely be tolerated, but should also be positively encouraged by giving them legal status, enabling them to develop partnerships with public and formal private providers and by enabling the mechanisms adopted by the poor to gain access to multiple independent providers while strengthening their regulation, particularly in areas related to health and groundwater depletion.[35]

[35] World Bank (2003).

The five case studies examined show that, by and large, recent and ongoing institutional reforms are not working for the peri-urban poor, nor are they enhancing the management of key natural resources in the peri-urban interface. However, there are some lessons to be learnt from each of these cases.

In most cases the process of decentralisation is an attempt to transfer some centrally administered responsibilities to lower levels. Formal private sector participation is clearly increasing, especially in Dar es Salaam, where a private company takes on some major tasks, though less significantly in Chennai, Caracas and Mexico City. Cairo, with its long tradition of centralised public service provision, is the exception, although the direction of current reforms appears to be ambiguous. Formally acknowledged practices by the community sector are gaining importance, particularly in Caracas, Mexico and Dar es Salaam. These show how important improvements in basic infrastructure can be a focus of community action, organisation, exercise of democratic principles, and women empowerment, as well as the more immediate meeting of needs. The case of Caracas demonstrates that participatory democracy can bring effective changes and promote social inclusion and responsible citizenship among peri-urban dwellers. It also shows that water and sanitation can be a vehicle for long-term social and political change.



In the next pages, Sections 2 and 3 examine the challenges faced at each stage of the water and sanitation cycle and the specific considerations that need to be taken into account when acting upon these challenges.

2. Taking Action

2.1 The Water and Sanitation Cycle

As with other infrastructure services such as telecommunications and electricity, technical, financial and institutional conditions now make possible the 'unbundling' of the different segments of the water and sanitation production process. These could, given the right regulatory conditions, be given to specialised agents (vertical unbundling) - whether in the public, private or community sectors who might be best equipped to take them on in different localities (horizontal unbundling). A given segment such as distribution may even be broken into smaller segments such as metering and billing, and these can be put out to a bidding process to private contractors (as has happened in cases such as Bogotá, Colombia and Mexico City in the 1990s).

Section 1.4 demonstrated the large variety of actors involved in the provision of water supply and sanitation services and how fragmented their responsibilities are. In characterising the roles of different providers in the PUI, it is useful to distinguish between the different components of the 'water and sanitation cycle'. [36] This is important not only from the technical perspective of delivering these services through efficient and effective means, but also from the governance perspective that informs this document. As said earlier, previous consensus about water supply and sanitation services being a 'natural monopoly', and, therefore best supplied (on technical and financial grounds) by a single body, has recently been brought into question. [37]

Outright transfer of the whole service to a private operator is a rare occurrence except in a relatively small number of large cities where large multi-national companies have taken charge of the most profitable stages of the cycle, such as distribution. The reality is that municipalities - or other state-owned agencies - are still in charge of supplying the vast majority of these services, particularly in the more central areas of big cities. On the whole, large private firms have not met expectations, as they have failed to provide much-needed investment to improve coverage, particularly among the poorest households most notably in peri-urban areas. Furthermore, many have sought to renegotiate contractual obligations which become difficult to enforce in the absence of strong regulatory mechanisms. And yet, official donor and country policies often continue to advocate greater involvement of the private sector as a means of widening access.

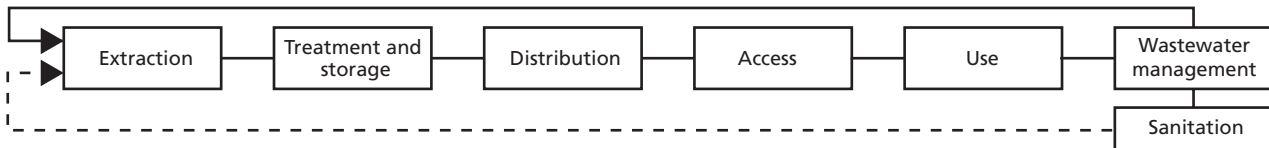
As exemplified by the five case studies introduced earlier, outside the metropolitan core and in poorer areas of cities, the different stages of the cycle are rarely covered by a single monopoly agency - whether public or private. The peri-urban interface is marked by a fragmentation of actors involved in the different stages, often with little coordination and articulation within a wide range of practices for accessing water and sanitation. Thus, both from a technical and a governance perspective, it is necessary to examine the different stages

[36] See Figure 4 and Allen, Dávila and Hofmann (2006).

[37] Johnstone and Wood (2001); World Bank (1994).

of the water and sanitation cycle and, in particular, the practices deployed at each stage, in order to gauge the extent to which they help households and small-scale producers improve access to peri-urban water and sanitation.

Figure 4: The Water and Sanitation Cycle



[38] In practice, the stages can be linked in different ways leading to simpler or more complex versions of the cycle. These are not captured in the diagram but will be addressed in the various sub-sections. For instance, water might be extracted and distributed without treatment.

[39] See discussion in Section 1.4.

The figure above presents a simplified version of the socially constructed cycle by which water is produced, consumed and disposed of, as opposed to the natural water cycle that excludes human interference. [38] This is particularly useful to identify the diversity of practices, the many actors involved and the various strategies adopted in relation to each stage.

As discussed in Section 1.4, there is a wide variety of practices in the PUI, often informal in nature, especially at the stages of distribution, access, use and reuse. This results, on one hand, from the fact that both poor communities and informal providers who have a high peri-urban presence often lack the resources and economic incentives to become involved in (large-scale) extraction, treatment and storage of water. On the other hand, it results from the fact that poor households might give less priority to wastewater disposal and sanitation facilities than to water supply, thus resulting in a smaller spectrum of practices around wastewater management and sanitation with a consequently smaller number of agents in this stage. [39] However, given the proven links between poor sanitation and the incidence of disease, any intervention process must view water supply, wastewater management, including sanitation, and hygiene promotion as a coherent whole.

Finally, if the goals of environmental, social and economic sustainability often espoused by aid agencies and governments are to be reached, the different stages of the peri-urban water cycle should also be seen within the wider context of integrated water resource management at a national level. This means that metropolitan interventions at an urban and peri-urban scale should be consistent with national plans for water resource allocation, conservation and pollution prevention. Although not easy to implement in practice, it also implies a level of institutional coordination to meet environmental standards and protect water sources such as rivers and groundwater, but also a degree of consultation with

communities in managing catchment areas and monitoring groundwater extraction as well as on decisions likely to affect their more immediate water and sanitation needs. The cases of collaboration between the public sector and communities in Caracas discussed earlier and Brazil's water catchment committees (comitês de bacia) with representation from a range of stakeholders including elected members from local communities [40] are successful examples of this.

[40] See for example Brannstrom, Clarke and Newport (2004).

The following sections point out the specificity of water supply and sanitation in the peri-urban interface at each stage of the cycle by drawing on the five case studies of the project. In that context, it is vital to examine the actors involved at each stage, their activities and relationships. This helps to understand the specific challenges faced in improving access for peri-urban dwellers and small-scale producers and in enhancing environmental sustainability. Each sub-section offers guidance and presents a number of entry points on how to address these challenges with references to a range of initiatives, some of which are summarised as case studies in Section 3.

2.2 Extraction, treatment and storage

Fresh water is a limited and precious resource that is often taken for granted. While many areas of the developing world lack supplies of safe drinking water, many developed countries (including moderately 'water stressed' ones) squander their resources by literally tipping most of it down the drain. Few urban inhabitants will seem aware of the high costs involved in extracting, treating and transporting water, and the need to conserve this scarce resource. In low-income, low density environments such as rural areas and many peri-urban areas, water can be sourced by individual households from shallow underground or surface sources. As population densities increase and water sources become more distant or more polluted, they will find it necessary to rely on external agents for a regular supply of water. This section examines the challenges of extracting, treating and storing water to be consumed by poor peri-urban households and producers whilst ensuring the long-term environmental sustainability of water sources.

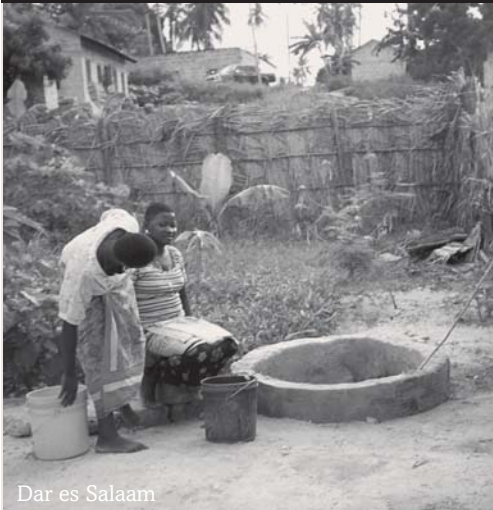
Any metropolitan area will access water from a range of sources. Some will be more important than others at different points in time. [41] Water sources can be classified in broad terms as either surface or sub-surface groundwater. Water from underground sources is generally purer, requires minimum levels of treatment and is therefore more suitable for smaller systems for which there are limited management resources such as those in rural and some peri-urban areas. Poor peri-urban communities can obtain water from shallow underground sources with the help of locals with good knowledge of aquifers and small contractors who can dig wells or drill shallow boreholes. However, information on the location and volume of deep underground sources which in a peri-urban setting are likely to be clean

[41] Table 2.7.6 in WELL (1998) lists a range of water sources and the risk factors and treatments associated with each of them.

or less polluted is difficult to ascertain without expert and often costly technical knowledge.

The case studies examined here show that, although much of the water consumed in metropolitan regions is extracted, treated and often stored by large public bodies, there are frequent gaps in supply affecting mainly poor urban and peri-urban settlements which are occasionally filled either by households themselves or more frequently by a range of local small-scale informal private suppliers as discussed in section 2.3. The case studies also point to the paradox that poor peri-urban residents and producers often suffer from inadequate water supplies while vast volumes of water are extracted from underground or surface sources within their territory by water supply authorities or by private operators who sell it at a profit to higher-income consumers. Some of the problems arising from informal extraction are documented in Box 13.

Box 13: Gap between Regulations and Provisions of Water in the PUI of Dar es Salaam



Despite provisions in Dar es Salaam's Water Utilisation Act (1974) and Water Policy (2002), current water extraction processes in the city's PUI remains unregulated. In most cases, individual households wishing to engage in the water selling business drill a borehole or a well and are not required to seek technical advice from DAWASA or the Ministry of Water. Therefore, the location of boreholes or wells does not comply with pre-requisite measures meant to ensure public health, especially in rapidly growing PUI settlements.

Once wells and boreholes have been drilled, the sale of water starts without tests on its quality for human consumption. It is noteworthy that even though the Water Utilisation Act stipulates that the amount that can be extracted from a borehole (22,000 litres per day), water vendors do not adhere to this regulation. As a result, there is over-extraction which in the long-run may increase water salinity.

In most of the case study cities public water authorities are officially responsible either for extracting water or for regulating the extraction process. They are also responsible for treating and storing it before it is distributed to final users. In the peri-urban areas of metropolitan Mexico, Caracas and parts of Cairo, for example, most of the water consumed comes from centralised water works financed and run by public agencies. Large-scale extraction and treatment comprise highly capital-intensive projects built over several years. Because of the high costs involved, there is little commercial incentive for the private sector to become involved.

Water extraction from peri-urban water sources is often associated with two problems. One is that surface and shallow groundwater are likely to be contaminated from the mix of productive activities and rapidly growing residential developments that characterise these

areas. The other is the wider one highlighted earlier of fragmentation of responsibilities for extraction and regulation.

In Caracas, for example, rivers in the low-lying peri-urban Tuy Valley are one of a handful of sources supplying the metropolitan area, and are heavily contaminated by effluents from poorly regulated pig farms and local industries thus requiring costly treatment and pumping to reach not only local peri-urban settlements but also the majority of the city's population located hundreds of meters uphill. Responsibility for extracting and treating the water lies in the hands of a national body.

In Greater Cairo the water consumed by the peri-urban poor is extracted not only by public bodies but also by informal operators from underground sources which are often contaminated by wastewater disposed of in open trenches. The lack of adequate treatment is widely perceived as a major problem by local communities, while there is confusion about who should regulate and monitor water quality.

Box 14: Water Extraction in Chennai

Peri-urban Chennai is the location of several water consuming activities. These include amusement parks, restaurants, farm houses, apartment blocks, plant nurseries, institutions like Colleges, universities, hospitals and IT parks and water intensive industries such as automobile and glass manufacturing. Groundwater is also extracted for delivery by tankers to city consumers - domestic, commercial, institutional and industrial. Because of the highly dispersed nature of water extraction and delivery through tanker lorries it is difficult to quantify the volumes of water supplied and consumed by different activities. But studies reveal that the oft-repeated claims of public officials that in order of preference drinking water is ahead of industrial uses for water sound hollow. Recent public hearings and research suggest that out of 75 millions of litres per day (MLD) of water extracted from sixty peri-urban Metrowater bore wells, 40 MLD were supplied to industries with the remaining 35 MLD supplied for drinking purposes.

'Packaged water' bottling plants for sale mainly in urban areas are also very important extractors of peri-urban water. The private packaged water industry is today a large business that extracts an average of 123 MLD of potable water. This is mainly consumed by the city's better-off. Even conservative figures indicate that water packaging units waste anywhere between 15 and 35 percent of the water they draw from the ground. Several Reverse Osmosis plants have been installed which return the water with higher concentration of metals and minerals back into the aquifer. These activities not only have the effect of reducing water availability for the poor but have a deleterious effect on the quality of water and the long-term sustainability of this valuable resource.



In Chennai extraction of groundwater from peri-urban and surrounding areas by public as well as private sector tankers has increased to such an extent that the source is not only

depleting at a fast rate but also gets contaminated from saline intrusion. This, as well as a whole range of rapidly growing activities associated with water extraction, is increasingly placing peri-urban poor residents and small-scale producers at a disadvantage (Box 14).

Water extracted for human consumption must usually be treated to reduce the risks of illness, but when put to other uses such as washing it usually requires simpler - and cheaper - forms of treatment. The choice of treatment and storage options will partly depend on the type and location of water sources. The five case studies show that in peri-urban localities water that has already been used is rarely treated, largely a result of the low priority given to the sanitary disposal of wastes in most developing countries. This has negative health and economic consequences for downstream users often in rural or other peri-urban localities, generally in less populated, less politically vocal local authorities than those which are more highly urbanised and those located in the metropolitan core.

Water storage is a step to consider before and after water has been distributed. This is particularly true for peri-urban users with no household connection and irregular supplies. The scale and choice of treatment and storage facilities will depend on the source of water. Rainwater harvesting, as practised in peri-urban Chennai and Mexico City, for example, involves relatively simple catchment structure and storage facilities at the household level with water requiring some treatment through disinfection and sedimentation. Water from boreholes of the kind found in peri-urban Dar es Salaam, Cairo and Chennai is rarely treated. If the water is drawn from uncontaminated sources it is unlikely to need treatment. However, underground sources may also become salinised by over-pumping or contaminated through leaks from sewerage or septic tanks nearby, as the case of Cairo already discussed suggests.

In some cities like Mexico, Caracas and Chennai most water treatment and storage is done by public agencies at a metropolitan scale, with large treatment plants, pumping stations and storage tanks serving vast sections of the city. Although there are localised treatment plants and pumping stations in Cairo and Dar es Salaam covering smaller parts of the city, some of the water for peri-urban use is drawn from local sources such as wells and deep boreholes which are often in private hands. In most Indian cities water tanks next to temples have historically been important sources of (untreated) water. In the case of public supply in peri-urban Chennai wells or tubewells in public lands serve as local sources.

Water contamination and losses are serious problems found not only in many peri-urban localities but often at the metropolitan scale too. Water which is of acceptable quality when leaving the treatment plant may become contaminated through leaking pipes and inadequate household storage conditions such as poorly maintained rooftop and underground tanks. Along the coast in Lamu in Kenya, households attach small fish ponds to their storage tank to help control mosquito-breeding. These different forms of post-distribution storage are not needed where water is readily available throughout the day but in



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cases such as Nairobi (Kenya), where piped water is distributed at night, they are a necessity. Most often those facilities are located within the household but there are also examples of community storage tanks, especially in poorer neighbourhoods where individual space is limited. Peri-urban communities in Mexico largely depend on water stored outside the house. Each household registered under the Zero Growth Pact is allocated two 200 litre barrels placed next to the street that are filled up once a week or every two weeks. The paint that is used for the barrels, however, has a detrimental effect on the quality of the water stored and subsequently on the consumers' health.

Metropolitan or national water authorities have generally sought to ensure the long-term availability of water by drawing up expansion plans to cover projected future needs based on growth estimates of population and economic activities. These 'supply-driven approaches' tend to focus on extraction, transmission and storage rather than distribution and connections (for example, government loans to municipalities in India are only available for the first three activities). To some extent decisions at this level have to be supply-driven to make sure that facilities are available where they are wanted in response to demand. As will be shown in section 2.3, the problems tend to arise at the distribution level where there is certainly insufficient attention to identifying demand and working out ways to respond to it effectively. This research has highlighted the fact that this is particularly true in urban and peri-urban informal sector settlements which are often ignored in official plans.

Despite the fact that there are economies of scale in extraction - and to a lesser extent treatment and storage - this begs the question of whether decentralised systems of extraction, treatment and storage managed by lower-tier authorities (such as peri-urban municipalities, or semi-urban panchayats in the case of India) are more desirable options for meeting the present and future needs of poor peri-urban communities and enhancing environmental sustainability. Decentralisation of water supplies is more likely to be possible where there is good quality groundwater, but decentralised systems dependent on shallow underground sources or surface water will generally be much more problematic due to the additional costs associated with treatment.

There are examples of community and private sector involvement in extracting water through private or community tube wells and boreholes where governments lack the capacity to extract and treat adequate quantities of water. However, as these are mainly informal solutions they lack proper regulation and may even have negative consequences resulting from over-extraction or reliance on over-estimates of aquifer volumes. In such cases, public



Mexico

bodies must face a choice between drawing up and enforcing regulations, and creating the necessary awareness and incentives for poor households and those who supply them to extract water within environmentally acceptable limits.

The search for alternatives to unsustainable water extraction is not a simple problem to which universal solutions can be drawn up. Although centralised water extraction, treatment and storage generally involve high capital investment in large-scale infrastructure and may be at times inefficient to run, when undertaken by a publicly accountable and regulated agency it is likely to lead to more acceptable levels of water quality - at least at the point where it leaves the treatment plant - and less wastage.

Decentralised water extraction and treatment also requires that authorities - whether local or metropolitan - ensure that water extracted from dispersed sources is adequately treated for human consumption, particularly if extraction is done informally or illegally. There are no guarantees even in cases where extraction and treatment is undertaken by an official body. In Greater Cairo, for example, the capacity of public-sector peri-urban treatment plants is well below those of more centrally-located areas. Private involvement in treatment and storage can at best indirectly benefit the peri-urban water poor. That is if it contributes to a more efficient management of water leading to more water being available at the periphery, provided water extraction is kept within environmentally acceptable limits.



Although often more desirable in the sense of providing more localised sources of water and requiring lower levels of investment (in, for example, pipes to transport treated water), a decentralised system raises another set of issues. One such issue refers to the control that publicly accountable agents or local communities can exert upon the extraction process; as pointed out earlier, in Chennai and Mexico City poor peri-urban residents complain that water from sources within their localities is exported to more centrally located and wealthier neighbourhoods while they face inadequate official supplies and must resort to more expensive private supplies.

A related issue arises where disproportionate use is made of aquifers by for example high- or middle-income 'gated communities' or high concentrations of service sector activities (such as Chennai's rapidly growing 'IT Corridor') which extract and often squander high volumes of water; over-extraction means resorting to deeper - and therefore costlier - boreholes to access the water therefore depriving poorer neighbours of access to them. In these instances, local authorities ought in theory to monitor the volumes that are extracted, but in practice they lack the staff and means to do so. An approach such as Brazil's watershed

committees mentioned earlier with representation from a range of stakeholders including provincial governments, users and the private sector, are potentially an effective and transparent water resource management tool. Similarly, metropolitan-wide systems of extraction offer the possibility of cross-subsidising poorer households and small-scale producers, whereby a higher proportion of the capital investment and maintenance costs are borne by better-off users through higher rates.

2.3 Distribution and Access

This section examines the circumstances that surround deficient distribution and lack of access to water supply in the peri-urban interface. As illustrated in section 1.4 with the 'water supply wheel', the peri-urban 'water poor' gain access to WSS through a large diversity of practices, each involving different forms of access (household connection, public facilities and so on). Distribution and access are examined simultaneously here partly to demonstrate the shortcomings in the formal supply system and how this is complemented by more informal and needs-driven practices, and partly to take account of the forms of access that are otherwise neglected such as clandestine connections, rainwater harvesting, 'water as a gift' and purchases from neighbours, all of which are especially important for the peri-urban water poor. Some of these practices might also occur in urban and/or rural areas, but the reliance by the peri-urban poor on a combination of different informal arrangements is particularly significant.

Generally, water can either be distributed in pipes or carried to the user by alternative means, e.g. through a vendor. The former is generally done by public means, though there are also private distribution systems, usually covering comparatively small areas. As far as access to water supply is concerned, the five case studies show that supply through peri-urban piped network connections is unsatisfactory (e.g. under 5% in Dar es Salaam's localities) and so are the few formal alternatives to the piped system, leaving the peri-urban poor to rely partially or mainly on combinations of 'needs-driven' forms of supply. Only a few of those practices, shown in the right column in Table 5, such as the community kiosks in Dar es Salaam or the horizontal condominiums in Caracas, are acknowledged and supported by formal institutional arrangements, with the majority arising out of poor people's efforts to gain access to what the formal system is unable to supply.

In some cases, for example Mexico City and Chennai, the inaccessibility of peri-urban localities significantly limits the provision of water supply not only in terms of extending the piped network but also for alternative forms of supply to reach these places. In other cases, such as Cairo, the formal system actively obstructs informal supply efforts, with the government trying to eradicate informal water vendors without realising fully the consequences this might have on limiting access by the peri-urban poor. In Dar es Salaam,

informally-supplied water fails to meet minimum standards of quality, with negative impacts on users' health. However, what needs to be considered is the informal private system providing a reliable and fairly flexible source to the peri-urban poor when it comes to the frequency of supply, pricing and modes of payment (Box 15). The formal (private) system, on the other hand, is highly regulated and thus less flexible to adapt to poor people's needs and capacities.

Table 5: Access to Water Supply in the Five Case Studies

Provider	Policy-driven Water Supply Practices	Needs-driven Water Supply Practices
Public (state) sector	<ul style="list-style-type: none"> - Piped network (household connections and public standpipes) - Wells and bore-wells (not Mexico City) - Provision by tankers (not GCR) 	<ul style="list-style-type: none"> - Public provision distorted by bribery practices (Chennai and Mexico) - Water kiosks (Dar es Salaam) - Negotiation with communities through 'technical water fora' (Caracas)
Private sector	<ul style="list-style-type: none"> - Buying from licensed tankers (not in GCR) - Buying packaged water (cans, bottles, sachets) 	<ul style="list-style-type: none"> - Buying from informal tankers - Private vendors drawing from own site piped connections/own boreholes or wells sold directly by bucket or through push carts and bicycle vendors (Dar es Salaam) - Sales from private boreholes or wells (GCR)
Community		<ul style="list-style-type: none"> - Rainwater harvesting (not Caracas or GCR) - Water theft - Gifts or paid provision from neighbours - Clandestine connections - Own individual wells and boreholes (not Mexico or Caracas) - Piped network (community organisation agreement with local authority (Mexico) or public water company (Caracas)) - Piped network kiosks and taps run by the community with NGO support (Dar es Salaam) - Boreholes and kiosks run by the community (Dar es Salaam) - Horizontal condominiums (Caracas)

There are examples in Egypt and Pakistan where the community - with support from engineers in Egypt and NGOs/CBOs in Pakistan - has extended the existing water distribution system. However, this is not common practice in peri-urban areas and does not constitute a viable solution for cases such as Mexico City, with its Zero Growth Pact discussed in Section 1.3.

Box 15: Small -scale Vendors in the Peri-urban Interface of Dar es Salaam

Small scale water vendors comprise the main suppliers and distributors of potable water in the PUI. The sources and operators constitute:

- Private deep wells and borehole owners who sell water in buckets to neighbouring households or sell to vendors who distribute using bicycles or push carts as well as to bulky suppliers operating water tankers. These in turn distribute water to households. Often, vendors have customers whom they supply water under agreed negotiation prices and schedules.
- Households with on-site pipe connection. These also sell water to neighbouring households. Payment is made in cash or on a monthly basis. They also sell water to vendors who distribute it using bicycles, pushcarts and water tankers. Mode of payment and price of water vary depending on agreement between the supplier and consumer as well as the distance from the source of supply. Small water vendors, especially proprietors of boreholes/wells and vendors who use push-carts and bicycles play very critical roles in providing water services in areas where the public sector has failed to provide services. Water vending is also an important source of income generation and employment among inhabitants in the peri-urban interface.



Small decentralised reticulated distribution systems are a reality in peri-urban and suburban localities where the main water distribution system has yet to reach. For example, there are 90 community-operated systems each covering between 50 and 300 households in peri-urban Cochabamba (Bolivia) drawing water either from underground or surface water sources. [42] Water is stored in overhead storage tanks and is delivered to yard or in-house connections. An attempt to systematise and scale-up this system is found in the work of Aguatuya, the result of a partnership between a private consortium, the city's municipal water company, a non-profit foundation and water committees with community representation [43]. Treated water is currently supplied by tankers to a single water-entry point and then distributed within the cell to about 100 households through a low-cost reticulated system. As the tanker only has to supply a single point, the community can negotiate a lower price per litre of water. This system can in future be connected to the city's main system.

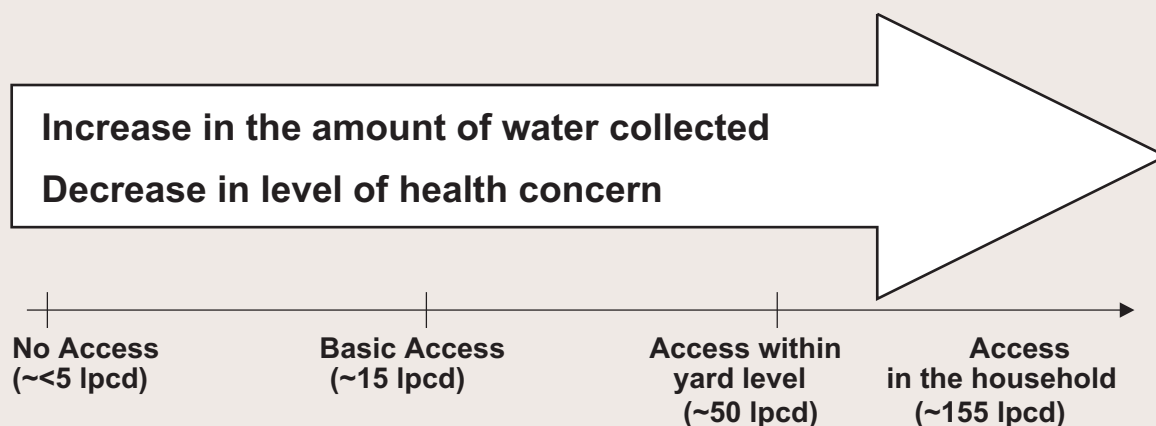
The argument that different people require different amounts of water each day was presented earlier. [44] Generally, however, the amount of water actually consumed and for what purpose is often not determined by people's needs but is very much dependent on the level of service available. In peri-urban areas, this is linked not only to the distance of a water source, which is an indication in rural areas, but also to the number of people sharing the same facility (the variable to consider in urban areas), as both have an impact on the time spent and consequently the amount collected. This correlation is illustrated in Figure 5 below.

[42] See Section 3 and Bustamante, Butterworth and Faysse (2004)

[43] See www.aguatuya.com

[44] See Section 1.2

Figure 5: Amount of Water Collected in Relation to the Level of Access



Key:

No Access = more than 1000m or 30 min collection time
Basic Access = less than 1 km or 5 to 30 min collection time
Yard Level = intermediate access (5 min collection time)
Household Level = optimal access through multiple taps)
lpcd = litre per capita per day
~ = approximately

Source: Hofmann (2004), based on Howard et al. (2003)

Adequate access to water supply is not merely dependent on the existence of a water source. Therefore, when assessing people's level of access both to water supply and sanitation, it is important not to restrict this only to issues of distance to a source and density of users, but it further involves a range of other aspects such as:

- 1) **Regularity**: how frequently is the service available to people and when;
- 2) **Sufficiency**: how much water is available per person;
- 3) **Affordability**: how much do people have to pay for the service, particularly in relation to their income;
- 4) **Quality**: what is the quality (of water and sanitation facilities) of the service available; and,
- 5) **Safety**: how safe and culturally acceptable is the access to and use of facilities, especially for women and children who must rely on facilities outside the household (e.g. public toilets).

When looking at service providers, past experiences have shown that water distribution

by (large) private contractors rarely extends to poor peri-urban neighbourhoods because it is too expensive and thus would only work if service to poor areas was cross-subsidised, as has happened in the case of Buenos Aires, Argentina. [45] Another option to provide affordable water to the peri-urban poor is through a partnership between the community and the private sector, where the private sector provides water in bulk to a neighbourhood with further dispersal managed by the community itself. However, in both cases this implies private sector participation (meaning private sector collaboration with other stakeholders) and not full privatisation of the system.

[45] For more information see BPD (1999).

In some countries, though particularly Latin American ones, the prevailing engineering and urban management culture considers centralised solutions as the most desirable in terms of cost effectiveness, management and quality control. This is partly based on the example of water authorities in large and comparatively wealthy metropolitan areas such as Sao Paulo, Caracas and Bogotá which are able to supply the vast majority of their population with water, including most of the peri-urban population. However, even a comparatively wealthy city such as Buenos Aires shows that peri-urban provision can be very limited thus opening the door to more decentralised distribution systems that might improve access.[46] As discussed in Section 1.3, other than the inefficiency of utility companies and inaccessibility of peri-urban areas, the informal status of settlements is another factor that may delay low-income groups' access to services, as authorities may be reluctant to provide connections where land tenure is in doubt. In such cases, an NGO or CBO could act as a guarantor to the municipal water authority until informal communities establish themselves as reliable clients. [47] In Mexico City, however, the government is not formally obliged to supply the population living outside the Zero Growth Pact area with services. [48] In these areas, the population gains access to water only by receiving water from those that have access to it; they are in an extremely fragile position since they depend on the good will of neighbours and/or their own financial ability to purchase water.

[46] Hardoy et al. (2005)

[47] See Section 3, Dhaka case study.

[48] See Box 7 in Sub-section 1.3.

When discussing access, the issue of users' willingness to pay for services is important. In many contexts, decades of poor management, under-investment and patronage politics have meant that access to basic public utilities results not from implementing long-term plans, but from piecemeal interventions in small sections of the metropolitan population. Because of the lower population densities than inner urban areas, their comparatively recent origins and the diverse nature of their inhabitants with a mixture of new and old arrivals, poor peri-urban locations rarely register in the radar of local politicians and infrastructure budgets. When they do, infrastructure projects become a form of coinage exchanged for political support. The impression among users that infrastructure has somehow already been paid for by a state that has little else to offer them leads to a culture of non-payment, which is often encouraged by local politicians. This results in a vicious circle of poor revenues and capital leading to chronic under-investment in maintenance and inadequate or non-existent network extensions leading to unwillingness to pay. This, however, needs to be contrasted with the fact that the peri-

urban poor are already accustomed to paying for water since they currently spend a large amount of their household income on it, even in countries where water is regarded as a right and should, in theory, be provided for free, as discussed in Section 1.2. The alternative forms of supply on which households mainly rely are in most cases more expensive than water from the piped network. Peri-urban households in Greater Cairo buying from informal private vendors currently spend 50 times or more on water compared to those who are served by the heavily subsidised formal network system. Even if households were to pay the full economic cost of the network supply, water vendors' charges would still be about 20 times higher. The revenue from these informal practices, however, is rarely channelled to the formal system in the form of, for example, income taxes or extraction levies.

Although not based exclusively on peri-urban data, the following table illustrates that people paying for water by the bucket from tankers, well operators, kiosks or vendors pay up to 100 times more per litre than households served by the public utility though this does not include one-off connection charges which are often comparatively high. [49]

[49] See also Lovei and Whittington (1991) cited in Ray and Kakebeeke (2003).

Table 6: Ratio of the Price of a Litre of Water charged by Vendors Compared with Public Utility Rates		
Country	City	Ration
Bangladesh	Dhaka	12-25
Haiti	Port-au-Prince	17-100
Indonesia	DKI Jakarta Surabaya	4-60 20-60
Kenya	Nairobi	7-11
Mauritania	Nouakchott	100
Nigeria	Lagos Onitsha	4-10 6-38
Pakistan	Karachi	28-83
Uganda	Kampala	4-9

Source: Bosch et al. (2002)

This further confirms that the poor are willing and often able to pay a certain fee for adequate services. However, as Table 6 shows, because they pay much more both in nominal and relative terms (with one-fifth or more of household income going into paying for water), this can result in either cutting other household expenditures such as food, which can lead to malnutrition, or may be forced into informal and precarious forms of supply, increasing the risk of water-related diseases. Some households can afford to boil the water from unsafe sources before consumption, in which case the money spent on fuel needs to be added to the water bill. However, in peri-urban Chennai, for example, the poor rarely boil the water prior to drinking, leading to

several diseases and high medical bills. In addition, the amount of time spent collecting water from a kiosk or standpipe outside the household can be as much or even more in monetary terms than the water per se, which further adds to the water bill. This has been addressed in La Sirena, a peri-urban settlement of Cali, Colombia. [50]

A successful community supply model can have multiple benefits. For one thing it can minimise the burden on women and children by decreasing time spent on collecting water. At the same it has the potential to improve livelihoods of the peri-urban poor, as many of them

[50] See Section 3.

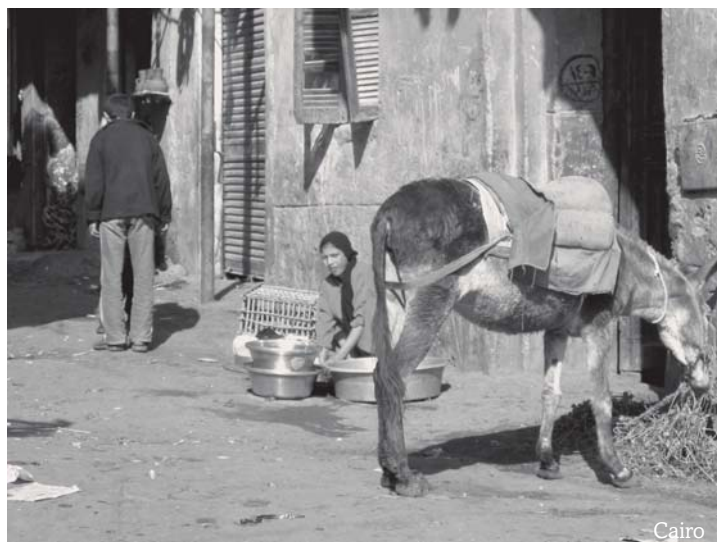
greatly depend on water for productive uses. [51] Moreover, the transition from informal vendors to purchasing water from community managed systems can lower the money spent on water considerably. This has happened in the case of Dar es Salaam, where the monthly charges for potable water from peri-urban community managed systems can vary, depending on its quality, but are cheaper overall than the monthly fee for the public network system. In Caracas, within the new policy framework, lower-income groups in the PUI pay a social rate that is half of the normal rate in peri-urban areas. However, the intermittent supply to poor communities still needs to be addressed.

[51] See Section 3, Tegucigalpa case study.

Another problem frequently faced in poor urban and peri-urban settlements is the effect water losses have on network supplies. In the five case studies, for example, losses through a small range of causes such as leakages and evaporation are estimated to be in the range of 35% to 55% of the water produced. In peri-urban Cairo losses are higher in informal settlements because of poor illegal connections. A greater sense of 'ownership' of the formal network system by users is likely to lead to greater rates of detection and reporting of losses, thus reducing the number of illegal connections, maintenance and repair costs. In addition, a formally established collaboration between communities and local authorities provides a way to increase municipal revenues that can be used to improve the system further.

It is apparent that the day-to-day realities of low-income people living and working in peri-urban areas are very complex and diverse. Solutions have to be more innovative and reflect the specific local circumstances, taking into account the needs and capacities of the communities concerned (for example, by providing funds and skills to the community for construction and maintenance of services). The various informal practices that have emerged in the peri-urban interface to cope with the lack of access to services demonstrate that communities are highly capable of mobilising and organising themselves quickly. Poor communities can take greater control of their lives through processes of empowerment that go beyond merely meeting basic needs such as accessing reliable sources of water. Women can play key leadership roles in this, as Box 16 and several of the case studies in Section 3 show. This is also an advantage in cases where some funders expect community to be organised as a condition for their support, as in the case of WaterAid's assistance in Dar es Salaam.

Disaggregation of the peri-urban poor, particularly along gender lines, is central when defining the configuration of a good working system, taking into account that women and



children are likely to face higher levels of due to inadequate access to water. As shown in Box 16 the participation of peri-urban communities and especially of women is key in order to achieve sustainable outcomes and it helps to base new approaches on effective demand in terms of technology, level of service and prices that those to be served are, realistically, able to pay. There is evidence that communities have always been involved in the distribution of water. Ongoing reforms in the water sector have the potential to properly incorporate such small scale, and often informal, practices into the formal system and thus both recognise and raise their importance by providing them with support.

Box 16: Participatory Decision Making in Caracas

One of the features of the Drinking Water and Sanitation System of the CMR, including Tuy Valley, is its participatory character, fostered by the new Drinking Water and Sanitation Service Act (see Boxes 5 and 12). This participatory vision has influenced the water company to create a Community Affairs department to deal with communities and CBOs. Participation is understood and implemented not in an instrumental way but as a means of empowering the community to be part of decision-making and service management in an effective and responsible way.



The Technical Water Fora (TWF) are also part of this framework. Despite being a government initiative, the TWF are fairly autonomous. Community members participate in these organisations to access, improve, maintain and control the quality of the water and sanitation services as well as to create a water culture that cares and values this resource. The relationship between these organisations and institutions, mainly the water company, is based on a joint responsibility and identity with the service. Communities are not only users and consumers of a service, but also part of the service who can help to build it up. They participate in the service construction process from the initial diagnostic and project design stages to regular monitoring. At the same time, communities build a network of relations and values that help create citizenship.

This participatory strategy has contributed enormously to the main goal of increased access to water and sanitation and, by 2005, had helped meet the water targets in the Millennium Development Goals planned for 2015. It has also contributed to the strengthening of community fabric, social citizenship and a new network of relationships between the community and the state in the creation of a new water culture.

A key aspect is the participation of women in this process. Women represent more than 75% of the members and heads of the TWF. The empowerment through their determined and decisive participation in these organisations has contributed to the emergence of female leadership within popular groups. This leadership is responsible for substantial achievements. The emergence of women in particular and of popular groups in general has created a change in the way the peri-urban poor perceive their reality, creating a positive attitude towards new forms of social inclusion and hope for improvements in livelihoods.

The active participation of women in the TWF represents a change from a well established patron-client form politics. It also reinforces the need to develop a gender focus in policies aimed at improving and making the Drinking Water and Sanitation System a more democratic one.

Interventions designed to engage with problems of scale and diversity over the long term frequently require first and foremost a new political and organisational culture on the part of water and sanitation authorities, local politicians and users. As the case of Caracas shows, this vicious circle can be successfully broken when people's priorities and energies are incorporated through active collaboration with the water authority. This provides communities not only with greater control over the design and management of their own services, but also reduces their dependence on corrupt patronage politics, strengthening their identity and a belief that water is not merely a right, but also involves a set of responsibilities on the part of users. In Caracas, this is a process of empowerment that goes beyond the supply of infrastructure and aims to help create a new democratic culture and 'social citizenship'. Failure to involve the local community has, in many cases, resulted in the non-usage of services.

2.4 Water Use and Wastewater Management

The use of water and the management of wastewater are discussed jointly, as the stages of use, reuse and management of wastewater overall are closely interlinked and thus contributions from and collaboration between all the agents become very important.

At present, most countries of the world do not manage water in a sustainable way. If people can afford it, water is used lavishly, creating an increasing problem for many cities to procure enough water to satisfy the needs of all inhabitants. Many institutions in Chennai, Cairo and Caracas, such as private hospitals, colleges, plant nurseries and industrial plants are frequently located in the peri-urban interface and constitute large consumers of water. In contrast, peri-urban low-income households have difficulties accessing sufficient water and thus use it very carefully as they simply cannot afford treated water other than for drinking and, therefore, draw on water of lower quality for non-potable purposes. In this context, it is essential to acknowledge that they do not consider themselves purely water users. Section 1.2 illustrated that the livelihoods of many peri-urban households, especially the poor, are dependent on productive uses of water, which can be as important as pure consumption for human needs. National and international institutions have become increasingly aware of this reality, leading to an initiative, outlined below in Box 17, that seeks greater recognition of productive uses through research, capacity building, and advocacy work with the overall aims of poverty reduction and gender equity.



The peri-urban poor are able to draw on any additional low-cost water source that becomes available. In Mexico City's peri-urban localities the practice of individual rainwater harvesting is widespread. However, this is currently not endorsed by the formal system, thereby hindering a safer and more effective approach to this potentially environmentally-friendly practice. Mismanagement of water is an important cause of ecological, economic and social problems related to water use. Therefore it is important to assess the efficiency of peri-urban water systems not only in terms of the costs involved, but also in the technologies applied and the strategies for saving-water that can be implemented, such as micro-irrigation techniques, industrial water reuse and the informal practices emerging in peri-urban areas.

Box 17: PRODWAT - Promoting Productive Use of Water at the Household Level

"Poor men and women have much to teach us, if we can only find the time and the humility to listen ... poor people are saying that they need water not only for drinking, cooking and washing, but also for productive purposes. We must hear the desire of poor households to lift themselves up out of poverty, and the role that water can play in this process."

Ronnie Kasrils, Minister of Water Affairs and Forestry, South Africa

The PRODWAT group is a collaborative partnership between international and national organisations that are interested in providing better water services, emphasising productive uses as a means of alleviating poverty and promoting gender equity. Their efforts focus on three main groups of activities:

- Bringing together a group of sector professionals from the water, rural development and poverty alleviation sectors to operate as a "think tank", with the aim of advancing our common understanding of the issues related to developing and scaling up community managed, multiple-use, water supply systems and improving the productivity of water used at the household level;
- Initiating specific "projects" (e.g. action research, workshops, e-conferences, etc.), involving a wider group of stakeholders, to improve our understanding of how to: implement effective systems on the ground, support improved water productivity (market linkages, crop choice, inputs etc), and scale-up community and household managed multiple-use systems; and,
- Engaging in advocacy activities to support and promote self-managed multiple-use systems. Advocacy is principally aimed at policy makers and donor agencies, and the wider community of sector professionals.

The framework of action was based on the findings and recommendations of an international symposium held in Johannesburg, South Africa, in January 2003. These include:

- Productive use of water at the household level by poor people reduces poverty;
- people require more than their domestic water needs to be productive;
- productive use enhances the sustainability of water supply systems and services;
- people need local solutions and multiple sources for multiple uses; and,
- an integrated approach is essential to achieve significant impacts on poverty.

Further information about the initiative is available at: <http://www.prodwat.watsan.net/>

Source: IRC (2004)

The lack of inter-municipal coordination and coordination between urban and surrounding rural authorities tends to intensify conflicts among them dealing with management of water sources and rivers, as well as resulting in the absence of bodies with a clear responsibility over the watershed as an ecological unit.

Once water has been used, the wastewater produced has to be disposed of. This is usually the responsibility of the municipality or other body. Toilets that use water to flush excreta produce 'black water' (sewage), which contains urine and faeces. Black water has a high oxygen demand and will contain pathogens if a person using the latrine is infected with a faecal-oral disease. 'Grey' or sullage water, produced by washing, laundry and during food preparation has a lower oxygen demand than black water and much lower counts of the faecal bacteria that are used to provide an indicator of the presence of pathogens that are harmful to human health.

Box 18: The Role of Informal Wastewater Management in Greater Cairo



Cairo

Both peri-urban localities in Greater Cairo studied lack a public underground sewerage system. The majority of residents use domestic tanks which act as cess pits (but with some percolation to the ground) to discharge wastewater. These tanks are meant to be emptied with a frequency dictated by their size and household use. Residents usually use public vacuum vehicles through their local government or Markaz (district capital). However, lack of financial resources in local governments units and the consequent lack of sufficient and/or efficient equipment poses problems for most residents. Public emptying vehicles operate infrequently, thus causing sewage overflow in the streets. Frequent run-offs with high contents of biological pathogens help spread infectious diseases. Residents resort to informal private emptying vehicles, usually found at the entrance of the locality and always on call. A standard

cost of vacuuming is 20 Egyptian Pounds (US\$3) for the service though fees vary according to the location of houses and the size of tanks. Most peri-urban dwellers interviewed had no complaints about the efficiency of this informal private service, though they resented the high costs - twice that of public service fees.

The peri-urban localities of the five case studies have very limited or no underground sewer systems to dispose of wastewater while septic tanks are a common option. Private sector involvement in the management of wastewater is very limited. Yet, where the public sector is unable to provide the service of emptying tanks, informal, small-scale private operators can play a central role, as shown in Box 18 for peri-urban Cairo. The poorest

[52] Sub-section 2.5 deals specifically with the disposal of human excreta.

[53] See sub-section 1.2.

households and some remote areas in the peri-urban interface lack any form of drainage and consequently open discharge is a common practice, leading to ponding in roads, open spaces and vacant plots, and the eventual contamination of aquifers. Linked to this is the fact that, in all five case studies, wastewater management is less of a priority compared to water supply. Still, wastewater has to be dealt with properly and its disposal becomes a critical issue particularly when this includes not only grey water but also black water. [52] In one of Caracas case study localities, Paso Real 2000, there are plans to connect individual plots to an existing industrial sewer system. Until the plan is put into action, however, the locality faces with serious environmental problems as leaking septic tanks cause landslides and open sewage flows in the streets, leading to environmental pollution. Both have consequences not only for the environment, but also for the health of the inhabitants. [53]

In contrast, wastewater is not merely waste but can also provide a valuable resource, particularly for the city fringe. If dealt with properly, the reuse of water alters the water cycle and creates alternative water sources, conserving limited resources and minimising environmental pollution. The peri-urban interface embodies a number of practices that can potentially benefit from the reuse of both grey water and black water. The peri-urban poor not only use water prudently, but they often reuse it to gain maximum benefits. Grey water is mainly used for toilet-flushing (if available), washing, (street) cleaning and gardening. In Mexico, especially those peri-urban households farthest away from the formal villages rely heavily on reusing water in order to satisfy their water needs: 64% of the people interviewed reuse water used for personal hygiene, or for washing dishes or clothes for toilet flushing (55%), cleaning (25%) and plant watering (20%). Yet, these water-preserving practices do not receive any formal support. In Chennai, due to serious water scarcity, even higher-income households have adopted this strategy so dual plumbing systems are common. Furthermore, industrial plants, which are increasingly located in the peri-urban interface, use grey water for their cooling systems. Most of this reuse is non-consumptive and therefore the water can subsequently be reused again.

The most widespread use of black water in the peri-urban interface is sewage to irrigate and fertilise agricultural plots at the same time. Sewage irrigation is particularly convenient for peri-urban agriculture because these activities are closest to the point of discharge and sewage farms are traditionally located in the city fringes. However, wastewater cannot be used without restrictions. Depending on the type of crops grown on plots, prior treatment of wastewater is required to minimise any health impacts. At the same time it is vital to sustain the level of nutrients in the water to keep up the fertilising effect. In the peri-urban interface, most reuse activities are initiated individually, informal in nature and therefore lack appropriate health and safety measures. In the city of Hubli-Dharwad, India, for instance, peri-urban farmers extract sewage from the open canals close to their plots. The sewage in the canal does not undergo any prior treatment by the municipality which is, theoretically, in charge. This constitutes a serious health hazard not only for the farmers, but also for the

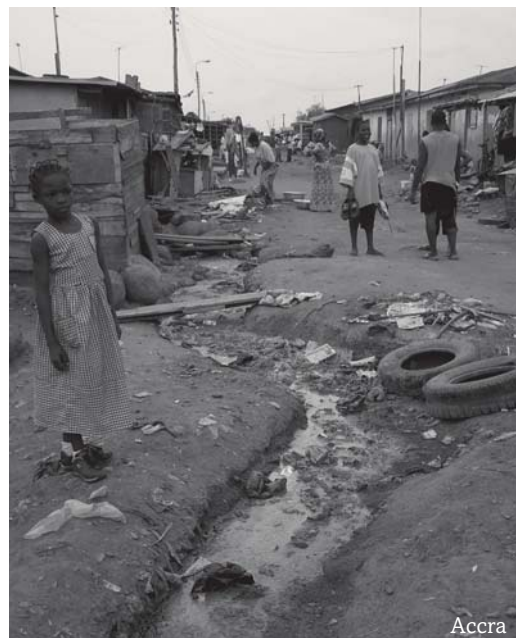
consumers of the food produced when eaten raw. Moreover, as the poorer farmers cannot afford to install expensive pumps with proper filters, it is not unusual to find syringes and other hospital waste in the water, which further adds to the impact on health.

Worldwide, water pollution is mainly produced by agricultural activities and, secondly, by human settlement by-products. The lack of sewage treatment infrastructure, involving sewer systems and control over industrial discharges, has dramatic impacts on watercourses. Human settlement by-products, such as solid wastes, also impact groundwater quality through the percolation of residual liquids.

What is not properly recognised by the formal system is the fact that the reuse of wastewater carries dual benefits. Not only does it help farmers to solve problems of irrigation and fertilisation, but at the same time, it provides a chance to subsidise wastewater treatment. The major problem is that disposal and treatment of wastewater, demand for it and its use, particularly by peri-urban farmers, are currently processes that are formally not linked or part of overall government plans. In all cases, it is important to protect public health and minimise environmental risks at all times and therefore avoid uncontrolled use of wastewater, as is still the case in Egypt, India and Mexico not only by lower-income groups, but also by commercial and industrial estates [54].

A crucial starting point to support and promote the sustainable use and reuse of water is an appropriate policy framework for water resource management that addresses disposal, treatment and reuse simultaneously. The World Health Organisation is currently revising its 'Guidelines for the Safe Use of Wastewater and Excreta in Agriculture and Aquaculture', first published in 1989. However, there is no consensus about whether these standards should be more or less restrictive, which is reflected in the variation of standards and guidelines adopted in different countries. These vary furthermore depending on the type of use, the specific context and the overall perception of risk. Egypt has recently launched its new code for wastewater disposal and reuse in addition to existing environmental laws for the use of wastewater. Many states in India have not set any standards yet. This needs attention, as biological pathogens and toxic chemicals in water represent serious health hazards. The significance of hygiene education and training for the improvement of service provision is increasingly being recognised. As a result, hygiene education and training needs to be included and thus constitutes an integral part of many community water and sanitation projects. [55]

Given the financial and economic limitations of developing countries, the issue of affordability when developing strategies should not be neglected. In Dakar, Senegal, a partnership between local authorities and communities with the support of an NGO has



[54] USEPA and USAID (2004)

[55] See Section 3, Dhaka and Tegucigalpa case studies.

[56] See Section 3, Dakar case study .

managed to develop a low-cost, community-based wastewater collection and treatment system. [56]

When developing solutions, it has to be taken into account that the reuse of wastewater can complement current water sources and, therefore reduce money spent on treatment, transportation of water and the development of new water sources. This is particularly relevant in the case of Caracas, where energy costs to pump water up to the city are very high, and Chennai, which imports water from an irrigation reservoir in a neighbouring state, with high levels of losses before reaching the final destination. A crucial starting point is the collaboration of actors involved at different steps in the water and sanitation cycle and, in some cases, an institutional reorganisation might be the best way forward. Such a plan is currently being developed for Cairo, where up to now, two different entities deal separately with water and the management of wastewater and sanitation. For the peri-urban poor, it is particularly important that innovative efforts with a potential to contribute to environmental sustainability, are formally supported in technical, financial and policy terms.

2.5 Sanitation

[57] The World Health Organization estimates that worldwide, 2.4 billion people lack access to improved sanitation, and 1.1 billion lack access to improved water supply (WHO and UNICEF 2000).

The term sanitation can be interpreted in different ways. Here its meaning is taken as facilities and hygienic principles and practices relating to the safe collection, removal and disposal or removal of human excreta. Worldwide, levels of adequate sanitation provision lag far behind those of safe water provision.[57] This is important since poor sanitation and hygiene are likely to have a significant impact on health and quality of life in densely populated urban areas, where people cannot avoid coming into contact with excreta disposed of in an insanitary way (examples of insanitary sanitation include open defecation, 'wrap and throw' methods, crude 'dry' toilets, bucket latrines and poorly maintained communal latrines). As shown in Section 2.4, the method used for excreta disposal will influence the quality of the wastewater.

While overall levels of provision in urban areas are higher than those in rural areas, levels of service in low-income peri-urban settlements are generally very low. Using the case studies examined for this research, this section explores these issues and outlines the challenges and possible lines of action needed to improve service levels among poor peri-urban households and producers within an overall aim of environmental sustainability.

In response to non-existent or limited government action, many households in peri-urban areas take matters into their own hands by providing their own on-plot or in-house sanitation facilities. Their responses, together with those of other sanitation service providers can be plotted onto the 'sanitation wheel' described in Section 1.4. The most important point to note about the 'sanitation wheel' is the division between actions that affect individual households, and those that affect positively or negatively the local community or other

communities, for example those located downstream from rivers receiving wastewater. In general, interventions by households and the private informal sector relate to activities that achieve private and perhaps local shared goods (an example of a local shared good would be the improvement in the local environment brought about by the installation of tertiary sewers; these bring about benefits to specific communities but, without adequate higher-order provision, may simply displace the problem of excreta disposal). To the extent that such interventions are self-contained, they may be satisfactory. However, there are likely to be many cases in which action at the household or local level produces wastes that then pose environmental and health problems for adjacent areas. Similarly, informal pit emptying services are often insanitary, creating health risks for workers. [58]

In some of the case studies the private formal and informal sector is involved in providing septic tank or latrine emptying services. In Cairo, for example, this service is supplied by local firms in exchange for a fee with the local government's acquiescence to up to three-quarters of peri-urban households (see Box 18). Similar services may be found in other cities around the world, particularly in Asia.

Adequate peri-urban sanitation coverage remains a problem in many cities. Although there is a taboo attached to an open discussion of the topic of sanitation in most cultures around the world, participants in the present project's local workshops identified open defecation as a nuisance, particularly in Chennai and Dar es Salaam. Generally, provision of adequate sanitation takes a much lower priority for both households and public bodies than water supply. In some Indian cities such as Mumbai and to a lesser extent in Chennai public toilets have become the norm for low-income settlements and they are the responsibility of state authorities. A problem identified in peri-urban Mexico City and Caracas is that black water flushed from toilets is not treated. In peri-urban Mexico, residential wastewater flows down open channels so downstream river pollution levels are high.

Facing these problems involves a number of challenges. An important dimension relates to the public health aspects of the safe disposal of excreta. Although it could be argued that sanitation is a household responsibility, the links between poor sanitation and health points to the need to raise awareness among poor communities about this.

Good hygiene and adequate in-house sanitation contribute to the wellbeing of individuals and households and so can be viewed primarily as 'private goods'. In contrast, the benefits of removing wastes from the local environment and disposing of them in a safe and environmentally acceptable way accrue to the wider community and so drainage, sewage disposal

[58] See Cotton and Saywell (1998) for information on informal pit emptying methods in India and their potential health hazards.



Chennai

and faecal sludge management are primarily 'public goods'.

Clearly, a challenge faced by those working in peri-urban areas is to match investment in improved water supply with that in improved sanitation. For example, the case of Tegucigalpa, Honduras, summarised in Section 3, shows that between 1987 and 1996 water supply was extended to 150,000 people in 80 peri-urban settlements while a parallel sanitation programme only reached 5,000 people in four settlements. This time lag between water supply and sanitation points to the need for an increased emphasis on sanitation and hygiene promotion, an issue recognised in several of the initiatives identified for this project. The sanitation marketing campaign launched by the World Bank's Water and Sanitation Programme in Africa is one such example. [59]

[59] See www.wsp.org.



[60] UN-HABITAT (2003b); Muller and Rijnsburger (1994).

(see Section 3) and Nairobi and the Mapet system in Dar es Salaam. [60] In both cases, the aim was to encourage small-scale private operators to adopt the system. Analysis of both systems reveals limited capacity, suggesting that they are only likely to be viable if suitable treatment or transfer facilities are locally available. Both the Nairobi and Dhaka initiatives have experienced financial difficulties and this suggests that they may not be viable without NGO/international agency support.

There are relatively few examples of public sewerage in peripheral low-income areas. Those sewers that are provided often do not extend beyond the secondary level. This may be one reason why people often do not connect to sewers, even when they do exist. Another reason may be the relatively high cost and difficulty of making connections to deep sewers. There have been a number of initiatives to overcome these problems by involving the community in local sewer provision. The Dakar case study in Section 3 provides an example of a system involving shallow sewers to transport wastewater to decentralised treatment plants. Other examples of the use of in-house sanitation and 'appropriate' sewerage can be found in Brazil, Pakistan, Yemen, Indonesia and Ghana among others.[61]

[61] See Zaidi (2001) on the Orangi Pilot Project in Pakistan; Foley, Soedjarwo and Pollard (2000) on Indonesia; and Salifu (1997) on Ghana.

Some of these initiatives have involved formal cooperation between the public sector and civil society organisations. In others, particularly those that were initiated by non-governmental organisations, limited progress has been made in reaching agreement on roles, responsibilities and standards. Perhaps the greatest integration has been achieved in Brazil, where the condominium approach has been adopted for urban and peri-urban settlements by some major agencies, including CAESB, the Water and Sewerage Company of Brasilia.

Most examples of public-private cooperation relate to the management of public latrines. Some municipal authorities and specialist sewerage agencies have also entered into service and management contracts for latrine emptying and the management of sewage pumping stations and sewage treatment works. [62] However, the lack of conventional infrastructure in low-income peri-urban areas means that such contracts rarely impact upon conditions in those areas.

[62] See Tayler (2005a) for a discussion of examples in South Asia.

It is sometimes assumed that communal facilities provide the only affordable option for providing sanitation facilities for low-income people. In fact, their experience worldwide suggests that public facilities that can be open to everyone are often problematic. Cleaning and maintenance are often the main problems with publicly managed facilities. Many, perhaps most, have been abandoned and those that remain are often in a completely unhygienic state. As already noted, one response to these problems is to assign the management of community facilities to either the private sector or civil society groups. Most such initiatives require that users pay to use facilities. This suggests that communal facilities are often relatively expensive for users.

A better option is to provide toilet facilities that are shared by specified families, each of whom is provided with a key. Examples of this approach include systems provided with support from Lutheran World Services in Kolkata, India and WaterAid's partner organisations in Addis Ababa, Ethiopia.

Shared facilities may be the only option where either space is very limited or people are too poor to pay for on-plot facilities. In all other cases, the aim should be to provide on-plot facilities for individual families. Research has shown that on-plot sanitation is possible on plots with areas as small as 14 square metres [63]. It is arguable that the potential public health benefits justify some subsidy if it means that people can afford on-plot facilities.

[63] Cotton and Saywell (1998).

The Sambizanga Project in Luanda in Section 3 is an example of an initiative to provide household level facilities, in this case dry-pit latrines. An important feature of this project is its emphasis on encouraging demand for improved sanitation through the use of community 'mobilisers'. This is particularly important for initiatives that focus on in-house sanitation, which is normally a household responsibility. However, initiatives that involve users in the provision of public sewerage facilities, may also require action to mobilize community interest. For instance, the Orangi Pilot Project in Pakistan emphasises the need to identify 'lane managers' who can first convince their neighbours of the importance of improved sanitation and then take a lead role in implementing the sanitation scheme.

The conventional wisdom is that sewerage is unaffordable in low-income communities. This may be true of sewers constructed to conventional standards. However, the examples quoted earlier in this section indicate that sewers can be affordable. The key is to use appropriate standards, for instance reducing cover to allow for the fact that sewers can be laid in vehicle-free lanes and, in the case of some Brazilian 'condominiums' through private back yards. Shallow sewers require inspection chambers rather than manholes and can be much cheaper to build than conventional sewers.

The problem with many initiatives is that, while locally successful, they do not have a city-wide impact. The Winterveldt Community Sanitation Project summarised in Section 3 aims to provide on-plot sanitation facilities on a scale that will make a difference to sanitation conditions on a significant scale. The project illustrates the importance of responding to community demand and the value of piloting sanitation initiatives before introducing them on a settlement or city-wide scale. It also shows the value of partnerships, in this case between an independent public authority (Rand Water), a government department (Department of Water Affairs and Forestry) and an NGO (Mvulu Trust). Other significant aspects of the scheme are its promotion of sanitation-related enterprises and the introduction of a community-based lending scheme. These show how an intervention can be designed to both introduce practical measures to increase the effective demand for sanitation services and develop capacity to respond to that demand.

Other projects have had a major, if not always citywide impact. For instance, the Orangi Pilot Project estimates that around 100,000 households now have sanitation facilities in Orangi Township, one of the largest katchi abadis (informal developments on public land) on the outskirts of Karachi, Pakistan. In an urban setting in India, SPARC, Shelter Associates and other NGOs were involved with the city authorities in a city-wide effort to provide public sanitation facilities in 'slums'. Although an urban rather than a peri-urban example, the latter initiative shows the importance of political and administrative commitment to good practice: although successful, the initiative stalled when the Municipal Commissioner was transferred and replaced by a man who returned to the old discredited system of contractor-built and publicly operated public toilets.

2.6 Governance and Institutional Responses to Peri-urban Realities

The five case studies documented earlier and the examples in Section 3 help piece together a picture of the daily reality of millions of poor peri-urban households and small-scale producers around the world in accessing water and sanitation services. The previous sections have highlighted the complex nature of the problems of a reliable and affordable supply of these services in the specific case of peri-urban localities in metropolitan regions. Even in those cities where there is a large and active public sector, a multiplicity of other agents - including

formal and informal operators - is present at different stages of the water and sanitation cycle.

This final sub-section seeks to bring these issues together whilst outlining the nature of governance responses required if the challenges of incorporating the needs and realities of poor peri-urban communities and the search for environmental sustainability are to be met. As the research teams found in their own cities, a number of elements contribute towards these goals. These can be seen at different scales.

At the national level, national regulatory and legal frameworks that take into account these realities are of crucial importance. In the case of Caracas, for example, the new regulatory environment provided by the 1999 National Constitution is supported on the principles of participatory democracy, environmental protection and sustainable development, and the public property of water resources. This set of constitutional principles facilitates the kinds of actions mentioned earlier at different points in the cycle. For example, they have made possible a new 'water law' and the unbundling of water services into different functions such as regulation and management. They also paved the way for a new 'water culture' where water is not seen by users merely as a right but also as the result of taking on responsibility for ensuring its sustainable supply. The Technical Water Fora have enabled a more equitable sharing of responsibilities between poor peri-urban communities and the public agency officially responsible for supplying these services through its Community Affairs department.



National policies regarding the supply of infrastructure services may also determine the extent to which the peri-urban poor gain access to reliable and affordable services. Policies that favour exclusively large-scale, centralised network systems, for example, fail to recognise that, in the absence of such a network, small informal operators often respond well to localised demand in non-central localities, particularly if there is some degree of competition between suppliers, as was shown in the case of Dar es Salaam. In such cases, regulatory efforts are often directed towards creating a 'formal' market with the avowed aims of improving the conditions under which a service is supplied, improving the information about the price of a service by fostering transparency and reducing abusive practices. By officially registering these businesses, they are also designed to increase the revenue of municipalities or other official bodies through taxes and other charges. This may also help in reducing the power of cartels of suppliers charging high prices for their services.

Although these efforts might match long-term development goals, there is the danger that by formalising and regulating these services and by enforcing higher official standards of service and restricting some informal practices that effectively reach the poor, the price of some of these services may increase. Although in theory desirable, regulation and formali-

sation may push out smaller operators who cannot afford the additional costs, thus reducing their capacity to respond to market conditions and serve remote peri-urban locations. The voice of the poor as consumers should not be ignored, but in many cases, formalising a market may go against their well-being by placing basic services beyond their financial reach.

Other national-level policies fail to recognise or prevent the recognition of peri-urban realities, such as rural or urban biases in development plans and programmes. A simple rural-urban dichotomy fails to take into account the institutional vacuum in which peri-urban households and small-scale producers often fall, as was illustrated earlier for several of the case studies. This dichotomy is frequently reinforced by donors and other external support agencies, for whom the peri-urban dimension rarely - if ever - exists. The cases of intervention summarised in Section 3 such as Dakar's, Cali's and Cochabamba's to name a few, highlight some examples where an explicit peri-urban dimension became an integral component of a programme of support and organisation involving local communities.

As more national governments embark on administrative and political decentralisation programmes involving the transfer of responsibilities for providing services to lower government tiers, the question arises as to whether these offer improved forms of access to basic services to the peri-urban poor. This is not a foregone conclusion and the one case study documented in this piece of research in which decentralisation of water and sanitation service provision will soon become a reality does not seem to point towards this end. The forthcoming decentralisation process in Venezuela suggests that some municipalities are reluctant to accept the added responsibility (often restricted to distribution and customer service) even if their role is one of regulating and administering a water and sanitation concession to a third party (such as the private sector, or a public-private partnership). It is also unclear whether the current system in Caracas which has become fairly responsive to the needs of the peri-urban poor can equally be met by a municipality lacking the human resources to work constructively and creatively with these communities.

On a metropolitan scale, a step towards improving peri-urban access to basic services is the recognition of the conflicts that so often plague them, particularly around the issues of land and water. As the cases of Chennai and Mexico City show, peri-urban residents resent the vast volumes of water that are extracted from sources within their territory to be sold in the core city whilst they suffer water shortages. In these cases, as some of the fora organised as part of this research project revealed, it becomes necessary to put into practice effective conflict management systems. These ought to ensure that the peri-urban poor are not losers in the process. At a local and even a metropolitan level, apart from meeting the most basic needs of both households and small producers, water and sanitation services may, in effect, serve as income generating activities for a considerable number of individuals and small firms. Such is the case of Dar es Salaam, with its vast number of peri-urban informal operators, many of whom are as poor as the customers they serve. Policies that restrict their operation may have the unintended effects of increasing unemployment and poverty levels.

Finally, it is worth highlighting that the research reported here has served to raise awareness and, in some cases, effect policy and procedural changes towards water and sanitation in a peri-urban context in the five case studies. Research, information sharing and debate about these issues can eventually contribute to the dual goals of reducing poverty and enhancing environmental sustainability. A lesson from the research project is that awareness raising about legal frameworks and the daily reality of the peri-urban poor is a first step in the process. In this, members of the media, both as professionals and stakeholders, can play an important role.

In the cases of Chennai, Dar es Salaam and Caracas, for example, the research teams contributed significantly to increased awareness among the community and even local government officials about mechanisms or legal instruments that, if used adequately, could change the conditions under which water and sanitation services are provided. In Dar es Salaam, the research made officials realise that many poor peri-urban users are unable to pay for water services while highlighting the fact that there is no official strategy to help them. It also helped publicise the conditions under which poor community members could benefit from existing programmes. In all case studies, the research fostered a process of interaction and debate among different stakeholders and helped them appreciate the role being played by others, including the crucial services offered by informal operators and the capacity of peri-urban communities to become involved, take control of their environment and shape their own destiny.



3. Learning from Experience: Case Studies

The first three sections offered a conceptual and practical background on WSS issues in peri-urban areas for those involved either directly or indirectly in the long-term planning and daily management of metropolitan regions in developing countries. Despite the peri-urban focus of this document, those who are involved in development of WSS must not overlook the fact that PUI problems have citywide impacts. Moreover, PUI potentials can serve as opportunities for entire metropolitan regions. Improving WSS in peri-urban areas means bearing in mind their unique features and viewing the PUI as the product of a specific set of conditions which exist in a much wider context than one community or one geographical space.

Governmental agencies, donors and communities are beginning to turn their attention to peri-urban issues. This shift presents a significant opportunity for forward-looking planners and organisations to set precedence for future interventions. In order for the potential of WSS improvements to be maximised, a variety of factors must be considered. This final section examines how the issues discussed here have been addressed by a number of case studies carried out in metropolitan regions around the world.



Despite the number of people reliant on informal means of service provision and the apparent ease with which these services are delivered, the public sector typically displays resistance to informal solutions to what are, in actuality, problems within public remit. In lieu of viewing the widespread and often innovative reality of informal options, governments generally operate in a manner that is counter-productive to informal WSS providers, as is particularly relevant in cases of informal land regularisation in the PUI. However, the public position in relation to informal, or needs-driven, efforts in serving the PUI is slowly being resolved through successful interventions in which public, private and civil society actors are combining their efforts, blurring traditional informal/formal divides and creating a new

type of synergy. It is the basis of this type of multi-stakeholder innovation that future projects and programmes delivering WSS should be modelled upon.

This document argues in favour of needs-driven, as opposed to policy-driven, strategies and practices in WSS. This is emphasised by some of the cases presented or referenced. The key factors in upgrading WSS lie in heightened awareness of the PUI context and recognition of the benefits of needs-driven practices and their articulation to the formal system under new governance regimes.

Building a synergetic intervention process requires consideration of the specific challenges involved in improving service provision in the peri-urban context. In compiling this report, research was done on a multitude of cases in which innovative approaches are being used. The final part of this document will draw on several practical examples, showing how strategic and innovative practice forms creative structural arrangements, embracing needs-driven approaches in order to move forward. Before presenting the case studies in more depth, this section will briefly outline the key points from the approaches they present.

Case Introductions

In Rufisque Dioukoul, 25km outside the Senegalese capital of Dakar, local authorities and communities have successfully established a waste-water collection, treatment and disposal scheme. Focusing on a sewage system and treatment facility, the initiative is working toward a future in which agriculture is supported by wastewater. The partnership is based on a strong community foundation and metropolitan-level reforms aiming to spread welfare to residents. Among the achievements of this scheme are the establishment of local savings, community-led and managed initiatives and significant progress in advancing power-sharing procedures.

Luanda, Angola is the site of the Sambizanga project, a community-led and widely-supported standpipe and latrine installation scheme which has been replicated city-wide. Facing increasing difficulties due to massive urban migration in recent years, Luanda's peri-urban areas, officially considered transitional rather than permanent, have often gone ignored during periods of infrastructure improvements. The Sambizanga project has alleviated strains on households, who were spending a quarter of their income on water, allowing them to redirect their earnings and benefit from water standpipes run as small enterprises by local committees. The success of the project has led to further investments in sanitation and the establishment of credit facilities and neighbourhood workshops. Furthermore, the project's success has afforded communities greater opportunities to engage with local government using participatory techniques.

Initiated as a result of community pressure, a partnership between peri-urban community members, Rand Water and public and non-governmental actors launched the Witerveldt Community Sanitation Project in Tshwane, South Africa in 2001. The project's objectives of establishing responsive, needs-based policies, community learning and participation leading to community ownership have improved WSS and stimulated local economic activities and savings schemes. Crucial to the approach in this case was adherence to a distinct set of principles emanating from Rand Water's client-focused approach.

The work of local NGO Dushtha Shasthya Kendra (DSK) on behalf of poor communities has overcome severe barriers to WSS improvements in Dhaka, Bangladesh. DSK undertook a variety of responsibilities, obtaining permits and mobilising community members in the collection of payments to local water authorities. Early successes in this case led to further partnerships between DSK and public, private and civil society actors and additional projects which supplied more than 200,000 people with water. Over time, community members and small, local businesses have increasingly taken over responsibilities, showing the value not only of community financial contributions, but also local management and leadership.

Peri-urban WSS improvements in Port-au-Prince, Haiti have evolved over time, mostly focusing on the improvement of distribution and access. Innovations have derived from the 1995 establishment of a partnership amongst public, international, non-governmental and community actors. Initiated in 2001, recent efforts have focused on further decentralisation of a system limited in its capacity to serve a burgeoning population. This has been done through the use of community groups to fund, install and manage distribution points, reservoirs and supply networks. The long-term stability of work in Port-au-Prince remains guaranteed as a result of financial, administrative and managerial training programmes.

Prior to initiatives in 1987 and 1996, nearly 200,000 people lacked access to safe drinking water in the peri-urban areas of Tegucigalpa, the capital city of Honduras. Commonly resorting to the collection of rainwater or buying drinking water from private vendors, residents of these areas were spending a significant proportion of their household income on water. The local government's creation of the Executive Unit for Settlements in Development (UEBD) marked the beginning of a commitment to improve WSS in Tegucigalpa's peri-urban areas. Partnerships developing in conjunction with this commitment involved international organisations, NGOs and community members taking part in labour, savings and management schemes.

Efforts to improve WSS in the peri-urban community of La Sirena in Cali, Colombia, began in 1984, when a community funded, owned and managed aqueduct was constructed with NGO and public support. Following construction, a voluntary, user-elected committee assumed responsibility for the aqueduct, employing private operators to assist their efforts and later improvement projects. Still in existence today, this programme has grown to include additional partnerships and further innovations, with low-income groups managing their affairs with great success over a significant period of time.

The traditional notion of public-private partnerships is being challenged through work done in Moreno, Argentina, where strategic alliances between community organisations, the city and private providers are overcoming WSS deficiencies. Initially reluctant to extend

infrastructure to low-income, peri-urban areas, private providers, together with public, international and community actors, coordinated a project featuring design, research and construction using human resources at all levels. In the process, WSS problems have been overcome and an inclusive, collaborative approach has been institutionalised, blurring the lines separating regulators, providers and community members.

In Bolivia, Cochabamba's community-managed water systems are not only effective in comparison to centralised ones, but, moreover, are underpinned by a sense of ownership among those who are served by them. Local water schemes benefit a high percentage of residents, whose gratitude and sense of ownership is reflected in well-run payment systems and the number of people directly participating in management of community resources. Despite the clear opportunities of formally developing locally-managed systems, a number of factors limit their potential to grow and, later, to be replicated. First, the land from which these systems draw their water legally remains in the hands of other actors. Second, failing to see their potential, municipal authorities are developing their own programmes. The contradictory efforts of locally- and centrally-developed and managed systems exemplify problems in the governance of water supply and sanitation in the peri-urban interface. Today, as these two actors pursue conflicting courses, the potential to develop partnerships, support mechanisms and more effective policies remains unexplored.

3.1 Community-based Wastewater Management in Rufisque Dioukoul (Senegal)

Since 1991, a water and sanitation scheme has been operating in Rufisque Dioukoul, an informal, semi-urban township comprised of nine low-income communities, situated 25km outside Dakar. The settlements are unplanned and are located within one of the five 'communes' of the Dakar Urban Authority. The scheme operates as a partnership between local authorities and communities and the international NGO ENDA Tiers-Monde. It is essentially a community-based wastewater collection, treatment and disposal collective, that aims to "solve local wastewater and refuse problems and make people aware of the connections between them" (Goetz and Gaventa, 2001: 3).

The initiative is centred on a low-cost, shallow sewerage system linked to a decentralised treatment plant with purification and recycling components. Local young people are engaged to treat and combine wastewater, sewage and refuse to form compost for market gardens. The scheme envisages that in the future, treated wastewater will be used for urban agriculture and aquifer recharge and will be extended to include the collection of solid waste in horse-drawn carts. Initiated with kick-off funding, it now relies on a revolving fund that mobilises and manages local savings with a brief to also fund other community-led initiatives. Local management committees guarantee the fund.

Since its inception, the scheme has come to be considered a success as a result of its strong community focus and the effective participatory methods adopted in dialogue and negotiation between stakeholder groups, including: the communities themselves; a non-governmental entity; local authorities and the Public Works Department. Discussion fora, initially formed by community members, have subsequently evolved into local management committees for planning, monitoring and evaluation purposes. Notably, women feature prominently, constituting the majority of active participants.

On a national basis, Senegal has seen sustained improvement in the provision of water and sanitation services. The most recent data (2000) indicate that 92% of urban households in Senegal have access to an adequate water supply, while 94% have access to sanitation services. In rural areas, these figures drop to 65% and 48% respectively (WHO, 2000). Potable water quality is adequate in urban systems, but is often not in rural areas.

Official policy on water provision is detailed in a national strategy for water resources and management and the sector is accorded a high priority by political leaders. The key institution for urban water is Société Nationale des Eaux du Sénégal. However, no specific institution for urban sanitation and for rural water and sanitation exists. In terms of new approaches, the government has established the objective of managing water resources, preserving the health of the population and protecting the environment. Specifically, strategies now include the installation of new water points in rural communities, the empowerment of end users, the extension of urban water distribution services and the

creation in 1996 of the policy-formulating Office National de l'Assainissement du Senegal (ONAS). Funding limitations, an inadequate cost-recovery framework and logistical problems are identified as the main constraints to the sector's development.

At a metropolitan level, the Dakar Metropolitan Agglomeration is the industrial, commercial, and administrative centre of Senegal, encompassing 2,244,682 inhabitants, (24% of the country's population in 1999). The Dakar urban area has an estimated population growth rate of 4% per annum and covers an area of approximately 525 km² (0.34% of the national area), including 70 km of coast. Fully 80% of Senegal's industries are concentrated in Dakar, which generates two-thirds of national income and three quarters of the country's water supply. Upgraded port and airport facilities have consolidated Dakar's position as a hub for business in West Africa, and the city is home to the head offices of several international organisations.

The importance of the city and its financial resources give it a strong voice within the national government, a situation enhanced by decentralisation in 1996, which resulted in a transfer of government responsibilities to municipalities. The onset of regionalisation has paved the way for a series of reforms launched at the municipal level, aimed at improving the welfare of the population, but also directed at controlling urban growth while preserving a certain quality of life. The stated overarching objective in recent years has been to shift Dakar toward sustainable development through specific actions responding to the fundamental needs of its citizens. Nevertheless, with a density of about 3,000 inhabitants/km², Dakar suffers from an intense deterioration in environmental conditions and increased natural and technological hazards, compounded by poverty, unemployment, unsanitary conditions and shortages of all sorts, particularly affecting the health and welfare of the inhabitants of low income areas.

In this institutional context, the Rufisque initiative has provided particularly useful lessons regarding the democratic and power-sharing procedures available to local communities. In particular, the experience of building a strong platform for ongoing engagement with the relevant local authorities in the management of resources has contributed a significant precedent. The procedural institutions established along with the self-financing character of the ongoing project, have had the effect of facilitating high levels of participation, community empowerment and a balance in gender representation. Equally, and very much in the spirit of decentralisation, local authorities have come closer to the needs and daily reality of their citizens, who are represented on the local management committees and have access to required urban planning and development policy documentation.

Finally, the project has harnessed existing local resources, building on existing community social capital and skills and utilising them innovatively. Consequently, after successfully attracting kick-off funding from various bilateral and multilateral donors, the project was cited as UNCHS (now UN-Habitat) Best Practice in 1996 and has been replicated since by other communities within Senegal, always under the coordination of ENDA Tiers-Monde.

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3.2 The Sambizanga Project in Luanda (Angola)

The Sambizanga project in Luanda, Angola, offers a successful example of community installation and management of water standpipes and family dry-pit latrines in the city's peri-urban squatter areas (musseques). Conceived as a pilot project, it took place between 1989 and 1995 in a single musseque, and has since been replicated on a city-wide basis, covering eight of Luanda's nine municipal areas. By the end of 1997, the number of standpipes in the city had been increased from 50 to 220, serving an estimated 120,000 musseques-dwellers, supported by partnerships between local communities, local authorities, the municipal water company (EPAL) and civil society groups (Development Workshop, 1998). Also, between 1995 and 2000, 5,000 dry-pit latrines have been constructed, based on a system in which community mobilisers work with families in designated localities to encourage and support latrine development, with the aim of achieving provision in 90% of households in the locality (Cain et al, 2002).

Although Angola has extended access to safe drinking water by more than 50% since 1990, half the population was still without access in 2002. Access to basic sanitation in urban areas has dropped from 62% to 56%, and from 19% to just 16% in rural areas. As a result of increasing urban migration since the war, Luanda now has the largest concentration of displaced persons in the country, and has seen its total population increase from 500,000 inhabitants in 1975 to a current estimation of nearly 4 million; well over 25% of the country's total population. This massive level of internal displacement intensified urban poverty yet infrastructure generally remained confined to the pre-independence 'cement city', home to the more affluent sections of society.

The cement city is surrounded by the vast, densely-populated musseques, which have long been regarded as transitional settlements destined for replacement and thus unworthy of government investment. Water, drainage and sanitation infrastructure is overwhelmingly inadequate, resulting in high rates of waterborne and excreta-related diseases. 60% of urban households live below the poverty line and there is a wide and growing gap between rich and poor.

At the time of project initiation, the musseques relied on some 10,000 informal water vendors, the majority of whom bought untreated water from tanker vendors and re-sold it for many times the price of piped water in the cement city, with the result that many poor households spend 25% of their income on water. This inefficient and highly inequitable water economy also indicates a substantial loss in tax revenue from the undeclared income of water vendors, amounting to approximately \$40 million per annum. The situation with regard to sanitation is worse still, with fewer than 50% of musseque households having access to adequate on-site excreta disposal.

Water standpipes are run as small enterprises, with a community committee elected to collect water fees, to pay the water company and to oversee maintenance. The low overheads

inherent in this system enable the committees to sell water at rates as low as 12% of those charged by private vendors.

The sanitation component of the project was added subsequently and is based on a similar approach to community-based commerce. Dry-pit latrines have been introduced into areas with no sewage system, with latrine workshops established in selected neighbourhoods to sell latrine slabs and to provide credit facilities to families for their purchase.

The success of the intervention is premised on its use of an inclusive model for basic service provision, with successful replication validating this judgement. By utilising a system of community-based commerce, the project has been able to achieve an impressive level of sustainability on the basis that local communities constitute a sound location for investment, as they were already fully accustomed to paying for services (indeed, doing so at vastly inflated rates). Elected user committees have successfully assumed responsibility for maintenance and management of standpipes and latrines. These committees received training in basic technical and financial management and are fully responsible for revenue collection as well as payment for required services. This model has been so effective that surpluses have been generated and reinvested by these communities in further infrastructure improvement, including expansion into solid waste disposal.

The project has built explicitly on social capital, reinforcing the capacity of peri-urban residents to work together through inclusive local organisations to address collective problems and to provide social safety nets for the most vulnerable. It also incorporates a strong gender component, in that women have proven most inclined to take advantage of the system as they head 23% of musseque households. Women currently occupy 64% of the positions on standpipe committees and are well represented in key management decisions. Women also constitute 60% of the community mobilisers.

The project has also contributed to improvements in governance systems through an emphasis on engaging with local government using participatory techniques. As a result of the potential for the project to provide a sustainable source of self-funding in local service provision, Luandan authorities have supported this form of engagement. Indeed, user fees provide an additional source of revenue (revenues from standpipes are shared on the following basis: 30% EPAL, 20% local government, 25% maintenance fund, 25% water committee).

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3.3 A Partnership Approach to Water and Sanitation in Tshwane (South Africa)

The Winterveldt Community Sanitation Project was launched in 2001 with the intention of building on earlier improvements in community health achieved through extending provision of clean drinking water. The project was designed to tackle both lack of awareness regarding appropriate sanitation practices and lack of access to adequate sanitation facilities. Strategies designed to achieve these twin objectives were based on a number of key principles endorsed in the White Paper on Basic Household Sanitation (2001). These included a demand-responsive approach, financial and environmental sustainability, full community appreciation of appropriate hygiene practices and full participation in projects and decision-making. Equally important was the national policy for rural and peri-urban household sanitation, which anticipated community ownership of on-site sanitation facilities through provision of a household subsidy. The 2001 White Paper noted the severity of the sanitation situation, with nearly 1 million households across South Africa having no access to sanitation, whilst a further 2 million had inadequate facilities. The project focused on the provision of ventilated dry-pit latrines as they are regarded as the most cost-effective means of providing sanitation in peri-urban and rural areas. 1,050 had been constructed by 2003 (Rand Water, 2003).

Following the 2000 municipal elections, all tiers of South African government were subject to a democratisation programme, with new municipalities demarcated in 2001. This process effectively raised the status of local government and introduced new concepts such as mega-cities or uni-cities, executive mayors, speakers and municipal managers. The City of Tshwane, South Africa's administrative capital, is one such municipality, consisting of 13 former councils managed by an executive mayoral system. It was established in 2000 by incorporating various local authorities including Greater Pretoria and its surrounding areas. This new institutional landscape impacted adversely on some urban areas, which had to contend with a range of different settlement types, many without adequate sanitation and with insufficient municipal funds to enable provision (Gadd and Holden, 2003).

The municipal area of Tshwane covers an area of 2,199 km² with a population of about 2.2 million. The Winterveldt community consists of approximately 25,000 households living as tenants in mixed rural and peri-urban settlements, north of Tshwane in Gauteng Province. Rand Water is Tshwane's main water supplier, supplying about 70% by volume. The remainder is supplied by the city's own sources, namely fountains, boreholes and the Rietvlei Dam Water Treatment plant. The municipality registered low revenue collection rates from informal and low-cost housing areas, while peri-urban settlements in particular presented greater challenges than their rural or urban counterparts.

The project was initiated as a direct result of community pressure, beginning with a pilot initiative in Ten Morgan, the most rural section of Winterveldt, consisting of 1,000 households. The lessons learnt were applied to planning for other under-served areas in Winterveldt.

The starting point was the establishment of a partnership model on which to base activities. This partnership structure included the local community, an independent public authority (Rand Water), the Department of Water Affairs and Forestry and an NGO (Mvula Trust), with the trust's input mainly confined to overall evaluation. Particularly noteworthy is the cooperative and mutually supportive relationship established between Mvula Trust and the Department of Water Affairs. Also important was the development of a distinct set of principles emanating from Rand Water's client-focused approach. These included:

- 1) The need for strong relationships at community level, supported by appropriate incentive structures, with the community acknowledged as the client;
- 2) The requirement for extensive social intermediation to be undertaken by both Rand Water and community organisations to provide support to community members with training and advice;
- 3) The belief that a demand-driven approach increases sustainability;
- 4) The necessity to delegate genuine control of the project to the community, whilst maintaining central support and monitoring; and,
- 5) The importance of an appropriate community-level financial framework, in which ceilings for per capita grant finance allocations and upfront contributions from the community are integrated to achieve incentives and to enhance sustainability.

With these principles in mind, the project incorporated two additional components: promotion of local economic activity and a community-based lending scheme. The former was achieved through a mentoring system encouraging the establishment of viable small, medium and micro enterprises (SMMEs), to provide construction services as well as ongoing maintenance and improvement services once initial construction had finished. The community-based lending scheme was established through introduction of a social investment fund designed to provide financial support, training, information and technical assistance to organised community water and sanitation committees.

With respect to gender considerations, the project specifically aimed to involve women as key players (over 50% of builders were women), on the assumption that they would be best able to communicate key hygiene and maintenance messages in the future.

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3.4 Secure Access through NGO intermediation in Dhaka (Bangladesh)

In an effort to address severe institutional and technical barriers to the provision of adequate potable water in Dhaka, Dushtha Shasthya Kendra (DSK, a local NGO) undertook to act as an intermediary between slum communities and public water authorities. DSK assumed a role as a guarantor to municipal water authorities, on behalf of poor communities, thus enabling the establishment of water connections. They successfully obtained permission from the Dhaka City Corporation (DCC) to build water points and to cut roads on lands owned by the DCC. In parallel, DSK mobilised slum communities to bear the capital cost and to manage such water points, assisting in the establishment of sustainable systems enabling community payment to the water authority to maintain supply. This initiative was based on a firm partnership between DSK, the Dhaka City Corporation (DCC), the Dhaka Water and Sewerage Authority (DWASA), the communities themselves and several external donors who provided the initial funds in the form of kick-off loans. Since the inception of the project in the late 1980s, 88 water points have been established in 70 slum areas, benefiting more than 200,000 people, whilst about 12 water points have been paid for and handed over to the user groups.

In Dhaka, projected to be one of the world's 10 mega-cities by 2015, approximately 55% of the urban population, lives below the poverty line, whilst half the urban poor live in the city's 22,000 slums and squatter settlements and have limited or no access to adequate water supply, sanitation, solid waste management and other services (UNCHS, 1995). Water supply for the urban and peri-urban poor, though especially for slum dwellers, is hampered at both institutional and technical levels. Institutionally, the agency responsible, Dhaka Water Supply and Sewerage Authority (DWASA), is mandated to provide connections only to property owners, on presentation of a 'holding number' related to their plot or house, effectively excluding slum dwellers. Technically, Dhaka does not run continuous water supply and most households construct storage tanks to collect water when supply is available; an investment that slum dwellers cannot afford. Moreover, conventional sewage systems exist only in parts of Dhaka city.

The project was based on the assumption that, given the opportunity, informal communities can be capable and responsible managers of capital assets providing essential services and reliable clients for the relevant service providers. A key principle underlying this model is that interventions must respond to demand for water, which is indicated by willingness to pay. This approach aims to achieve sustainable service provision by focusing on small community-based business involvement. User groups are expected to assume responsibility for management of water points and are integrally involved in all planning and implementation phases. Community groups were organised to manage the water points and ensure prompt and regular payment of water bills, meet supervision and maintenance costs as well as repaying the capital cost.

Those communities willing to form self-help groups were provided training by DSK on management and maintenance of water points, and health and hygiene practice. User participation was sought with regard to design and placement of the water points and related infrastructure. DSK formulated guidelines on water access and cost sharing.

Specific attention was also paid to gender mainstreaming. Management committees consisting of nine women are elected annually by user groups, to assume responsibility for water point supervision and to manage payment collection. Management committees are assisted by an elected advisory committee consisting of five men. A caretaker is appointed on a monthly rotational basis from management committee members to assume responsibility for the day-to-day running of the water point. A very high degree of transparency is thus achieved from a community perspective. A women's NGO, Phulki, took responsibility for coordinating gender training for both women and men to ensure genuine participation from women.

In terms of technical innovation, the project used a very simple technical design of street hydrants fitted with two simple suction handpumps, drawing from an underground reservoir connected to DWASA mains.

The cooperation granted to the project by both DWASA and DCC was twofold and mainly underpinned by DSK's agreement to serve as guarantor for the security deposit and the regular payment of bills on behalf of the community. Moreover, the community's successful management of the water systems ensured DWASA regular revenue from water supplied to them, reducing the number of illegal connections. The project's success in showing the potential for informal communities to be reliable clients has prompted the water authority to allow communities to apply for water connections on their own behalf, without the need for a guarantor. It is also cooperating in the replication of the project in 110 community-managed water systems, benefiting around 60,000 slum dwellers, with plans to expand the arrangement to one of the largest slums in the city with over 250,000 inhabitants.

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3.5 Public-Community Partnership in Port-au-Prince (Haiti)

Since 1995, the Public Water Service Restructuring Project has been installing standpipes in Port-au-Prince's poor, peri-urban neighbourhoods. The project is based on a partnership between the public water supply utility, CAMEP (Centrale Autonome Metropolitaine d'Eau Potable), an international NGO, GRET (Groupe de Recherche et d'Echanges Technologiques) and local water committees across 37 informal communities, representing as many as 600,000 people. Small-scale water providers and the donor community (primarily the French Development Agency, AFD, and the European Union) are secondary stakeholders.

In 1995, half the 2 million inhabitants of Port-au-Prince lived below the poverty line, lacking basic services and infrastructures and experiencing social, economic and political marginalisation. The population of Port-au-Prince has grown tenfold over the last 30 years and unemployment and violence has become commonplace. These problems are particularly severe in poor, peri-urban neighbourhoods. Approximately 50% of the city's population does not have access to CAMEP water supply, forcing affected residents to purchase water from informal vendors, paying almost double CAMEP's rates. In institutional terms, there has been growing discussion since 2001 on decentralising water supply to local water committee level and also on privatisation, but these plans have not materialised.

The project was initiated against this backdrop, and consequently reflects the priorities of participants at the time. GRET's interest lay in its social mandate to provide regular, affordable and sustainable water services to poor users in the context of an improved relationship between users and the water authority. CAMEP's interest lay in the successful record achieved by community groups in other locations in getting the poor to pay for reliable water supply, while the communities themselves saw the potential for significant improvements in reliable and affordable access to drinkable water. The project required the installation of water distribution points, reservoirs and supply networks and the establishment of management procedures by community committees. The committees would be required to safeguard installations and ensure cost recovery. According to GRET, the programme was designed "... to have strengthened the legitimacy of CAMEP ... and to have implemented decentralised neighbourhood management" (GRET, 2005). On this basis, standpipe construction costs were shared between CAMEP and the communities, the latter providing labour towards construction. Community water committees were then established to provide overall financial and administrative management. Each committee received relevant training and hired a standpipe manager to supervise the standpipe and collect payment. They also retained the right to utilise any surplus generated to finance small collective infrastructure projects in their area.

The project effectively established regularised water services for poor communities at significantly reduced cost than had been available previously. CAMEP is able to profitably

provide bulk water to the district via the water committees, which act like small water companies. The project has recorded almost full cost-recovery. In the absence of a formal regulating body, CAMEP has created within its structures a 'Low Income Users Unit', whose task is to liaise with the water committees. For the government, an added benefit has arisen as CAMEP has effectively become the only real representative of the state present in these poor neighbourhoods.

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3.6 The Tegucigalpa Model: Water Supply and Hygiene (Honduras)

This programme improving water supply to peri-urban settlements in the Honduran capital is widely known as the Tegucigalpa Model. It emphasises community organisation and participation, in the context of a cost-sharing and cost-recovery system, plus hygiene education and training.

At the time of programme initiation there were approximately 225 peri-urban communities (barrios marginales) in Tegucigalpa; home of half of the capital's 850,000-strong population. These communities were subject to severe deficiencies in the provision of basic social services with almost 200,000 people lacking access to a safe source of drinking water. Alternative water sources were generally polluted, with the closest aquifer too deep to be accessed. These problems were exacerbated through a lack of clear zoning restrictions and weak coordination between government departments, resulting in the extensive degradation of watersheds and recharge areas around the city.

As a result, the provision of water and sanitation services has proven difficult and costly. Residents were forced to collect rainwater when possible and otherwise, to buy water from private vendors at high commercial prices, using up to 30% of household incomes for water purchase. By 1986, studies indicating the insufficiency of available potable water resources for the rapidly growing urban population alerted policymakers to the urgency with which solutions were required in peri-urban areas. This political commitment was manifested in the creation of the Executive Unit for Settlements in Development (UEBD); a body charged specifically with peri-urban water provision with a nation-wide mandate to construct and manage self-contained water supply systems.

A two-fold programme aimed at improving water supply and hygiene in selected communities was consequently undertaken as a joint initiative between 1987 and 1996 by a partnership involving UNICEF, the National Autonomous Water and Sewage Authority (SANAA) and the relevant peri-urban communities. The newly established UEBD was assigned to oversee the operation, to mediate between programme and community interests and to administer the revolving fund that was established. Once completed, the initiative had established water supply to 150,000 people across 80 peri-urban communities with sanitation coverage for around 5,000 people in four communities.

Community participation and investment are strong features of the intervention. The community had first to demonstrate its commitment to the initiative through mobilisation and formal application. Additionally, they had to provide labour and purchase construction materials, as well as contribute financially through water tariffs. They were expected to recover the full investment cost from the construction process onwards. To meet these obligations, they established independent Water Foras to collect tariffs administer the water system and manage required maintenance. Eventually, it was envisaged that each community would assume ownership of its water system.

In addition, a revolving fund was established for the construction of water supply facilities and expansion of coverage. Overall, the communities' financial contribution amounted to about 40%, whilst UNICEF's was 35% and SANAA's 25%. As a rule, the communities decided the speed with which the revolving fund was paid back.

In addition to improving physical water supply a hygiene education component formed part of the programme. The aim was to improve sanitation practice with the added benefit of enhancing environmental protection and conserving water and land. Hygiene promoters - predominantly women - were recruited from within their communities and were trained in hygiene education and sanitation. These promoters undertook family, school and community group visits and by 1998 a significant change was noted in sanitation and hygiene behaviour in around 80% of houses visited (Metell and Mooijman, 1998).

Women's participation was a vital factor for success across this programme. Women emerged as the main drivers behind community mobilisation and organisation, holding approximately 1/3 of the seats on the Water Foras and 62% of committee president or financial controller positions as well as constituting half of the body of participants in plumbing workshops.

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3.7 Sustainable Solutions through Community Action Committees in La Sirena (Colombia)

La Sirena is a peri-urban community situated on the steep hillsides south-west of Cali, Colombia's third largest city, overlooking the river Cañaveralejo. It has been settled illegally by immigrants from the rural hinterland since the late 1960s and has seen public service provision deteriorate in tandem with population growth. Today, La Sirena is a formally recognised barrio (urban settlement) with a population of 4,200 (approximately 500 households), whose economic activity lies predominantly in the informal sector.

Since 1984, the settlement has embarked upon a community-led programme of upgrading water supply. This effort, spanning three separate projects, has been supported by a variety of partners from the local and national government levels and from national and international civil society. Overall, the experience of La Sirena constitutes an instructive example in progressive community development and, more specifically, in the increasing capacity of communities in the urban periphery to construct, operate, manage and maintain water systems as long as they are given the necessary institutional support, technologies and training.

Prior to 1984, water had to be pumped to La Sirena at a very high cost. Supply of potable water and problems arising from untreated water consequently posed the single biggest challenge for the community. This led to a decision to construct a community-owned and managed water supply system in the period 1984-7. This project was developed by the community with the support of CINARA at the Universidad del Valle, a national research institute specialising in water and sanitation; the Departmental Health Secretariat and Planning Department; and the Secretariat of Health of the municipality of Cali. The financial resources for the construction were raised and controlled by the community. This system was complemented by a multi-stage filtration mechanism and a piping network that provided and distributed potable water throughout the settlement.

Since the conclusion of improvement works in 1987, the system has been managed by a voluntary, user-elected and legally recognised, community-based organisation. This Community Action Committee has been active continuously since its inception, employing two operators who monitor water quality and conduct daily network inspections. The committee is also responsible for tariff setting, and has established a differentiated tariff regime based on household type. It is also charged with overseeing the use of waters and preventing/mitigating wastage. In 1997, the Committee transferred some of its responsibilities to a separate, user-based entity, so as to lighten its activity load and focus specifically on water-related conflicts arising within the community.

In 1995, the community linked up with an international participative action research project aiming to strengthen community management of water and sanitation, once again joining a multi-stakeholder partnership, this time comprising CINARA, the Universidad del

Valle, the international NGO IRC, the provincial and municipal Health Secretariats and Cali's utility companies. Over the next year, the community proceeded to undertake further improvements to the water and sanitation system after successfully obtaining external funding.

The La Sirena experience showcases successful attainment of a range of goals and provides a variety of lessons in how a CBO may successfully manage water and sanitation services in a low-income area and on a cost-recovery basis. To date, 95% of the community has direct access to potable water in their places of residence. This has, in turn, directly resulted in a reduction in the time spent by women and children, fetching water, with a corresponding rise in small-scale, home-based enterprises such as producing and selling ice cream and refreshments.

The actions of the La Sirena community provide impressive evidence of the capacity of low-income groups to achieve sustainable and effective solutions through collective action and women have played a significant role throughout this process. Women assumed leadership roles early in the life of the first project and also in the Action Committee with the consequence that many women are strongly associated with activities designed to improve the quality of community life. They have proven themselves to be "dynamic agents of social processes and the engine for community organisation" (IRC, 2003).

This situation in which a community both supplies and manages its water was unusual. Both the Colombian National Constitution and the Public Household Utilities Law enshrine the principle that communities have the right to manage their own water systems, and 80% of water systems were indeed managed by community-based organisations. However, community provision of water was highly atypical. The precedent was set in La Sirena, effectively achieving community gains in the context of the decentralisation and new public management reforms to which Columbia is committed.

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3.8 A Pro-poor Model of Private Sector Participation in Moreno (Argentina)

The project titled 'Public-Private-Community Partnerships for the Delivery of Water and Sanitation in Informal Settlements of Argentina' forms part of the global UNDP-funded Public-Private Partnership for Urban Environment (PPPUE) initiative. Its success challenges many of the negative presumptions attaching to similar partnerships in other areas. The project is dependent on strategic alliances between community organisations, the municipality and the local private concessionaire, guided by the overarching goal of tackling problems of water and sanitation provision and, therein, contributing simultaneously towards poverty eradication and environmental protection. It is committed to the maintenance of transparency and extensive community participation in its operations.

In the late 1980s the performance of Buenos Aires' public water utility was deteriorating in terms of provision and coverage, as was financial viability and technical maintenance. Service expansion to the fast-growing poorer sections of the city was not even attempted. Many existing piped services to low-income neighbourhoods were illegal, impacting adversely on both water quality and cost-recovery. Against this background, Argentina launched water and sanitation supply privatisation programmes. The process started in Buenos Aires, where, in 1992 and 1999, consortia of private companies were awarded 30-year contracts to take over the state- and metropolitan-owned sanitation and water utilities respectively. These reforms were not successful, culminating in the cancellation of the water utility privatisation after recurrent technical, administrative and political problems and a succession of social conflicts (Weitz and Franceys, 2002).

The district of Moreno is located on the western outskirts of Buenos Aires on the second of three concentric ring zones, about 37km from the capital. The district is predominantly urban, featuring one of the metropolitan area's highest population densities, with (in 2001) a population of 430,000 living in an area of 186.13km². It is one of the poorest municipalities in the city with more than 60% of its residents living below the poverty line and a large proportion living in informal settlements.

In terms of water and sanitation services, more than 80% of the residents had no connection to a piped water network and 90% lacked connection to sewers. Informally settled communities in particular lacked even basic access to essential services, as local authorities were reluctant to service them on the premise that such provision would strengthen their argument for legalisation of tenure. As a result, residents were left either with cesspools in their backyards or open drainage ditches, unable to rely on the municipal government to cover maintenance costs. Neighbourhoods of between 200 and 1,000 households shared a single water pipe. At the time of project initiation, the private water concessionaire in the area was reluctant to provide the large capital sums needed to extend the network into informal neighbourhoods, even though they were included in plans for expansion.

The project commenced in 1992 against this backdrop. The institutional aim was to promote a pro-poor model of privatisation that would explore tripartite (public-private-civil society) partnerships as an effective means of tackling social development problems and demonstrating how to override negative market-based considerations of water privatisation in relation to informal settlements.

The project featured a partnership comprising the municipal Institute for Urban, Environmental and Regional Development (IDUAR) and the regulator; international civil society, through the international NGO IIED; the private concessionaire; several community groups; and an international donor agency (UNDP). Roles and responsibilities were clearly outlined, with the NGO leading the partnership as the overall co-ordinator and broker, IDUAR coordinated project implementation, data supply, manpower and technical support at the municipal level. The community's input amounted to information gathering exercises, workshops and meetings.

The project was predominantly focused on institutionalising an inclusive and collaborative approach towards resolving the water and sanitation problems encountered by informal urban and peri-urban communities. As such, infrastructure requirements were not addressed. The dimensions targeted included:

- 1) Development and institutionalisation of a planned process promoting a partnership-based management model for service provision;
- 2) Flexible application and adaptation of norms so that technical systems, financial mechanisms and organisational arrangements are rendered suitable to local circumstances;
- 3) Awareness-raising across all stakeholders groups and identification of synergies between them;
- 4) Creation of a platform for dialogue between all partners;
- 5) Enhanced active community participation and improved governance; and,
- 6) Exploration of the collaborative potential between informal and formal private sectors for integration of pro-poor considerations.

The project's partnership-based model was reflected in the establishment of a Joint Management Unit (JMU), encompassing representation from each partner. The JMU aimed to "demonstrate greater flexibility in meeting the needs of low-income groups through a combination of technological systems, financial mechanisms and organisational changes" (BPD, 2004). It is envisaged that this experience will encourage and underpin the development of a fully centralised water system in the municipality in the form of a Local Water Authority catering for the provision of water and sanitation services to all neighbourhoods, including poor and informal ones. Furthermore, a strong participatory methodology was adopted from the inception of the project, as it was believed that successful community involvement would

legitimise the project's outputs. As a result, consistent community involvement, the establishment of networks and awareness-raising were prioritised, whilst a participatory diagnosis of the nature of water and sanitation service provision across Moreno was undertaken.

The project has been considered a success in several ways, both nationally and across the range of the 14 PPUE UNDP projects internationally. The exercise has narrowed the gap between the regulator and the municipality served, thereby facilitating community voice and direct access to the central/local state. The partnership has further created a strong and mutually beneficial relationship between IDUAR and IIED, paving the way for ongoing collaboration in further social development efforts in Moreno. Finally, the project highlighted the benefits of involving the concessionaire, as the latter intends to replicate this partnership approach elsewhere in Moreno.

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3.9 Locally-managed Water Supply Systems in Cochabamba (Bolivia)

Locally-managed water supply systems are common in Bolivia, especially in rural and peri-urban areas. 54% of water supply systems in the country are managed by committees, 25% by cooperatives, 11% of systems (mainly larger) are operated by municipalities and the rest are run by other organisations, including private companies. Despite being acknowledged by national policies of decentralisation and local government, these locally-managed water supply systems do not fit neatly into national policies and plans for water and sanitation, especially at the PUI in Bolivia.

In the municipalities of Tiquipaya and Colcapirhua (near Cochabamba), there are 90 domestic water committees currently operating in the PU area. These systems were often initiated by the inhabitants themselves, in the absence of government or municipal services. A research (Bustamante et al, 2004) carried out in 2003 analysed the performance of these locally-managed water supply systems through a selection of 22 systems in the first locality and 6 in the second. Data was gathered through interviews to the systems' representatives.

Fifteen of these systems are managed by Territorial Based Organisations (TBOs), which are the only recognised local actors concerning development issues and get an annual fund from the local municipality for community development projects. Thirteen others are run by drinking water committees, which are independent but have strong links with TBO.

These water supply systems serve between 50 and 300 households (203 in average), managing a groundwater source (well or spring) with a storage tank and a piped network that delivers water to households. In Colcapirhua wells are the only source, whilst surface water from a river is also used in Tiquipaya. In many cases, an organization has access to more than one well or spring. Most of the households have a yard or in-site connection to the network.

Most of the local supply systems do not provide sanitation service, which is deficient in both localities. In Tiquipaya 68% of households have septic tanks or cess pits. On the contrary, in Colcapirhua 40% of dwellers of the more urbanised area have access to a sewage system.

The quantity of water supplied by locally-managed domestic water systems is relatively high compared to national and international standards (e.g. WHO target of 50 lpcd). Based upon estimates at the system level, consumption exceeds 10 m³/month per household (equivalent to 80 lpcd) in about 85% systems. However, several committees who use surface water face problems of water quantity, which are likely to increase given fast rates of population growth. Water quality is good, but there are problems in some areas due to mineral and microbial contamination.

The water availability is good. Over 50% systems supply water for 24 hours a day and 25% of the systems supply water for at least 12 hours each day. In contrast, water supplies

from the centrally-managed system in the city of Cochabamba (SEMAPA) are often only available in some of the service areas for a few hours every two days.

Domestic water charges levied by the locally-managed water supply systems include a connection fee and a monthly fee. Connection fees are very high (between US\$300 and US\$600), compared to incomes, which constitutes a major barrier (55% people have an annual income below US\$426). There are different fee systems and levels. Locally-managed systems on average tended to provide water for around 1 Boliviano per m³ (or US\$ 0.13/m³) in 2004, which is low and relatively affordable when compared to other piped water supply systems in Bolivia. The average rates in other metropolitan areas are US\$0.46 where there are concessions in place and US\$ 0.25 in other cities. Costs of tankered water are even higher, around 10 Bolivianos per m³ (or US\$ 1.3/m³).

Domestic water supplied through the pipes of the locally-managed water systems is not only used for basic uses like personal sanitation, drinking, cooking, washing and cleaning, but also for productive activities like keeping animals (cattle, pigs, etc.) and orchards as well as environmental and recreational uses such as cultivating lawns and flower gardens.

There is a high level of community participation in the development of these systems and a strong sense of local ownership. Only 13% of the water sources studied were developed (digging a well, building an intake etc.) without the direct contribution of the local people, and all the rest were either entirely financed by community (34%) or developed in collaboration (47%) with external organisations or institutions (such as the water utility in Cochabamba SEMAPA, NGOs, or the Fondo de Inversion Social etc.). In all the systems, infrastructure (piped networks) was built with the participation of users, who contributed with labour and cash in most cases.

This direct participation and community contribution explains why dwellers consider themselves 'right holders' and not just users of the systems. This implies that they are entitled to make decisions about the system management, in addition to receive the water service. In 68% of the cases studied, the representatives considered that the community 'owns' the water source. However, in only 28% of the cases there was a legal document to prove these property rights, whilst in 43% cases some kind of documents with unclear legal value exists. In a further 21% cases, there is no documentation. In relation to the infrastructure, with the exception of only one system, representatives consider that infrastructure belongs to the community that uses it, although only three of the systems have a document that proves this ownership and only two have that document legalised.

Despite the good performance of locally-managed supply systems, they are currently under risk. A joint project (MACOTI) has been developed by the Tiquipaya and Colcapirhua municipalities to provide sewerage to these localities. To meet funding requirements, the project has to include a "water supply systems improvement and expansion" component. The project is attempting to connect 32.000 households to the domestic water network and 10.000 households to the sewage system, increasing the reticulated sewerage coverage from

11% to 95% across the whole area.

Drinking water committees and local irrigation systems' association (ASIRITIC) protested against what they perceived as the encroachment of the planned system over their rights. This led to changes in project design such as the proposals to supply bulk potable water to existing small systems. Each locally-managed domestic water system will, according to the current discourse, be free to decide whether they want to buy water from the MACOTI system. Importantly, there are no agreements or contracts in place that specify how much water will be purchased by the locally-managed systems and the price of bulk water. This leaves the MACOTI project vulnerable to the risk that locally-managed systems do not purchase additional bulk supplies, and that locally-managed systems will be exposed to significant political pressures to purchase water that has to be sold in order to collect revenue and repay loans. More positively, new bulk water supply infrastructure may improve the availability of water resources and security of supply.

Tiquipaya and Colcapirhua are not isolated example and given the importance of locally-managed domestic water supply systems in Bolivia, what happens with this project will be important for the future of domestic water supply institutions in other peri-urban areas of the country.

A key recommendation is that specific policies and support mechanisms (including investment in capacity building) are required to support locally-managed domestic water supply systems. Recognising and tapping the contributions of local communities may lead to greater efficiencies and be more sustainable than large and centrally-planned systems.

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