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# Unbundling Tenure Issues for Urban Sanitation Development

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A Doctoral Thesis

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---

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*As competent human beings, we cannot shirk the task of judging how things are and what needs to be done. As reflective creatures, we have the ability to contemplate the lives of others. Our sense of responsibility need not relate only to the afflictions that our own behaviour may have caused..., but can also relate more generally to the miseries that we see around us and that lie within our power to help remedy. That responsibility is not, of course, the only consideration that can claim our attention, but to deny the relevance of that general claim would be to miss something central about our social existence. It is not so much a matter of having exact rules about how precisely we ought to behave, as of recognising the relevance of our shared humanity in making the choices we face.*

Amartya Sen, 1999 Development as Freedom

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## List of Abbreviations

- AAAS - *Association des Acteurs de l'Assainissement du Sénégal*, pit emptier association, Senegal.
- BSCOS – Department of Surveillance and Control of Land Occupation, Ministry of Urban Planning and Land Management, Senegal
- CLTS – Community Led Total Sanitation
- DALY – Disability Adjusted Life Year
- DAT – Department of Town and Country Planning, Ministry of Urban Planning and Land Management, Senegal
- DFID – UK Department for International Development
- DIY – “Do it yourself”
- DUA – Department of Town Planning and Architecture, Ministry of Urban Planning and Land Management, Senegal
- EAWAG – Swiss Federal Institute of Aquatic Science and Technology
- FDV – Fondation Droit à la Ville
- FSM – Faecal Sludge Management
- GCST – United Nations Global Campaign for Secure Tenure
- GTZ - German technical cooperation
- HCES – Household Centred Environmental Sanitation
- HDR – Human Development Report
- IWA – International Water Association
- IYS – International Year of Sanitation
- JMP – Joint Monitoring Programme
- MDG – Millennium Development Goal
- MUAT – Ministry of Urban Planning and Land Management, Senegal
- NGO – Non-Governmental Organisation
- NIE – New Institutional Economics
- NIMBY – “Not in my backyard”
- ONAS – National Office for Sanitation, Senegal
- OPP – Orangi Pilot Project
- PAQPUD – Sanitation Program for Peri-urban Areas of Dakar
- PDU – Urban Master Plan
- PEPAM - Water and Sanitation Millennium Project (Senegal)
- PLT - Long Term Water Supply Project (Senegal)
- PUD – Detailed town planning document
- SANDEC – Department of Water and Sanitation for developing Countries (part of EAWAG)
- SDE – *Senegalaise des Eaux*, Water Utility Senegal
- SLA – Sustainable Livelihoods Approach
- SSA – Strategic Sanitation Approach
- TSM – Thiaroye Sur Mer, Pikine Commune, Greater Dakar.
- UN – United Nations

- UNDP – United Nations Develop Program
- UN-HABITAT - United Nations Human Settlements Programme.
- UNICEF- United Nations Children's Fund
- WHO – World Health Organization
- WSSCC – Water Supply Sanitation Collaborative Council

## Abstract

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Urbanisation in sub-Saharan Africa is characterised by a proliferation of informal settlements which all too often embody poverty; low access to basic services and lack secure tenure. The reality of sanitation infrastructure in low and middle income cities is a spectrum of sanitation systems ranging from conventional utility managed systems to basic household facilities. Population growth has outpaced urban planning and provision and, given projected urbanisation trends, a prevalence of non-piped self-build sanitation systems is the most likely scenario for urban sanitation in the developing world, at least for the immediate to mid-term. This presents different governance challenges especially as informal occupations are often on unsuitable land which exacerbates the difficulties in service provision. Sanitation, tenure and development are inextricably linked, not only with respect to these challenges of urbanisation, but also under the strategic objectives of the Millennium Development Goals (MDG). Together sanitation and tenure security are primary indicators of the MDG7, targets ten (access to improved sanitation) and eleven (improving the lives of slum dwellers). The link between sanitation and tenure is the focus of this research. Both tenure and sanitation are fragmented into their component parts to understand exactly how and where they interact. Tenure is defined in terms of formal land tenure; tenure status (to differentiate between landlord and tenant) and tenure security. Sanitation issues are investigated with respect to access, household investment and emptying behaviours.

The research framework combines the concept of decision making domains to describe the urban context with a city-wide systems view of sanitation, where both formal and informal institutional arrangements are considered. This research concludes on five main points: firstly, tenure security is a necessary precondition for household investment but, given that urban sanitation development and provision happen largely under the radar of formal city planning and urban management, it is *de facto* rather than *de jure* tenure rights that provide the security for household investment in sanitation. The second finding is that few urban sanitation strategies cater for those who are unwilling or unable to invest. This is a fundamental oversight in current urban sanitation strategies of the population segments who cannot invest, thus failing to provide a sanitation strategy for all. This is of growing concern given the type of urbanisation being witnessed in developing countries characterised by increasing concentrations low income populations and tenants. The third finding is that those who are unwilling to invest may be willing to pay (and do) for sanitation services. This places a greater emphasis on downstream and operational sanitation activities (i.e. tenure neutral options). The fourth finding is that there are multiple service providers and majority of urban sanitation transactions take place outside the formal service provision. Giving meaning to these informal transactions is likely to offer insight into improved governance for urban sanitation. The final point is that there is a need to widen the scope of formal sanitation service provision to include tenure neutral sanitation options to reach the needs of tenants and those living with poor tenure security.

Practically, this means that by taking a city-wide approach supported by the 'sanitation cityscape' tool which is presented in the thesis one can identify which element(s) of the sanitation system are most appropriate to target given the tenure situation. Without this consideration, urban sanitation interventions are likely to be targeted inappropriately. These conclusions are based upon primary data collected from a household survey (n=363) and a series of key informant interviews collected during 2008 in Greater Dakar, Senegal.

# 1. Introduction

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## 1.1. Chapter Outline

This chapter introduces the thesis and the main concepts that it touches upon. The background and context of the research is presented, explicitly placing this study within the overall frame of knowledge and practice. The main concepts of the global sanitation deficit and urbanisation dynamics in low income countries are presented leading to a justification of why this study is important. The chapter concludes with an overview of the structure of the thesis.

## 1.2. Background and Context

In 2000, poor water, sanitation and hygiene caused almost 1.73 million deaths from diarrhoea, 68 percent of which were children (Prüss-Üstün, 2006). This disease burden is carried almost exclusively in developing countries where an estimated 2.6 billion still lack access to improved sanitation; 1.1 billion who have no facilities at all (WHO / UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation 2010a). This deficit is primarily quantified in terms of latrines per population; however, the extent of the problem, especially in urban areas, is not limited to access to sanitation facilities alone; inadequate faecal sludge management compounds the environmental and health risks. This is the reality of the sanitation crisis in the twenty first century.

The profile of sanitation has been raised on the international agenda in recent years. The British Medical Journal voted sanitation as the greatest medical milestone of the last 150 years (Ferriman 2007) and the UN declared 2008 as the International Year of Sanitation (UN General Assembly 2006). The latter demonstrating a consensus for the acute need to improve sanitation in low-income countries.

In sub-Saharan Africa, urbanisation is stressing infrastructural and institutional capacity. Africa's growing cities and towns are characterised by a proliferation of informal settlements which are characterised by poverty; overcrowding; low access to water and sanitation; lack of secure tenure and poor housing quality (UN-HABITAT, 2003b, Flood 2002). Under this definition, as much as 70 percent of Africa's urban population resides in slums, where there will be an estimated additional 218 million African slum residents by 2020 (UN-HABITAT, 2003b).

The reality of sanitation infrastructure in low and middle income cities is a spectrum of sanitation options from utility managed to self-build household systems, the majority and

growth area being in the latter. This challenges utilities and governance bodies as conventionally they are only concerned with the utility managed sanitation systems. Moreover, given current demographic and urbanisation trends, non-piped self-build sanitation is likely to remain the most common sanitation solution for years to come. The informal development of settlements, sometimes on unsuitable land, exacerbates the difficulties in service provision.

This research explores flexible approaches which enable non-piped, on-site, sanitation systems to be considered under the same remit as sewered sanitation, to identify where the formal and informal service providers can co-exist and interface, both physically and to strategically enable city wide sanitation management.

At the household level, drivers for sanitation demand are relatively well understood. Nevertheless sanitation interventions constantly negotiate the paradox, that whilst disease reduction is the fundamental stimulus to improve sanitation on the development agenda, it is not a key driver at household level (Jenkins, Sugden 2006). Furthermore, less attention is paid to the emptying of household pits or septic tanks. The profile of faecal sludge management (FSM) activities has been raised through a more comprehensive view of *sanitation systems* being endorsed. In low and middle income cities the FSM market consists of both formal and informal small-scale independent providers. These include manual pit emptiers who, despite being largely overlooked in official discourse, remain a common pit-emptying method for many low and middle income households. Often non-piped sanitation facilities are not constructed with emptying in mind therefore issues such as lack of access and sealed pits can be problematic.

Tenure and development are inextricably linked as key issues in managing urbanisation and poverty reduction (Payne, Durand-Lasserve & Rakodi 2007). Lack of secure tenure for urban residents and the proliferation of informal residential settlements feature highly on the development agenda. Both are highly political and complex issues as they are embedded in formal and informal, historical and cultural conventions (Payne 2002). Tenure is notoriously complex, but the issues of land tenure and tenure security are key elements of development. These issues will be explored in detail where the central debates in the tenure literature focus on how tenure is constituted; and whether it is legal titling rights, or the reinforcement of de facto rights, which is an appropriate mechanism of establishing tenure security.

Together, sanitation and tenure security are primary indicators of the 7<sup>th</sup> Millennium Development Goal under targets 10 (access to improved sanitation) and 11 (improving the lives of slum dwellers). Given the importance placed on both tenure and sanitation in human development in that they feature in the Millennium Development Goals very little research examines the interface between them. This research seeks to address the nexus between sanitation and tenure. It is the scope and nature of these relationships between legal tenure,

tenure status (i.e. tenant or landlords) and tenure security with urban sanitation developments which are the focus of this research.

### **1.3. Research Problem**

The aim of the thesis is to investigate the links between tenure and urban sanitation. More specifically the research questions what the relationships are between tenure issues and sanitation and to what extent do they affect urban sanitation development?

To answer this central research question it is divided into three sub-questions. Applying the concept of decision making domains in urban environments, each sub-question relates to specific decision making domains of a city: the household; the service providers; and the city planning and urban management. The data generated with respect to each domain will be used to ascertain the rules and norms that govern these relationships across urban sanitation as a whole.

Essentially this thesis argues that, whilst some aspects of tenure do act as a barrier towards some aspects of urban sanitation development, this is not a blanket conclusion. Practically, this means that by taking a city-wide approach to sanitation one can identify which element(s) of the sanitation system are most appropriate to target given the tenure situation. The thesis also argues that current urban sanitation strategies aimed at stimulating household investment essentially overlook a significant segment of the urban population: those who are unwilling or unable to invest. The conclusions of this study are based upon primary data collected from a cross-sectional household survey and a series of interviews collected during 2008 in Dakar, Senegal.

To guide this study a number of research issues and existing literature are examined. The following topics are detailed in chapters two and three: the evolution of sanitation discourse; the sanitation challenges for high density urban environments; land tenure and urbanisation; the provision of basic services to informal settlements; land delivery mechanisms; and appropriate conceptual frameworks for sanitation and tenure research.

### **1.4. Key Concepts and Definitions of Terms**

This thesis is based on the interaction of two main concepts: sanitation and tenure. These are considered in an urban context where the household is placed at the centre of the analysis. These concepts are elaborated in greater detail in chapter two but to provide a sound foundation for this thesis they are defined from the outset.

'Sanitation' is defined differently across organisations. The UN Task Force, in advance of the 2008 International Year of Sanitation, defined *sanitation* as the collection, transport, treatment and disposal or reuse of human excreta, domestic wastewater and solid waste, and associated hygiene promotion where *basic sanitation* relates to the disposal of human excreta to prevent disease and safeguard privacy and dignity. It is the narrower definition that is used in the Millennium Development Goal monitoring system: the Joint Monitoring Program and it is the definition of *basic sanitation* that will be assumed in this research.

Sanitation facilities can be understood as both piped and non-piped systems. The term *on-site* is often used to describe non-piped systems however in light of the systems view of sanitation adopted in this research the term *on-site sanitation* can be a misnomer. This said the term '*on-site sanitation*' is still widely used; therefore both '*on-site*' and '*non-piped*' will be used interchangeably throughout this thesis, and used to emphasise the meaning.

The term '*tenure issues*' is often used to describe one of three aspects of tenure: land tenure legality, tenure status and tenure security. Tenure security is often taken to mean legal land tenure however as explained in more detail in section 2.4, this is not always the case. For this study, *tenure typology* will be used to describe land tenure and the legal right to hold land, rather than the fact of possession. *Tenure status* is used to differentiate between landlord and tenant. *Tenure security* describes an agreement between an individual or group on land and residential property and relates to *the right of all individuals and groups to effective protection by the state against forced evictions* (UN-HABITAT 2002).

The definition of the *urban*, *peri-urban* and *rural* environment is contentious as the boundaries can change depending on the factor of definition. Defining urban areas in terms of municipal boundaries, population size, density or access to services can all yield different results and affect who is considered to be part of the urban population. The *peri-urban* area is understood to lie between urban and rural but includes a mosaic of urban and rural characteristics. For the purpose of this research *urban* is based upon the population mass (i.e. size, density) as opposed to municipal boundaries as this was considered most relevant and representative for the research.

The survey took place in the department of Pikine, the largest of the four departments of Greater Dakar. The centre of Dakar-Pikine lies only fifteen kilometers to the east of Dakar and is essentially an extension of Dakar proper. Dakar-Pikine accounts for over half of Greater Dakar's population and shares similar population densities of Dakar proper. Dakar-Pikine hosts an array of traditional villages, established settlements with title and spontaneous occupations. The study reflects on the survey findings and the wider sanitation issues of the urbanised area.

The final two concepts important to this research are the *household* and the *plot*. The household is often adopted as the unit of analysis in development studies. On the other hand,

a plot is the unit used by urban planners to denote the geographical boundaries of land occupancy units. One, or several, households can live on the same plot. It is often impossible to know before physically entering a plot what the living arrangements are and the number of households under each roof or behind each door. Both units of analysis are relevant to this study. For the purpose of this research a plot was used to determine the physical boundaries of dwellings (i.e. geographical units identifiable by physical boundaries). The household, under the official definition in Senegal, is understood as one economical unit *or a group of individuals who live together and share all or any of their resources to meet their essential needs (ESAM 1995)*.

### **1.5. Originality and Relevance of the Thesis**

This thesis is an original contribution to knowledge in several ways. It is unique in its scope of focus on sanitation and tenure. Whereas previous research has touched upon single aspects of tenure or sanitation, this research breaks new ground by its comprehensive and empirical approach to both tenure and sanitation. Furthermore, it is original in analysing tenure issues along the sanitation system rather than focusing solely on sanitation access or technology. It considers for the first time, in detail, the dichotomy of providing household sanitation services for those who are unwilling or unable to invest. It provides empirical data to support the differences and relevance of considering *willingness to pay*, *ability to pay* and *willingness to invest* for urban sanitation services. In addition, it elaborates on the Household Centered Environmental Sanitation (HCES) and Sanitation21 frameworks by incorporating service providers explicitly and it is original in its attempt to merge the systems thinking of sanitation to the domain frameworks.

The subject of the thesis is also topical. The research coincided with the UN International Year of Sanitation in 2008 which was itself an acknowledgement of the current sanitation crisis. The study is presented at a time where sanitation is the most off track of all the Millennium Development Goals and when the majority of the world's population live in urban environments, thus it is hard to under emphasise how relevant a study on urban sanitation is. It is also presented at a time of increasing focus in the development community on property rights and their implications for development.

### **1.6. Structure of the Thesis**

This thesis is arranged in nine core chapters. This chapter has introduced the research, giving contextual background to the study leading to a statement of the research problem. The key concepts of sanitation, tenure and the urban context are defined to provide the foundation for the study. The originality of this particular study in explicitly addressing tenure and sanitation is also presented.

The second chapter presents a review of the current literature and documented knowledge relevant to this study, spanning both theoretical and empirical work. This section is split into three main sections considering the sanitation literature first, followed by the urban and tenure related work. Whilst the overlap between these two bodies of literature is not large they do meet relating to the provision of basic services to informal areas. This is the third body of literature discussed in the review. Several gaps in knowledge are identified and are explicitly stated in section 2.11. The chapter concludes with a statement of the main research question.

Chapter three constructs the conceptual framework for the research. This is done by presenting the key principles of several existing frameworks or models. These span both general development and sanitation specific areas and are presented chronologically allowing the influences of development to be seen in the evolution of the sanitation frameworks. The following are discussed: the New Institutional Economics; Sustainable Livelihoods Approach; the F-diagram; the Strategic Sanitation Approach; Household Centred Environmental Sanitation (HCES); Sanitation21 and Sanitation as a System. Each framework offers its own insights and limitations. These are considered before building the conceptual framework for this study. The following fundamental principles were adopted in designing the study framework: a central focus on household; ability to draw linkages from the household to the wider city level issues; decision making arenas; sanitation as a system; ability to consider formal and informal institutions; ability to consider property rights. The proposed framework borrows heavily from the Sanitation21 and HCES model using decision making domains to frame the urban context. A significant departure however from these models is the incorporation of the sanitation system with this model denoting the second domain of the urban environment to relate to the sanitation service provider as opposed to a geographical or organisational delimitation as is the case with the HCES and Sanitation21 models. Guided by the conceptual model, this chapter concludes by breaking down the main research question into three sub-research questions, each relating to a different domain of the city: the household; the sanitation service provider and the city planning and urban management.

The fourth chapter presents the methodological aspects of study. It follows the process of planning for research that starts with the epistemological and ontological position of the researcher and then proceeds to select an appropriate research design; where the research questions inform the design choice. Each stage of the research planning process informs the next to determine the appropriate research methods, data sources and sampling techniques to ensure the design responds to the research questions. The chapter concludes with a critique of the adopted methodology and its possible limitations.

Chapter five presents the study area by providing an institutional analysis to frame both the sanitation and tenure side of the study. For both topics the organisational and institutional settings are presented in addition to a brief outline of the relevant planning documents, national strategies and regulatory frameworks. In addition the different sanitation and tenure

options of the study area are presented. This chapter concludes with a review of the socio-economic impact of land titling in Dakar.

Chapter six presents the findings of the research. Guided by the conceptual framework identified in chapter three, the different decision making domains of the urban context are addressed in turn: the household; sanitation service providers and finally city planning and urban management. Data describing the first domain is informed by primary data collected during the household survey. Data describing the second and third domain is provided by primary data from semi-structured interviews. For clarity, the key findings are summarised at each domain level in addition to the overall chapter summary.

Chapter seven discusses the research findings against the wider body of knowledge. Again guided by the research framework, each research question is addressed in turn. The first research question deals with how tenure and sanitation relate at the household level. This is presented by discussing how the different elements of tenure (i.e. formal tenure; tenure status and tenure security) interact with household decisions with respect to sanitation. The second research question addresses how these interactions affect sanitation service provision. This section considers how sanitation services are delivered in the urban context and looks at the issues through two lenses: urban decision making domains and the sanitation system. The third research question aggregates the issues discussed with respect to the household and sanitation service providers and considers how these points impact upon the city planning and urban management; again applying the lenses of domains and the sanitation system. To conclude, the main findings are considered against the current urban transitions of: *urbanisation*; *urbanisation of poverty* and *the increased attention to property rights*. These conclusions inform chapter eight which considers what the implications of these findings are for conceptual thinking; policy and practice; and methodologies.

The main body of the thesis is concluded by chapter nine which briefly outlines the study, states the main conclusions and the wider contributions this research makes to knowledge. The limitations of the study are discussed, some of which inform the recommendations for future work. The chapter and thesis is concluded with a closing statement reflecting on what needs to be done to improve future urban sanitation developments for all.

## **1.7. Chapter Summary**

This introductory chapter laid the foundations of the thesis. The core research problem examining the nexus between sanitation and tenure issues was presented. The contextual issues of relating to both sanitation and tenure were outlined. The research is then justified based upon the relative neglect of research in this area and the potential implications of the findings. This chapter concludes with a descriptive outline of the overall structure of the

thesis. Based on these foundations, the following chapters proceed to comprehensively detail the research.

## 2. Literature Review

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### 2.1. Chapter Outline

This chapter presents the current knowledge and research relevant to this study. This study bridges two main areas of research: sanitation in development and tenure, which is closely aligned to urbanisation literature. The current knowledge is contextualised against the evolution of the related fields. The sanitation literature will be considered first followed by the tenure literature. Specific attention will be paid to the two areas where tenure and sanitation literature overlap: the cross cutting issues of investment behaviours and the interface between formal and informal areas. The chapter concludes with a summary of the main arguments and evidence found and a statement of the gaps in current knowledge that have been identified.

### 2.2. Defining Sanitation

As briefly addressed in the introductory chapter, there are numerous definition of the term 'sanitation' used in development, public health and environmental discourse. Even within development organisations such as the Joint Monitoring Program (JMP), the WHO, UNICEF and the Water Supply and Sanitation Collaborative Council (WSSCC) multiple definitions of 'sanitation' are used in an attempt to adequately capture and frame the issue. As the profile of sanitation has grown on the international agenda, the definitions of sanitation changed. Taigbenu *et al.*'s (1999) definition of sanitation used in the 2006 HDR Practical Action Occasional Paper (Dondo, Scott 2006) encompasses both the marketing aspects of sanitation on a social level in addition to continued maintenance of sanitary conditions. Taigbenu *et al.* (1999) define sanitation "as the promotion and prevention of disease by the maintenance of sanitary conditions and the safe management of human excreta."

In recent years the profile of downstream sanitation operations has increased, rightly so "as on-site latrine construction alone is not sufficient as the faecal sludge has to be disposed of on an adequate manner to safeguard public health and the environment" (Koné, Strauss & Saywell 2006). This shift in focus is reflected in the definition of sanitation adopted for the International Year of Sanitation (IYS) in 2008 by the Water Supply and Sanitation Collaborative Council and approved by the UN-Water Task Force on sanitation. The IYS definition of sanitation was "the collection, transport, treatment and disposal or reuse of human excreta, domestic wastewater and solid waste, and associated hygiene promotion" (UN Water 2008). Sanitation is being increasingly viewed in terms of dignity, privacy and a human rights issue: the United Nations defined basic sanitation for IYS as "the disposal of human excreta to prevent disease and safeguard privacy and dignity" (*idem.*). Most recently the report

*Sanitation: A human rights imperative* advocates for a human right where sanitation is defined as: “access to, and use of, excreta and wastewater facilities and services that ensure privacy and dignity, ensuring a clean and healthy living environment for all” (COHRE, WaterAid, SDC and UN-HABITAT, 2008).

The definition used in the Millennium Development Goals (MDG’s) is *basic sanitation*, where the JMP categorises an *improved sanitation* facility as one that hygienically separates human excreta from human contact (WHO / UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation 2010b). Under the JMP improved sanitation is considered as connection to a public sewer, connection to septic system, pour-flush latrine, simple pit latrine, ventilated improved pit latrine whereas unimproved sanitation systems are service or bucket latrines, (where excreta are manually removed), public latrines, and latrines with an open pit (WHO / UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation 2010b). This categorisation has been criticised as problematic as it does little to mention the quality or use of the facilities (Jenkins, Sugden 2006, Cairncross 1992).

Whilst the wider and evolving definitions of sanitation are very relevant, for the purpose of this research and comparability of the results, this study will focus on basic sanitation (i.e. the disposal of human excreta) using the JMP categorisations of *improved sanitation, shared and unimproved sanitation* (WHO / UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation 2010b).

## **2.3. Sanitation Discourse and its Evolution**

### **2.3.1. A history of sanitation and the evolution of sanitation paradigms**

To understand and frame contemporary sanitation, it is important to consider its evolution and inherent legacies. The origins of planned urban sanitation are often related back to the sanitary revolution of 19th century Britain and ‘the great stink’ of 1858. Edwin Chadwick, a key figure of London’s sanitary reform, argued the need for public health reform in recognition that disease was directly related to poor living conditions (Chadwick 1842). Chadwick understood disease transmission via the miasma theory which explained disease to be carried by ‘bad air’ the current theory of the time. The high incidence of cholera epidemics in areas of poor living conditions and foul water supported this argument. Chadwick argued that the safe removal of human excreta was essential and considered water as a transport mechanism which would allow for excreta to “*be most cheaply and innocuously conveyed to any distance outside towns*” and away from the population (Chadwick 1842). At the time water-borne sewerage was an effective solution to a city at crisis point. As such water-borne technology for excreta removal became the dominant sanitation solution and made a considerable impact on the public health and cleanliness of the city. Around the same time, John Snow proposed a

rival theory to the miasma theory: the germ theory, where pathogens or micro-organisms carry disease. Applying the germ theory, Snow traced the 1854 London cholera outbreak to a particular well in Broad Street, arguing that the spread of disease was not consistent with the miasma theory of transmission. Despite Snow's proof, the germ theory did not gain popularity until several years later, well after Chadwick's water carriage sewage technology was commissioned. Thus, the London sanitary revolution formed the baseline of conventional urban water supply and sanitation systems still in use today. This historical narrative is illustrated on a timeline of sanitation and development (with particular reference to Senegal) presented in figure 2-1 (adapted from Abeysuriya 2008 and Fisher, Cotton & Reed 2006).

### **2.3.2. Conventional Sanitation**

The water-borne flush systems connected to centralised sewers are primarily focused upon transporting excreta away from densely populated areas (McGranahan *et al.* 2001). These systems are characterised by large scale, highly engineered centralised infrastructure, where clean water is piped to the user and water acts as the transport mechanism to carry waste away by pipe and, in an optimised system, treated. Recovering nutrients from large volumes of wastewater is costly and problematic and therefore under conventional and centralised wastewater treatment systems, the nutrient properties of domestic wastewater are often disregarded (Wilderer *et al.* 2002). Chadwick was not ignorant of this but the London sanitary revolution coincided with Guano imports becoming available as an alternative source of fertilizer for agriculture, thus the importance of the nutrient benefits of wastewater was sidelined (Abeysuriya 2008). These origins of waterborne conventional sewerage consequently led to the institutions of water and sanitation being twinned.

Taking a fresh look at the sanitation problem Abeysuriya (2008) speculates if the germ theory had been accepted a few years earlier, or an alternative source of agricultural fertiliser was not available at the time to what extent would water-based sanitation have been as readily accepted? Would the mixing of faeces with vast quantities of clean water be considered the optimal solution? Perhaps, as Schertenleib (2005) points out, we may need to consider under current circumstances, if we are optimising the wrong sanitation system.

### **2.3.3. Urban sanitation solutions in developing countries**

Informed by the early approaches to sanitation, traditional sanitation thinking favours networked systems for densely populated areas stating reasons such as economies of scale, space requirements, ground water pollution and problematic emptying procedures. The reality of high-density urban settlements in the developing world context often excludes networked options in the immediate term and the prevalence of alternative solutions such as on-site sanitation are widespread and acknowledged as a viable alternative (Franceys, Pickford & Reed 1992).

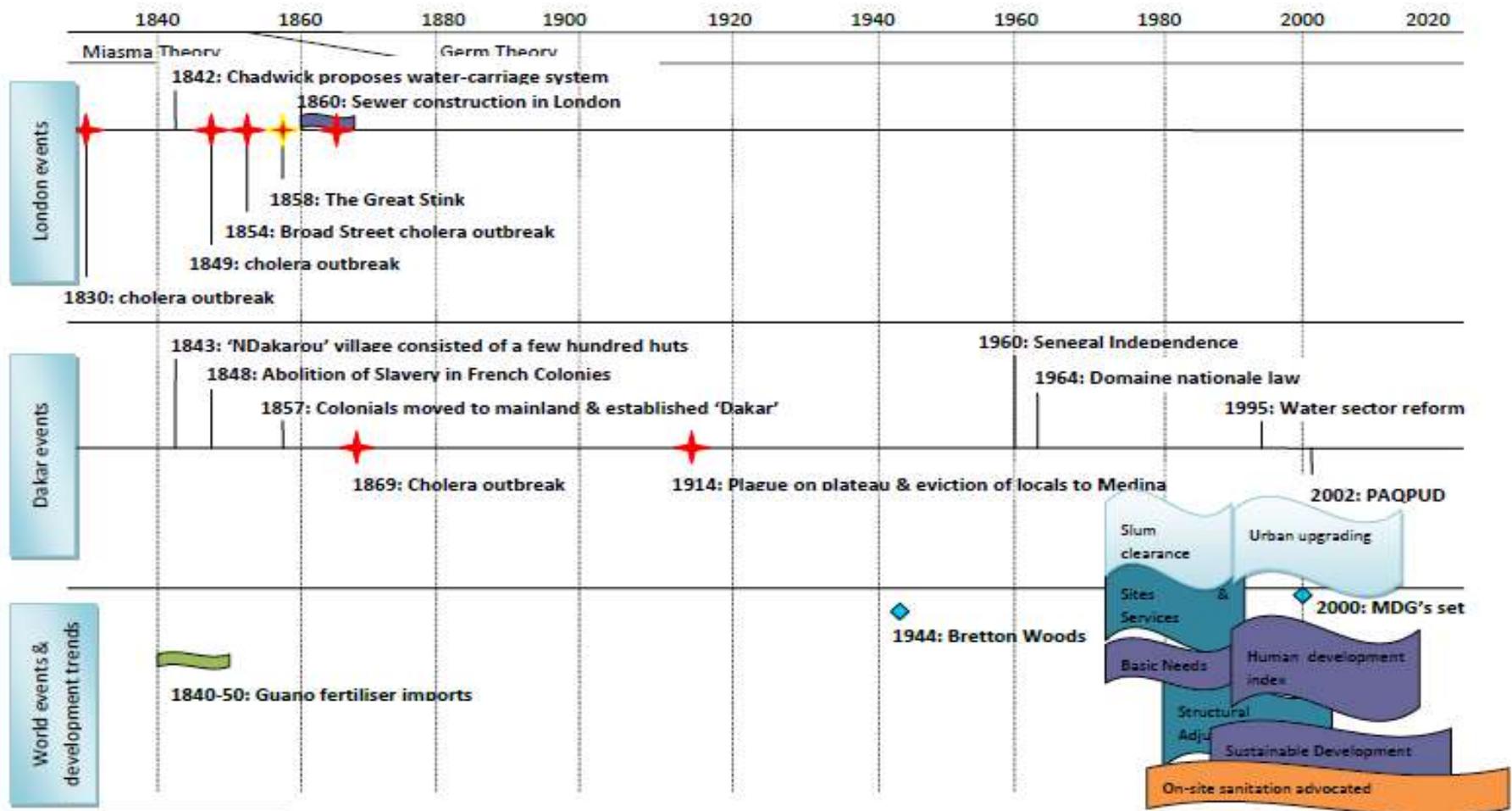


Figure 2-1: A timeline of Sanitation and Development looking at London, Dakar and key world events.

The literature sometimes fails to distinguish between sanitation technologies and sanitation solutions. Rather than repeat the technological characteristics of urban sanitation technologies, as it has been done elsewhere (Tilley *et al.* 2008), the following section considers the wider characteristics of urban sanitation solutions. Figure 2-2 characterises the various sanitation types found in today's urban sanitation landscapes. The information has been collated in such a way to underline that for a user to move up the sanitation ladder the advantages of a new sanitation option must outweigh the barriers of moving from the former system. What follows is a brief overview of the range of how urban sanitation services have been delivered.

### 2.3.3.a. Sites and services schemes

In the 1970s improvements to sanitation infrastructure fell under the general scope of programs aimed to improve living conditions of the urban poor mainly through slum upgrading. In the face of failure of previous housing schemes in the developing world, the *sites and services* schemes gained popularity. Sites and services were based upon a number of studies arguing for community upgrading and the recognition of the ability and common practice in informal settlements for low-income houses to build their own dwellings (see Laquian 1983). Recognising this practice the sites and services schemes, advocated by the World Bank, were promoted as the solution to housing problems in developing countries. The underlying principles were to provide a plot of land with basic infrastructure supply, where households would construct their own house using their own resources. The variations of sites and services included i) a plot with a utility wall containing connections for basic services (water, sewerage and electricity); ii) a plot with a latrine and iii) a frame / core house where a plot was provided with some basic dwelling structure (i.e. a roof, plinth or basic structure).

The first World Bank loan for an urban development project was the *Parcelles Assainies* project in Dakar, approved in 1972. This project aimed to construct conventional sewers within an urban development project. The *Parcelles Assainies* are discussed in further detail in section 2.6.2. Suffice to detail here that the overall project was fraught with complications and delays. In terms of the sewerage longevity, the required capacity was significantly underestimated, where the sewerage system is now heavily overloaded with between three and five times greater volume than anticipated (Cohen 2009).

	Conventional Household Sewerage	Simplified Household Sewerage (Condominial And Small Bore)	Improved Non-Piped (On-Site) Systems	Shared Non-Piped (On-Site) Systems	Unimproved Non-Piped (On-Site) Systems	Open Defecation Systems
<b>Technology</b>	Piped		Non-piped			none
<b>User Group</b>	Defined user-group <sup>1</sup>					n/a
<b>Capital costs</b>	Utility	Utility / Local organisation	User Household	Owner Household(s)	User Household	none
<b>Operational costs</b>	Utility / User Household	Utility / Local organisation / User Household	User Household			none
<b>Time horizon for investment and decision making</b>	Long term		Mid-term		Mid-short term	Immediate

Figure 2-2: Characteristics of different urban sanitation options

<sup>1</sup> this table does not include non-defined user groups such a public toilets

### 2.3.3.b. Low-cost sewerage

In an attempt to maintain the benefits of conventional sewerage whilst addressing the characteristics of low income cities (cost, lack of finances for large scale infrastructure, post urbanisation service delivery) an alternative solution has been developed; that of low cost sewerage systems. These fall into two main systems: settled sewerage and simplified sewerage, both of which use small diameter shallow sewers. Settled sewerage originated in Zambia in the 1960s. It uses a single compartment septic tank for solids at the household level. Settled sewerage is a means of conveying domestic sewage which has been settled in a septic tank or 'solids interceptor tank' (Mara, Sleigh & Tayler 2001, Mara 1998). Simplified sewerage is a similar system but does not include the interceptor tank. In Brazil a system of simplified sewerage was developed in the 1980s and is now used across Brazil and South America (Mara, Sleigh & Tayler 2001, de Azevedo Neto 1992).

In Pakistan, the Orangi Pilot Project (OPP) is one of the most widely known large scale non-governmental provision of urban sanitation in informal areas. The unique project of self funding and self-built low cost simplified sewerage in an informal settlement of Karachi, Pakistan had by 2001 benefited 92,184 families in 6,134 lanes, representing almost 90 percent of the whole settlement (Zaidi 2001). The project cultivated a sense of responsibility into the public domain where residents were encouraged to view the lane network as an extension of their property, which was critical to the lane-level maintenance model (Khan 1992). Residents and owners of low income areas demonstrated their willingness to pay for an improved sanitation level and contribute to its management beyond the private domain. The OPP is unique in its approach where the focus lies on the ability of people and communities to help themselves where the role of the OPP is restricted to an enabling and advisory role. It is important to point out however that the residents of Orangi had been guaranteed a security of tenure through no eviction from the government. Most of the residents owned the property where they lived. This factor is one of several questions relating to the particular conditions of Orangi itself<sup>2</sup> which may limit the model's reliability elsewhere (Zaidi 2001).

Dakar, Senegal has eleven settled sewerage systems scattered across the Greater Dakar region. This technology was originally piloted in the region by the NGO ENDA-RUP (Gaye, Diallo 1997) and later introduced into the PAQPUD national urban sanitation project. The implementation is still underway and has encountered some problems; as of April 2010, only five of the eleven settled sewerage schemes were operational, serving an estimated 2355 to 3246 households, falling short of the 7200 target (Norman, Scott & Pedley 2011).

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<sup>2</sup> Natural slope of land, majority informal owner occupiers acknowledged by government; education.

### 2.3.3.c. Household ‘on-site’ or ‘non-piped’ sanitation

Arguably the most common form of sanitation facilities in the developing world is on-site non-piped systems. The reality of unplanned urban settlements, intermittent water supply and capital intensive costs often precludes conventional networked solutions to many in these areas (UN-HABITAT, 2003b). As such, the prevalence of alternative non-piped sanitation facilities is widespread.

Whilst on-site sanitation may provide an appropriate alternative to piped systems (Franceys, Pickford & Reed 1992, Cotton, Saywell 1998) operation and maintenance (O&M) mechanisms are often sidelined both in planning and discussion in the literature. This is a considerable oversight as there is growing recognition that O&M activities are the critical elements of long term user satisfaction and sustained use (Jenkins, Sugden 2006). Without appropriate and affordable pit-emptying services, excreta is likely to be periodically disposed or flushed back into the immediate environment (Jenkins, Sugden 2006, Eales, Schaub-Jones 2005) thus undermining many of the health benefits of using a sanitation system at all.

These issues have raised questions about the appropriateness of the ‘on-site’ terminology as it tends to overlook downstream excreta management (Schaub-Jones 2005). The term on-site sanitation distinguished itself from piped systems (i.e. sewers) where the human waste was taken *off-site* and treated (Franceys, Pickford & Reed 1992). Early on-site sanitation systems advocated in development were technologically robust, using large tanks and twin pit systems essentially to avoid the need for emptying. As late, faecal sludge management (FSM) has received greater emphasis in the literature where the removal and safe treatment of excreta is discussed in its own right to complement appropriate technologies such as on-site sanitation (Havelaar *et al.* 2001). More recent discussions have begun to recognise the networks of sanitation services that exist within non-piped systems, where sanitation is built up of a component system. As such the term ‘on-site’ has become a slight misnomer; whilst the sanitation facilities are not connected physically to the sanitation network the sanitation service chain elements of FSM essentially act as a *mobile sewer*<sup>3</sup>.

### 2.3.3.d. Shared and public sanitation facilities

The term ‘shared sanitation’ currently encompasses two types of facilities in sanitation discourse: both public and private shared facilities. ‘Shared sanitation’ was introduced as a category in sanitation monitoring by the JMP in 2008 (WHO, UNICEF 2008). This was in recognition of the growing concentrations of low income populations, tenants and informal settlements; it is likely that more and more urban dwellers will rely on public or shared facilities (WHO & UNICEF 2006b). Shared sanitation is defined by the JMP as “*Sanitation*

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<sup>3</sup> Term used by Dr. Doulaye Koné (SANDEC), SanCoP3 meeting, London 2008.

*facilities of an otherwise acceptable type shared between two or more households. Shared facilities include public toilet” (WHO, UNICEF 2008).*

The most widely known successful example of shared public sanitation facilities are that of SPARC and Sulabh International. Sulabh International, an Indian NGO and the pioneering work of Dr Bindeshwar Pathak have provided quality sanitation facilities on a pay per use basis using a cross subsidisation method whereby public toilets in the city subsidise those in slums. The blocks are managed by Sulabh International and maintained through the funds collected from users. The first public facility was built in 1988 and now Sulabh runs several hundred public toilet facilities across several Indian States (Patak 2006). The model has since been exported to Bhutan and Afghanistan (*idem.*). SPARC favoured community toilets in their sanitation program in the expectation that the shared toilets made the housing units unattractive to middle-class buyers, thus reducing the possibility of gentrification (Burra, Patel & Kerr 2003). These examples demonstrate successful examples of well managed public (Colin, Nijssen 2007) and community toilets (Burra, Patel & Kerr 2003).

Less is known about private shared facilities. Multiple households sharing the same latrine facility are most common in Sub-Saharan Africa (WHO, UNICEF 2008) but are a sanitation solution worldwide<sup>4</sup>. An example of shared private facilities include the backyard tenants of South Africa, whereby tenants live in different types of dwelling but share the sanitation facilities with the main dwelling (Schaub-Jones 2009).

Wegelin-Schuringa and Kodo (1997) differentiate between two types of shared sanitation: two types of public latrine management options are discussed i) community run, communal responsibility or ii) pay and use (membership or one off) where management is handed over to a designated paid individual. In this qualitative study, based in Kibera (Nairobi, Kenya), Wegelin-Schuringa and Kodo (1997) conclude that in this context, a form of public latrine is the best option. Their reasoning is due to high density of slum areas, lack of secure tenure and the acute need for sanitation provision without a willingness to invest on behalf of the residents. In this context Wegelin-Schuringa and Kodo conclude that alternative solutions to the standard sanitation options are required. One specific case is detailed where increasing numbers of tenants move to one area (Kitui, Nairobi). Under the increase of tenant users of the communal block, cleanliness became more of an issue as tenants do not feel the same level of responsibility as owner occupiers. The Wegelin-Schuringa and Kodo paper highlights an important issue, that of user group in considering the management and decisions regarding sanitation infrastructure in low income urban areas.

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<sup>4</sup> Indeed many individuals and families in developed countries, under the definitions applied in this thesis, use shared bathrooms and sanitation facilities.

### **2.3.3.e. The unimproved and un-told sanitation solutions**

Whilst much development effort goes into improving sanitation and providing improved and successful sanitation solutions, the reality is that 2.6 billion people do not fall into the above categories and 1.1 billion people have no sanitation at all (WHO / UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation 2010b). Whilst open-defecation and the wrap-and-throw option are not considered as actual 'solutions' in terms of improving sanitation, they are for many the only option for defecation. The numbers practising open-defecation remain significant, notably in south eastern Asia and sub Saharan Africa, where open-defecation practice is more common in rural areas (*idem.*). Similarly, manual emptying of household pits is often overlooked in mainstream sanitation discourse whilst there is substantial evidence that demonstrates this is a widely practised solution.

It is widely acknowledged that sanitation solutions need to be context specific (population concentration and density; site characteristics; resources available; capacity of local government. This said a more detailed acknowledgement of the characteristics of the urban residents is often overlooked. Considering densely populated areas, the needs, priorities, willingness to pay for installation, operation and maintenance for sanitation of different urban residents are likely to be very different. Similarly the access and usage of sanitation facilities within a household may vary depending upon these relationships (Beall, Kanji 1999). For example, the decision mechanisms of an owner-occupier are likely to be very different to that of a tenant, the perspectives of both need to be better understood. Essentially the conventional understanding of the 'household' in sanitation may be inappropriate in the urban setting. This is especially relevant to current sanitation interventions as they often aim to address sanitation at lowest appropriate level, thus targeting the household unit. The appropriate unit for analysis for sanitation research is revisited in sections 4.6.1. and 8.3.

### **2.3.4. Demand-led Urban Sanitation Strategies**

The emphasis of sanitation interventions has witnessed a shift from top-down supply towards demand-led approaches (Cairncross 1992). This reflects a wider development dynamic of responding to the needs of the users. This said demand-led sanitation approaches are no silver bullet. The following section presents the main arguments and evidence relevant to the strategy of demand-led urban sanitation.

#### **2.3.4.a. Unlocking Demand**

Sanitation interventions constantly negotiate the paradoxical situation that, whilst disease reduction is the fundamental stimulus on the development agenda to improve sanitation, it is not a key motivator at household level (Jenkins, Sugden 2006, Jenkins, Curtis 2005, Evans, Hutton & Haller 2004). From the household perspective comfort, privacy, safety, convenience,

social status and cleanliness are more prominent drivers for householders to invest in sanitation than disease reduction (Cairncross 1992). The public and societal drivers for improved sanitation relate to personal motivations, the economic, development and environmental benefits of reducing excreta-related diseases and environmental damage (see table 2-1 below). The figure is populated from Jenkins and Sugden (2006) which compiles a number of case studies and project reports based on household interviews, surveys and group discussions in many different settings (Jenkins, Curtis 2005, Jenkins 1999); (Obika *et al.* 2002); (Mukherjee 2000); (Allan 2003); (Elmendorf, Buckles 1980); (D’Sousa 2005); (WSP-EAP 2002); (WSP 2004). The societal drivers for improved sanitation detailed in these studies are rarely quantified or ranked (Jenkins, Sugden 2006).

Household Perspective	Society-Public Perspective
<ul style="list-style-type: none"> <li>• increased comfort</li> <li>• increased privacy</li> <li>• increased convenience</li> <li>• increased safety, for women, especially at night, and for children</li> <li>• dignity and social status</li> <li>• being modern or more urbanised</li> <li>• cleanliness</li> <li>• lack of smell and flies</li> <li>• less embarrassment with visitors</li> <li>• reduced illness and accidents</li> <li>• reduced conflict with neighbours</li> <li>• good health in a very broad cultural sense, often linked to disgust and avoidance of faeces</li> <li>• increased property value</li> <li>• increased rental income</li> <li>• eased restricted mobility due to illness, old age</li> <li>• reduced fertilizer costs (ecological sanitation)</li> </ul>	<ul style="list-style-type: none"> <li>• reduced excreta-related disease burden (morbidity and mortality) leading to:               <ul style="list-style-type: none"> <li>○ reduced public health care costs</li> <li>○ increased economic productivity</li> <li>○ increased attendance by girls at school (for school sanitation) leading to broad development gains associated with female education</li> </ul> </li> <li>• reduced contamination of ground water and surface water resources</li> <li>• reduced environmental damage to ecosystems</li> <li>• increased safety of agricultural and food products leading to more exports</li> <li>• increased nutrient recovery and reduced waste generation and disposal costs (for ecological sanitation)</li> <li>• cleaner neighbourhoods</li> <li>• less smell and flies in public places</li> <li>• more tourism</li> </ul>

Table 2-1: Drivers for improved sanitation

### 2.3.4.b. Social Marketing

In current sanitation strategy there is a big push to ‘unlock demand’ at the household level by stimulating households to invest in their own sanitation. To this end and widely promoted in the urban context is the social marketing approach (Budds *et al.* 2002). The marketing approach to sanitation is based upon the commercial principles of marketing to induce change in consumer behaviour (Kotler, Roberto 1989). It considers sanitation beyond the health perspective and emphasises the key stage of human decision in the sanitation system. Social marketing principles encourage households to install, maintain and use improved latrines over basic systems (or open defecation). A fundamental assumption of sanitation marketing is that an awareness of the benefits of improved sanitation will translate to household investment in sanitation technologies and a changed behaviour in the target population (Budds *et al.* 2002). This assumption is contested by critics citing high density urban settlements as heterogeneous

and thus the ability, will and freedom of the target population to modify their infrastructure may vary considerably (Ling *et al.* 1992, Mulenga, Fawcett 2003) .

#### **2.3.4.c. Community Led Approaches**

Another approach to demand-led sanitation is the community-led approach where community support and organisation facilitates households to invest and build their own sanitation facility. Orangi is a notable example in that it was able to respond to a willingness amongst the residents to invest in sanitation infrastructure and build simplified sewerage throughout the settlement. For Orangi, external funding was used to support the intervention in terms of technical development, participatory research and education but it was the households themselves who invested in the infrastructure. Similarly, in the Medinipur Sanitation Project in West Bengal households were provided with support but invested in on-plot latrines themselves. These two examples are cited by Evans *et al.* (2004) as notable sanitation successes which do not include large scale public funding several hence are largely self-funded.

#### **2.3.4.d. Self-Build**

Whilst many sanitation intervention schemes target unlocking household demand, there is little recognition of millions of households across the world who continue to invest in sanitation without subsidy or sanitation intervention programs (Jenkins, Sugden 2006, Evans, Hutton & Haller 2004, Cairncross 2004, Jenkins, Scott 2007). Evans *et al.* (2004) underline the discrepancy in the 1990s between the reported number of people gaining access to sanitation and the official levels of investment which is understood by the JMP to be due to direct household investment. Self-build sanitation is the ultimate of the demand-led approach but it is rarely quantified and, due to its nature, may not meet the standards expected of sanitation interventions and targets. Understanding household investment in sanitation, either through supported interventions or entirely self-build, is important (Evans, Hutton & Haller 2004) and more systematic knowledge is needed (*idem.*). This said self-build household sanitation alone is not a panacea. Sanitation services cannot be handled by households acting independently; their decisions and investment need to be supported at the municipal level (*idem.*).

#### **2.3.4.e. Understanding Household Investment & Circumstantial Barriers**

There is also evidence that aside from the need to create a demand for sanitation, households are likely to face a number of circumstantial barriers in implementation (Budds *et al.* 2002, Jenkins, Scott 2007).

Jenkins and Scott (2007) consider the process of behaviour change for sanitation adoption using a preference, intention, choice model. The model fragments the adoption decision stages and factors affecting demand at each stage of the process of acquiring a household latrine. The empirical study found that despite a will to build household latrines, household situational constraints such as limited space, tenancy issues and lack of savings in some cases prevented the latrine construction (Jenkins, Scott 2007). Factors affecting willingness to pay for sanitation included income level; tenure status; existence of piped water supply; existence of level of payment for sanitation services; and dissatisfaction with existing sanitary arrangements (Jenkins, Scott 2007). It was found that tenants have very little control over the infrastructure where they live, where despite a preference to install a household latrine, situational constraints often prevented tenants from realising this (*idem.*) The study also concluded that tenant households are very unlikely to invest in a household toilet (Jenkins, Scott 2007). Jenkins and Scott argue the need to target sanitation interventions appropriately through understanding the incentives and restricting circumstances. Marketing alone is not enough to reach households which lack agency or incentive to invest. Rothschild (1999) suggests a framework where marketing should be used alongside other behavioural change tools such as education and law.

Tenant households, which are prevalent in many urban settings, present additional challenges (Schaub-Jones 2005). Few authors have addressed the tenancy issues with respect to sanitation. The previously mentioned study of Wegelin-Schuringa and Kodo (1997) found that the high tenant population in Kibera Nairobi expressed an unwillingness to commit to long term sanitation investments. Schaub-Jones, in a series of sanitation papers, argues the relevance and implications of tenancy to sanitation in poor communities (Schaub-Jones 2005). Schaub-Jones argues that under the self-help and community mobilisation sanitation strategies, the landlord becomes a service provider and the challenge is to incentivise the landlord to invest for better services for their tenants.

Whittington in his landmark work on urban residents' willingness to pay for sanitation services in Kumasi, Ghana notes that tenant households cannot act independently stating that:

*"tenants may try to persuade the landlord to install an improved sanitation system, and they may promise to pay a certain amount each month towards the cost but ultimately the decision rests with the landlord"* (Whittington *et al.* 1993).

To address this, a micro-credit scheme was generated to provide loans to landlords to install shared latrine units for their tenants, the repayments were collected periodically from the tenants. This had limited success due to overbilling of tenants, landlords using the loan as working capital, lapses in loan repayment by the landlord and a difficult financial climate. (Saywell, Fonseca 2006). The lessons learnt from the Kumasi scheme suggest future brokering strategies to finance sanitation between landlords and tenants, where loan administration procedures should be simplified with clear lines of responsibility (*idem.*). However brokering

this relationship is fraught with issues. Eales and Schaub-Jones (2005) recognise that a key challenge is that both transient tenants and landlords are difficult to engage with on a community wide scale.

These findings suggest a limited scope of applicability of marketing approaches for sanitation, as they may not reach those with limited choice, such as the poor and those with insecure tenure (Mulenga, Fawcett 2003, Jenkins, Scott 2007, Rakodi 1999). In addition, social marketing to date has mainly targeted the initial household investment and to a lesser extent the downstream operations - little is known of the financial arrangements and implications for operation and maintenance throughout the lifetime of a toilet.

A key challenge of the demand-led approaches is to understand the external social, environmental and economic factors which influence decision making and investment at the household and intra-household level (Beall, Kanji 1999, Budds *et al.* 2002, Hardoy, Mitlin & Satterthwaite 1992, IWA International Water Association 2006).

### **2.3.5. Characteristics of sanitation in relation to all basic services**

The provision of sanitation services is often twinned with water due to the institutional legacy of conventional water-borne sewerage sanitation. In practice however, especially where non-piped sanitation is concerned, sanitation and water have less in common. Taking a fresh look at the characteristics of all the basic services, non-piped sanitation may have more in common with solid waste management rather than water provision. If we consider the main basic services as: water, electricity, sanitation, solid waste disposal and telecommunication services. The later being included as a 2010 report from India suggests more people own a mobile phone than a toilet (UNU-INWEH 2010). A study by the World Resources Institute found that as developing-world incomes rise, households spend on mobile phones grows faster than spending on energy, water or indeed anything else (Standage 2009)<sup>5</sup>.

Water and electricity are services which are delivered, dispersed and consumed by beneficiaries. The services are desirable products therefore, if necessary, people will 'collect' the service from a common point (either legally or illegally) and are willing to pay for their access (Whittington *et al.* 1993, Whittington, Lauria & Mu 1989).

On the other hand, sanitation and solid waste services essentially follow the reverse of this flow. The service of sanitation or solid waste collection involves the collection of an often

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<sup>5</sup> Mobile phone sales have demonstrated a leapfrogging of technology, where fixed phone lines which were a key intermediate step in the developed world, were largely omitted in developing countries (Hamilton 2003). Pay-per-use mobile phone telecommunications and the large informal economy of selling airtime and fixing handsets that has been set up around it responds to the needs and means of a poorer populations, catalysing its development (Etzo, Collender 2010).

dispersed product which is in many cases undesirable and requires careful handling. Those associated in this work are also affected by the social taboos of un-cleanliness and undesirability. As with any basic service, these activities incur a cost which can be problematic if there is little opportunity to realise the value of the end product. To illustrate the differences between conventional and on-site sanitation systems, their characteristics are compared side by side in table 2-2.

Conventional Sanitation	On-Site, Alternative Sanitation
Twinned with water	Independent from water
Capital intensive infrastructure	Remains capital intensive although avoids the costs of networks
High operating costs	Manageable, lower operating costs, managed at household level.
Centralised management and structure,	Self managed at household level
Supply driven	Demand driven
Long term time horizons (planning & investment)	Short term time horizons
Specialist knowledge / engineering tolerances	Artisanal knowledge, multiple variations
Public domain	Private domain
End of pipe treatment	Treatment may be on-site, semi- or fully centralised.

Table 2-2: Characteristics of sanitation as a service

## 2.4. Measuring Sanitation and its Impacts

The lack of sanitation was acknowledged to be at crisis level since 1985 with the launch of the international drinking water supply and sanitation decade (UN General Assembly 1985). This has only since been compounded with rapid urbanization and population growth. The so called 'sanitation crisis' is primarily quantified in latrines per population where in 2006 an estimated 2.6 billion people, representing almost half of population of the developing world, lacked access to improved sanitation (WHO / UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation 2010b). The ambiguity of the JMP figures is widely acknowledged. Critics argue that the physical presence of a latrine is not an accurate indicator of universal access, usage or state of repair of the toilet facility (Shordt, van Wijk & Brikké 2004). In addition to those reported as lacking sanitation are the 'invisible' populations of informal settlements, many characterised by poor sanitation. Weakness in measuring sanitation is set against a wider paucity of official reporting mechanisms to understand and adequately represent conditions on the ground. Satterthwaite (2005) cautions of a significant under-estimation of urban poverty in official statistics. This is due to inadequacies in measuring urban costs of living and limited data availability in many (informal) urban areas. The reality of poverty conditions of these 'missing millions' is quite simply not recorded owing to their being off the radar of official governments and reporting mechanisms as these areas are not recognised by governments (Jenkins, Sugden 2006, Satterthwaite 2005). As such it is a safe assumption that the actual figures of those living without sanitation may be higher than

reported. This said, despite these difficulties of measurement, by default the JMP data remains a widely used and accepted benchmark.

Epidemiological studies have contributed to quantifying the sanitation crisis where the cost of the sanitation deficit is reflected in disease burden (Prüss, Havelaar 2001). The statistics outline a shocking reality. Globally, 88 percent of all cases of diarrhoea are attributable to poor water, sanitation and hygiene (Prüss-Üstün, Corvalán 2006). Diarrhoea accounts for 3.7 percent of global disability-adjusted life year (DALY<sup>6</sup>). In terms of mortality, 3.1 percent of all deaths globally were attributable to poor water, sanitation and hygiene (Prüss-Üstün *et al.* 2004). This is a disease burden that is carried almost exclusively (>99 percent) in developing countries (*idem.*). In 2000, unsafe water, sanitation and hygiene caused almost 1.73 million deaths; 68 percent of these were children (*idem.*). In past years methodological difficulties in establishing causal links between infrastructure at the household-level and health benefits have led to reservations regarding the viability of using health and disease data as a proxy for sanitation effectiveness (Cairncross 1992) and the direct linking of sanitation interventions to diarrhoea reduction (Fewtrell *et al.* 2005). This is largely due to the multiple and interconnected potential pathways of faecal-oral transmission as illustrated in the F-diagram (see figure 2-3).

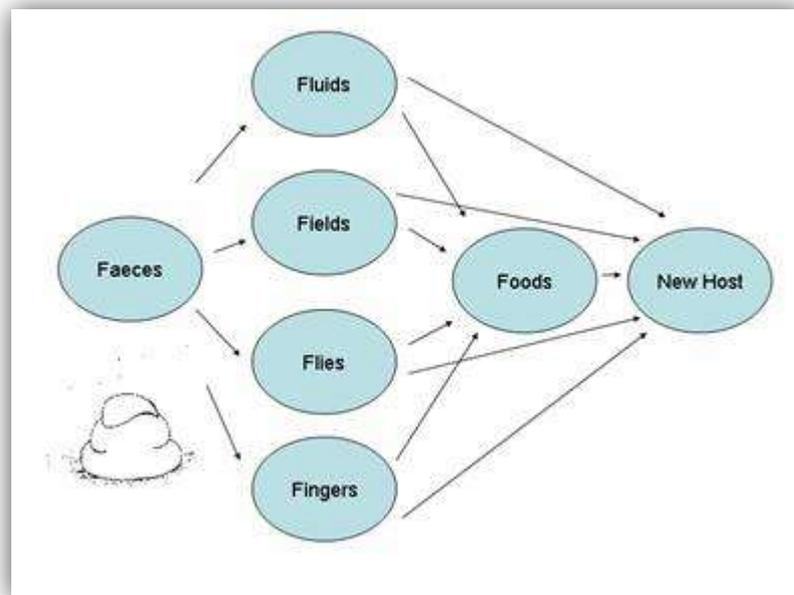


Figure 2-3: The F-Diagram (Wagner and Laniox 1958)

Nevertheless, empirical epidemiological studies attempting to prove this link are worthy of mention as they have provided a valuable foundation for the current WHO approach using composite risk factors of water, sanitation and hygiene. This evolution is briefly outlined.

<sup>6</sup> A measure of overall disease burden.

Several studies have claimed a positive relationship between the improvement in water supplies, sanitation infrastructure and hygiene behaviour in the reduction of diarrhoeal disease (Fewtrell *et al.* 2005, Esrey, Feachem & Hugues 1985, Esrey 1996, Moraes *et al.* 2003). More specifically, in a comprehensive literature review Esrey *et al.* (1991) found that latrine ownership was found to reduce diarrhoea by 36 percent. This finding was supported by a case-control study where patients with diarrhoea were less likely to live in houses with improved latrines (Meddings *et al.* 2004). Critics cite lack of plausible comparison groups (Fewtrell *et al.* 2005, Zwane, Kremer 2007), confounding factors in health improvements (Cairncross 1999) and wealth and education (Hoque 1995) as problematic. These methodological difficulties steered policy and research towards a more integrated approach where a composite risk factor of water, sanitation and hygiene reflects the faecal-oral pathogen load in the environment. This scenario-based approach is the method adopted by the WHO to quantify disease burden and relative water, sanitation and hygiene impacts (Prüss-Üstün *et al.* 2004). This approach categorises the faecal-oral pathogen load into *exposure scenarios*<sup>7</sup>: scenarios are assigned a relative risk using empirical knowledge of specific disease transmission pathways. In doing so the exposure scenario assumes a proxy for estimating disease transmission as the level of access to safe and adequate water and sanitation services (Fewtrell *et al.* 2007).

#### 2.4.1. Sanitation Monitoring & the Joint Monitoring Program (JMP)

The global Joint Monitoring Program (JMP) databases inform the Millennium Development Goals (MDG). Under the JMP, sanitation is primarily measured in terms of access to a sanitation facility. The basic indicator is expressed as the ratio of the number of people in urban areas with access to improved excreta disposal facilities to the total urban population, expressed as a percentage. 'Adequate' service provision is prescribed in terms of the facility's ability to safely manage excreta on a 'sanitation ladder.' The 'rungs' of the sanitation ladder range from open-defecation, unimproved sanitation, shared and improved facilities as described in table 2-3 and figure 2-4 (WHO, UNICEF 2008).

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<sup>7</sup> Scenario one represents the lowest theoretical risk, (i.e. no disease transmission through unsafe water, sanitation and hygiene). Scenario five represents the highest risk due to a high faecal-oral pathogen environment, typical for developing countries with less advanced water and sanitation provision.

The Sanitation Ladder	
Improved	Facilities that ensure hygienic separation of human excreta from human contact. They include: <ul style="list-style-type: none"> <li>• Flush or pour-flush toilet/latrine to: <ul style="list-style-type: none"> <li>- piped sewer system</li> <li>- septic tank</li> <li>- pit latrine</li> </ul> </li> <li>• Ventilated improved pit (VIP) latrine</li> <li>• Pit latrine with slab</li> <li>• Composting toilet.</li> </ul>
Shared	Sanitation facilities of an otherwise acceptable type shared between two or more households. Shared facilities include public toilets.
Unimproved	Facilities that do not ensure hygienic separation of human excreta from human contact. Unimproved facilities include pit latrines without a slab or platform, hanging latrines and bucket latrines.
Open-defecation	Defecation in fields, forests, bushes, bodies of water or other open spaces, or disposal of human faeces with solid waste.

Table 2-3: Definition of JMP sanitation ladder (WHO 2008)

Figure 2-4 presents trends in the proportion of the population using an improved, shared or unimproved sanitation facility or practicing open defecation, by MDG regions in 1990 and 2006.

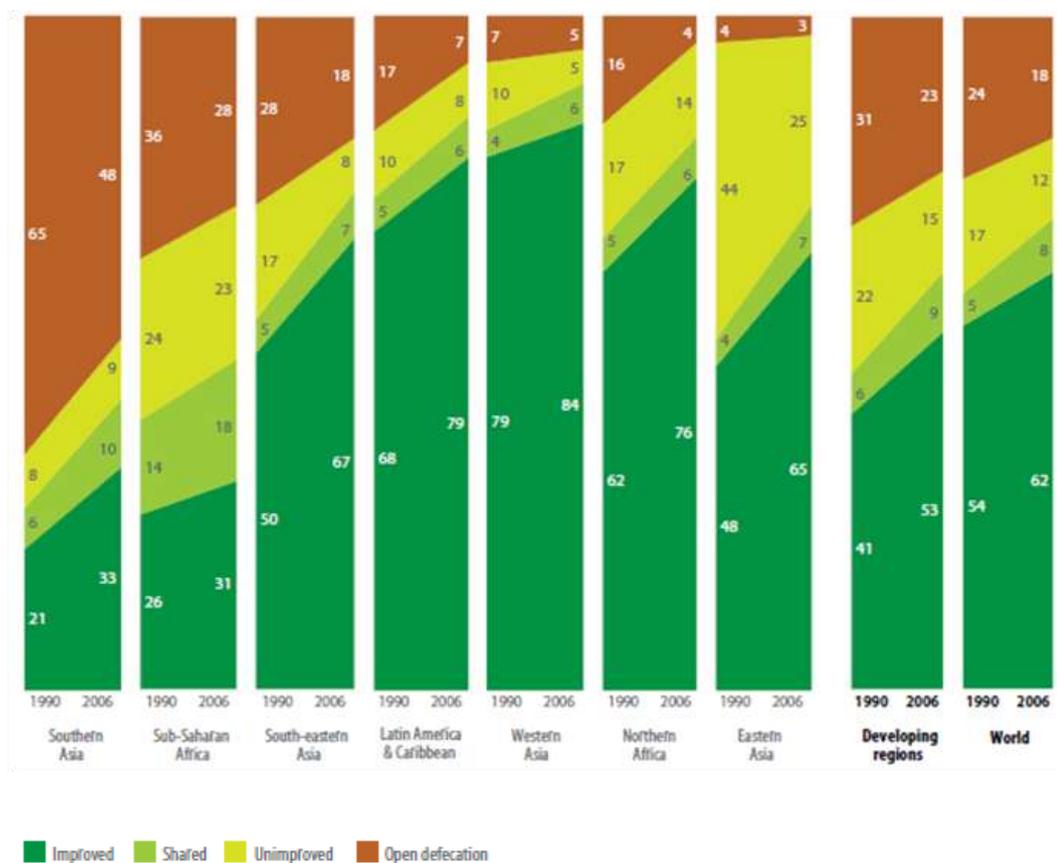


Figure 2-4: Sanitation coverage by MDG regions in 1990 and 2006 (WHO 2008).

Since the late 1990s data has been collected using routine surveys and censuses from households. Prior to this, the JMP data was sourced from service providers rather than the users themselves, thus omitting self-build household sanitation facilities. From 2000 measures were taken to address this, where monitoring shifted towards user centred data collected from household surveys. Household data is considered a more accurate representation of the actual existence and use of the sanitation facilities (WHO, UNICEF 2008). The main surveys which inform the JMP dataset are the Multiple Indicator Cluster Survey (MISC); the Demographic Health Survey (DHS); and the World Health Surveys (WHS). These surveys focus on physical location of a household sanitation facility. The MISC line of questioning focuses on the location of a latrine (i.e. within or outside the compound) whereas the DHS and WHS focus on presence and type of household latrine asking “*What kind of toilet facility does your household have?*” Comparability between these different surveys is often problematic, where it is difficult to establish trends over time and compare data across countries. This prompted the WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation (JMP) to advise a set of harmonized survey questions and response categories. These include the following questions regarding sanitation (WHO & UNICEF 2006a) :

- *What kind of toilet facility does your household usually use?*
- *Do you share this facility with other households?*
- *How many households use this toilet facility?*
- *The last time the youngest child passed stools, what was done to dispose of the stools?*

These core questions have subsequently been adopted by the DHS, MISC and WHS (*idem.*).

Whilst the JMP data are the most widely used and available, critics argue that it is not a realistic reflection of the actual situation. As Shordt *et al.* (2004) argue, supported by a history of failed sanitation interventions, the physical presence of sanitation infrastructure (i.e. latrine counting) is a poor indicator towards progress (UNDP 2006). Furthermore, inappropriate technology, lack of change in hygiene behaviour, overcrowding, poor operation and maintenance can significantly reduce the actual use and access of the facilities present (*idem.*) Another criticism is that the JMP is technology based, based on the definitions of improved or unimproved, rather than qualitative measurement of the sanitation service provided (Shordt *et al.* 2004, UNDP 2006). The reasoning behind this is that firstly, the physical presence of a latrine is known not to be an indicator of improved access.

A further criticism is that the MDG targets are static<sup>8</sup> but attempt to describe a dynamic process, thus do not reflect absolute change. Whilst some MDG sanitation figures show improvement, in terms of absolute numbers, the number of people living without access to improved sanitation now remains similar to that of 1990; trends in urban sanitation coverage show that despite a 779 million increase in urban dwellers who use improved sanitation

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<sup>8</sup> 1990 has been taken as the baseline year for MDG target.

between 1996 and 2006, this has failed to keep up with the overall urban population increase of 956 million worldwide (WHO, UNICEF 2008).

To address the shortcomings of JMP sanitation monitoring, complementary data sets have emerged. Mapping of sanitation was successfully used by the Orangi Pilot Project Training Research Institute to document the sewerage systems in the informal areas. Mapping was found to be an effective support and advocacy tool. The advent of geographical information systems (GIS) and global position systems (GPS) mapping techniques, which are becoming more widely available, is changing the way sanitation coverage is represented. WaterAid have developed a water and sanitation point mapping technique whereby the geographical locations of working water or sanitation facilities are correlated with official demographic information (e.g. population densities, administrative areas etc). The mapping exercise has proved a strong advocacy tool to visualise the problem and highlight the inequities of access, notably in the water sector (Welle 2005). These maps have proved to be politically sensitive in some countries as the mapping undermines the national assumptions on coverage. Sanitation mapping has been less prominent than water but examples are in Ghana and Nigeria where sanitation mapping is included. These complementary techniques advocate a focus of monitoring levels of equity in service delivery rather than physical infrastructure (Coates 2004).

Furthermore the scope of the JMP monitoring for sanitation is limited to access to sanitation; downstream operations, such as faecal sludge management are not measured. Whilst it is unjustified to judge a monitoring system on issues that are beyond its scope of objectives, the power of monitoring in terms of channelling development funds should not be underestimated. Donors are likely to support measurable objectives therefore any limitations in scope in monitoring may be reflected in subsequent development objectives. Downstream sanitation operations are often forgotten in sanitation interventions; much less is known about behaviours and realities of what happens 'beyond storage' (Schaub-Jones 2005). This situation could potentially be reversed if the entire sanitation system from user to treatment and disposal was included in global monitoring.

This concludes the review of the sanitation literature. The following sections 2.5 to 2.9 look at the body of literature pertaining to tenure issues. Key points of both bodies of literature are summarised in section 2.10.

## **2.5. Defining Tenure**

Before launching into a review of the tenure and urbanisation literature it is important to point out that land tenure, tenure security and tenure status (i.e. landlord or tenant) describe different aspects of tenure, where one does not necessarily lend itself to association with another. This complexity is briefly outlined below and in much greater detail as the chapter

progresses. In much of the urbanisation literature the concepts of formal land tenure and tenure security are used interchangeably. Tenure and property rights are however not the same. Payne (2005) explains the difference:

*“Tenure relates to how land is held or owned, or the relationship among people concerning land or its product. Property rights refer to a recognised interest in land or property vested in an individual or a group, and can apply separately to land or to development on it.”*

Formal land tenure relates to legal tenure rights recognised by the state land authority. Tenure security is a more elusive term to define (and discussed in more detail in section 2.8) but is generally understood to mean a lack of fear of eviction (UN-HABITAT 2002). There are several examples in the literature that demonstrate that providing land rights have improved tenure security (Payne, Durand-Lasserve & Rakodi 2007, Cantuarias, Delgado 2004). Nonetheless, as Durand-Lasserve and Royston (2002) argue, this does not mean that tenure security and formal tenure are one and the same. In fact Durand-Lasserve and Royston (*idem.*) argue that whilst formal land tenure can indeed improve tenure security for some, an intervention to provide land rights may impact negatively on some dwellers of a settlement. An example of this is explored later in this chapter where improving the formal land rights in a settlement has both positive and negative impacts on the tenure securities of groups of landlords and tenants (i.e. different tenure statuses). Moreover there are also examples where tenure security can be observed in the absence of any formal land rights. These brief points serve to illustrate the complexities of the relationships between the different elements of tenure issues which are explored in greater detail in the subsequent sections.

## **2.6. Tenure and Urbanisation Discourse**

This section discusses the history and evolution of tenure discourse and its relevance for this study. The section starts with presenting the arguments of relevance of tenure and property rights in urban areas and how this relates to economic development and investment. The main arguments of urban tenure discourse are considered such as whether it is *de jure* or *de facto* tenure rights which create the necessary security for investment. In reality, as demonstrated from the literature, it is more complex than this where it can be helpful to view tenure as a continuum.

### **2.6.1. The importance of tenure issues in urbanisation**

Urban poverty manifests itself in severe overcrowding, homelessness and environmental health problems caused, according to the United Nations Human Settlements Program (2003), by the worsened state of access to shelter and security of tenure. There are two major factors

compounding this problem: the rapid urbanisation of developing countries and the urbanisation of poverty. In a review of the dynamics of the urban landscapes in developing countries, Jones (2003) suggests these two dynamics (urbanisation and the urbanisation of poverty) are two of the three major contextual factors or 'transitions' which frame contemporary research and policy activities in the urban environment. The third transition, according to Jones (2003), is the increased focus on property rights on the international development agenda. These three transitions are discussed in turn.

- The first transition to frame the urban environment is the rapid urbanisation of developing countries. By 2025 an expected 80 percent of the population of developing nations is expected to live in urban areas (Jones 2003, Mooya, Cloete 2008, Mooya, Cloete 2010). Most of the overall urban growth is occurring in informal settlements (Flood 2002) because land in the formal sector is often unobtainable for many urban residents (Payne 2002, Payne 2005). Payne (2002) describes an exclusionary urban development where land markets and political and legal systems fail to meet the land and housing means and need of the urban poor. As a result, the estimated urban population in most developing countries currently living in informal settlements ranges from 25 to 70 percent (Durand-Lasserve, Royston 2002). This uncontrolled expansion of informal urban areas has major implications for urban planning, development and service provision.
- The second transition is the 'urbanisation of poverty' which describes the phenomenon where the number of poor people in urban areas is increasing at a faster rate than that of rural areas (Hardoy, Satterthwaite 1997). The dynamics of urban economies mean that resources (including land) and services are accessed at cost often making the poor more vulnerable to market 'shocks' (Jones 2003, Ruell, Haddad & Garrett 1999). Moreover the map of urban poverty can be superimposed on informal settlements with a fair degree of accuracy (Durand-Lasserve, Royston 2002). This has major implications for the living conditions of the urban poor and their access to land and basic services.
- The third transition is an increased focus on property rights on the development agenda. This results from the emergence of the field of New Institutional Economics (NIE) thinking and property rights focus within development discourse. Proponents of property rights and the importance of institutions (North 1990, Ostrom 1990) argue that institutions matter. The application of concepts central to NIE thinking by the likes of de Soto (1989) and the UN-Habitat Global Campaign for the Security of Tenure (UN-HABITAT 1996) in the developing world, focus on realising property rights for the poor making the link between poverty and property rights. This third transition is essentially a response to the first and second urbanisation transitions outlined above, in recognition of informal urbanisation dominating many cities of the South. This informal urbanisation is, in itself, a response to the lack of adequate and affordable urban land for the increasing populations living in urban centres. As a consequence there have been several land titling programs being implemented in many developing countries in the last decades (Payne 2002).

These three contextual factors are united under the current development objective: Millennium Development Goal seven – target eleven: to improve the lives of 100 million slum dwellers<sup>9</sup> (United Nations 2000). Werlin (1999) sets these contextual factors, *urbanisation*, *urbanisation of poverty* and *increased focus on property rights* against a history of development where infrastructure developments have been favoured over land tenure reform. Werlin offers three main reasons for this: firstly, countries are more willing to borrow for infrastructure than for land tenure because of employment and income considerations; secondly, planning and monitoring physical works are easier than land tenure and finally, to really improve the quality of lives of the poor, infrastructure investments are often critically needed (*idem.*). Over the last two decades there has been growing support from international donors of land titling programs towards the aim of improving property rights and reducing poverty (Payne, Durand-Lasserve & Rakodi 2007). Property rights and impacts of land titling schemes are generally considered in terms of investment in property, access to credit or trade on the real estate market (Besley 1995). For the purpose of this study it is the dynamic of investment in property that will be looked at in most detail.

### 2.6.2. Tenure security and investment

The causal relationships between land tenure, tenure security and investment are complex. Land ownership is, according to Durand-Lasserve and Selod (2007) essentially to be understood as a social relationship where different tenure arrangements exist with different degrees of informality and tenure arrangements constitute a continuum of rights. These tenure systems involve different degrees of tenure security which are not necessarily a function of their formality or informality.

The thesis that those without security of tenure are less likely to, or have less ability to, invest in their homes has been widely advocated over the last decades (Payne, Durand-Lasserve & Rakodi 2007, Payne 2002, Hardoy, Mitlin & Satterthwaite 1992, Turner 1977, Jimenez 1984, Malpezzi, Mayo 1987, Tipple 1996). This argument stems from the property rights discourse of North (1990) and Ostrom (1990) and widely accepted in conventional economic theory and generally supported in the literature (Payne, Durand-Lasserve & Rakodi 2007, Cantuarias, Delgado 2004, Besley 1995, Durand-Lasserve, Selod 2007, Field 2005, Lanjouw, Levy 2002, Van Gelder 2009). Understanding the significance of investment behaviours is important in relation to this study because at both the household and city level, sanitation is considered a capital intensive investment in a fixed asset. It is arguments such as these which feed into past and present national housing and upgrading strategies. John F.C. Turner (1977) was a key contributor to the early thinking on slum upgrading and urban housing investments. Turner argued slum residents would incrementally improve their

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<sup>9</sup> The data explicitly relating to slum dwellers is weak therefore the data relating to the world's urban poor is often adopted as a proxy for slum dwellers {{127 Durand-Lasserve, Alain 2002}}.

residences if encouraged by security of tenure and access to credit with minimal state intervention, leading to the concept of 'self-help' housing (idem.).

Critics of Turner's 'self help' approach caution that history has shown that self-help urban upgrading and 'less government' may be a myth (Werlin 1999). Werlin argues that by the end of the 1980s the long term and sustainable benefits of the slum upgrading programs were largely absent. Amongst other problems, the environmental and health risks caused by failed or unused sanitation infrastructure continued to be problematic (Werlin 1999). De Soto suggests that rather than Turner's model of 'less government,' what is needed is essentially 'responsible and effective government.' Others however continue to support Turner's 'less government' thesis stating that informal and spontaneous systems have in the past achieved far more than any official initiative (Van der Linden 1994). The intricacies of these dynamics continue to be debated as development organisations and governments grapple with how best to address the problems of improving the living conditions and livelihoods of urban slum dwellers.

Over the past four decades the argument of tenure security and investment has been unbundled. In an extensive study of land tenure for the urban poor, Durand-Lasserve and Royston (2002) underline the importance of security of tenure in this debate in stating that achieving security of tenure is the key to breaking the poverty cycle as it is intrinsically linked on multiple levels to accessing basic urban services and investment (Durand-Lasserve, Royston 2002). They argue that security of land tenure is a major and growing problem for developing cities in low- and middle- income countries. Research findings continue to suggest the element of Turner's thesis is true, that secure tenure generally leads to improvements both at the household and neighbourhood level (Durand-Lasserve, Selod 2007). However Payne *et al.*'s (2007) recent review of the outcomes of formal land titling programs discovered a concerning dearth of empirical evidence on this post intervention analysis, despite high levels of international interest (Payne, Durand-Lasserve & Rakodi 2007).

The processes in which housing investment is stimulated in developing countries is critical as, despite being rarely acknowledged in the general literature on poverty, much of the low-income population in the urban areas of low and middle income nations live in self-build houses or shacks (Satterthwaite 2005). To unbundle the debate on tenure security and investment, the tenure discourse can largely be grouped into two main perspectives on how tenure security is constituted; whether it is *de jure* (through legal titling) or *de facto* (from the absence of eviction) arrangements which provide the necessary tenure security for housing investment (Payne, Durand-Lasserve & Rakodi 2007). The reality of urban upgrading is of course less distinct than two exclusive arguments however this division is a useful way to understand the positions and evolution of influential tenure discourse. The following sections discuss these two perspectives on how tenure security is constituted.

### 2.6.2.a. Tenure security through legal tenure?

A guarantee of security of tenure and enforceable property rights is widely supported in the donor community as a precondition for improving investment, economic growth and improving the lives of the urban poor. Achieving tenure security through legalisation of tenure is a perspective that has been embraced in the past by international donor and finance organisations (e.g. The World Bank). This approach essentially advocates the integration of the informal markets into the formal ones through land titling schemes.

The history of urban upgrading is relevant both in terms of the main development debates but also in terms of the legacies various policy approaches have left over the past decades (Gulyani, Basset 2007). Following a surge in urban population the 1970s and 1980s, forced eviction was a common response to the growing unsanitary and overpopulated 'illegal' areas sprouting in cities (Dakar included); this did little but aggravate the problem and move it elsewhere in the city. By the late 1970s a number of physical slum upgrading initiatives aimed to address the problem more proactively.

Turner's self-help paradigm (1977, 1967) dominated early donor thinking on urban upgrading programmes, notably at the World Bank, which targeted housing (i.e. sites and services schemes). Donor projects focused on land titling and regularisation, physical upgrading of basic services and access to formal credit (UN-Habitat 2001). Senegal's Sites and Services Project was the World Bank's first urban project. Appraised in 1971, the Dakar Project included 400ha of sites and services providing 14,000 plots for 140,000 people in the *Parcelles Assainies* area of Dakar over a five year period. The project ran in to several severe problems due to misunderstandings and misconceptions between the World Bank and the Senegalese Government about the project objectives; severe delays in implementation; disagreements over design standards; low construction and occupancy rates (Independent Evaluation Group (IEG) 1983). Severe criticism ensued and the overambitious nature of this project was generally agreed. Following the *Parcelles Assainies* Project the World Bank urban program distanced itself from the policy debates about land use and the issue of urban form (Cohen 2009). More generally, the sites and services projects have been subject to several shortcomings often rendering them unaffordable or inaccessible to the lower income groups. More often than not, serviced sites ended in the hands of the rich, often after a series of land speculation and exchanges (Van der Linden 1986). Given their large expenditure, disputed economic consequences and considerable failure to meet the slum upgrading objectives, the World Bank abandoned these sites and services projects in the early 1990s (World Bank 2004). In hindsight, projects which attempted to simultaneously formal land tenure and basic infrastructure frequently failed (*idem.*) and the formal land titling process was acknowledged as a major source of delay for project implementation (Gulyani, Basset 2007). Payne poignantly summarises "*the irony is that regulatory frameworks established to achieve planned urban development have widely become a means of preventing this*" (Payne 2005).

Current donor upgrading policy decouples legalisation and infrastructure developments (Gulyani, Basset 2007) and is focused upon the broader objectives of poverty reduction, through supporting community based organisations (CBO) targeting context based sustainable livelihoods, rather than physical upgrading (UN-HABITAT, 2003a). This approach essentially revisits the self-help paradigm but through a social, rather than physical, lens, thus acknowledging the agency of the poor (Durand-Lasserve, Royston 2002). Critics claim this approach is vulnerable to laziness on behalf of those in the role of ‘enabler’ and as a consequence of which, the heterogeneity of an urban ‘community’ may be overlooked (Berner, Phillips 2003).

Slum upgrading regained popularity on the development agenda through the popular works of de Soto’s *Mystery of Capital* (2000) and the high profile of the MDG 7, target 11 to significantly improve the lives of at least 100 million slum dwellers by the year 2020 (MDG 2000). De Soto’s revival of the formalisation debate linked the property rights discussion to poverty alleviation (De Soto 1989, de Soto 2000). De Soto focused on formalising the relationship between economic development and the needs of the Third World for secure land tenure. The main argument of de Soto’s *Mystery of Capital* (2000) asserts that a formal title, or similar vehicle, is required to translate wealth tied up in the informal real estate or ‘dead capital’ into usable capital. De Soto’s claims that formal property rights have been key to the successful development of capitalism in the West through accountability, ownership and lending opportunities (De Soto 1998, 2000) have revived support for land titling programs and have been influential in several National and World Bank Policies.

De Soto’s work has been heavily criticised by several opponents for his arguments lacking empirical validity (Payne, Durand-Lasserve & Rakodi 2007, Durand-Lasserve, Royston 2002, Gilbert 2002, Fernandes 2002, Nyamu-Musembi 2006). Several have questioned his methodology and research and his failure to address the existing traditional land delivery systems and the power dynamics of colonial capitalist land delivery structures (Gilbert 2002, Fernandes 2002). A second critique of de Soto’s work is with respect to his thesis that formalisation of tenure increases credit opportunities, which in turn can be used for housing improvements and development. Several authors argue that this is an unjustified assumption as there is substantial evidence to demonstrate that formalised property rights do not necessarily lead to increased credit opportunities (Payne, Durand-Lasserve & Rakodi 2007, Durand-Lasserve, Royston 2002, Mooya, Cloete 2010, Gilbert 2002, McLeod 2001), housing investment and maintenance (Payne 2002, Gilbert 2002). De Soto’s work is also criticised for failing to take into account the plight of the poorest members of society under the process of gentrification which follows any land titling process (Home, Lim 2004). The counter arguments suggest that in many informal urban areas formal titling is inappropriate, unwanted and inequitable where other tenure options are available (Payne 2002; Durand-Lasserve and Royston 2002; Gilbert 2002). Payne (2002) argues that access to security of tenure through individual property rights is rarely efficient or equitable.

There is nevertheless evidence supporting the thesis that legal tenure stimulates investment. A Peruvian study claimed 75 percent of the surveyed population with property titles invested in their homes, versus 39 percent of those without formal titles (Cantuarias and Delgado 2004:9) however similarly to de Soto's work, the validity of their survey methodology and analysis have been questioned (Payne, Durand-Lasserve & Rakodi 2007). Payne *et al.* (2007) conclude that although titling is one of many means of encouraging investment in housing and land, it is by no means the only one. On the contrary some of the other expected benefits of titling may have the opposite to that desired.

A fundamental critique of the legal tenure argument is its assumption that providing legal tenure leads to tenure security. There are concerns that improving tenure security for some can actually impinge on the property rights of others (Durand-Lasserve, Royston 2002, Kumar 2001). There are additional dynamics that are not taken into account and critics argue that this assumption is often false (Durand-Lasserve, Royston 2002). Experience has shown that the poor often prioritise their ability to make a living over their formal land tenure and credit opportunities (Payne 2005, Turner 1967). Furthermore the ability of the urban poor to make a living often means occupying prime real estate land to be near their place of work. Land titling schemes of such prime real estate can encourage poor households to sell up to higher income groups and cash in their assets. Then the poor in need of shelter, re-squat elsewhere thus perpetuating, and even exacerbating, the problem (Payne 2005). Payne suggests a 'twin track approach' where any tenure upgrading program needs to be supported by methods to reduce the need for further slum formation. The key objectives of any such approach are to provide adequate security for the resident whilst remaining unattractive to the higher-income groups to avoid the poor cashing in. There are several potential forms this can take including a basic freeze on evictions, temporary occupation licences, communal or individual leases, community land trusts, communicable ownership and customary tenure (*idem.*).

In addition titling schemes to improve the tenure security in the formal rental market may also result in changes in market forces which may impact negatively on the informal rental sector, where tenants may be vulnerable to eviction, either directly or through market evictions (Durand-Lasserve, Royston 2002, Durand-Lasserve, Selod 2007). On the other hand, any interventions to strengthen the tenure security of the tenant can impinge on the property rights of the landlord. Distortion of the rental market is a real concern as rental housing (both formal and informal) represents sixty one percent of housing in Africa (UN-HABITAT, 2003a), where the most common form of rental is the self-help landlords who share similar socio-economic characteristics as the tenants. Tensions can arise in striking the balance between the interests of the landlords and tenants, as both groups, especially as most lack written agreements, are vulnerable to exploitation by the other (*idem.*). This tension between secure tenure for tenants and the property rights of the owners is also highlighted in the UN report (UN-HABITAT, 2003a) and the Global Campaign for Secure Tenure (UNCHS, 2001b: 11). It has been argued that rental housing can, and should, be encouraged as a viable alternative to homeownership, especially in developing countries (*idem.*). To do so, tenure-neutral policies

for both the tenant and landlord are needed and upgrading programs must find ways to engage with informal renting to succeed (*idem.*).

This revisits a concern raised previously regarding the non-heterogeneity of urban residents as in reality there is great diversity (Berner, Phillips 2003). In urban Ecuador, the findings of Lanjou and Levy (2002) indicate that titling programs may have more benefit for the recipients in areas which are more recent, disorganised, squatter communities, where care should be taken to include the most vulnerable households.

In response to the difficulties encountered in the early project and the growing body of evidence to support alternative and more nuanced upgrading methods, the World Bank's stance on formal legalisation has since relaxed and formal tenure is no longer viewed as a prerequisite for further improvements (World Bank 2004). This change in perspective fell under a general development consensus to retreat from top-down approaches towards a partnerships approach and unbundling of services. The alternative view of achieving tenure security through socio-economic development and securing incremental property rights follows.

#### 2.6.2.b. Tenure security through *de facto* rights?

An alternative approach to tenure legalisation prioritises socio-economic development, and doing so, recognises the tenure plurality that exists between informal and formal land markets. In a study of both formal and informal property rights in urban Ecuador, it was found that whilst formal titling did increase tenure security, in terms of household security informal property rights can act as a substitute, and thus both sources of ownership, (i.e. *de jure* and *de facto*) contribute to household security (Lanjouw, Levy 2002).

The argument that legal tenure is not a precondition for households to invest is supported by several recognised urban authors (Durand-Lasserve, Royston 2002, Razzaz 1993, Broegaard 2005) well as a growing body of empirical evidence (see table 2-4). A review of the literature underlines multiple factors which have been identified as contributors to the perception of tenure security in informal settlements. Leitmann and Baharoglu (1998) in a study of the *geckondos*<sup>10</sup> of Turkey observe that it is the footprint, the size and the age of the settlement which brings about tenure security to the residents. Other researchers support the view that the duration the settlement has existed is a contributory factor to tenure security (Jimenez 1984, Lanjou, Levy 2002). The provision of services and formal recognition by the authorities in the form of occupation permits known through the Orangi Pilot project (Khan 1992) are also recognised elsewhere (Payne 2002, Vélez-Guerra). Other factors include the balance between the degree of community organisation and the capacity of the government to deal with the

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<sup>10</sup> Term used in Leitmann and Baharoglu (1998) for informal settlements

situation (Payne 2002, Khan 1992, Durand-Lasserve, Royston 2002, Gilbert 2002, Leitmann, Baharoglu 1998). In Egypt the dominant factor affecting formal sanitation provision is the extent that a settlement is consolidated into the city fabric through size and age (i.e. *de facto* tenure), rather than formal tenure recognition (Payne 2002).

Factors Which Have Been Identified As Contributors To Tenure Security In Informal Settlements	Location	Study
Signs of goodwill by government officials; incremental tenure cards	Ahmedabad; Pakistan, Colombo, Sri Lanka	Payne (2002); WSP (2007); Orangi Pilot Project (1995); Vélez-Guerra 2006 ;
Provision of services and infrastructure	Ahmedabad, Pakistan, India; Colombo, Sri Lanka,	Payne (2002); Orangi Pilot Project (1995); Vélez-Guerra (2006); Leitmann, Baharoglu (1998)
Duration of occupation	Egypt; Colombo, Sri Lanka; Guayaquil, Ecuador; Turkey	Payne 2002; Leitmann, Baharoglu (1998) Vélez-Guerra (2006) Lanjow and Levy (2002)
Size of the settlement	Colombo, Sri Lanka	Leitmann, Baharoglu (1998) Vélez-Guerra (2006)
Ability to work outside the formal system without penalty	Turkey	Leitmann, Baharoglu (1998)
The degree of community organisation	Orangi Pilot Project, Pakistan	Payne (2002): Orangi Pilot Project (1995);
(In-)capacity of the government to act	Turkey	Leitmann, Baharoglu (1998)
Confusion about what is / isn't legal	Ahmedabad, Pakistan; Turkey	Leitmann, Baharoglu (1998); Payne (2002)
Housing self-improvements	Colombo, Sri Lanka	Vélez-Guerra (2006) Payne (2002)
The scale of informality	Turkey	Leitmann, Baharoglu (1998)

Table 2-4: Factors which have been identified as contributors to tenure security in informal settlements

These studies have identified that it is the dwellers 'perception' of their 'property status' that determines their security of tenure and investment decisions, above the formal property right (Razzaz 1993, Van Gelder 2007, Doebele 1978). Leitmann and Baharoglu (1998) claim that formal rules are largely irrelevant to those living in the informal settlements and argue that in considering informal settlements we need to focus on the sets of rules and incentives people actually live by rather than academic definitions. This inherently introduces a complexity of definition for tenure security, which will be discussed in section 2.8.

### 2.6.3. The reverse dynamic?

As has been discussed in the previous sections, the causal relationships and thresholds between either formal tenure or tenure security and consolidation are not easy to identify.

Although there is strong evidence to show that tenure legality is not a necessary precursor for housing investment, qualifying the strength of this relationship against other household factors is less determined (Van Gelder 2009). This is partly to do with a lack of consensus in definition of how tenure security is constituted. In unbundling these aspects Van Gelder (2009: 141) finds that:

*“Perceived tenure security, in the absence of legal status, is enough by itself to stimulate investment, but increases in legal status can significantly enhance this effect and people can be expected to consolidate significantly faster when their legal status increases, at least in circumstances similar to the barrio under study.”*

It appears that whilst security of tenure facilitates initial investment and consolidation, there may be an upper limit above which increasing security of tenure may be counterproductive (UN HABITAT 2003a: 108).

It is also important to highlight an alternative argument in the tenure security debate – that of investment in infrastructure as a strategic response in order to secure tenure (Gulyani, Basset 2007). There is some evidence to suggest that this may be a common strategy: in a study of an informal settlement in Jordan, residents invested in their homes to bring them more in line with official regulations to avoid demolition (Razzaz 1992). In the *Katachi Abadis*, of Pakistan, informal land brokers arrange and encourage investment of informal settlements which have become integrated into the city fabric (Khan 1992); in Brazil, where occupants invest in their land to a point that it is no longer feasible to be evicted (Payne 2002); and also in Dakar where the Baraka informal settlement has survived with the assistance of a local NGO by using housing and infrastructure to gain security of tenure (World Bank 2002). Payne (2002: 14) asserts that in many countries, it is the access to services and credit that is of greater concern to households. Obtaining this in turn increases the perception of *de facto* tenure security, regardless of their *de jure* status and ability to participate in formal markets.

## **2.7. The Tenure Continuum**

Traditional tenure and land delivery discourse uses the basic classifications of ‘informal’ and ‘formal’, or ‘tenant’ and ‘landlord’ (Durand-Lasserve, Royston 2002). In most countries, the majority of all housing and land development falls somewhere between these two extremes (Payne 2001). Recent thinking in tenure discourse is to go beyond this and consider tenure and land rights on a continuum from no rights to full property rights, (UN-Habitat 2003b, Durand-Lasserve, Royston 2002, Van Gelder 2007, Payne 2001). Using this continuum not only allows tenure to be discussed in terms of its component social relations rather than a dwelling or location, but also supports the point that people perceive their situation in a terms of a degree of legality rather than definitive ‘legal’ or ‘illegal’ (Kumar 2001). Importantly, the

tenure continuum allows home ownership to feature as one of many tenure options where it is acknowledged that maximising security of tenure is not always an option (Durand-Lasserve 2006). Tenure is contextually embedded; the impact of a tenure position on tenure security may differ from one location to another even in the same city (*idem.*).

Payne (2002) proposes a step-classification system to describe how tenure status and property rights contribute to overall tenure security of a given locality (see figure 2-5). The prevalence of different tenure groups (denoted by column width on the x-axis) is ranked against the (*de facto*) security of tenure available to those typologies (y-axis). Property rights held in each tenure typology are examined thus highlighting where removing a barrier to property rights may significantly improve tenure security for a specific group (Payne 2002).

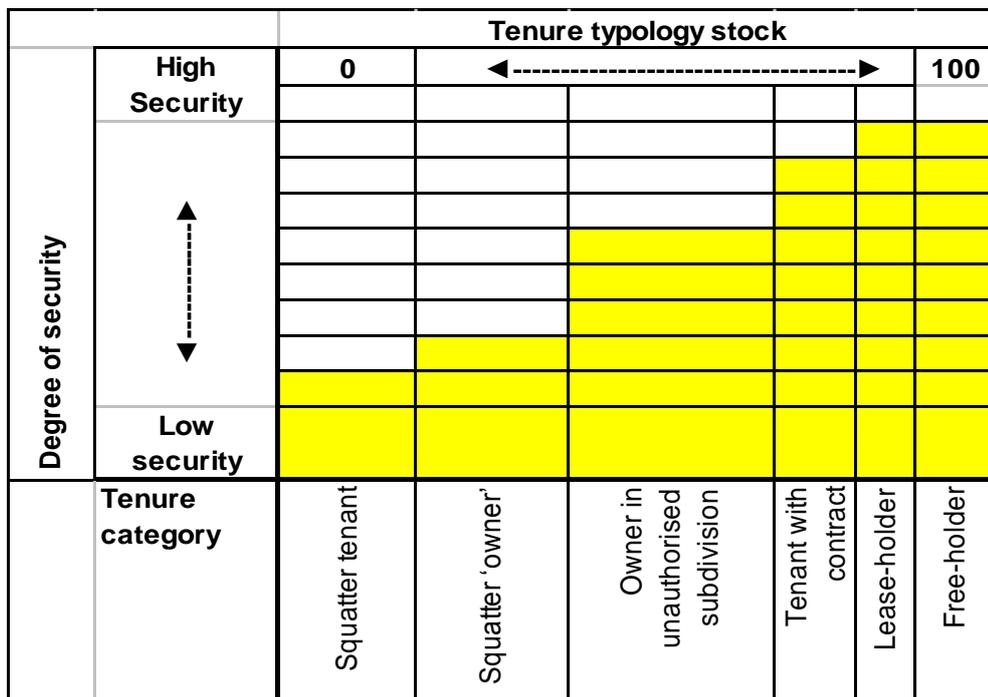


Figure 2-5: Tenure typologies and degree of security (Payne 2002)

Information was compiled based upon contextual evidence and information. It is a useful snapshot representation and documentation of property rights, tenure status and security of tenure to be considered at the individual level and can be used as a benchmark for future developments. However the model fails to include the tenure security of informal settlements provided through informal and customary land delivery systems. While the classic paradigm in land research is to consider the state as the dominant authority in land provision, with state acknowledgement offering greater security, in cases of strong informal institutions this may not always be the case. Customary land delivery mechanisms can provide various levels of rights in-parallel to the formal systems.

The informal-formal continuum must be conceived in a manner that acknowledges the coexistence of different tenure systems (UN-HABITAT 2002) involving complex relationships of informal and formal rights (Payne 2002). This is the approach of UN-Habitat and the UN Global Campaign for Secure Tenure (United Nations Human Settlement Program 2003). The UN Global Campaign for Secure Tenure (GCST) launched in 1999, adopts the thinking that security of tenure is indeed a prerequisite to social and economic development. It also is based upon the thinking that the provision of security of tenure has long-lasting positive effects on a wide range of stakeholders (UN-HABITAT 2003a). It is designed to improve the security of tenure for all, especially those living in informal settlements and slums. GCST aims to address these issues by advocating innovative legal frameworks and policies to strengthen tenure security for all, especially the urban poor (UN-HABITAT 2006).

Legal pluralism lies at the heart of the tenure issue (Lavigne Delville 2000) and adopting a pluralist approach recognises that tenure informality does not necessarily mean tenure insecurity (Durand-Lasserve, Selod 2007, Precht 2003). In addition, there is acknowledgement that the informal sector is not the chaotic, spontaneous sector it has been labelled (De Soto 1989, Turner 1967, Mangin, Turner 1968, Ward 1982). Non-state recognised land delivery mechanisms are evident across the globe and are supplying the land for the vast majority of demand (Cohen 2009, Precht 2003, Durand-Lasserve, Ndiaye 2008). It has been documented that many of these are well organized systems, often mimicking the formal land delivery processes and are meeting the needs of the population (Precht 2003). Furthermore during the past two decades, informal and customary land management practices have changed, adapting to the rapid spatial expansion of urban areas (Durand Lasserve 2003).

The following section describes the plurality of land delivery mechanisms in Senegal and their relevance in meeting the needs of the population.

### **2.7.1. Land Delivery Systems and Mechanisms in Senegal**

In the general discourse of urban planning and development spontaneous urbanisation is commonly described as 'informal' 'illegal' 'squatter' or 'slum' settlements. This generic classification masks a reality of a variety of land delivery systems in Greater Dakar, as in other African urban areas. In Greater Dakar land and housing categories are officially denoted by 'regular/legal' and 'irregular/illegal.' Those of the regular / legal category hold titles, permits or long leases; the irregular / informal houses lack a formal authorisation recognised by the state. An exception of is the 'traditional areas' that have been granted special recognition. Although considered informal, a distinction is made between 'traditional areas' and other informal types of land delivery. Consequently with official reporting the differentiation between very different types of informal environments becomes near impossible in Dakar. The continuum of land rights evidently exists where the main types of land delivery systems can be

grouped as follows: customary, neo-customary, informal and formal (Precht 2003). These are described below.

#### **2.7.1.a. Customary**

Under customary land tenure systems, tenure cannot be separated from social relations and the use of that land confers rights to it (Lavigne Delville 2000). Customary land ownership is understood to mean communal possession of rights to the land (Durand Lasserre 2003). In Greater Dakar customary land systems have been retained in approximately ten small traditional village settlements. In these 'traditional villages' the land is owned collectively shared between families along a hereditary line. Whilst the core of these areas have maintained customary systems the outskirts present a mosaic of formal, neo-customary and informal tenure systems (see below) (Precht 2003). This dynamic is seen across many urban areas where strict customary practices have been eroded and replaced by 'neo-customary' practices (Durand Lasserre 2003).

#### **2.7.1.b. Neo-customary & informal land**

In urban areas, customary land delivery is being progressively replaced by 'neo-customary' mechanisms which combine or re-interpret customary practices with other informal and formal practices (Durand Lasserre 2003). Neo-customary land delivery systems are distinguished from other informal land delivery systems in that they derive from customary origin (Precht 2003, Durand Lasserre 2003). Differentiating informal settlements in this way helps to explain the mechanisms and systems of current land and housing situation in many African cities (Durand Lasserre 2003). According to a nine-country case study, between 50% and 90% of the African urban population rely directly or indirectly on neo-customary land delivery systems to have access to land for housing (Durand Lasserre 2003).

Customary land becomes 'neo-customary' once it has been sold informally. From the legal perspective, neo-customary land is national domain land which is adjacent to the traditional villages that has been sold illegally. Under the customary paradigm, the land relinquishes the customary rights at the point of sale but maintains many of the social institutions associated with the transfer, such as trust and rights. In Greater Dakar a large amount of customary land was sold in the years preceding the 1964 law as many traditional landowners sold their land to avoid facing incoming land administration laws. This marked the beginning of the prevalent neo-customary land delivery system in Greater Dakar. A person who bought the land from a customary owner does not operate within the customary system but still remains within a non-written law and social institutions; his landholding is justified under previous customary ownership. In sub-Saharan African countries, given that a significant proportion of the urban

population rely on neo-customary practices, they are too widespread and too universal to ignore (Durand Lasserre 2003).

In Greater Dakar the distinction between 'neo-customary' and 'informal' land is difficult as land owners can claim a link to the original customary ownership (Durand-Lasserre et al. 2004). Precht (2003) distinguishes the two when illegal sub-divisions or occupation of land are made without customary justification, citing these as informal. The main motivation here is to make financial gain. For example, some title deed holders sub-divide their land in this way. In doing so, new developments will maintain conformity with planning regulations thus avoiding demolition but sidestep the lengthy formal planning procedures.

In Dakar the neo-customary and informal areas are widespread and it is these systems that meet the needs of a significant and growing urban population. They offer the option of buying (informal) land rights for a relatively modest sum (approximately one year salary of 500,000CFA) (Durand-Lasserre et al. 2004). New informal occupations happen in the form of increasing densification of inhabited zones and the expansion into new areas.

#### **2.7.1.a. Formal**

The formal tenure system of post-independent Senegal, as in other West African countries, is marked heavily by the colonial land-holding systems. As many other French speaking West African nations, land was nationalised thus abolishing the customary systems from the formal perspective. Formal land delivery has failed to meet the population's need where in 2000 it was estimated only 6 percent if the urban population of Dakar land needs were met by the formal system (Precht 2003).

Given its significance there is justification for the integration of the customary, neo-customary and informal land procedure into formal procedures. At present the situation and level of integration depends on different country settings. From the study of sub-Saharan Africa land practices, the governments of Uganda, Ghana and South Africa currently recognise customary land in a formal way; in Benin, Cameroon and Namibia legal recognition of customary land is limited to rural areas but customary land practices are tolerated in peri-urban areas; in Tanzania and Senegal however customary land is not recognised or is strictly limited to rural areas (Durand Lasserre 2003).

## **2.8. Measuring Tenure**

As the discussion thus far has detailed, the tenure debate is multi-faceted where tenure securities are layered through the primary rights on the land, legal tenure status and to the

occupancy status of the dwellings (Durand-Lasserve, Selod 2007). There are many operational, methodological, conceptual and institutional complexities inherent in defining the indicators for tenure studies (Laksa, El-Mikawy 2009). There are multiple layers of formality which can exist simultaneously. For example a dwelling may be built on formal land and awarded legal tenure status, and then later sold in the informal system, without transfer of the legal rights. In the context of Dakar, householders who own the dwelling on either formal or informal settlements are considered 'owners.' Tenants are defined as those who pay rent for their dwelling, either with or without a formal contract.

### 2.8.1. Measuring tenure security

Measuring tenure security remains a contentious and complex issue. For the Millennium Development Goals, indicator 32 refers to the proportion of households with secure tenure however quantifying this indicator has proved problematic. Despite several attempts, there is no universal, operational definition for security of tenure (Durand-Lasserve, Selod 2007, Laksa, El-Mikawy 2009). Furthermore the ambiguities over the definition of what constitutes *security* compounds the issue, making it difficult to determine what to specifically measure and how (Laksa, El-Mikawy 2009). It is for this reason that security of tenure indicator is omitted from the UN-Habitat slum definition indicators.

The operational definition of tenure security agreed during the Expert Group meeting on urban indicators is *"the right of all individuals and groups to effective protection by the state against forced evictions."* (UN-HABITAT 2002). Insecure tenure should thus be viewed as a risk of forced eviction.

It has been proposed to use two main components. Firstly, documentary evidence of secure tenure status and secondly, evidence of either *de facto*<sup>11</sup> or *perceived security*<sup>12</sup> from forced evictions (UN-HABITAT 2006). In an attempt to find consensus on this issue, the expert group meeting of urban indicators proposed a secure tenure index as a proxy indicator regarding both the household itself and the contextual environment consisting of legal and cognitive elements, they include:

- proof of secure tenure;
- perception at settlement level of secure tenure;
- annual evictions within the past 5 years (city and national level);

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<sup>11</sup> De facto security relates to actual evictions over the last ten years (UN-HABITAT 2003)

<sup>12</sup> Perceived security relates to household head's perception of secure tenure over the coming five years (UN-HABITAT 2003).

- women's equal right to secure tenure (household level);
- Existence of national / municipal provisions against forced evictions.

Attempts to quantify these points remain problematic (UN-HABITAT 2006). Durand-Lasserve (2006) considers that this is not through an underestimation of the importance of the phenomenon, rather through difficulty of definition.

The question of how to measure tenure security is revisited in chapter four, the methodology.

## 2.9. Provision of Basic Services to Informal Areas

Two bodies of literature have been covered in this review. This following section highlights where these two bodies overlap: considering the provision of basic services to informal areas.

Whilst it is suggested that the provision of basic services should not be linked to occupancy status (Durand-Lasserve, Royston 2002), the reality is that informal areas present both real and perceived barriers for service provision. The divergence of practices and perceptions at the formal-informal interface can act as a barrier to investment at settlement level (UN-HABITAT 2003a).

Barriers between the formal and informal sector are highly dependent on the historical, cultural and political contexts of any given country. In Buenos Aires a study found that conventional institutional frameworks impedes service provision to the informal sector due to both real and perceived barriers (Almansi *et al.* 2003) see table 2-5. The Buenos Aires study found that lack of land tenure is acting as a barrier to accessing water and sanitation services, yet there is no legal reason for this. Instead the absence of legal land tenure is used as a reason for poor service provision to informal settlements. Areas where work is more feasible are likely to be prioritised by government (Leitmann, Baharoglu 1998, Aguilar, De Fuentes & Ana García 2007) and there are strong incentives for governments not to work in informal areas (Evans 1995). Collignon *et al.* (Collignon, Vézina 2000) point out that

*“the concessionaires are aided and abetted in their reluctance by the official policy of labelling un-served areas as “unauthorized”, since such areas are automatically excluded from receiving public services — roads, water, electricity, sewerage, telephone. [...] The main result of the label is, in effect, to penalize residents for the inability of public authorities to cope with the urbanisation process.”*

In a review of service provision in ten African cities Collignon and Vézina (2000) state that there is a lack of appropriate urban growth policies to deal with the current reality. It is clear that conventional urban institutions favour formal land titling which is more likely to facilitate traditional cost recovery and therefore make investors less anxious.

Real Barriers	Perceived Barriers
Irregular layouts	Irregular layouts (assumptions of lack of space, lack of access)
Exclusively economic vision of service provision	Distance from formal networks
A fragmented institutional frame	Cost of construction of zones below the water table limit
Limited use of civil society organisations	Lack of confidence in recouping costs and payment for services
Tenure (due to administrative and technical barriers).	Tenure (if the real barriers are surmountable with other options)

Table 2-5: Example of real and perceived barriers Compiled from (Almansi *et al.* 2003)

Examples in the literature have shown that the perception of tenure security, even without formal land titling, has been sufficient to generate community activities and motivated community-based organisation to launch improvement projects such as sewerage lines, garbage disposal and street lighting (Payne 2002: 149). Some examples are detailed: In terms of sanitation, there are examples of provision to informal areas, notably the Orangi Pilot Project, Pakistan and Ahmedabad, India. In Orangi, upon being granted informal security of tenure, residents invested and constructed simplified sewerage to service 72000 homes (Orangi Pilot Project 1995). Similarly, in Ahmedabad residents were offered intermediate forms of tenure such as occupational licences, which do not allow the land to be sold but does allow improvements and upgrading (WSP 2007).

Leitmann and Baharoglu (1998) study claims that formal rules are largely irrelevant to those living in the informal settlements due to: i) the scale of the problem and incapacity of the government to act; ii) the ability to work outside the system without penalty due to loopholes and; iii) confusion at the municipal level regarding what was or was not illegal.

There are multiple pressures regarding spontaneous informal settlements, which can make life difficult for water and sanitation provision (Evans 1995). There is pressure to avoid difficult problems such as land tenure, cost recovery and community responsibility as development agencies are under pressure not to delay the lending process (Werlin 1999). In addition the weight of the political dimension of delivery of infrastructure to informal areas is often overlooked. Leitmann (1998) argues that political pressure is the key factor behind infrastructure delivery. Inherent in this is a political time horizon where there is a preference for visible and rapidly delivery urban services such as water, roads, electricity, solid waste collection, and transportation. Basic services such as sewerage and drainage are often more complex, and especially in the case of household sanitation developments are often invisible as they happen in the private sphere. This is compounded by the bias in urban planning and

upgrading literature towards conventional networked sanitation where several authors addressing the topic of informal settlements consider on-site systems as unsustainable and un-preferred (Precht 2003, Aguilar, De Fuentes & Ana García 2007).

### **2.9.1. Independent service providers**

There are both real and perceived barriers for service provision to informal and spontaneous areas as the previous sections have explored. Informal areas are often ignored by the city utilities for numerous reasons and often under the assumption that residents may be too poor to pay for their services. In fact, there is a strong body of evidence demonstrating that they are able to pay, but for a lower cost, lower standard, more flexible range of services (Collignon, Vézina 2000). Non-state providers, both formal and informal, play a large role in the provision of services to those in informal areas. These independent providers are becoming increasingly recognised as a potential effective means to provide services to the urban poor (Collignon, Vézina 2000, Sansom, Bos 2008). The World Bank's Water and Sanitation Program (WSP) has adopted an increasing focus to improve the involvement of independent providers as partners with formal utilities, with the ultimate goal of improving the supply of water and sanitation services to low-income and informal urban settlements (Collignon, Vézina 2000).

It has been found that rigid tariff structures are particularly problematic for poor customers (Sohail, Cotton 2001). In the WSP review of independent water and sanitation providers in African cities points out that whilst utilities cite barriers preventing their operation and service in the informal areas, independent providers not only overcome these barriers but thrive due to their flexibility and their responsiveness to demand (Collignon, Vézina 2000). WSP argues that the small scale providers respond to the way the urban poor needs services: reliably, and in small quantities which remain affordable when family funds are tight and income irregular (Collignon, Vézina 2000).

This service however comes at a price, where there is a stark difference in how much people pay. The unit cost from pay per use services is often much higher than private household services (Kjellén, McGranahan 2006). This is clearly documented with the inequity of prices of unit water costs. For water, pricing structures and costs vary dependant on the types of water source where customers of water vendors can end up paying excessively higher rates. As an example, in Dar Es Salaam the unit cost of water from the neighbours' tap was 3.6 higher, tanker water was up to 29.4 higher and a pushcart water vendor was up to 36.7 higher than the utility price that wealthier customers with household connections benefited from (idem.)

Providing basic services is often a competitive business, where cartels can be formed to prevent new people entering the market and fixing rates (Sohail, Cotton 2001). Although

Collignon and Vézina (2000, p. 2) suggest that “*in contrast to parastatal or multinational companies that seek new urban service concessions, these independent entrepreneurs reap no monopolistic benefits or rents. They must win their customers’ loyalty and maintain their equipment on a daily basis. They must be ready to innovate and adapt in order to stay in business in this competitive market*”. This said, existing cartels may not be apparent until there are attempts to challenge them (Cairncross , Kinnear 1991).

For sanitation services, since the level of non-piped systems is the dominant form of sanitation in developing country cities, private service providers dominate the market. Their services range from masons to build the facilities, pit emptiers and pay-per-use facilities. Their services are tailored to meet the needs of households and to suit different budgets. Figure 2-6, from the WSP review of independent service providers, illustrates schematically the range of sanitation services offered to low-income residents and other customers in Africa’s big cities.

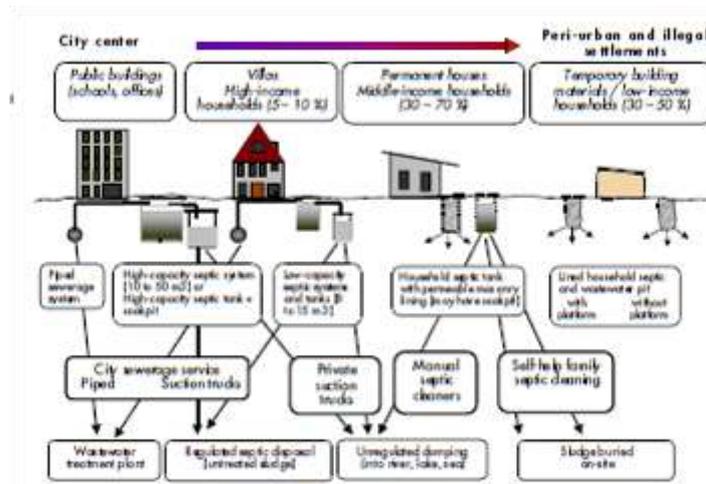


Figure 2-6: How the urban sanitation market works in African cities (Collignon, Vézina, 2000: 28)

This concludes the review of the literature. Before identifying the gaps in knowledge, the main arguments and concepts outlined from the review of literature are listed below.

## 2.10. Main Conclusions and Key Points of the Literature

The main arguments and concepts outlined in this review of the literature are:

- The underlying goal of sanitation is to safely contain excreta. Water-borne sewerage was derived from a city at crisis point where water provided the cheapest and easiest transport mechanism of removing faecal matter away from the city and its residents. Sanitation thinking today is influenced by these legacies.

- Several sanitation solutions have been tried and tested in urban environments of developing countries with varying levels of success. The most prominent urban sanitation solution is on-site non-piped sanitation.
- Moreover, the majority of these urban sanitation solutions are built without intervention or external subsidy at the household's discretion and cost.
- Demand-led sanitation focuses on unlocking demand and marketing sanitation at the household level.
- Sanitation, although institutionally linked to water, shares similar characteristics with solid waste disposal mechanisms.
- For the purpose of this study, three aspects of tenure are considered: tenure typology (legal, illegal property rights); tenure status (owner occupier or tenant) and; tenure security (fear of eviction).
- There is general consensus that tenure security is needed for housing investments but the literature deliberates between whether it is *de jure* (through legal titling) or *de facto* (from the absence of eviction) arrangements which provide the necessary tenure security for housing investment. For this reason it can be helpful to consider tenure on a continuum.
- Provision of basic services to informal areas is where the sanitation and tenure bodies of literature overlap; the literature suggests tenure presents both real and perceived barriers to sanitation provision to informal areas.
- There is increasing acknowledgement of the role of independent service providers as partners with formal utilities, with the ultimate goal of improving the supply of water and sanitation services to low-income and informal urban settlements.

The following section 2.11 discusses the gaps in knowledge that have been identified. This is followed by a chapter on conceptual frameworks in chapter three.

## **2.11. Identified Gaps in Knowledge**

The review of the literature has identified tenure to be one of several factors relevant to household sanitation decisions (see figure 2-7). Following a comprehensive review of the literature, there is a limited literature which addresses the distinct characteristics of sanitation in the low income urban context and how they relate to tenure. The disappointing achievements of the sites and services programs resulted in the consensus that basic services should be separated from urban upgrading and legalisation. As such, urban upgrading has since focused on providing basic services and stayed away from the complexities of land and management. Four decades later the literature still deliberates on the dynamics of tenure and access to basic services.

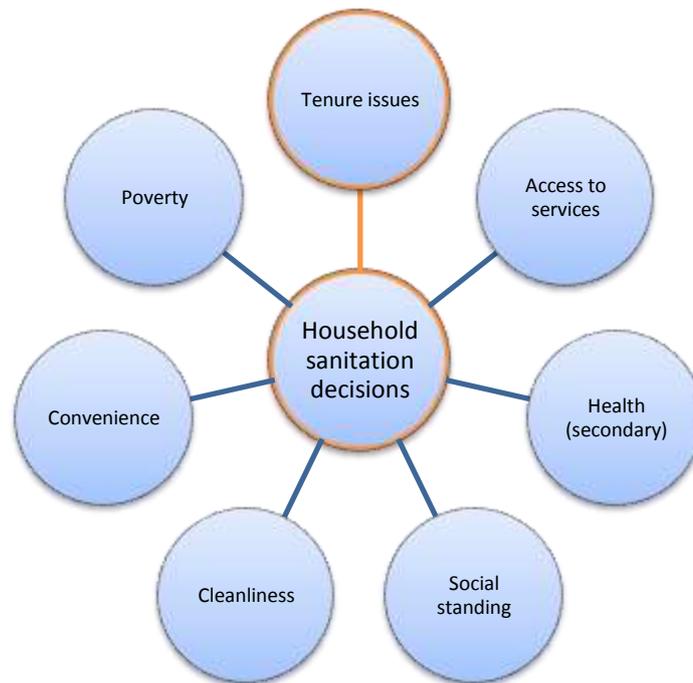


Figure 2-7: Drivers & barriers affecting household sanitation decisions

Specifically looking what is known in relation to the nexus between sanitation and tenure, the following five gaps in the literature have been identified:

- There is no consensus on the impacts of titling on access to urban infrastructure. This is further confused for sanitation as, despite having very different characteristics in terms of service provision, it is often bundled in ‘basic services’. Does formal tenure matter for sanitation?
- Tenants and rental housing arrangements are often neglected in development discourse (UN-HABITAT 2003a). Therefore models of sanitation management between tenant and landlord (i.e. investment, emptying behaviours) are also not well understood and documented. Does tenure status matter in urban sanitation and how do tenants, as urban residents, feature in the urban sanitation systems?
- Much of recent sanitation strategy has focused upon stimulating household investment and creating household demand. However little is known about household investment decisions and behaviour. Moreover with respect to tenure issues, the property rights thesis would suggest that tenure security is related to investment. Therefore an identified gap in knowledge pertains to household investment decisions and if the property rights thesis holds true with respect to sanitation.

- Despite recent interest, there remains limited knowledge with respect to downstream activities of sanitation, especially regarding the household decisions and drivers regarding pit emptying decisions.
- Finally, service provision to informal areas has been an ongoing dilemma for many governments, and sanitation being considered a capital intensive and large works service is often sidelined. Little is understood on how to improve service provision to informal areas and how to approach and manage city wide sanitation.

A review of the literature identified a gap in knowledge regarding the nexus of sanitation and tenure. This led to the desire for this study to address this gap by answering the main research question:

**Main research question:**

**What are the relationships between tenure issues and sanitation and to what extent do they affect urban sanitation development?**

In order to bring clarity to the debate, this study aims to unbundle the different aspects of both tenure and sanitation. Tenure exists on three levels: land tenure, tenure status (landlord or tenant) and tenure security. Similarly sanitation presents many different characteristics to other basic services and, in itself, goes beyond access to a toilet and encompasses both behavioural and decision factors and the downstream activities of emptying, removal, treatment and even re-use.

## **2.12. Chapter Summary**

This chapter has considered the two main bodies of literature relevant to this study: urban sanitation and the literature relating to tenure and urban regularisation. The evolution of sanitation discourse has been considered from the sanitary revolution in London to the present day urban sanitation solutions in developing countries. The review considers what sanitation solutions have been applied in the urban context but also underlines the prevalence of self-build household sanitation systems. The nature of sanitation as a basic service is also considered. The tenure literature is closely aligned with urbanisation where the importance of tenure issues in urbanisation are considered and how they affect access to basic services. The chapter concludes with a brief overview of the main and relevant arguments of the literature which inform where the gaps are in knowledge.

# 3. Constructing the Research Framework

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## 3.1. Conceptual Frameworks: An Introduction

This chapter considers potential conceptual frameworks to guide the research. Miles and Huberman define a conceptual framework as *'the researcher's map of the territory being investigated'* (Miles, Huberman 1985). Before selecting an appropriate conceptual framework for this study, the underlying principles and structure of several existing models, frameworks and theories are explored.

Several frameworks have been used to frame sanitation research and planning including F-diagram, the Strategic Sanitation Approach, Household Centred Environmental Sanitation, Sanitation21 and systems thinking. In addition two more general development approaches: the Sustainable Livelihoods Approach (SLA) and New Institutional Economics (NIE) are also discussed. SLA and NIE were chosen given their wider influence on development discourse. The aim of their inclusion is twofold; firstly, to frame the evolution of sanitation thinking against the wider development narrative and secondly, to provide a broader conceptual and theoretical background to this research thus contextualising the tenure and sanitation issues in the urban development context. The frameworks are explored in chronological order in an attempt to show the evolution of sanitation and development thinking over the past decades.

The key principles and processes of the existing frameworks are outlined below then, drawing upon the insights that these provide, the chosen framework for this study is presented. Applying the study framework to the main research problem guides how to break up the main research question into appropriate sub-questions. This section concludes with explicitly stating the main and sub-research questions to be explored in this research.

### 3.1.1. New Institutional Economics

The analysis of institutions involves the study of how rules shape human behavior and spans decades of development discourse. Rules or institutions can be formal and codified as law, or informal and exist as rules-in-use and norms. Researchers using an institutional approach focus on how individuals and groups construct institutions, how institutions operate, and the results generated by institutions. New Institutional Economics, originating with the work of Coase in "The Nature of the Firm" (1937) and "The Problem of Social Cost" (1960) incorporates the theory of institutions into economics.

New Institutional Economic (NIE) has been highlighted in section 2-6 in relation to the increased focus of property rights on the development agenda (the third transition to frame the urban context). New Institutional Economics (NIE) is an extension of conventional economic theory by focusing on the social and legal norms and rules that underpin economic activity. NIE differs from classical economics in that it rejects the assumption of costless transactions and gives meaning to informal and traditional transactions (Toye 1995). North (1990) pioneered institutional analysis as a paradigm to explore informal land delivery as an alternative option to formal systems.

NIE is based on a few concepts *“that are logically coherent and that provide powerful tools for delineating the questions to be explained and for shedding light on a large set of facts and relationships among these facts”* (Menard 2001) including theories of property rights and transaction costs.

Transaction costs consist of information search costs, the coordination costs and strategic costs. Originally the concept of transaction costs were used analyse the scale and the scope of the firm where Coase (1960) conceived the additional costs attached to operating in the market above the standard production costs were transaction costs. Transaction costs encompass all aspects of the contractual relationship of exchange.

Property rights define how property can be used. The conventional wisdom is that well-defined and secure property rights allow for lower transaction costs allowing the poor to operate on the formal market (Mooya, Cloete 2007), an argument which lies at the core of the de Soto thesis (2000). However, as discussed in the previous chapter, the literature deliberates whether it is de jure (legal) or de facto property rights which provide the security.

NIE rejects the assumption of classical economics that people make rational decisions based upon full information. NIE takes into account limited and incomplete information and humans limited mental capacity. People form institutions in response to deal with the incomplete information and imperfect transactions. However there is a great deal of variance in how people understand the world and people make their decisions based upon their bounded rationality - their environments, cultural and societal norms.

NIE lends itself to institutional analysis focusing on property rights and market economies. It is fundamentally an economic perspective where its strength lies in its ability to analyse these institutions with respect to the background social and legal underpinnings. From a NIE perspective, social institutions matter, and therefore NIE opens a forum to consider the interactions between formal and informal institutions. Opper (2008) suggests that the analysis of developing and transition economies opens up an opportunity to consider a critically under-researched topic: that of the relationship between the informal and formal and, which norms actually matter?

### **3.1.2. Sustainable Livelihoods Approach**

The Sustainable Livelihoods Approach (SLA) marked a significant milestone in international development strategy. Work on 'sustainable livelihoods' originated with Robert Chambers in the 1980s and formed a central concept of the UK's Department for International Development's strategy during the 1990s (Department for International Development (DFID) 1997). It was seen as an improved way of thinking about the objectives, scope and priorities of development. Since its appearance several other international development agencies have shown commitment to SLA. Thinking in terms of livelihoods considers poverty beyond financial indices and seeks to understand how the lives of the poor (most often rural poor) are constructed, where poverty manifests itself in multidimensional ways (Chambers 1995). SLA is based upon the rationale that an improved understanding of how poor people make a living will improve targeting of poverty reducing strategies. The key elements of the livelihoods approach are people's assets (both tangible and intangible, often described as 'capitals'); their ability to negotiate shocks in a context of vulnerability and the policies and institutions which reflect the priorities of the poor (Chambers, Conway 1992). The livelihoods framework places people at the centre, where the poor are considered as active agents, responding to external factors and events around them. Under the SLA framework, improving livelihoods seeks to strengthen people's control over their assets thus making them less vulnerable to shocks. Farrington (2002, 2001) suggests that the process of applying the SLA framework has multiple benefits and offers a prospect of bringing different sectors and disciplines together, adopting a set of underlying development principles for a common goal.

### **3.1.3. The F-diagram**

An early sanitation framework is Wagner and Lanoix's F- diagram (1958)<sup>13</sup> that considers sanitation as a system. The F-diagram, illustrates the major pathways of faecal-oral disease transmission emphasising that sanitation is a process of barriers to faecal-oral transmission. Cairncross (1992) advocates sanitation to be conceived as series of technology and hygiene barriers that constitutes a barrier to the faecal-oral contamination route rather than any singular product. It is an early approach to conceiving sanitation as a system which is discussed in more detail in section 3.17.

### **3.1.4. Strategic Sanitation Approach**

The Strategic Sanitation Approach (SSA) was originally developed by the UNDP World Bank Water and Sanitation Programme in the 1980s and documented in Wright's (1997) review. SSA is a comprehensive approach that engages with the social, technical, institutional and economic factors to achieve sustainable sanitation coverage in urban areas. The underlying

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<sup>13</sup> Presented in section 2.4

principles of SSA are that it is demand-responsive and incentive-driven where suitable technical and management solutions can be chosen. It requires implementing agencies to find out what potential users want and can afford and manage. Then to design systems, financing mechanisms, and support structures that are best suited to their needs (*idem.*). Wright (1997) introduces institutional thinking into sanitation and argues a demand-driven approach requires alternative institutional arrangements. Wright proposes two sets of actions to adopt a strategic sanitation approach. The first step is to develop an institutional framework to provide the incentive structure to induce key players in the sector to implement the policy. The aim of the institutional framework is to create incentives that are compatible with the investment goals and operational efficiencies. Wright (1997) argues that when institutional goals and incentives are well matched, individuals make decisions that produce rewarding outcomes. Once the institutional framework is in place the second step of the SSA process is to formulate a demand-based sanitation policy (Wright 1997).

Wright underlines the importance of low transaction costs as a prime consideration for developing an appropriate institutional framework. The challenge in developing an institutional framework for the sanitation sector is to achieve investment and operational efficiency with low transaction costs (1997).

SSA is also concerned with the unbundling of service delivery and management responsibilities along the supply chain from household to city. Vertical unbundling in this way allows financial and managerial responsibilities to be spread across the sanitation actors from household to municipal level.

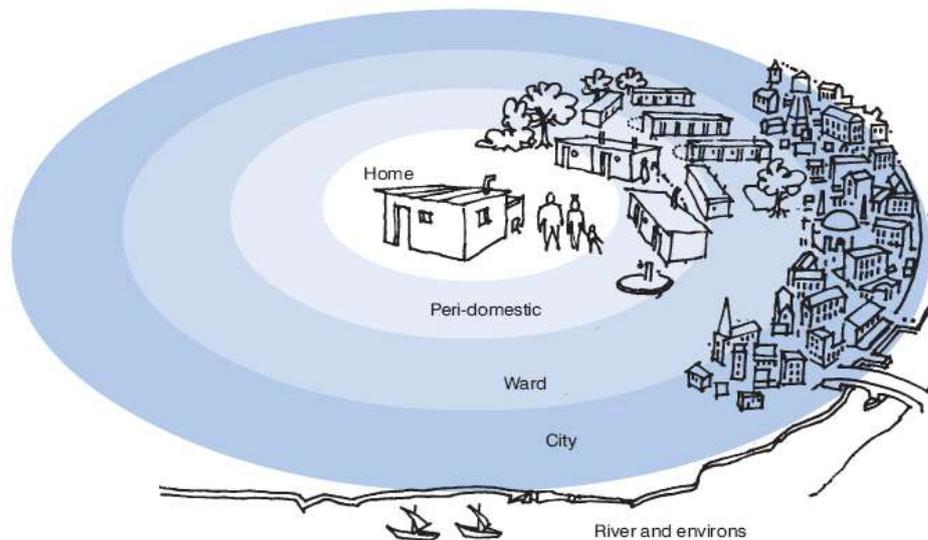
### 3.1.5. Sanitation21

Sanitation21 echoes some of the thinking of the Sustainable Livelihoods Approach, by placing the main development objective (i.e. the household) at the centre. It places sanitation (in terms of excreta disposal) within the broader context of environmental sanitation which addresses the aggregate nature of unsanitary conditions that increase the risk of disease. The concentric rings link the public and private domains of sanitation. This concept was first presented in the DFID / WELL manual proposing that

*“One way to see this in an urban context is to think about the environmental priorities of many city-dwellers. The first environmental priority for most families is a clean and pleasant household, followed by a better environment in their street, followed next by a cleaner neighbourhood; only after these are all satisfied can there be much real concern over the city-wide environment and beyond” (WELL 1998).*

This framework was later developed under Sanitation21 initiative and published in 2006 by the International Water Association from the task force on sustainable sanitation (IWA

International Water Association 2006). Its aim was to support the analysis and selection of appropriate sanitation systems. The Sanitation21 task force proposed that a better understanding of the context allows technical proposals to be assessed against institutional realities. The 'context' is split into four key elements: i) decision making domains ii) objectives iii) external factors and; iv) capacity. Under this framework several decision-making domains exist within a city. Figure 3-1 provides an illustration of this, although in reality, domains and boundaries can vary enormously with social and political norms and structures. In light of this IWA (2006) suggests the domains and boundaries are flexible given the situation.



**Figure 3-1: Sanitation21 – Environmental Priorities of city dwellers (WELL 1998)**

Contextual analysis under the Sanitation21 framework allows for each domain, the different objectives, external factors and capacities to be considered. The framework then provides a process designed to match a technological solution to the context and capacity of any given domain. Different technical options can be fitted to the context where the sanitation system is described as comprising of: a toilet, a collection mechanism, a transportation mechanism, a treatment process and a disposal/reuse mechanism. It is a relevant conceptual model as it gives a voice to the household, assesses demand and incorporates and links the roles of all of the stakeholders.

In the Sanitation21 (2006) document, tenure is identified as an external influencing factor on household decisions (IWA International Water Association 2006). Whilst this acknowledges a potential role of tenure in sanitation, the terms “land tenure” (p.16, p.26), “tenure security” (p.18), and “tenure status” (p.35) are used interchangeably, without clarification.

### 3.1.6. Household Centred Environmental Sanitation (HCES)

The Household Centered Environmental Sanitation (HCES) approach was developed as a planning model by the Swiss Federal Institute of Aquatic Science and Technology (EAWAG) and adopted by the Environmental Sanitation Working Group of the Water Supply and Sanitation Collaborative Council (WSSCC) in 2000. As with the Sanitation21 framework, HCES places the household at the centre of the framework and breaks the city into decision making domains (See figure 3-2.).

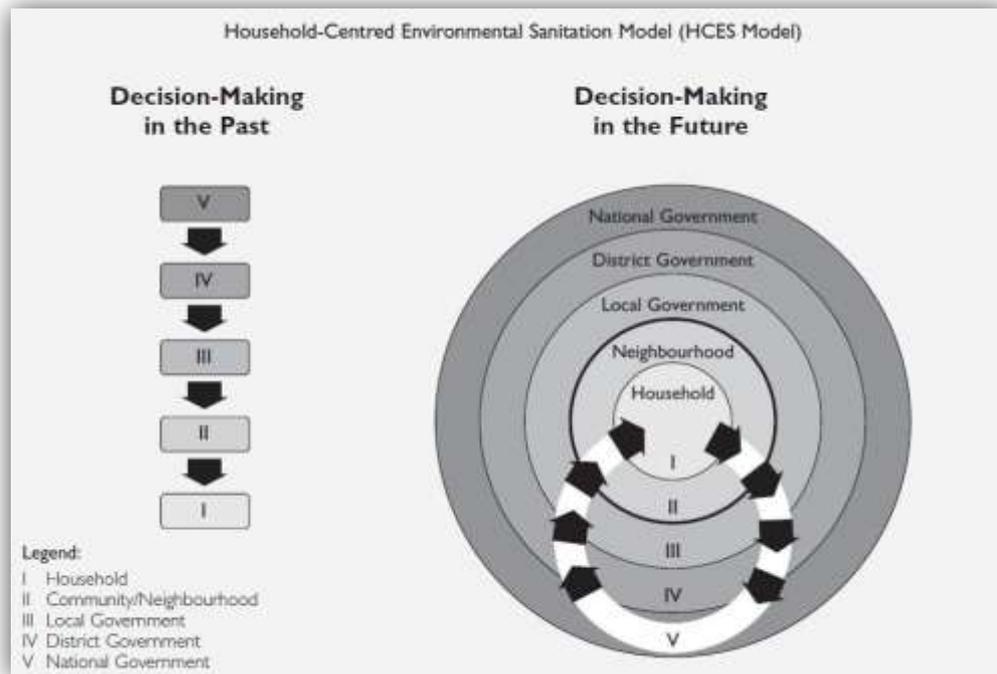


Figure 3-2: HCES model (Kalbermatten *et al.* 1999)

Based upon the Bellagio principles<sup>14</sup> (Hardi, Zdan 1997), the HCES framework seeks to correct previous failings of ‘business as usual’ approaches. HCES is based upon the principles that i) stakeholders are members of a zone; ii) stakeholders act within their zone; iii) decisions are reached through appropriate consultation with all stakeholders; iv) problems should be solved as close as possible to their source and finally; v) decisions, and the responsibility for their implementation, flow from the inner zones to the outer zones (Kalmermatten 1999).

The concentric rings visible in figure 3-2 represent decision making arenas. HCES places the preferences and the capabilities of the household at the centre of the framework, as such the decision-making process flows from inside to out. In each domain the social, economic and technological aspects of conservation, recycling and reuse of resources are considered. HCES

<sup>14</sup> The Bellagio Principles are practical guidelines to assess progress towards sustainable development providing a link between theory and practice.

was designed as a strategic planning tool to give a comprehensive analysis of urban environmental sanitation needs and a systematic approach to plan improvements.

### 3.1.7. Sanitation as a system

More recently systems-thinking has become increasingly prominent in framing urban sanitation (Tilley *et al.* 2008, Schaub-Jones 2005, de Bruijne, Geurts & Appleton 2007). This concept has been expanded to document the multiple stages of the sanitation process or system (Tilley *et al.* 2008, Scott 2008). Scott (2008) presents a systems flow diagram conceiving sanitation as a system as comprised of i) the user; ii) a 'device' for safely containing human excreta; iii) a process for safely containing and removing the excreta; iii) treatment or re-entry process back into the environment. Tilley *et al.* (2008) in the compendium of sanitation technologies define five functional groups of a sanitation system, illustrated in figure 3-3 below.



Figure 3-3: Functional groups of a sanitation system (Tilley *et al.* 2008)

Importantly, under the Tilley *et al.* (2008) and Scott (2008) models and unlike some other conceptual sanitation systems (de Bruijne, Geurts & Appleton 2007) the first stage of the sanitation process involves the user and human decision - a crucial point within the demand-led paradigm; the first stage of the sanitation system is a human decision to use, or not, a device to contain their excreta. The 'processing' stage (i.e. collection, conveyance and treatment) encompasses the multitude of ways of storage and transportation away from the source, which may involve multiple or no cycles, prescribed by the choice of networked or on-plot technologies. For example, in a physically networked system (i.e. conventional sewerage), excreta is immediately transported away and treated elsewhere; a simple bucket latrine is likely to undergo a very small (if any) amount of decomposition, then transport, then perhaps returned to the environment without full decomposition. Open-defecation essentially bypasses this process all together.

In the context of high density settlements, where the boundary between sanitation being a public and a private good is less clear (Cairncross *et al.* 1996), the route from excreta disposal to re-entry into the environment can be very condensed. Under these stressed circumstances technology, hygiene behaviour and social approaches to sanitation improvement need to complement, rather than undermine, one another.

The importance of considering the user behaviour as the first stage in the sanitation is advocated by Feachem *et al.* (1983) who suggest that latrine efficacy, in terms of health benefits, is determined primarily by whether or not sanitary facilities are used all the time by everyone (*idem.*) where the type of sanitation technology (if well maintained) is less significant (Feachem 1983, Waterkeyn, Cairncross 2005).

A practical application of systems thinking in sanitation is demonstrated in the WSP study of independent service providers where Collignon and Vézina (2000) present a citywide perspective, including different housing types and their respective sanitation technologies both improved and unimproved and how the downstream operations flow in sequence (shown in figure 2-8).

From the review detailed in chapter two it becomes clear that a significant amount of urban sanitation is organised by the household themselves and is not a publically delivered service. In addition it represents the scope and activities of independent sanitation services providers to low-income residents of African cities. This schematic representation is useful as it considers the 'citywide perspective' of both utility provided services and independent service providers in parallel. This could be expanded further to include shared or pay per use sanitation facilities. In addition, as this model is focused on service provision it cannot represent open defecation.

This concludes the presentation of conceptual frameworks, what follows is a review of the insights and limitations they offer.

## 3.2. Insights and Limitations

The main research question of this research is: **what are the relationships between tenure issues and sanitation and to what extent do they affect urban sanitation development?** To address this, the insights and limitations of the conceptual frameworks outlined above are considered here. This is followed by the identification of the main elements of the frameworks that are pertinent to answering the stated research question.

Applying a livelihoods approach would facilitate a good understanding of how people make decisions with respect to tenure and sanitation. It would place the focus on individual households or sanitation service operators. It could also provide valuable insight into the livelihoods of pit emptiers, notably those operating on a small scale and informally. However a livelihoods approach would not be able to place these findings in the context of the overall city planning and urban management. It would provide in depth knowledge of how peoples' lives are constituted but may fail to draw holistic linkages and relationships.

An institutional approach would facilitate a good understanding of the way rules shape human behavior. Applying an institutional approach would enable linkages to be drawn between individuals and groups, the institutions they construct and the resulting behaviors. It would provide a framework that links the individual to the wider urban context. In relation to this research, the combination of institutional approaches; an economics perspective through applying New Institutional Economics concepts would strengthen these linkages. Applying NIE concepts would not only give greater insight into the decisions people make but also give meaning to the formal and informal transactions, property rights and inherent transaction costs. This is of particular relevance in the urban context where both land and sanitation services operate in both the formal and informal markets.

The F-diagram is a model rather than a complete conceptual-theoretical approach. Its strength lies in the fundamental recognition of the purpose of sanitation: to break the faecal-oral route. This is a strong foundation which can form the basis of a framework however alone does not address the complexities of the urban sanitation and tenure problematic.

The strategic sanitation approach offers several interesting insights. Firstly, Wright (1997) applies an institutional approach to sanitation planning. Furthermore he underlines the importance of low transaction costs to incentivise all stakeholders (applying a concept central to NIE). SSA also promotes the involvement of non-formal institutions to serve as intermediaries between consumers and formal service providers. Finally the SSA conceptualises the sanitation needs of cities as a whole & introduces the concept of vertical unbundling of service delivery and management responsibilities along the supply chain from household to city. The strategic sanitation approach is, as many of the sanitation approaches outlined above, a planning model rather than a conceptual model. Experience to date has cautioned against the complexity of the model in practical terms (WSP 2000).

Sanitation 21 builds upon the demand-led approaches and places the focus clearly upon the household at the centre of the framework. It was devised in its inception as a planning model although does offer some interesting conceptual insights, most notably the idea of decision making zones. Different arenas of decision making are demarcated in Sanitation21 by the concentric rings of the model. It delineates different decision making areas and, perhaps more importantly, the interfaces between them. The Sanitation21 framework also highlights how external factors can influence decisions at different levels within the urban context. The Sanitation21 document identifies tenure as one such external factor, whereby confirming the applicability of this type of approach to the problematic of this thesis.

HCES also applies the concept of decision making zones and places the household at the core of the urban decision making arena. Again, HCES was conceived as a planning tool however in line with SSA, HCES attempts to apply a systematic approach to conceptualize the whole urban environment.

Finally, conceiving sanitation as a system has gained popularity in recent sanitation thinking and has several conceptual strengths. Firstly it gives greater attention to the downstream sanitation operations such as emptying, transport and treatment. This is important for two reasons, firstly that in the past downstream operations have often been overlooked in sanitation discourse and secondly, they are of greater importance in the high density settings. Secondly, systems thinking allows non-piped sanitation systems to be considered under the same remit as conventional piped-systems, where the emptying and transport mechanisms act as a *mobile sewer*. This echoes the thinking of the conceptual frameworks outlined above which allow the formal and informal institutions to be considered together under a city wide view.

A review of the existing literature has led to the conclusion that no one existing framework can sufficiently conceive the research problem. Applying any one of the approaches outlined above would highlight different aspects of the problem however limiting the approach to one could potentially leave the analysis vulnerable to the same conceptual limitations as previous work. There are commonalities between several of the frameworks outlined above where the SSA, Sanitation21, HCES and systems approaches complement each other. The concentric and systematic structures echo the wider holistic and people-centred development concepts (Chambers 1997). HCES offers a flexible framework where the different elements of the sanitation system and urban environment can be integrated. It does not however focus upon the underlying institutional dynamics which are needed to incorporate the tenure issues. SSA and the Sanitation21 offer greater insight here.

Based upon these strengths and weaknesses and how the conceptualisation of sanitation and urbanisation has evolved, the following key points are considered pertinent to the research question and necessary requirements for the chosen framework:

- Central focus on household / user
- Ability to draw linkages from the household to the wider city level issues
- Decision making arenas
- Sanitation as a system
- Considers formal and informal institutions
- Considers property rights

These elements are applied in building an appropriate conceptual framework for the thesis. As such, the following section outlines the chosen framework for the research.

### 3.3. Study Research Framework

By drawing upon several fundamental principles and strengths of various existing frameworks outlined above, a new framework has been constructed to guide this research. The proposed framework adopts several of the key principles discussed previously. Guided by the HCES and Sanitation21 principles, this framework adopts the concept of decision-making domains (see figure 3-4) to describe an urban context.

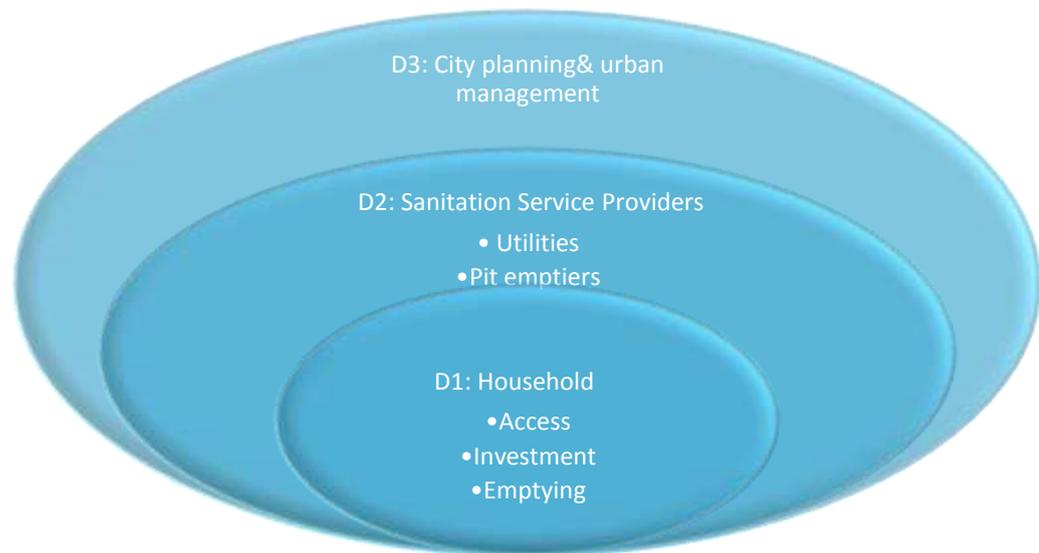


Figure 3-4: Decision making domains

The concentric rings relate to increasingly wider domains of the city as applied in the HCES and Sanitation21 models. A significant departure however is the incorporation of the sanitation system with this model; denoting the second domain of the urban environment to relate to the sanitation service provider as opposed to a geographical or organisational delimitation as is the case with the other models. Moving outwards in the concentric rings reflects a simultaneous move further down the sanitation system (i.e. the sanitation service providers) and encompasses a wider scope of the city sanitation and urban planning. The domains are defined as D1: the household; D2: sanitation service provision and D3: City planning and urban management. The concentric structure of the framework places the household in the primary domain of the study (D1). Household members are considered as active agents, where the household is influenced by, and in turn influences, other arenas of the urban environment.

A matrix will be used to guide the enquiry for domain one (D1) systematically through the multiple elements of both tenure and sanitation. This is detailed in section 4.6 of the methodology. The second decision-making domain (D2) considers the next stage of the sanitation system (i.e. sanitation service provision). Both the sanitation utility and small scale entrepreneurs (both formal and informal) are grouped at this level. Finally, the outer decision-

making domain (D3) considers the wider city planning and urban management issues and decisions.

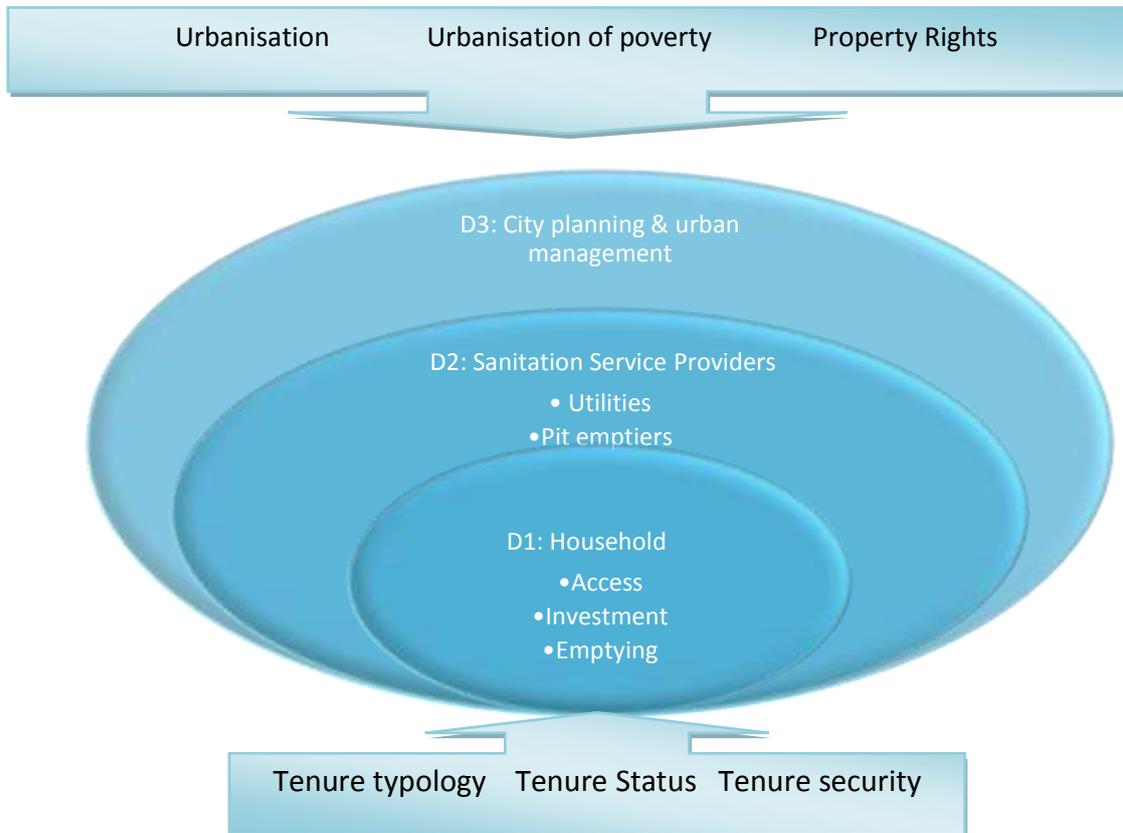


Figure 3-5: Study framework

The model is framed by the three transitions of the urban context (Jones, 2003): urbanisation, urbanisation of poverty and property rights which will explicitly place the model in the urban context. Guided by the principles of NIE, the institutional concepts of formal rules, informal norms and incentives are useful to describe each of the domains and their interconnecting relationships.

The proposed framework for the research is shown in figure 3-5. Sub-research questions (outlined below) will address each domain respectively.

### 3.4. Research Questions

As previously stated, the main research question of this research is: **what are the relationships between tenure issues and sanitation and to what extent do they affect urban sanitation development?** To adequately address the question, the study framework guides us to consider decision making domains. Therefore, applying the framework to the research problem the main research question can be broken up to reflect the domains of the household (D1); the service provision (D2) and the city planning and urban management (D3), where each research question relates to its respective domain. The sub research questions are defined in figure 3-6.

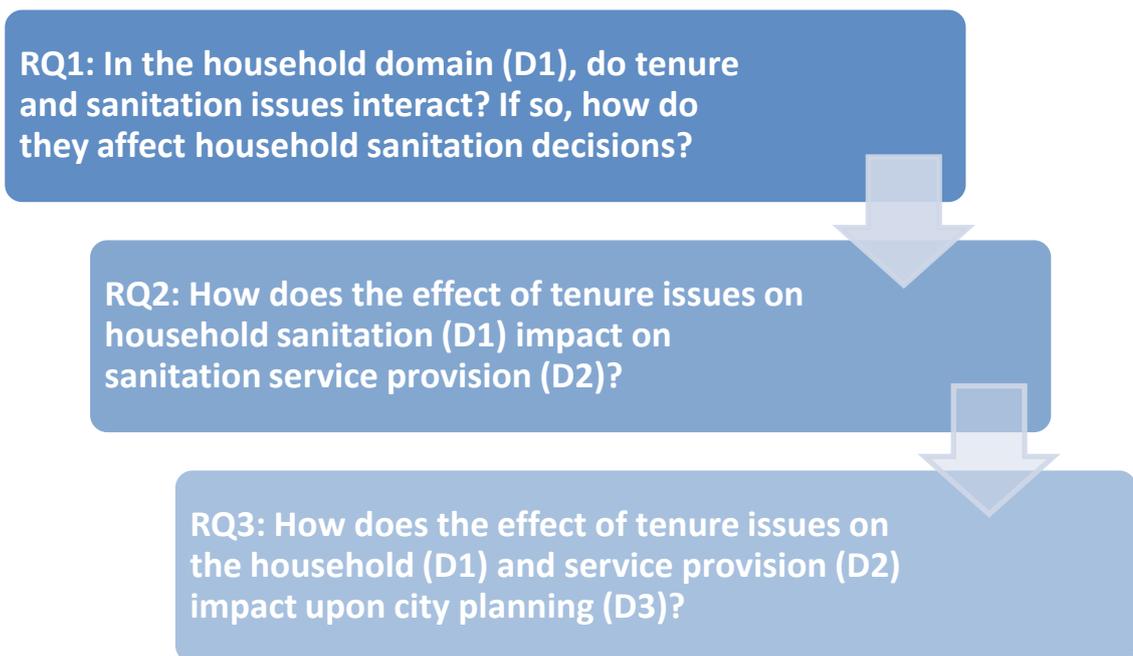


Figure 3-6: Sub-research questions

### 3.5. Chapter Summary

This chapter considers the conceptual framework for the study. It begins by looking at the existing and evolution of concepts sanitation and in wider development including sustainable livelihoods approach; new institutional economics; the f-diagram; strategic sanitation approach; Sanitation21; household centred environmental sanitation (HCES) and sanitation as a system; some of which offer conceptual insight, others offer are more explicit planning approaches. By considering the insights and limitations of each, a framework was developed for this research adopting several key principles of the aforementioned frameworks whilst allowing for particular issues to be explored in this research. The chosen framework applies the decision making domain approach of Sanitation21 and HCES frameworks placing the household at the centre but adapts it to maintain a sanitation system approach whilst taking

into account the dynamics of the urban context. This chapter concludes with the statement of the three research questions to be addressed in this study.

# 4. Methodology

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## 4.1. Chapter Outline

This chapter describes the methodological aspects of study. It explicitly states the rationale for how and why the chosen research approach is appropriate to meet the research questions. This chapter considers the overall research design, the data collection techniques and data analysis. The chapter concludes with a critique of the methodology.

## 4.2. Planning for Research

Laws *et al.* (2003) suggests several planning stages which determining the final research design. Figure 4-1 illustrates these stages, where the final research design is driven by the overall purpose, scope of the research and key research questions.

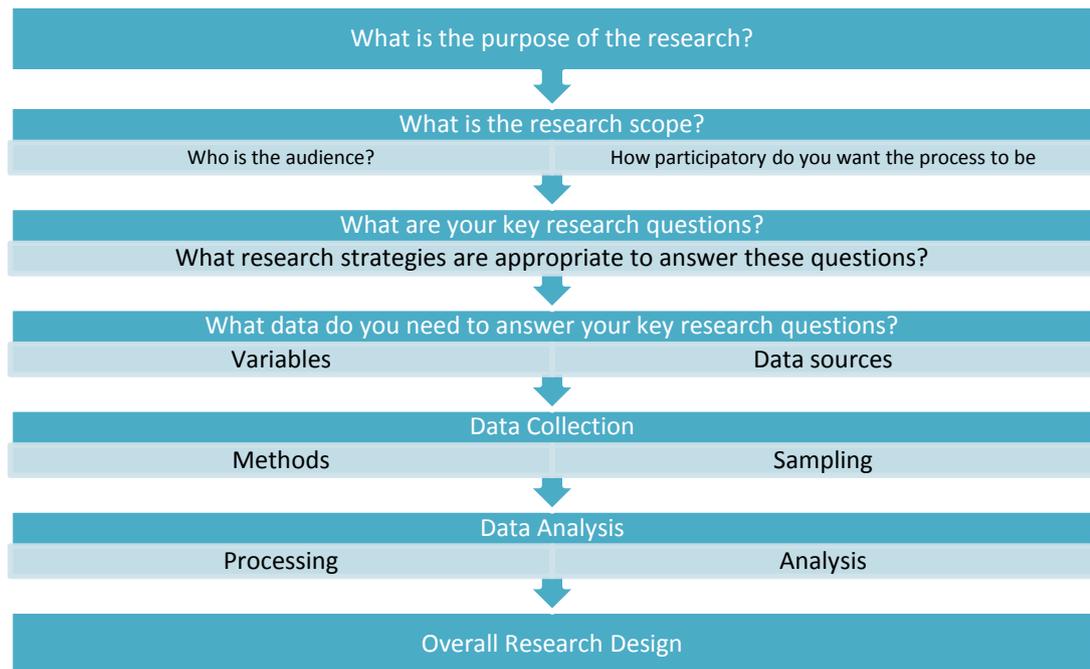


Figure 4-1: Research Planning Flow diagram - adapted from Laws *et al.* (2003: 90)

The purpose and scope of the research were presented in chapter one followed by a comprehensive review of the literature and gaps in knowledge. This informed the research questions detailed in section 3.4. The subsequent sections consider the epistemological and

ontological positions of the researcher followed by the formation of an appropriate research design.

### 4.3. Epistemological and Ontological Positions

Research is a systematic process of inquiry to create new knowledge. To achieve this, a guiding research strategy is needed to ensure consistency and appropriate methods and techniques are used to address the objectives of the study. Creswell (2003) describes two ways of knowing. Firstly where a positivist epistemological perspective assumes that reality can be described through objective measurement and quantification, emphasising the importance of reliability in research and the objective position of the researcher (see table 4-1). Secondly, the constructivist perspective asserts that views of social phenomena and their meanings and knowledge are socially constructed; where different people can experience different realities (Berger, Luckmann 1967). More succinctly, positivism entails a deductive approach towards the relationship between theory and research where, by contrast, constructivism emphasises the generation of a theory (Bryman 2004).

Post positivism	Constructivism
Determination	Understanding
Reductionist	Multiple Participant Meanings
Empirical Observation and Measurement	Social and historical construction
Theory Verification	Theory Generation
Deductive approach	Inductive approach

Table 4-1: Ways of Knowing (Creswell, 2003; p.6)

Constructivists question the nature of ‘reality’ and the ability for a researcher to remain fully objective. Plato’s cave narrative clearly demonstrates that different views of the world exist and individuals make decisions in a bounded rationality dependant on their social environment.

Conventionally quantitative techniques are perceived to be rooted in positivist theory, employing a deductive research strategy whereas qualitative research is more rooted in interpretative theories using induction methods (Grix 2001). This said often the distinction between the two is less clear (King 1994). The quantitative or qualitative dichotomy is discussed widely in the academic literature (Bryman, 2004, Cohen *et al.*, 2000, Creswell, 2003, Sale *et al.*, 2002). King *et al.* (1994) argue that the best research uses a combination of both methods. Whilst Creswell (2003) agrees this can be the case, he suggests one method should always be the dominant method. All however agree that it is essential to chose methodology and methods relevant to the research questions and objectives (Laws, Harper & Marcus 2003, Creswell 2003, Bryman 2004).

In this study, the research aim was to investigate if and how tenure and sanitation relate to each other in an urban context, covering the sanitation system from the household, to the wider city level, i.e. to gain an improved understanding and unbundle the complexities of the relationship. Tenure is defined as being, above all, a social relationship (Payne, Durand-Lasserve & Rakodi 2007, Payne 2002). Taking this definition and the institutional pluralism inherent in social studies (Payne, Durand-Lasserve & Rakodi 2007, Payne 2002, Rakodi 1999, Payne 2004), understanding multiple participant meanings are key. Therefore this study adopts the ontological position that knowledge is socially constructed. It will first explore if there is a relationship between the different aspects of tenure and sanitation at the household level, and if there is, what are the wider implications for sanitation developments along the sanitation chain?

#### 4.4. The Selection of an Appropriate Research Design

Ensuring an appropriate research design is fundamental in ensuring a logical flow from the research objectives, to guide the data collection and ultimately lead to its conclusions (Yin 1994). In inductive reasoning, rather than testing an existing hypothesis, the process begins with specific observations and measures, to look at patterns and norms. From this, tentative hypotheses can be explored, finally producing the research conclusions.

The selection of an appropriate research design and methods to follow this process depends on numerous factors such as the types of questions being asked and the time horizon of the research. Where Bryman (2004) categorises social research into five common research designs: experimental; cross sectional; longitudinal; case study and comparative research design, Yin (2003) applies three guiding conditions to research design types to guide the selection of research design (see table 4-2).

Strategy	Form Of Research Question	Requires Control Of Behavioural Events	Focuses Contemporary Events	On
Experimental Design	How, why?	Yes	Yes	
Survey Design	Who, what, where, how many, how much?	No	Yes	
Archival analysis	Who, what, where, how many, how much?	No	Yes / No	
History	How, why?	No	No	
Case study	How, why?	No	Yes	

Table 4-2: Selecting an appropriate research strategy - adapted from Yin 2003

The Bryman and Yin models informed the selection of the research design. The appropriateness of particular research strategies is considering taking into account i) the types

of research questions being asked; ii) the ontological position of the researcher and; iii) the resources for the research. The research is concerned with various stages of the sanitation system in Dakar therefore a research strategy is required to account for the whole service delivery system. Following Yin's (2003) method the focus of the research is on contemporary events thus eliminating historical strategy. An experimental (or quasi experimental) design would assume a cause and effect model. For example, this could have the research question "what effect does tenure regularisation have on sanitation developments?" Such studies are much sought after by policy makers. However in reality, assuring internal validity in such studies is problematic, especially in the urban context due to the complexities of external factors. Durand-Lasserve and Precht (2003) recently conducted such a study in Dakar. Whilst this study is a valuable contribution to paucity of literature on the evaluation of tenure regularisation programs (Durand-Lasserve, Selod 2007), this type of design is not suited to unbundle the complexities of the relationship between tenure and sanitation as it assumes a casual relationship whereas this research aims to go one step back from that and investigate what the relationship is. Therefore experimental design was also deemed unsuitable. Given the rate of urbanisation and paucity of the archival data in relation to urban development, especially in the informal sector, archival analysis was also considered not relevant. Thus the research strategy choice was reduced to survey design or case study analysis.

Applying the logic that the research questions inform the research strategy (Laws, Harper & Marcus 2003, Yin 2003), research question one considers first *if* there is link between tenure and sanitation issues. The research subsequently addresses if there is a link, what is it?; thus moving to the '*what*' questions under Yin's (2003) categorisation. Where a link is demonstrated, additional exploration is needed to understand the dynamics; several '*Who, what, where, how many, how much?*' questions need to be asked in order to be able to inform the '*how*' and '*why*' questions. To elicit data from the household level, Yin (2004) suggests a survey design to be relevant to the research strategy. Bryman (2004: 50) provides a helpful distinction between the objectives of a cross-sectional survey and a case study whereby in a cross-sectional survey '*the town provides a backdrop to the findings rather than a focus of interest in its own right*'. This is indeed the case of this research, where the focus is on the relationship between tenure and sanitation, rather than focused specifically on how Dakar's tenure and sanitation systems interact. This 'snapshot' facilitates the feasibility of the study in the context of a PhD research study however it does introduce ambiguity as the data does not incorporate the element of time (Bryman 2004). In order to strengthen the temporal aspect of the study, the researcher aims to introduce a retrospective line of questioning to maintain a historical perspective and to support potential hypotheses of causal direction.

In summary, a combination of research methods in a mixed method design was deemed the most suitable for this exploratory study. To elicit data across the whole city different approaches would be necessary to reach both the households (D1) and key informants and decision makers in domains two and three – sanitation service provision (D2) and city planning and urban management (D3). At the household level a cross sectional survey will be used to elicit both quantitative and qualitative data. This will be complemented by integrating this

data in to a wider inductive analysis through interviews with key informants and representatives of societal and governmental institutions to construct the wider service provision and city dynamic (D2 and D3). These are detailed in section 4.7.

#### 4.4.1. Maximising Reliability and Validity

Good research seeks to maximise reliability and validity, where built in quality measures can strengthen research design and reduce researcher bias. The research sought to understand the potential risks to reliability and validity thus guarding against inadvertent researcher bias and error.

*Reliability* is the degree to which results can be repeated if the same protocol is followed (Bryman 2004). It can be challenged in two main ways: either *intra-* or *inter-*interviewer variation. *Intra-*interviewer variation is, for example, where the administration of a questionnaire is not consistent from one household to the next. *Inter-*interviewer variation is when different interviewers administer the questionnaire differently (Bryman 2004). In this study, reliability was addressed in both the survey and semi-structured interviews. In cross-sectional surveys reliability is primarily determined by the quality of the measurement process. In the survey, the questionnaire was administered by one of two interviewers which allowed possible errors of both types. Measures to control this variation were taken through standardisation of practices in questionnaire design, interviewer training, response monitoring and review (Laws, Harper & Marcus 2003, Aday 1996) and detailed in the sampling procedure outlined in the following section 4.7. For the semi-structured interviews, all the interviews were conducted by the principal researcher using an interview guide and systematic process to increase reliability.

*Validity* is concerned with the integrity of the conclusions that are generated from a piece of work. There are four types of validity to consider in research (Bryman 2004):

- *Construct validity* refers to whether the measure of a concept really does reflect what it is supposed to be describing (i.e. is the presence of a sanitation facility really a measure of access to improved sanitation?). In this study several variables were used to build an appropriate understanding regarding sanitation and tenure. These were also stated explicitly in the interview discussions to ensure the same understanding.
- *Internal validity* refers to causality; with how much confidence can the study draw causality of the dependant variable acting on the independent variable. Internal validity is typically weak in cross-sectional surveys designs as it is difficult to elicit causal direction from the resulting data. The study was exploratory in nature so was not attempting to prove a causal direction. This said, the qualitative data collected throughout the study complemented this weakness of the cross-sectional study,

- *External validity* refers to the extent the study's findings are valid beyond the specific research context. External validity can be questionable in this type of research if the sampling is not random. External validity in each typology was maintained through using random cluster samples in the cross sectional survey. Furthermore whilst the research is set against a backdrop of the Dakar case it is not defined by it and therefore offers applicability elsewhere.
- *Ecological validity* refers to the relevance and applicability of the findings to people's everyday settings. Whilst a study may have strong construct, internal and external validity, the unnaturalness of the questioning may have limited ecological validity. Whilst all research instruments are likely to introduce an element of bias for ecological validity, best practice measures outlined in the following section were taken to minimise these.

#### 4.4.2. Rationale for the research location

Sanitation remains a priority for Sub-Saharan African on the development agenda. The projected demographic and urbanisation trends presents significant challenges for improving sanitation, where urban population growth by far exceeds increased sanitation coverage. The 2006 WHO report claims that by 2015 there will be 91 million additional un-served sub-Saharan African citizens than in 2004 (WHO & UNICEF 2006b). The trend in terms of sanitation coverage per population growth is negative. For these reasons sub-Saharan Africa was chosen as the geographical area of the research.

The decision was then made on if one or more cities should be studied. Yin (Yin 1994) argues that comparison is applicable where 'replication logic' of different context examples can strengthen the research. As this study is largely exploratory into the relationships to be tested between tenure and sanitation, and there was not yet a relationship to test, the benefit of additional cities was limited. In addition, time and available resources for the research was limited. In view of this, the study was limited to a single city.

The pre-selection criteria for the research location were based upon urban agglomerations exceeding two million; population density and the absence of recent conflict or political instability. Six sub Saharan African cites were then shortlisted (Accra, Addis Ababa, Dakar, Dar es Salaam and Nairobi<sup>15</sup>). Further criterion were then examined, including the following:

- urban sanitation coverage
- percentage of population living in informal settlements as a percentage of total urban population
- sanitation policy and options

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<sup>15</sup> Short listing was prior to post election violence in Kenya 2008.

- tenure policy and options
- data availability.

Upon review, Dakar, Senegal was chosen as the location for research into this topic due to its rapid urbanisation rate and its innovative approaches to both urban sanitation and tenure regularisation policies (these are presented in greater detail in chapter five). The department of Pikine of Greater Dakar was selected due to the cross section of tenure typologies with a similar age<sup>16</sup>, location in terms of proximity to the economic centre and regulatory setting in close proximity; factors which Durand-Lasserre and Selod (2007) consider to affect the validity for socio-economic research of land issues.

## **4.5. Research Methods**

The research planning framework outlined at the start of this chapter suggests that once the research questions are determined, the next stage is to identify what data is needed to best answer those research questions. The aim of this section is to consider different research methods available, both for quantitative and qualitative data collection as the study involves both. Various research methods and their advantages and limitations are outlined below. This information is compiled largely from the works of an established social research methods author (Bryman 2004) and reference books with a specific focus on research in development (Laws, Harper & Marcus 2003, Scheyvens, Storey 2003). For clarity, this information is also presented in table form in appendix A. The following section considers which of these methods are best suited to gather the appropriate data to answer the research questions.

### **4.5.1. Structured interviews & postal surveys**

Structured interviews and postal surveys share similar characteristics hence are grouped here under the same heading. They are both research methods apt to gathering large amounts of data, potentially both quantitative and qualitative, from individuals. Structured interviews can be administered either by phone or in person, administered by an interviewer. Postal surveys on the other hand are self-administered. Postal surveys are known to have weak response rates. For administered surveys Bryman (2004: p114-115) suggests face to face interviews may have a slightly better response rate than those administered by phone. This is significantly more evident with sensitive topics. Administered surveys in person offer the additional benefit of the ability to collect subsidiary data from the respondent through observation which would not otherwise be possible. This displacement however is more costly and time consuming than remote administration. Potential errors can be introduced through

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<sup>16</sup> With the exception of the traditional Lebous villages who predate all urbanisation on the Dakar peninsula.

interviewer variation which can be reduced through training and instruction to ask the questions the same way and in the same order. Also, and more pronounced for the face to face encounters, it is known that the interviewer's characteristics (i.e. gender, ethnicity, socio-economic status) may provoke a bias in the respondent. Whilst this is a recognised phenomenon, the extent and nature of the bias are often impossible to disentangle. Rather the researcher should be aware of this dynamic and potential limitation of the method.

An important consideration in this type of research method is the available sampling frame. Where detailed and accurate information of residency information is reliable, respondents can be targeted using a number of sampling frames, for example the telephone directory or municipal tax files. In some cases however formal sampling frames may not exist, are unreliable and/or may not fully represent the population. This is an important consideration for research in informal settlements, which are often excluded from formal activities and monitoring. In the absence of a formal sampling, frameworks of physical dwellings using GIS or other geographical mapping systems can be used. In the cases of informal urban settlements these spatial sampling frames are most likely to be accurate given they represent what is actually present rather than what is formally recognised by the state.

#### **4.5.2. Semi-structured interviews**

A less structured interview type lends itself to collecting qualitative data. A semi-structured interview can be supported with an interview guide to cover some main points but allows flexibility in the order and line of questioning to follow up on interesting topics. As with the social interactions described with face to face structured interviews, this type of social interaction can introduce a bias between the interviewer and interviewee. The ability to ask specific questions whilst interviewing allows for information on topics which are not amenable to other research methods such as observation. Maintaining some structure in an interview allows the interviewee to maintain some control over the direction of the discussion.

#### **4.5.3. Focus groups**

A focus group is a group interview concerned with a particular topic, where a moderator will stimulate a discussion and then aim to let participants discuss freely. Focus groups are known to provide very rich and in depth data and is good at eliciting different perspectives on a topic. Limitations with focus groups include concerns on the joint production of meaning and less control for the investigator. Focus groups can also produce large amounts of data which can be difficult to analyse in terms of linking how people interact and the themes of discussion. Kitzinger (1994) suggests that group interaction is often overlooked in focus group. Wilkinson (1998) argues this analysis is poor as group interaction is not the same as individual

interviews. Bryman (2004) also suggest that focus groups may not be appropriate for more sensitive issues given the public nature of the debate.

#### **4.5.4. Oral-history interviews**

Oral history interviews fall under the unstructured category of interview methods. Another similar technique is life history interviews. The later is often combined with personal documents such as diaries and photographs. Oral histories however are largely unstructured interviews where an interviewee is asked to reflect about past events. They can be very rich in qualitative data although, as they are essentially memories, there is an evident potential bias of the memory of the respondent. Oral histories are particularly useful in giving voices to untold histories or marginalised groups, where the limitations of the potential bias are accepted.

#### **4.5.5. Participant Observation**

Participant observation is a widely used qualitative research method which often complements others such as interview techniques. Participant observation is essentially where the researcher immerses themselves in the social context they aim to observe. This method can provide rich qualitative data, including non-verbal data. A particular strength of this method is its ability to observe deviant and hidden behaviours that people are potentially less inclined to speak about. There are however possible reactive effects where people knowing they are being observed may make them behave less naturally. This is reported (Bryman 2004) to decrease over time. There are also ethical considerations and issues of instruction to consider with this type of research. Whilst the data is rich, this type of research technique can be disruptive to peoples' normal lives.

### **4.6. Data Sources and Variables**

There are two different types of data sources: primary data, collected by the investigator and secondary data which is collected by someone other than the user. Both of these are used in this research and they are outlined below

#### **4.6.1. Primary data sources**

Under the research framework there are three decision making domains: the household; sanitation service provision and the city planning and urban management. Figure 4-2

illustrates the main data sources that would provide a good cross section of the overall city. In D1 the household domain, a cross section of the tenure typologies is sought. In D2, the service provider domain, data is sought from the utilities as the formal service providers but also the pit emptiers serving the households who have non-piped on-site sanitation. This is in recognition that a small percentage of Greater Dakar residents are in fact connected to the mains sewers. Finally in D3 the city planner domain, the different branches of the Ministry of Urban Planning are consulted.

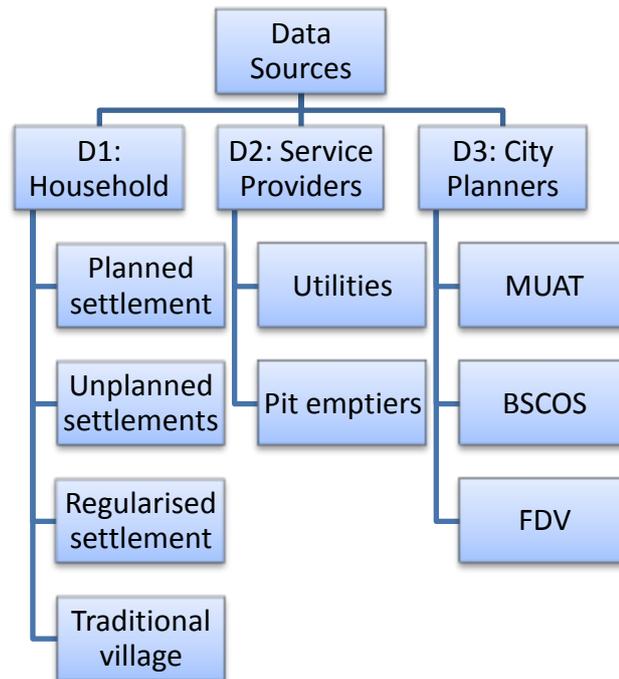


Figure 4-2: Primary data sources

#### 4.6.1.a. Key variables

Under the proposed framework, the research maps how the tenure variables relate to sanitation issues at this lowest level (i.e. the household – D1). For sanitation, household decisions will be disaggregated into four elements (also illustrated in table 4-3):

- *access to sanitation* – to reflect the JMP categorisation;
- *user satisfaction*<sup>17</sup> – as a factor in continued use of sanitation facilities
- *household investment in sanitation* – given importance of investment as discussed during the literature review.

<sup>17</sup> This is treated as a separate factor at this stage but will be subsequently merged into the other three for discussion.

- *Emptying behaviours* – to take into account downstream operations.

	Domain 1: Household			
	Access	User satisfaction	Investment	Emptying
Tenure typology	*	*	*	*
Tenure status	*	*	*	*
Tenure security	*	*	*	*

Table 4-3: Matrix of enquiry for the household domain

As the literature has informed us, tenure issues have been outlined as potential influencing factors upon sanitation. In line with the objective to consider sanitation as a system, a number of indicators were collected in relation to sanitation. The indicators were based on the WHO / UNICEF recommended questions for household surveys on water and sanitation (WHO & UNICEF 2006a) for the household sanitation. Emptying however is not covered in the JMP figures; these figures were devised based on the literature review and existing studies.

As discussed in the literature review (section 2.8) measuring tenure is complex. There are many operational, methodological, conceptual and institutional complexities inherent in defining the indicators for tenure studies (Laksa, El-Mikawy 2009). For this study, tenure is divided into three aspects i) land tenure typology; ii) tenure status and; iii) tenure security. For tenure typology Greater Dakar was split into four different types of land ownership and land delivery mechanisms: planned settlements with formal land rights; unplanned spontaneous settlements; spontaneous settlements that have undergone regularization and traditional village. Tenure status was divided up into owner-occupier or tenant; where residents who own their property even on informal land are considered owners in Dakar (Durand-Lasserve, Ndiaye 2008). For tenure security, the UN-expert Group meeting suggested that tenure security should be measured using several proxy indicators: legal property rights; national provisions against forced evictions; women’s rights; perception at settlement level and history of evictions in the last five years (UN-HABITAT 2002). The UN-Habitat method of measuring tenure security combines expert opinions on the general context to elaborate on a household survey (Laksa, El-Mikawy 2009). This research will apply a similar process where a review of the land and tenure rights, specific to the research context, will be presented in chapter five. This contextual analysis will complement the household level data collected in the survey. There is relative consensus that *perceived security of tenure* is the primary indicator of interest when discussing tenure security at the household level, (Van Gelder 2007, Payne 1997). This can be measured through the perceived risk of eviction (van Gelder 2007). Payne argues that this is an important consideration as a single case of forced eviction has the potential to destroy levels of confidence built up over many years (Payne 1997). As such, for the purpose of their household survey, tenure security will be measured using the proxy indicators of *legal*

*tenure documentation; perceived risk of eviction; duration of residence and plans to leave.* The key variables used to measure tenure aspects are shown in figure 4-3.

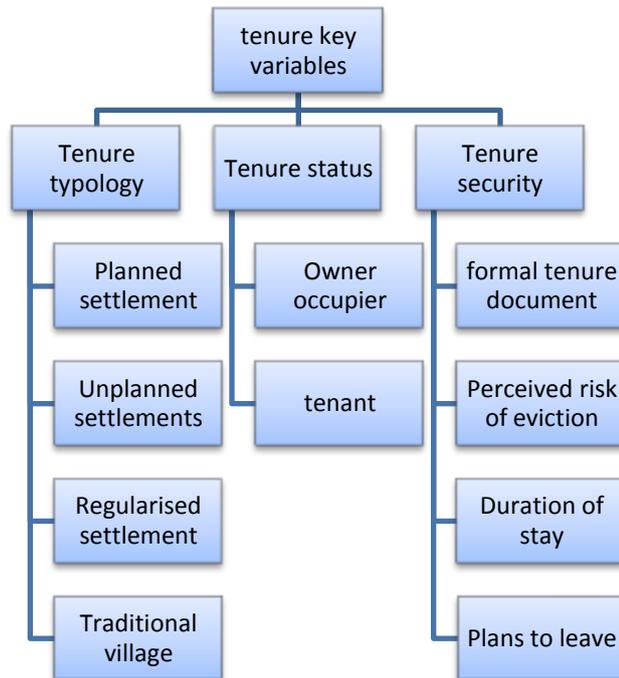


Figure 4-3: Key variables for sanitation and tenure issues

#### 4.6.1.b. Units of analysis

Conventionally the sampling unit is the household where the household is defined as an economic unit (Hunt and Bostoen 2006). Caution must be exercised regarding assumptions of occupancy that could lead to intra-household and intra-plot inequities (Beall, Kanji 1999). In a review of sanitation policy in South Africa it was found that backyard dwellers were excluded because the municipality recognised a plot as one ‘household unit’ despite multiple households being present (Mjoli 2010). A similar observation in a low-income area Kumasi, Ghana where in a dwelling comprising of an owner family and several tenants, only the owner and core family members were permitted to use the ‘household’ latrine, other residents relied upon public toilets or open-defecation (personal observation 2006). From external observation alone there is no way of knowing what the occupancy type is of a dwelling and which residents have access to the sanitation facilities. A similar case is reported in the *thika tenancie*<sup>18</sup>s of the bustees, or registered slums, of Calcutta where sanitation improvement programs have provided two toilets per plot of 200 people. The common reality of the situation is that one toilet is reserved for the *thika* tenant and immediate family leaving the other toilet for the vast

<sup>18</sup> Thika tenancies are where land has been taken over by the government. A thika tenant is given rights to build on the plot and sub-let. The plots are often 200-300 square meters and occupied by approximately 200 people.

majority of the poorer tenants (GARNET 2003). These examples demonstrate how access to sanitation is being drawn along lines of tenure and raises questions on the intra-household and intra-plot variation of tenure and sanitation access.

In order to capture such discrepancies whilst maintaining comparability with other studies, data in this study was collected on both a plot and household basis. The occupancy type of the plot is also recorded (i.e. if the plot was owner only, shared owner tenant or tenant only). Different questionnaires were administered to different plot types; where the bulk of the questionnaire collected household level data, where the socio-economic data is particular to each household. In addition plot data was recorded, specifically physical characteristics, occupation model and location. This underlines the importance of the more in depth sanitation line of questioning where sanitation data was also recorded using households per sanitation facility and if the households were 'owners' or simply 'users' of the facility. Where possible for mixed tenancy plots both owners and tenant households were interviewed from the same plot

#### **4.6.2. Secondary data sources**

In addition to the initial literature search, secondary data was sourced from several libraries and databases located in Dakar. The following resources were consulted:

- Agence Nationale de la Statistique et de la Démographie (ANDS), Dakar.
- l'Institut africain de gestion urbaine (IAGU), Dakar.
- Library of the University of Cheikh Anta Diop, Dakar.
- ENDA RUP library, Dakar.
- SANDEC / ONAS Workshop on faecal sludge management, Dakar May 2007.
- EDE Consultants, Dakar.

The aim of using this data was to, where possible, apply the best practice of triangulation of methods to strengthen findings of the primary data and explore diverse perceptions (Cohen 2009, Laws, Harper & Marcus 2003, Olson 2004).

#### **4.7. Data Collection: Methods and Sampling**

The methods used to collect the data were a combination of a questionnaire survey (D1), observation and semi-structured interviews (D2/D3). This section details how each of these methods were administered.

### 4.7.1. Chosen Research Methods

To address the first research question: *In the household domain (D1), do tenure and sanitation issues interact? If so, how do they affect household sanitation decisions?* is specifically concerned with what happens at the household level. In line with the Bellagio principles, information to answer this objective is gathered at the lowest possible level, i.e. the household through a cross-sectional survey. This method enables a large amount of data to be gathered from individual households and was easy to record. The strength of administered questionnaires lies in the ability to ask the same questions in the same order to a large number of respondents. In addition this is complemented by some subsidiary data collected through structured observation at each household surveyed. This data is included in the survey analysis.

The second research question: *How does the effect of tenure issues on household sanitation (D1) impact on the sanitation service provision (D2)?* links the household to the sanitation service providers where service providers are understood to mean both the formal utility companies but also the informal and small scale service providers operating as emptiers. In this domain semi-structured interviews were considered the most appropriate method of data collection as they could be used and tailored as appropriate to both the utilities and the informal emptiers. This was complemented by participant observation where the research spent two days with the mechanical emptier firm operating in the Greater Dakar area.

The third research question: *How does the effect of tenure issues on the household (D1) and service provision' (D2) impact upon the city planning and urban management (D3)?*, is concerned with the wider city planning and urban management questions thus sourced data from representatives of stakeholder institutions in urban planning and sanitation. As with D2/RQ2, and to complement that structure semi-structured interviews were considered the most appropriate method of data collection. In addition this is complemented by some oral history interview data from the local leaders of each of the settlements surveyed. This provided valuable background and contextual data for the research.

In summary, the primary data collection methods used were as follows:

- administered questionnaire survey
- semi-structured interviews
- participant observation
- oral history interview

This was complemented where possible by secondary data sources to provide contextual background to the data for the purpose of interpretation and understanding.

The remainder of this section provides more detail regarding the design, sampling and administration processes used in these specified data collection methods.

## 4.7.2. Administered questionnaire survey

Administered questionnaires, consisting of both closed and open-ended questions, provided primary data from the household level across four different types of settlements in peri-urban Dakar.

As discussed in the previous chapter (section 2.6), in much of development discourse tenure is described as legal / illegal or formal / informal. Those of the regular/legal category hold titles, permits or long leases; the irregular/informal houses have no formal authorisation (Durand-Lasserve, Ndiaye 2008). In reality however the mechanisms of land delivery and structure ownership offer a much broader scope of land delivery options. In an attempt to avoiding losing this spectrum of tenure and land delivery options in peri-urban Dakar, settlements were divided into four mutually exclusive groups using the *Plan du Director Horizon 2025* report (MUAT-DUA 2001), secondary data and local knowledge.

### 4.7.2.a. Questionnaire Design

Good practice guidelines were applied in the research design to build a robust questionnaire (Laws, Harper & Marcus 2003, Bryman 2004). The questionnaire design was such that the researchers could build a rapport with the respondents by starting with straightforward questions, whereby more complex questions featured towards the end of the questionnaire (idem.). The questionnaires consisted of two parts, the first detailing plot characteristics and the second relating to specific responses from the household. (see appendix B). The WHO and UNICEF recommended questions for household surveys on water and sanitation were also taken into account (WHO & UNICEF 2006a). The questionnaire consisted of both open and closed ended questions design to elicit data regarding the current characteristics of the household but also detail the historical aspects of events leading up to the present day.

The questionnaires were written in French, however most commonly administered in Wolof, being the most commonly spoken local language. This introduces potential errors in intra and inter-interviewer variation in translation. Prior to the survey the research team in two groups translated the questionnaire from French to Wolof and back to French again. In doing so, differences in meaning were highlighted allowing the most appropriate wording of questions to be determined. The questionnaire was subsequently modified. Research training also covered the motivation of the lines of questioning and basic administration techniques including introductions and closing protocol of the survey.

#### 4.7.2.b. Sampling

A geographic sampling frame was applied to determine the four different tenure categories to be studied. The area was divided up into these four mutually exclusive groups shown in figure 4-4 and table 4-4.



Figure 4-4: Sampling Zones (map adapted from googleearth.com)

SURVEY AREA	NAME	CODE
Unplanned settlement	<i>Thiaroye Kao</i>	A
Planned settlement	<i>Pikine Ancien</i>	B
Regularised settlement	<i>Pikine Irrégulier Sud</i>	C
Traditional Lebou village	<i>Thiaroye sur Mer</i>	D

Table 4-4: Household survey areas

The group representing the informal, unplanned area is very large and realistically needs to be broken down to make meaningful comparisons. The administrative communes of Pikine can vary significantly with respect to size, age, population size and density. In order to control as much as possible for these factors, the district or commune of *Thiaroye Kao* was selected as being the most comparable to group B (Durand-Lasserve, Selod 2007).

The Lebou villages are very different to the other three groups (with respect to geographic size, age, land delivery history, population size and density). They are scattered across the

Dakar peninsula and have become nested within urbanisation of the region. From a list of traditional villages in Greater Dakar and relevant to the study, the Lebou village of *Thiaroye sur Mer* was randomly selected. The smaller population of this group is reflected in the smaller sample group.

This method of cluster sampling at the neighbourhood level may weaken the representativeness of the sample across the wider Dakar-Pikine area. However it allows greater exploration of the impact of phenomena (e.g. localised flooding, road access, distance from city centre) that may be affecting tenure security and investment in greater detail. A random sample across larger populations (i.e. regional) could potentially lose these local level dynamics.

Once the research areas were identified, survey districts (or DRs) were randomly selected from survey maps. In each survey district, ten households were randomly selected by visiting every n-th dwelling.<sup>19</sup> See figure 4-5 for an example of the survey district sampling frame and table 4-5 for a summary of the sampling method.

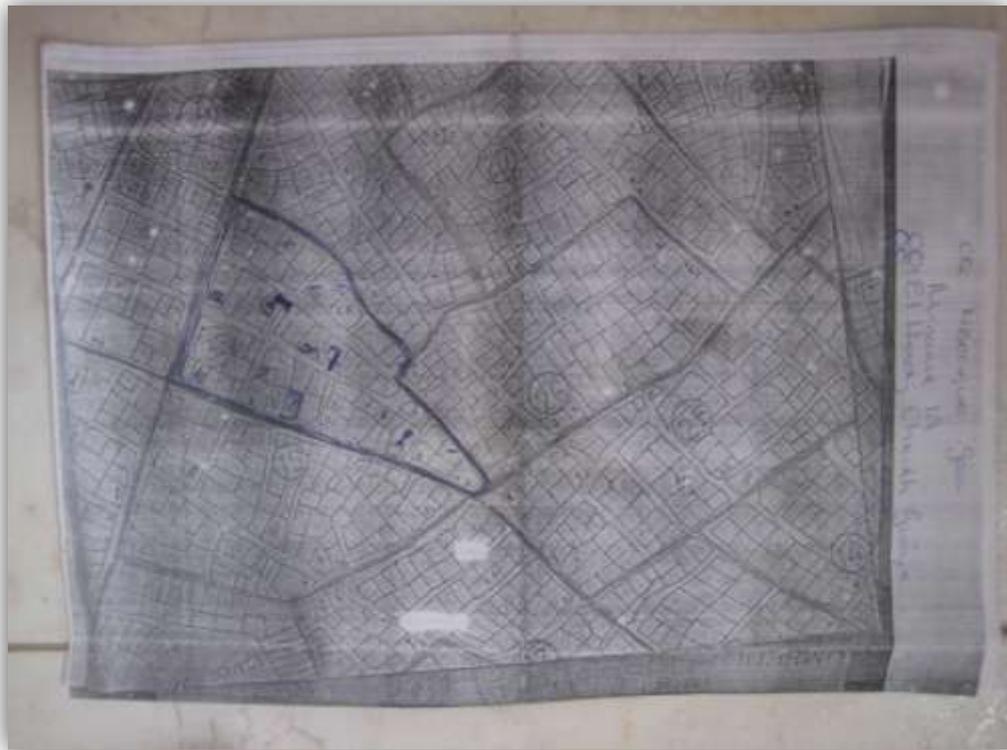


Figure 4-5: Survey district map and random household selection.

<sup>19</sup> This was calculated on an individual DR basis as the number of plots in each DR varied. In all cases it was between five and seven.

As previously discussed, the standard unit of analysis is the household however the literature is limited on how to survey multiple household dwellings with diverse occupancy patterns. A household was understood to mean an economic unit, where for the purpose of the research meant in practice that they shared the financial cost of food and eat together. There is scant mention of mixed dwellings where multiple households live under one roof (such as landlord and tenants) and potentially share basic facilities (Gilbert, Varley 1991) or other complex arrangements (Jenkins, Scott 2007, Rakodi 1995). Informed from the limited literature on the topic, for the purpose of this study, multiple occupancy dwellings were categorised as follows:

- Owner occupier dwelling;
- Owner sharing dwelling with one tenant / guest household;
- Owner sharing dwelling with multiple tenant / guest households;
- Tenant(s) only dwelling, owner living elsewhere.

TENURE GROUP	NAME	AREA DESCRIPTION	SETTLEMENT SELECTION	HOUSEHOLD SELECTION	SAMPLE
A: Unplanned settlement	<i>Thiaroye Kao</i>	Spontaneous development settlement to the East of the original and planned settlement area of Pikine Ancien. (pop. 100,000)	Purposeful selection of a commune for comparability against other groups. Random selection from list of all EAs in commune.	Random selection of 10 EA within neighbourhood; random HH selection within each.	100
B: Planned settlement	<i>Pikine Ancien</i>	The original and planned settlement area of the Pikine district. (pop. 125000)		Random selection of 10 EA within neighbourhood; random HH selection within each.	100
C: Regularised settlement	<i>Pikine Irrégulier Sud</i>	The area undergoing regularisation (pop. 70000)		Random selection of 10 EA within neighbourhood; random HH selection within each.	100
D: Traditional Lebou village	Thiaroye sur Mer	Traditional Lebou Village at hub with mosaïque of land tenure encircling core.		Random selection of 4 EA, random HH selection within each.	40

Table 4-5: Sampling method

The sampling frame applied during this study (given the lack of formal sampling frames) was a GIS frame (Bostoen, Chalabi 2006). However in practice this meant that it was plots or dwelling units which were sampled as it is impossible to tell occupancy arrangements of any given plot on observation. This was deemed the fairest approach. In each plot the researchers

asked to speak to the head of the household. In the case of multiple household plots, for example in shared owner-tenant dwellings, the researchers administered separate questionnaires to both landlord and tenant. In residencies with multiple tenant households, the head of the 'lead' tenant household was questioned (i.e. the oldest or longest tenant in the property). Where this was not obvious an available tenant was chosen at random. The sampling method is summarised in the figure 4-10 below:

#### 4.7.2.c. Survey Administration

Before the main survey the questionnaire was pilot tested at twenty households across two test areas representative of the settlements to be surveyed. The pilot test highlighted areas where lines of questioning needed clarification or response codes needed to be adapted to the local context.

Two research teams comprising of one interviewer and one observer were engaged to administer the questionnaire and complete the observational checklist. The question of gender of the interviewers was carefully considered. Some sanitation studies underline the importance of gender balanced teams to tackle sensitive or taboo issues with female household members. However eliciting information on tenure legality and status can also be a difficult where issues of gender and seniority can affect the dynamic of interviewee and interviewer (Durand-Lasserve, Ndiaye 2008). After discussion with a local NGO (ENDA-RUP) experienced in socio-economic surveys in the target areas and consideration of the nature of the sanitation research questions (focused more on infrastructure and construction than behaviour change), two male teams experienced in surveys were engaged for training and to administer the survey.

In the main study, the main researcher accompanied the survey administrators in the field for the first twenty interviews each conducted and was present for 34 percent of the overall interviews. In an attempt to minimise any responder bias to the presence of the main researcher as an outsider, during these interviews the main researcher was not directly involved with the interview. The interviews were conducted in Wolof the most common local language which provided a natural detachment. Throughout the survey the questionnaires were checked at the end of the day by the main researcher for completeness and to address any issues which arose throughout the day immediately with the interviewers.

Systematic observation of each location and household was used to complement the survey. To complement the questionnaire survey, each administered questionnaire was supported with an observational checklist regarding the physical environmental conditions and situation of each household (see appendix B). This checklist was designed to capture the overall characteristics of the dwelling, (e.g. construction materials, number of storeys) and

also the immediate environment<sup>20</sup> (e.g. small access passageways, flooding). Key characteristics were taken from the UN-HABITAT Global Observatory urban indicator guidelines (UNCHS 2004). An impression of the dwelling by the observer was also noted against the above criteria. Observation allows the researcher to directly record what is happening rather than solely rely on the reported behaviour or reality of the informant; in doing so greater insight was gained into the results of the survey.

In each area that was visited, a map was used to identify the boundaries of the survey district and sampled plots were marked on the map. In the case where members of a dwelling were unavailable or unwilling to participate, the location was marked and the interview was conducted at the next available dwelling.

### **4.7.3. Oral history interviews**

Oral histories were collected from the local leaders of each of the areas or 'quarters' surveyed. Thirty two were collected in total. Data was recorded in note form and coded. Each interview followed a structured interview format to collect historical and geographical data about the settlement. More specifically these enquiries related to when the settlement was built, construction materials and any changes or developments, details of any external interventions for water, sanitation or planning, any prominent issues regarding the settlement. Whilst these interviews are inherently biased by the memories of the interviewees they provided valuable information regarding the type of settlement and development and triangulation of the administered survey.

### **4.7.4. Semi-structured interviews**

Semi-structured interviews were used to gather data from key informants for domains two and three of the framework. These included urban planning officials, and both formal and informal service providers. Key informants were determined against selection criteria of relevance to tenure, land management or sanitation issues in both the formal and informal sectors. Semi-structured interviews were deemed the most appropriate for this environment to allow data collection to be of a formal nature but allow for flexibility in approach and sequencing of topics (Laws, 2003: 287). This technique enabled the investigative themes to be covered fittingly and included several specific questions echoed across all informant groups. Interviews lasted approximately one hour. Where explicit permission was given an audio recording of the interview was made. In two instances informal interviews were used as they took place in the working environment. These interviews followed a more natural conversation about their work (see table 4-6).

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<sup>20</sup> Within a ten metre radius of the dwelling.

PARTICIPANT	ROLE	METHOD	NUMBER
ONAS PAQPUD	Head of PAQPUD project	Semi-structured interview	1
ONAS, Direction of Commerce	Director	Semi-structured interview	1
ONAS, Direction of works and research	Director	Semi-structured interview	1
Sénégalais des Eaux, Direction of Works	Director	Semi-structured interview	1
Sénégalais des Eaux, Direction of Customer services	Director	Semi-structured interview	1
Direction of observation and control of land occupation (MUAT / BSCOS)	Director	Semi-structured interview	1
Direction of Urbanism and Architecture (MUAT / DUA)	Director	Semi-structured interview	1
Direction of Organisation of Territory (MUAT / DAT)	Director	Semi-structured interview	1
FDV regularisation project	Target group specialist	Semi-structured interview	1
Urbanisation Office of Pikine	Land management officer	Semi-structured interview	1
ONAS (TSM representative)	Local representative	informal interview	1
Civil society (TSM resistance)	Locally elected leader	Semi-structured interview	1
Faecal sludge management (AAAS, trucks)	President of AAAS (truck emptier association)	Semi-structured interview	1
Pit emptying truck company	Manager and owner	informal interview	1
Pit emptying truck company	Operators	informal interview	1

Table 4-6: Semi-structured interviews

Semi-structured interviews were conducted with representatives of city planning and urban management, water and sanitation institutions and organisations (n=15) and local leaders of the residential settlements (n=32). Interview guides were used to guide the line of questioning. A database summary can be found in appendix C.

#### 4.7.5. Participant observation

To complement the semi-structured interviews of the pit emptiers, the researcher spent two days of participant observation in one of the pit emptying mechanised trucks. This included the observation of how the team arrange their business throughout the day; non-verbal data; observation of common practices and also the observation of supposedly hidden activities.

#### **4.8. Ethical Practice and Issues of Access and Consent**

The research strove to adhere to “good Practice” at all times. Scheyvens and Storey (2003) discuss the issues of ethical practice with direct relevance to development work. Below are some points which are of direct relevance to the study.

*Informed consent, confidentiality and anonymity:* Participants of the household survey were guaranteed confidentiality and anonymity through a coding system of the questionnaires. The data was only seen by the researchers and not seen by any third party. For the questionnaire survey, the *chef de quartier* (local leader) of each survey district sampled was visited in person by the researcher prior to the survey commencing. In this meeting the objectives, details and scope of the study were explained and the authorisation and acceptance of the *chef de quartier* was sought. Each participant household received a clear explanation of the research aims the researcher’s affiliations and all were explained their right to withhold or withdraw information at any time. For the interviews participants were asked permission for audio recording of the interview. Some were unwilling to give permission for this but did allow notes to be taken. Participants were offered the opportunity to modify any comments following each interview.

*Respect and due diligence* of local cultural practices and social institutions was sought at all times. The researcher never deliberately placed herself in a position of power and strove at all times not to reinforce a notion of inequality through appropriate data collection techniques.

*Access to information and dissemination of findings:* No information was withheld from participants or gatekeepers without good ethical reason. The knowledge and information produced as a result of the study will be made available to the supporting organisation ENDA-RUP to be held locally. Information will also be available online once published. No personal information of participants was made available to others.

*Reciprocity:* In keeping with the ongoing local research and following discussion with local researchers and officials, monetary reciprocity was not deemed appropriate. The research was conducted at the location of the participants at all times such that the disturbance to the participant’s daily activities was minimal.

#### **4.9. Data Analysis**

The data generated from the household questionnaire survey and observation checklist was processed using SPSS software. Descriptive statistic analysis was used to look at the household dynamics and relationships. To test the significance of relationships between variables Chi-squared values were used to test for significant differences at each stage of the

matrix relating tenure and sanitation issues. Data gathered from open-ended questions of the questionnaire and observation provided the background for individual household cases with notable characteristics to be explored in more detail.

For the data pertaining to domain two and three of the research framework, interview transcripts were transcribed in French (the language of the interview). The transcripts were analysed to reveal the dominant themes running through the interviews and the qualitative elements of the questionnaires. Once these themes had been identified, the transcripts were grouped into service providers, and urban planners. The analysis borrowed from New Institutional Economic discourse to organise these themes into a more rigid structure, under *formal and informal rules, incentives, and resulting behaviours*. In doing so, the different perspectives of service providers, urban planners and household members themselves were identified.

#### **4.10. Critique of methodology**

The sample size of this study could not feasibly be representative and therefore this study does not intend to draw conclusions of the wider Dakar population. This said, the study achieved a good response rate and the sample does cover a cross section of Dakar's different land typologies including planned and spontaneous areas plus those under regularisation. Good practice was adhered to in the aim of reducing potential variation in research and researcher errors; however the researcher acknowledges that, by nature, social interactions are a two-way social exchange.

Research has shown that the characteristics of the interviewer may impact the interviewee response (Bryman, 2004: 126). Firstly, as Durand-Lasserve and NDiaye (2008) also observed, survey interviewers are seen as state representatives and questionnaire responses as seen as a means of conveying a message to the leaders. Another potential bias relevant to this study was differences in social standing and ethnicities between respondents and interviews. Ethnic identities are strong in Senegal but interethnic relations are generally good and rapport is quickly built between strangers through the exchange of teasing pleasantries or "Kal" however social standing and seniority remains a strong dynamic.

Other research issues that came up are noted below:

- Some participants expressed survey fatigue or resistance to what were seen as external or government 'projects'. The survey was conducted at a time of severe shortages in electricity, water, cooking gas and a sharp rise in rice prices (June-July 2008) which affected households across many areas of Greater Dakar. This appeared to compound the frustrations of households being surveyed.

- As detailed in the research design, for mixed occupancy dwellings, a lead tenant was sought to complete the survey. The motivation for this was to gain quality data however this exposes a potential weakness in reaching more marginal tenant groups.
- In several mixed occupancy dwellings, and most often in the case of single person tenant households, tenants were reported to only return to the dwelling very late at night and leave early in the morning for work. Capturing these tenants to survey was practically very difficult and for this reason they are largely omitted in the survey.
- Some area representatives or *Chefs de quartier* who were interviewed were elderly and their recollection of historical events imprecise. Where possible, the research team aimed to untangle the chronological timeline of events and this data is treated as oral testimony rather than fact.
- Some institutional representatives were reluctant to allow audio recordings of their interviews, particularly in the case of informalisation of procedures. In these cases, notes were taken by the interviewer followed by a detailed write-up immediately after the meeting.

These points are listed to demonstrate an acknowledgement of their potential impacts and biases within the work. It does not claim to be a perfect study however what this research does intend to do, is unbundle the complexities of urban occupancy patterns, legal forms of tenure, tenure securities and the implications for urban sanitation, spanning several peri-urban Dakar settlements.

#### 4.11. Chapter Summary

This chapter began by outlining the several planning stages required to determining the final research design. Guided by the research planning process the research questions determine the data sources, and in turn the data sources determine the most appropriate methods of obtaining the data and so forth. This chapter begins with stating the ontological position of the researcher and then subsequently and systematically considers the most appropriate research design to enable the main research question to be answered. Guided by Yin (2003) and Bryman's (2004) research design criteria, qualitative mixed method approach was deemed the most suitable research design, whereby complementary approaches of both quantitative and qualitative methods was used to elicit data across the different domains of the city.

Both primary and secondary data sources are detailed where the chosen primary data collection methods consist of a household administered survey and semi-structured interviews with service providers and city planners. The chapter concludes with a critique of the methodology which includes a justification of its appropriateness to answer the main research question and presents issues that were raised during the research. The findings of the process

described in this chapter are presented in chapter six and subsequently discussed in chapter seven. First however, chapter five presents the study area.

## 5. The Study Area

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### 5.1. Location of the Study: Dakar-Pikine, Senegal

Sub-Saharan Africa presents some of the most critical challenges for improving sanitation, where population growth by far exceeds increased sanitation coverage. By 2015 there will be 91 million more un-served sub-Saharan African citizens than in 2004 (WHO & UNICEF 2006b). The projected demographic and urban sanitation trends present significant challenges for the region, for this reason sub-Saharan Africa was chosen as the geographical area of the research. The location of the city to study was based upon several selection criteria detailed in the methodology (section 4.4).

The field work for this study took place in the department of Pikine of Greater Dakar, the capital city of Senegal. Senegal is a West African nation bordering North Atlantic Ocean, between Guinea-Bissau and Mauritania. The Republic of Senegal has an estimated population of 14 million growing at 2.5 percent a year (CIA 2010). Greater Dakar is located on the Cap Verde Peninsula covering 550 square kilometres and is the economic and political centre of Senegal. It is comprised of four 'departments': Dakar, Pikine, Guediawaye and Rufisque. Senegal's urbanisation rates rank as one of the fastest in sub-Saharan Africa where Greater Dakar represents approximately 50 percent of the total urban population at an estimated 2.8 million residents (UN-HABITAT 2008) growing at 3.1 percent (United Nations Development Program 2007) per year. Estimates vary but in Dakar, 30 (World Bank 2002) to 45 percent (UN-Habitat 2001) of the urban population live in unplanned areas. Being a peninsula, Greater Dakar has become increasingly saturated as urban development expands to the east. In terms of area, 38 percent of the total residential area of Greater Dakar is classified as 'informal', including 16 percent which is classified as 'traditional villages' (Precht 2003). The department of Pikine lies to the east of Dakar city centre, originally founded in 1952 by the Colonial government to relocate residents of the overcrowded Dakar centre. The original settlement of Pikine, now named '*Pikine Ancien*', or Old Pikine, has since expanded through largely spontaneously development into an informal urban area covering the majority of the 'neck' of the peninsula.

Figure 5-1 presents a brief history of the origins of Dakar. This is followed by a description of the institutional environment of the study context with respect to sanitation (section 5.2), a review of the different sanitation options present (section 5.3), a description of the institutional environment of the study context with respect to urbanisation and land delivery (section 5.4) and a review of the different land delivery mechanisms (section 5.5 and 5-6). The chapter concludes with a review of the socio-economic impacts of an existing regularisation project in Dakar-Pikine.

## A BRIEF HISTORY OF DAKAR

Between the 1350-1600s, the Cap Vert region was ruled by the powerful Djolof Empire, consisting of five coastal kingdoms serving the central state of Djolof. A combination of events, including new riches of trade routes, weakened the Djolof Empire, eventually leading to its demise. The area encompassing Greater Dakar, the Kingdom of Cayor, became independent from the Jolof Empire in 1549. In 1795 the Lebou of Cap Verde revolted against the Cayor rulers and formed the 'Lebou Republic.'

The Lebous fishing communities are considered as the original settlers of the peninsular now known as Greater Dakar. It is understood the Lebous settled towards the end of the XV century, although inhabitants are recorded on the Dakar peninsula from the Paleolithic period.

Early colonial presence on the peninsula concentrated on the nearby island of Gorée, which is known today as one of the main slave trading posts off the West African coast. Gorée island was first colonised by the Portuguese in 1444. Subsequently it was controlled by the Dutch in 1588; the English in 1664 and finally the French from 1667. The village of N'Dakarou which gives Dakar its name was established by the Lebous residents of the peninsula to service the Europeans of Gorée Island. In 1843, N'Dakarou was observed to consist of just a few hundred huts. Following the abolition of slavery, the French developed a groundnut factory on Gorée island. As production expanded it moved to the mainland (Rufisque) in 1840. Gorée soon became overcrowded and the French no longer fearing the power of the Cayor Kingdom took possession of Dakar mainland coast in 1857. 1858 saw the first cadastral plan, followed by another in 1876.

Dakar's influence in the region grew, acting as a trading hub for the region with the development of a railway and port. Dakar became the capital of the short-lived Malian federation between 1958 and 1960. Dakar became the capital of an independent Senegal in 1960.

Figure 5-1: A brief history of Dakar

## 5.2. Institutional Environment of Sanitation Service Provision in Dakar

Four main aspects describe the sanitation sector in Dakar<sup>21</sup>.

- Organisational and institutional setting
- Planning documents
- National sanitation policy and programs
- Legal framework

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<sup>21</sup> Hoang-Gia *et al.* 2004 also include financial and promotional tools which lie beyond the scope of this research.

The institutional and operating environment of sanitation service provision in Dakar is characterised largely by the utility ONAS and the pit emptiers. Informed by the principles of the research framework both formal and informal actors are included; the organisational setting discussed below considers both service providers simultaneously.

*Organisational and institutional setting* helps to illustrate what rules and norms describe the operating environment of the service providers. Following a redistribution of State services in 2010 (decree N 2010-925 of July 08th, 2010) the Ministry of Urbanisation and Sanitation are responsible for sanitation on a national level. Prior to this, this was previously the responsibility of the Ministry of urbanism, habitat, urban hydraulics, public hygiene and sanitation. The state holds a service contract with ONAS who is in turn responsible for the implementation and management of national sanitation policies. The institutional setting of the sector has experienced significant reform in the past two decades; there are three significant years: 1995, 2002 and 2008.

- 1995 marked the water sector reform, where the independent office for sanitation (ONAS) was created. The motivation for this was to place a greater emphasis on sanitation developments and develop sanitation strategies that were appropriate for all.
- 2002 marked the implementation of the PAQPUD strategy directly targeting peri-urban areas of Dakar and brings on-site sanitation as part of the national sanitation strategy.
- Finally in 2008, a revised code of sanitation was agreed explicitly stating the roles and responsibilities relevant to the PAQPUD developments. In the same year ONAS signed a new contractual agreement with the state where ONAS takes a greater responsibility for faecal sludge management and treatment, including establishing a framework for the licensing of the faecal sludge entrepreneurs.

With regards to faecal sludge management, there are two types of pit emptiers in Dakar: those that empty mechanically with a suction truck and those that empty manually using buckets and spade, the “baay pelle”. The findings of the research detail both practices are widely used and, in some cases, the mechanised truck operators will empty compacted sludge using manual methods. Household pit emptying services tend to operate outside the formal system therefore formal rules have little effect on their operations. They are small size and independent operators that work largely independently. The mechanical operators have organised themselves into an association (the A.A.A.S.) since 2007. Although some of the mechanical emptiers know manual emptiers, the manual emptiers are less organised and tend to operate more locally.

*Planning documents.* Early sanitation planning documents in Dakar followed a model of conventional urban planning where the sanitation Master Plan document (*Le Plan Directeur d’Assainissement*) was aligned to the overall town master plan (*Plan d’Urbanisme*). This approach applies designated land use and planned development. In practice however this method was found to lack flexibility and was considered inappropriate from earlier lessons of the sites and services schemes. As such, a new planning approach was adopted applying the

demand-responsive and incentive-driven principles of strategic sanitation planning (see section 4.1.4). As such Senegal's Strategic Sanitation Plan (*Le Plan Stratégique d'Assainissement*) was developed.

*National sanitation strategies.* Senegal's Water and Sanitation Program for the Millennium (PEPAM) is a strategic response to meet the water supply and sanitation Millennium Development Goals (MDGs). The PAQPUD represents the urban component of the PEPAM which focused on the provision of sanitation services to low-income populations of peri-urban Dakar. It included household sanitation, small-bore sewerage networks, public toilets, and school sanitation and sludge treatment facilities.

Also since 2006 ONAS has collaborated with SANDEC (the Department of Water and Sanitation in Developing Countries) in improving the management of the faecal sludge treatment plant and conducting research on the technical and economic processes of sludge treatment.

*Legal framework.* ONAS' activities are governed under three different legal codes: the code of hygiene<sup>22</sup>, the code of the environment<sup>23</sup> and the city and urban planning code<sup>24</sup>. As part of the PEPAM strategy, a new code of sanitation was developed in 2008 regrouping the existing legal requirements and bringing it up to date with the new activities under the PAQPUD project (Code de L'Assainissement, 2009). Key points of the 2009 Sanitation Code include:

- Approval and accreditation of the faecal sludge transporters by ONAS (Article L79; Article L.82)
- Prohibition of dumping faecal sludge anywhere but the faecal sludge treatment sites (Article L.86).
- Defined owner responsibilities
  - Every house owner not served by a public sewerage network has to build an on-site system that conforms to current standards (Article L.93)
  - Every owner has to ensure their on-site sanitation is in good working order (Article L.94)
- Defined user responsibilities
  - Every user of an on-site sanitation facility must ensure a regular maintenance (Article L.95)
- The design, the realization, the smooth operation and maintenance of on-site sanitation facilities is falls under the Ministry in charge of sanitation. If a deficiency of an installation is observed, the works are automatically chargeable to the owner (Article L.96)

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<sup>22</sup> Law No. 83-71, 5th July, 1983

<sup>23</sup> Law No. 2001-01, 15th July, 2001

<sup>24</sup> Law No. 88-05, 20th June, 1988

This code of sanitation is noteworthy for grouping the various regulatory requirements across several departments but, and more pertinent for this research, it formally defines the relationship between private pit emptiers and ONAS and; explicitly states the roles and responsibilities of both owners and users of on-site sanitation. This revised sanitation code however is relatively new and was introduced after the fieldwork. As such, the discussion that follows on how sanitation services are delivered does not reflect on the actual impact, if any, of this law. For example illicit dumping is also governed by the legal frameworks, it is not strictly controlled. During the data collection, illicit dumping was witnessed on to wasteland at the side of the main road out of Dakar during daylight hours.

### 5.3. Sanitation Options in Senegal

Sanitation access in Senegal is good, where access rates in Greater Dakar are 81.5 percent of the total population. Sanitation options in Senegal can be grouped into three categories: sewerage sanitation; on-site sanitation and semi-collective systems (simplified sewerage).

By far the most common form of sanitation in Senegal is a form on-site system (Hoang-Gia 2004). The range and use of various sanitation technologies in Greater Dakar are reported below (Direction de la Prévision et de la Statistique 2004).

• Flush to sewer	25.6%
• Flush to septic tank	55.9%
• Covered latrine	8.7%
• Ventilated Improved Latrine	1.7%
• Bucket	3.7
• Simple latrine	1.1%
• No sanitation	1.9%

Sewage networks exist in five cities in Senegal (Greater Dakar, Saint Louis, Louga, Saly, Kaolack and Thies). Greater Dakar sewage network comprises of 742km of sewers and 43 pumping stations (Hoang-Gia 2004). An estimated 14 percent of sewage collected is treated (blue arrow in figure 5-2 where rest is discharged directly to the sea (red arrows in figure 5-2).

Cambarène is the centralized activated sludge treatment plant for Greater Dakar which has recently extended its capacity through a US \$13 million African Development Bank loan to 15,000 m<sup>3</sup> per day (idem.). Conventional sewerage network is still limited mainly to the commune of Dakar, where approximately 50 percent of households covered by the network are connected, representing approximately 25 percent of the urban population.



Figure 5-2: Sewage treatment and disposal on the Cap Vert peninsula (Hoang-Gia 2004)

Extensions were made to the central network to several areas of the peri-urban commune of Pikine in 1989 and 2003-2005 with the African Development Bank and World Bank funding respectively. The town of Rufisque, on the outskirts of Greater Dakar also has a small localized system and treatment plant with approximate capacity 2856 m<sup>3</sup> per day. A known issue with Dakar's sewage network is that it inadvertently collects rainwater which can cause flooding of the sewers in heavy rains.

A handful of semi-collective settled sewage schemes have been installed across several areas of Greater Dakar, first by the NGO ENDA-RUP (Fall, Gueye 2005) and subsequently as part of the national sanitation strategy for urban areas (Hoang-Gia *et al.* 2004). In total an estimated 2000-3000 households are served however there are reports of difficulty in uptake and implementation (Norman, Scott & Pedley 2011).

The aforementioned PAQPUD (*Project d'Assainissement dans les quartiers périurbains* or sanitation project in peri-urban areas) is the urban component of a comprehensive national program to improve the provision to the urban and peri-urban districts, the *Projet eau à Long Terme* (PLT) or the long-term water project. This was realised through the creation of a national water supply and sanitation program (PEPAM). For urban centres this program was realised through the PAQPUD project. The PAQPUD, launched in 2002 specifically targeting the peri-urban areas initially estimated to reach 400 000 beneficiaries between 2002 and 2008. The primary beneficiaries were low-income populations living in peri-urban areas of Dakar

who have inadequate sanitation, primary schools in these areas, artisans and small stakeholder businesses of the area. The program comprised of four main elements:

- Sanitation infrastructure construction
- School sanitation
- Improvement of emptying procedures and services
- Improvement of the capacities of actors within the sector

Sanitation technology was chosen by the users based on their household needs, capacity and willingness to pay. Local skilled workers were commissioned to build these infrastructures. Hygiene education was incorporated into the start of the project using PHAST methodologies. The PAQPUD project was rated a success by ONAS and the World Bank and due to the on-going demand a new two year phase of the project has been launched where an additional 15000 households will be targeted (CMAE *et al.* 2008).

All of the aforementioned programs follow a considerable reform of the water and sanitation sector of Senegal in 1996. The reform split the main water utility (SONEES) into three offices: the National Office of Water for Senegal (SONES) charged with asset management; Senegalaise des Eaux (SDE) charged with water provision and operation and maintenance and the National Office of Sanitation for Senegal (ONAS) charged with collection, treatment, and disposal wastewater and storm water for the urban and peri-urban areas.

In terms of water provision, the majority of households in Dakar (77.3 percent) have a private connection to a water supply. See Table 5-1 for a distribution of household water access in Dakar, results taken from the 3rd general survey of the population and habitat from 2002.

	internal wells	external wells	internal taps	public taps	forage	water vendor	cours d'eau	other
Urban	2.4%	4.0%	78.8%	11.8%	0.1%	2.4%	0.1%	0.4%
Rural	6.1%	33.3%	15.2%	40.6%	0.2%	4.2%	0.1%	0.3%
Total	2.5%	4.7%	77.3%	12.5%	0.1%	2.5%	0.1%	0.4%

Table 5-1: Water supply and coverage, Senegal (ANSD 2006).

## 5.4. Institutional Environment of City Planning and Urban Management in Dakar

Four main aspects describe the institutional environment of city planning and urban management in Dakar:

- Organisational and institutional setting
- Planning documents
- National sanitation policy and programs
- Legal framework

*Organisational and institutional setting* Institutional arrangements and managing urban development in Senegal is complex and has experienced redistribution of services over recent years. At the time of the research, the Ministry of Urban Planning and Land Management (MUAT) comprised of:

- **Department of Town and Country Planning (DAT)** is charged with defining national policy; prepare and implement decisions made with respect to the town and country plans.
- **Department of Town planning and Architecture (DUA)** produces the planning documents and realises any restructuring operations.
- **Department of Surveillance and Control of Land Occupation (BSCOS)** created in 2004, charged with ensuring if the occupation and building construction are in accordance with town planning schemes.

MUAT also oversees the “Fondation Droit à la Ville” (FDV) – the public organisation founded in 2000 to implement the urban restructuring and the regularisation program. Since then, changes in organisation now place these departments alongside the Direction of Sanitation under the Ministry of Urbanisation and Sanitation.

The strong regulatory framework surrounding land management and tenure issues (Durand-Lasserve, Ndiaye 2008) in Senegal today, as in other West African countries, is underpinned by layers of customary and colonial rule. The formal tenure system of post-independent Senegal is heavily influenced by the colonial land-management systems. The Lebus are recognised as the original settlers of the Dakar region, whose systems originate with clearance rights such as the right of axe or the right of fire as a means of holding land.

During Colonial times, land was treated by the Colonial powers as property, in contrast to the existing communal land management systems. Following independence, land was nationalized under law of the national domain (no.64-46 of 17<sup>th</sup> June 1964). This law called the population to register their land held in the traditional system under formal law, theoretically abolishing customary ownership by formalising it. This was refused by the Lebou authorities and customary land delivery was maintained via the Muslim courts (*cadi*) and customary leaders. 1970 saw a byelaw granting special arrangements for the traditional villages, although

they are still classified as 'informal' by the state. Lebou villages represent about 16percent of the land of the Greater Dakar area however vast areas of land remain unregistered, 95percent of the land of Senegal remains National Domain property.

Despite a history of concerted planning and strong policies to avoid spontaneous settlements developing (see section on national policy and planning below) experience has shown that the control measures and new plot developments have not been able to keep pace with the proliferation of spontaneous occupation. The reality of Dakar's urbanisation, as with many developing country cities, the growth has been largely in the informal sector. Tenure pluralism dominates the tenure systems of Senegal. This pluralism plays a major role in the urbanisation history and current day practices.

*Planning documents.* The main planning documents are a series of urban master plans (Plan Directeur D'Urbanisme PDU) and detailed town planning documents (Plan d'Urbanisme Détaillé, PUD)<sup>25</sup>. The most recent plan Dakar Horizon 2025 presents a vision of 2025 Dakar as a modern metropolis city of designated land use, green spaces and controlled urban development. It applies a curative urbanism approach in regularizing the informal areas and to limit the uncontrolled expansion by addressing the land use and ownership issues at the fringes of urbanisation. This said, the validation of this plan was suspended by authorities and subject to the review of certain data and is, at the time of writing, yet to be approved. The PDU town planning documents determine land use and planning. Their approval process is lengthy and they are often developed outside the remit of the PDU without submission to public enquiry (Schafli 2001). From 2005, the government of Senegal through the Cities Alliance program is in partnership with Agence Française de Développement (Afd) , UNEP , World Bank and UN-HABITAT to develop a city development strategy (CDS) for Greater Dakar.

*National policy and programs.* Dakar has witnessed several slum clearances, as early as 1914 when non-colonial residents of the central plateau were evicted due to a cholera outbreak. Clearance of overcrowded inner-city settlements featured throughout Dakar's demographic and geographic expansion. In 1952 Pikine was created to relocate a new wave of evictions from Dakar's plateau. In the 1980s the government undertook an aggressive stance against unplanned settlements of Dakar city where homes were demolished by bulldozer. Displaced people relocated to the peripheral areas of Greater Dakar (Barbier 2006). This caused such public outcry and significant civil unrest leading to the clearance policy being abandoned in 1987. This gave rise to a revised approach of dealing with informal settlements: slum upgrading. In 1991 the Senegalese government adopted a new policy of slum regularisation in collaboration with GTZ. The current policy of urban planning in Senegal is

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<sup>25</sup> The first PDU dates from 1946 (SONED-Afrique 1981), Dakar had four urban master plans prepared in 1946, 1961, 1967 and 2001.

based upon the aforementioned planning documents is characterised by a three pronged approach to progressively eliminate spontaneous settlements:

- a restructuring program of spontaneous districts
- enforced control of land use to avoid new spontaneous settlements developing
- The creation of urban development zones or ZAC (*zones d'aménagement concerté*): serviced (water, electricity) plots to accommodate the relocated and new urban growth.

The city-wide restructuring program of spontaneous districts '*Programme de Restructuration de l'Habitat Spontané*' was launched first in Dalifort (1987) as a pilot project and subsequently extended to 'Pikine Irrégulier Sud' in the mid 1990s with the support of GTZ. Tenure regularisation occurs in the form of offering a *droit de superficie* (occupation right), an incremental and real property right which are granted on a renewable fifty year period. An 'occupation right' can be inherited, transferred or mortgaged. The occupation right acts in a horizontal way where the land itself is leased from the state, whereas all that sits on the land belongs to the owner of the title. Houses affected by the development of trunk roads as part of the regularisation process, or those prone to severe flooding, were allocated a plot in a designated urban development zone.

*Legal framework.* The Ministry of urban planning works in accordance to the Urban Planning Code (law no.88-05 29 June 1988). Several other laws impact on tenure regularisation

- Law of the national domain (no.64-46 of 17th June 1964) defines that the National Domain constitutes of lands that are i) not classified under the public domain ii) those that are not registered or ii) those whose property was not registered by the land registry from the date of this present law. Also not included are lands which, on this same date, were the object of a procedure of registration in the name of a person other one than the state.
- The constitutional law (no.2001-03) affirms the right to privately own land, equally for a man or a woman.
- The regime of the law no. 95-11 of the 7th April 1995 which created the la Fondation Droit à la Ville (FDV): specialist operator in urban restructuring and regularisation.
- Decree N 2010-925 of July 08th, 2010: distribution of the services of the State and the control of public institutions, national services and services with public participation between the Presidency of the Republic, the Primature and the ministries

## **5.5. Urbanisation and Land Delivery in Greater Dakar**

Urban growth and rural to urban migration have generated a rapid urbanisation of Senegal's capital, Dakar. The rural – urban migration has been accelerated by a prolonged drought and the withdrawal of state agricultural subsidies as a measure of the structural adjustment programs (Fall, Gueye 2005).

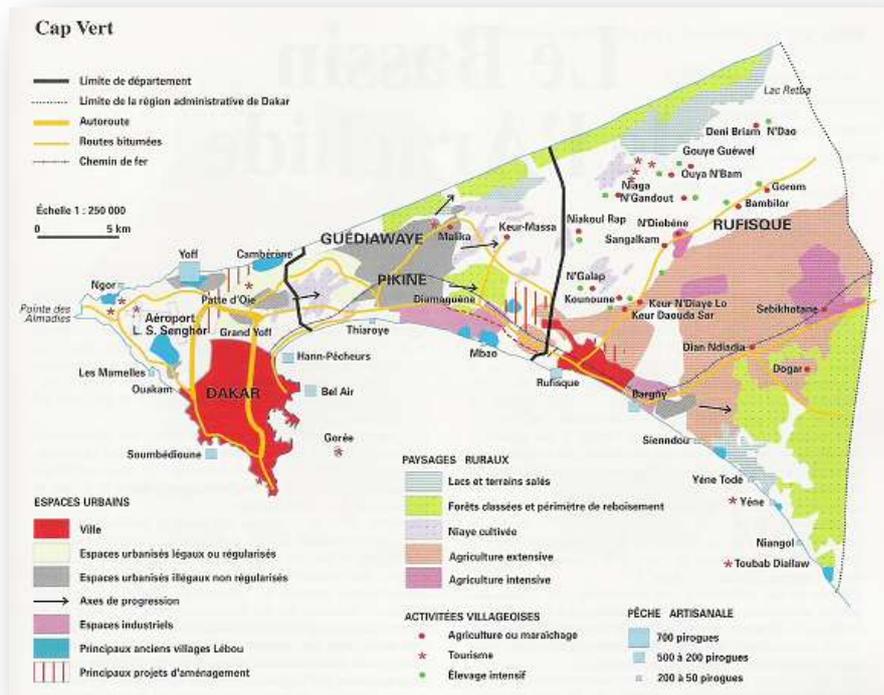


Figure 5-3: Land occupations on the Cap Vert Peninsular and Greater Dakar (MUAT-DUA 2001)

This rapid increase in population generated a spatial expansion and densification of the Dakar peninsula where those migrants choosing to permanently relocate to Dakar occupied vacant land within and on the outskirts of the city. Figure 5-3 illustrates the different land occupations of Greater Dakar where a limited number of informal and spontaneous settlements are shown in grey (in reality they extend across much of the neck of the peninsula.)

Officially in Dakar, land and housing categories are divided between ‘regular/legal’ and ‘irregular/illegal.’ Those of the regular/legal category hold titles, permits or long leases; the irregular/informal houses have no formal authorization.

## 5.6. Integration of the Formal and Informal Land Delivery Systems

In Dakar the informal land delivery system is thriving as formal land delivery mechanisms are unable to respond to the demand of the population. Although informal land delivery systems are not recognised by the state, tenure security is provided through absence of land clearance (since the 1991 acceptance of these areas). Through the *droit de superficie* mechanism areas delivered through informal means can buy into the formal system. However

people in these areas lack *de jure* tenure, and in case of forced eviction, are thus unlikely to receive compensation. People value upgraded basic services more than obtaining *de jure* tenure security. People build permanent structures showing they are willing to invest and are not in fear of eviction. However they are not able to secure loans with this type of tenure security.

In terms of ownership of the house itself, Dakar hosts the largest proportion of rented accommodation in Senegal (49.4percent), see Table 5-2.

	owner	co-owner	tenant	lodged by employer	lodging with family	other
Dakar	41.8%	3.5%	49.4%	1.7%	2.9%	0.8%
Senegal total	67.2%	6.9%	19.1%	1.2%	4.9%	0.8%

Table 5-2: Tenure status in Dakar and Senegal (Precht 2003)

## 5.7. The Socio-Economic Impacts of Land Titling in Dakar

This section borrows heavily from a recent evaluation of the socio-economic impacts of the land titling program in Dakar, Senegal implemented between 1987 and 2007 detailed in Payne *et al.* (2007) and Durand-Lasserve and Selod (2007). This case is relevant for three reasons:

- Senegal was the first West African country to implement a systematic and nationwide urban regularisation program based on the delivery of real property rights. It has nationwide policy of systematic land regularisation and upgrading of basic services in informal urban areas.
- The approach was considered an innovative response to tenure informality in Western Africa.
- Relevant to the location of the field work.

The main findings of this evaluation on the impacts of tenure regularisation were:

- Tenure regularisation has had a limited impact on security of tenure as it was already guaranteed by a government commitment against forced evictions (adopted in 1991) and strong customary ownership processes.
  - Most residents consider themselves as owners of their property, including the land whatever their status is.
- Progress to deliver titles was poor - many of households participating in the project had not completed the process, thus not in possession of the title. (Reasons for this were delays in the administrative process; insufficient resources of beneficiaries to pay for the full cost and; but most commonly beneficiaries being unwilling to pay the full amount as they do not consider it necessary (having the option to obtain legal title is often sufficient).

- Impacts on housing improvements are difficult to measure as it is difficult to distinguish between regularisation and provision of infrastructure.
  - Although observed improvements include roof improvements; additional rooms and additional story.
- Impacts of access to credit are limited. A guarantor is usually required to secure a loan rather than property title.
- To date, the cost of regularisation is not being recovered
  - Populations are reluctant to pay government for a plot that they have already paid for along customary and private channels.
- The impact on poverty reduction is not verifiable statistically however the process creates opportunities to build community based organisations which have indirect improvements.
- Impacts on land and housing markets are contradictory – acceleration of gentrification through market driven displacements
  - Accelerated the informalisation of formal land transactions.
- Tenure regularisation does not always result in significant improvement of sanitation and drainage.

The review (Durand-Lasserve, Selod 2007) concludes that the achievements of this tenure regularisation program are limited in comparison with the resources involved and raises two questions regarding the principles of land titling.

The first is regarding the limits of such a project in a context of urban poverty; weak governance in land administration and tenure plurality. The tenure regularisation project was in fact a brainchild of donor agencies rather than the Senegal government and has therefore suffered obstruction and limited buy in despite being adopted as a national policy in 1991. Furthermore, administrative agencies involved in land titling lack capacity to deal with the increased duties of land titling; this is compounded by the complexities of operating under a system of tenure plurality.

The second question raised is whether such titling schemes are relevant given that communities in the settlements targeted already enjoyed a relatively high level of tenure security. As the case study showed, owners are unlikely to follow an additional, expensive and complicated process of obtaining a title when they consider it unnecessary and of little benefit. The main beneficiaries in this context are buyers.

## **5.8. Chapter summary**

This chapter presents the study area of the research: Dakar-Pikine, the largest of the four communes of Greater Dakar that occupy the Cap Vert peninsular. The institutional environments relevant to both sanitation and tenure are presented. Notable points of these include Dakar's strong regulatory framework on land management is underpinned by layers of

customary and colonial rule, which is common to many ex-colonial African cities. Dakar however has since implanted significant urban upgrading, first in the *Parcelles Assainies* and more recently with the GTZ urban upgrading strategies in addition to a very innovative PAQPUD sanitation strategy specially targeting low income urban settlements of Dakar. A recent evaluation of the urban upgrading project in peri-urban Pikine is also described which questions the relevancy and limits of such processes given the costs and resources required for limited results. This chapter essentially provides the backdrop for the findings of the study which are presented in the subsequent chapter.

# 6. Findings

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## 6.1. Chapter Outline

This chapter presents the findings pertaining to each of the three domains of the research framework outlined in chapter three: the household (D1); sanitation service provision (D2) and the city planning and urban management (D3). Each domain is presented in turn and includes a description of the data, the findings and concludes with a summary. Whilst in some cases some description is necessary to present the data, the aim of this chapter is to present the findings objectively; chapter seven allows for more detailed discussion of the findings against the wider body of knowledge.

As stated in the methodology, the section titled ‘Domain 1: The household’ relates to the findings of the questionnaire survey. The sections ‘Domain 2’ and ‘Domain 3’ follow respectively presenting the findings from the interview data.

## 6.2. Domain 1: The Household

This section details the findings relating to the household domain (D1) informed by the survey. The questionnaire administered in the survey can be found in appendix B. This section is split into two parts. Firstly a general description of the survey data is presented to give a general overview. The second part (sections 6.2.2- 6.2.5) presents the main findings of domain one where the research maps how the tenure variables relate to sanitation issues at this lowest domain (i.e. the household). The matrix presented in figure 4.5 (section 4.6) is used to guide this investigation systematically through these multiple elements of both tenure and sanitation. Finally section 6.2.6 concludes with the key findings regarding the household domain.

### 6.2.1. Description of the household domain data

Survey data was collected from four areas of Dakar-Pikine: *Pikine Ancien*, *Pikine Irrégulier Sud*, *Thiaroye Kao* and *Thiaroye sur Mer* contacting a total of 363 households on 340 plots. For contextual purposes photos of each of the settlements can be found in appendix F and a short description of each settlement follows.

*Pikine Ancien* is the original settlement of the Dakar-Pikine, originally founded in 1952 to accommodate evictees from central Dakar. The three main roads travelling north to south are paved while the majority of secondary roads are unpaved. Several of the original plots marked

in 1952 have been subdivided. Whilst the majority of buildings are constructed of concrete and range from single to multi-storey blocks, several wooden shacks still remain. Flooding can still be a problem due to its proximity to the Niayes (swampland).

*Pikine Irrégulier Sud* lies to the east of *Pikine Ancien* and is an area which has been targeted for redevelopment under the urban upgrading scheme. A major part of this redevelopment has comprised the building of two main paved roads running east to west through the settlement. The secondary roads are unpaved and some are narrow. Although some multi-story buildings are present, the majority of the buildings are singly story made from concrete with corrugated roofs. There is no drainage to channel grey and rainwater and, with the increasing concretisation and urbanisation of the areas, flooding is a problem during the rainy season and severe flooding has displaced several households.

*Thiaroye Kao* is a vast spontaneous settlement extending to the north and east of *Pikine Ancien*. It displays little formal urbanisation and only unpaved secondary roads infiltrate the area. Some of these roads are very narrow and several large areas are difficult to access by vehicle. The majority of buildings are singly story made from concrete with zinc or asbestos corrugated roofs; however several wooden shacks still remain. As with many areas of *Pikine*, flooding is a problem and large water basins have been dug as a result of the “Plan Djaxaay”, the State plan for flood prevention.

*Thiaroye sur Mer* is a thin strip of land along the south of the neck of the Cap Vert peninsula which is bounded at the north by the main route out of Dakar and at the south by Hann bay. It is originally a Lebou fishing village but spontaneous urban developments have since engulfed the area. Towards the core and along the coast the Lebou village layout is still evident, with concessionary housing, and very narrow streets (less than one metre). The outskirts resemble other spontaneous areas of Dakar with a formal housing development area to the east. The majority of the roads are unpaved and houses tend to be single or double story concrete buildings. A rail track bisects the area and pollutants are a problem as it lies next to the industrial areas of Dakar<sup>26</sup>.

Descriptive characteristics of the sample are reported in table 6-1 against national figures taken from the third national survey of 2002 (2006). 58.7% of the plots surveyed were owner plots only, and 20.7% were renters, the remainder consisting of various combinations of owners and tenants living on the same premises. The type of occupational status of this study sample is comparable to similar studies in the Dakar region (see table 6-2).

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<sup>26</sup> Since 2007, lead poisoning from informal recycling of automobile batteries has been responsible for at least 18 child deaths in the Ngagne Diaw area of *Thiaroye sur Mer*. The WHO has condemned the affected area as toxic and unsuitable for inhabitation. The Ngagne Diaw area is adjacent to the settlement where the research took place.

Category	Characteristic	N=	Sample Description	National Survey (2002 Rgph)
Respondents age	20-29		3%	7.6% (urban)
	30-39		8.5%	20.4% (urban)
	40-49		20.9%	27.7% (urban)
	50-59		31.4%	21.2% (urban)
	60+		36.1%	22.1% (urban)
Ethnicity	Wolof / Lebou		49.6%	47.5%
	Peul / Toutcolour		26.4%	19.6%
	Serere		8.8%	15.0%
	Mandingue / Soce		4.1%	3.0%
	Diola		3.0%	4.0%
	Other		8.1%	
Highest education	None		13.8%	46.4% (urban)
	Arab / Koran		51.2%	
	Professional		0.6%	
	Primary		19.3%	32.1% (urban)
	Secondary		11.6%	19.9% (urban)
	Tertiary		3.6%	3.5% (urban)
Occupancy	Owner		71.9%	45.3% (Dakar)
	Tenant		26.7%	49.4% (Dakar)
	Other / guest		1.4%	2.9% (Dakar)
Type of dwelling	Single story		89.0%	65% (Dakar)
	Multiple story		11.0%	27.4% (Dakar)
Water	Inside tap		78.0%	77.3% (Dakar)
Electricity			89.0%	85.7% (Dakar)
Greywater discharge	Networked drain		8.0%	36.2% (Dakar)
	Open drain		1.1%	2.8% (Dakar)
	Nature		53.7%	42.0% (Dakar)
Household size	average		10.87	8.2 (7.5 for Dakar)
Income / month (CFA)	< 50,000		5.0%	
	50 000 - 99 000		17.4%	
	100 000 - 149 000		24.9%	
	150 000 - 199 000		21.8%	
	200 000 - 249 000		12.7%	
	250 000 - 299 000		6.4%	
	300 000+		6.6%	
	unclassified		5.2%	

Table 6-1: Socio-economic description of sample

Occupational status Dakar-Pikine	Survey sample data	IFAN (1992) <sup>27</sup>	ESAM (2004)
Owner	58.7%		
Owner with tenant	5.5%	57.8%	43.9%
Owner with multiple tenants	15.2%		
Tenant w/ absent owner	20.7%	36.0%	48.0%
Guest	5.0%	6.1%	

Table 6-2: Occupational status of Dakar-Pikine

<sup>27</sup> (Antoine, 1992)

The Ethnic groups represented in the survey sample are largely typically of Dakar where approximately half the respondents were of Wolof or Lebou origin, a quarter was Peul or Toutcouleur and the remainder displayed a varied mix of ethnicities from across the region. Education beyond primary school was uncommon and the most common form of employment was in the informal sector in sales or artisanal vocation. Owner households tend to be larger than tenant households with 12.1 and 6.39 residents on average respectively. Tenant households tend to have lower incomes, fewer assets, ethnically different and a higher male head ratio to that of owner households.

The levels of owner occupation in the Dakar region is relatively high, particularly in the peri-urban areas which has been the case throughout Dakar's evolution. In Dakar, given the larger size of owner households and their prevalence, a greater proportion of the Dakar population lives with the owner of the property. These characteristics are summarised in table 6-3.

Household Sample Characteristics	Scott (2008)	
	Owner	Tenant
Household size (5% trimmed mean)	12.01	6.39
Number of adult males (5% trimmed mean)	3.03	1.51
Number of adult females (5% trimmed mean)	3.43	1.45
Gender of household head (%female)	30.1%	26.8%
Primary ethnic groups	Wolof 55.9%; Pular 21.5%	Pular 37.1%; Wolof 34.0%;
Household total monthly income (median)	150,000-199,000 CFA	100,000-149,000 CFA
No of TV's (5% trimmed mean)	1.24	0.62
No of fixed telephone lines (5% trimmed mean)	0.28	0.00
No of mobile phones (5% trimmed mean)	3.35	1.76
No of fridge (5% trimmed mean)	0.46	0.19

Table 6-3: Characteristics of owners and tenant households.

Renting a room for owner occupiers is seen in Dakar as an additional source of income. Often owners will add an additional floor to their existing property to rent to tenants. Therefore, in terms of access to basic services such as water and electricity, tenants and landlords in Dakar tend to live in the similar types of habitats.

As explained in sections 2.8, the measurement of tenure security can be problematic. Conventionally it has been defined using a composite of proxy indicators (UN-HABITAT 2002). For this study the following proxy indicators are used to describe tenure security: proof of ownership; perceived risk of eviction; length of duration of residence; plan to leave.

Surveyed respondents were asked if they had a document that proved their ownership or guardianship of the property; results were divided into owners and tenants. Of the 261 owner households, 41.4 % (n=108) were unsure of their status with regards to proof of ownership (or did not want to confirm). Of those however who were able to respond 37.3 % (n=57) claimed

their ownership status lied in the form of a legal document<sup>28</sup> whereas 47.1% (n=72) claimed their ownership status was proven by an informal act of sale. See table 6-4.

Frequency of land title documents	Frequency	Percent	Valid Percent
<b>legal document (Title, PO, DS)</b>	57	21.8%	37.3%
<b>inheritance certificate</b>	10	3.8%	6.5%
<b>act of sale</b>	72	27.6%	47.1%
<b>none</b>	14	5.4%	9.2%
<b>Total</b>	153	58.6%	100.00%
<b>Missing (unsure of documents)</b>	108		
<b>Total owner households</b>	261		

Table 6-4: Proof of ownership response frequency

It must be said that the concept of formal tenure is largely defined and understood at a city planning and urban management level and not at the household level. Many of the owner participants of the survey in Dakar-Pikine had followed the socially accepted channels of buying land or a house, which involves paying a fee, signing ‘proof of sale’ documents in front of witnesses. The fact that this process is not legally recognised is rarely of concern if even acknowledged to owner occupiers. They enjoy a relatively good level of tenure security without the need for formal recognition. To register the sale under the urbanisation offices, owners would incur additional costs which are considered largely unnecessary.

Of the 97 tenant households interviewed, the vast majority, 92.8% (n=90) did not have a written agreement with their landlords, many paying two months’ rent advance which acted as a security bond.

All survey respondents were asked to rate the likelihood that they would be forced to leave their residence in the next year. Many respondents 41.9% (n=152) were unable to quantify this likelihood, claiming eviction is a force out of their hands, and for many, ‘in the hands of God’. For those who were able to respond, 32.8% (n=119) considered the risk of eviction to be ‘impossible’ and 14.9% (n=54) considered it a ‘weak’ risk. Reasons given to justify respondents’ perception of security, were compliance to accepted norms 25.9% (n=94) as the primary justification. Only 6.9% (n=25) cited legal compliance as a reason for their perceived tenure security. In 8.8% of the cases (n=32) respondents were aware that a higher authority could force them out if they so decided. Many respondents found this question to be difficult to answer in quantifiable terms. Being asked to leave was considered something beyond the households’ immediate control and, for many, was a question that was not one they considered until they had to. These difficulties underline the need to use supporting proxy indicators for tenure security relating to household decisions.

<sup>28</sup> Legal title, occupation permit (permis d’occupation) or right to occupy (Droit de superficie).

This concludes the summary of the description of the survey data; the following section proceeds to present the findings from this data.

### 6.2.2. Tenure and access to sanitation

This is the first of four sub-sections that detail the findings of how the different tenure indicators relate to access to sanitation. Guided by the matrix of tenure and sanitation aspects (table 4-3), the findings are presented systematically; looking at each of the aspects of tenure (i.e. tenure typology; tenure status and tenure security) and their relation with sanitation access at the household level. The following sections consider the different elements of sanitation and address in turn how tenure relates to *user satisfaction*; *investment decisions* and *household pit emptying*. For clarity the main findings are presented in bold text and summarised at the end of each sub-section.

#### 6.2.2.a. Tenure typology and access to sanitation

This section considers if and how tenure typology and access to sanitation relate. To draw an accurate picture of household access and use of sanitation facilities, three different questions were asked of the respondents. First to identify the presence and technology type of the sanitation facilities, the plot questionnaire asked “is there a toilet / latrine on the plot?” if respondents answered yes, then the researchers inquired “what type?” to identify the technology level and type. Secondly, individual households were asked “what toilet facility do you usually use” and finally, respondents were asked “how many other households share the same facility?”

At first sight, working with the plot level data, the sanitation technologies were analysed against the tenure typology. Under this analysis it is clear that there is a significant delineation between sanitation technology and if the settlement was planned and legal. As to be expected given the sanitation types available in Dakar, all of the respondents who were connected to a conventional sewerage system resided in a regular planned area. Of the total number of plots interviewed in the planned area, 28.2% were connected to mains sewers, improved on-site sanitation remained the dominant sanitation solution. This suggests that living in a formal area is a necessary but not sufficient precondition of accessing networked sewerage. This finding however relates to technology type and the physical presence of the household facility. In reality this data is collected on a plot level rather than a household level. To allow for meaningful socio-economic comparisons between household characteristics we need to look at household level data and adopt the lens of the JMP categorisation system of improved sanitation; shared sanitation; unimproved sanitation and open-defecation as this takes actual access and the number of households per facility into account.

When the JMP ladder categorisation is applied as opposed to technology type and the data is analysed at the household level, a different reality emerges. This data is presented in table 6-5. What this data shows, when moving away from defining sanitation as a technology and applying the JMP categorisation, is that **there is no significant correlation between the level of sanitation and the tenure typology.**

Sanitation ladder		Tenure.type				Total
		informal	planned	regularised	traditional	
improved	Count	76	66	67	22	231
	% within Tenure.type	62.80%	64.70%	72.00%	48.90%	64.00%
shared	Count	42	34	25	22	123
	% within Tenure.type	34.70%	33.30%	26.90%	48.90%	34.10%
unimproved	Count	3	2	1	1	7
	% within Tenure.type	2.50%	2.00%	1.10%	2.20%	1.90%
Total	Count	121	102	93	45	361
	% within Tenure.type	100.00%	100.00%	100.00%	100.00%	100.00%

Table 6-5: Tenure typology \* sanitation ladder

Percentages of those households using improved sanitation are similar between spontaneous (62.8%) and planned areas (64.7%) are even higher in the regularised area (72.0%). This trend however was not followed in the traditional / customary area, where the level of shared sanitation was equal to that of improved private sanitation facilities (48.9%). These traditional areas, which are the oldest areas of Dakar, are village type settlements which have become part of the urban expansion. Here many continue to live with large extended families in concessional housing arrangements. This high incidence of private improved sanitation in the regularised area is potentially explained by the PAQPUD and other development interventions in this area. The fact that there is a higher incidence of private improved toilets in the regularised area than both the formal planned area and the informal spontaneous area suggests that formal tenure itself is not a factor in household sanitation developments.

To explore if external factors are impacting these results, the data is analysed by holding education and income constant. Firstly, controlling for education, groups were categorised into those which had followed formal education until completion of secondary level and those who had not. When comparing land tenure typology and sanitation ladder revealed little difference in overall figures where 66.7% of household heads educated to secondary level or above had improved sanitation whereas 63.6% without that level of education also had

improved sanitation. Controlling for income however does demonstrate a difference where 35.8% of households with a monthly income of less than 100,000CFA have private improved sanitation in comparison to 60.0% for 100,000 – 149,000CFA, 72.2% for 150,000 – 200,000CFA and 85.9% for 200,00+CFA (this data is presented in table 6-6 below). This confirms that income is a factor for sanitation.

Household Income Band	Sanitation Ladder		Planned Area	Regularised Area	Unplanned / Spontaneous Area	Traditional Area	Total
<100,000 CFA	improved	Count	4	8	16	1	29
		% within Tenure.type	23.5%	47.1%	36.4%	33.3%	35.8%
	shared	Count	12	9	27	2	50
		% within Tenure.type	70.6%	52.9%	61.4%	66.7%	61.7%
	unimproved	Count	1	0	1	0	2
		% within Tenure.type	5.9%	0.0%	2.3%	0.0%	2.5%
Total	Count	17	17	44	3	81	
	% within Tenure.type	100.0%	100.0%	100.0%	100.0%	100.0%	
100,000-149,000 CFA	improved	Count	4	31	16	3	54
		% within Tenure.type	30.8%	75.6%	66.7%	25.0%	60.0%
	shared	Count	9	9	6	8	32
		% within Tenure.type	69.2%	22.0%	25.0%	66.7%	35.6%
	unimproved	Count	0	1	2	1	4
		% within Tenure.type	0.0%	2.4%	8.3%	8.3%	4.4%
Total	Count	13	41	24	12	90	
	% within Tenure.type	100.0%	100.0%	100.0%	100.0%	100.0%	
150,000-199,000CFA	improved	Count	18	13	18	8	57
		% within Tenure.type	69.2%	72.2%	75.0%	72.7%	72.2%
	shared	Count	8	5	6	3	22
		% within Tenure.type	30.8%	27.8%	25.0%	27.3%	27.8%
	Total	Count	26	18	24	11	79
		% within Tenure.type	100.0%	100.0%	100.0%	100.0%	100.0%
Cont. on next page							

200,000+ CFA	improved	Count	35	14	21	9	79
		% within Tenure.type	87.5%	100.0%	95.5%	56.3%	85.9%
	shared	Count	4	0	1	7	12
		% within Tenure.type	10.0%	0.0%	4.5%	43.8%	13.0%
	unimproved	Count	1	0	0	0	1
		% within Tenure.type	2.5%	0.0%	0.0%	0.0%	1.1%
	Total	Count	40	14	22	16	92
		% within Tenure.type	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6-6: Controlling for income

The data also highlights a further dynamic: across all tenure typologies, for approximately a **third of the households surveyed shared sanitation facilities**. From the respondents the average number of households per sanitation facility ranged from 1.69 in the regularised area to 2.1 in the traditional village type settlement (see table 6-7 below for mean numbers of household per san facility).

	Tenure type			
	informal	planned	regularised	traditional
<b>Average household per sanitation facility</b>	1.88	1.87	1.69	2.1

Table 6-7: Mean number of households per sanitation facility across tenure types.

In summary, does land tenure typology affect household access to urban sanitation? When looking at this through a technology lens the answer would appear to be yes as conventional sanitation is likely to only service residents on formally recognised land. For the non-planned survey areas a form of on-site sanitation was the only sanitation solution available to the respondents. However this data relates to the physical presence of a latrine rather than usage at the household level. The study also considered sanitation access through the lens of the JMP categorisation. In doing so it becomes clear that formal tenure itself is not a factor in household sanitation developments. This highlights methodological limitations of focusing on physical presence of the sanitation facility, notably as it often relates to plot data rather than actual household and user specific data. Controlling for education and income does relate to sanitation access, whereas it was found that education did not. The findings also highlight that shared sanitation is a common solution across all tenure typologies.

**Key point:**

- **These findings indicate that there is no significant correlation in the context of this study between access (as a function of household level on the sanitation ladder) and land tenure typology alone.**

- **Shared sanitation represents approximately a third of the sanitation solutions for the households surveyed.**

### 6.2.2.b. Tenure status and access to sanitation

This section will consider how the tenure status of residents (i.e. if they are tenants or owner occupiers) affects access to sanitation.

The JMP categorisation of *improved* and *shared* sanitation are differentiated based upon the number of households sharing the sanitation facility, where two or more households sharing a sanitation facility are grouped as having access to *shared sanitation*. The previous section highlighted a high incidence of shared sanitation, which was common across all land tenure typologies. An analysis of the data along the lines of tenure status using a chi-squared test confirms a significant difference between sanitation level and tenure status of the household [(p=0.000), N= 342]. This remains constant when controlling for income and education level. **This implies that there is a significant relationship between the tenure status and access to sanitation.** The data shows that tenants households tend to share their sanitation facility with more households; where 81.1% of owners have a household improved (private) sanitation facility compared to 20.6% for tenants (see table 6-8). On average tenants share their sanitation facility with 3.2 households (average 20.4 people) compared to 1.2 households (14.4 people) for owners.

	Improved		Shared		Unimproved		Open Defecation		Total	
	Count	%	Count	%	Count	%	Count	%	Count	%
Owner / co-owner	210	81.1%	45	17.4%	4	1.5%	0	0.0%	259	100.0%
Tenant	20	20.6%	75	77.3%	2	2.1%	0	0.0%	97	100.0%
Total	230	64.6%	120	33.7%	6	1.7%	0	0.0%	356	100.0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	115.275 <sup>a</sup>	2	.000
Likelihood Ratio	114.704	2	.000
Linear-by-Linear Association	98.004	1	.000
N of Valid Cases	356		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 1.63.

Table 6-8: Access to sanitation by tenure status

The trend of tenant households being more likely to share is true of both male and female headed tenant households. 22.5% (n=16) of male headed households use improved sanitation facilities compared to 15.4% (n=4) of females. Whilst this may indicate female-headed tenant

households are lower on the sanitation ladder than their male counterparts, the sub-groups of the data set are not sufficiently large enough to draw robust conclusions here.

When the access to sanitation data is compared to other basic services for both tenants and landlords, it is clear that this large differential only seems to occur for sanitation (see table 6-9 below). Water and electricity show little difference in terms of access for tenants or owner households. This highlights the importance of considering the differences between owner-occupiers and tenants in sanitation.

Access To Basic Services & Living Standards For Owners And Tenants	Owner	Tenant
Households with water connection in-plot	89.7%	83.5%
Households with electricity connection	90.1%	84.5%
Households with improved (private) sanitation	81.1%	20.6%
Households with shared sanitation	17.4%	77.3%
Number of households per sanitation facility (5% trimmed mean)	1.2	3.2
Average users per sanitation facility unit	14.4	20.4
Number of households per pit (5% trimmed mean)	1.2	3.4
Average daily loading on pit (kg) <sup>29</sup>	25.9	39.1
Households using improved (mechanical) pit emptying	47.6%	32.8%
'Poor' level of habitat observed	16.2%	27.1%

Table 6-9: Access to basic services & living standards for owners and tenants

This relationship is confirmed when looking at the plot level data and plot composition. As table 6-10 shows the majority (70%) of plots housing both owner-occupiers and tenant households tend to share their sanitation facilities. From the study 91.5% of the owner-occupier plots had improved sanitation compared to 30.0% for owners housing one tenant and 27.3% for owner-occupiers housing multiple tenants. Only 22.7% of tenant only plots (i.e. where the owner was absent) had improved sanitation. **Tenants without the owner present were the most likely to have unimproved sanitation.**

Of the mixed plots in this study (n=35), 45.7% shared their sanitation facilities with the tenants, although respondents indicated that this was not always ideal. One owner renting out rooms to tenants and sharing the same latrine stated:

*“on n’avais jamais eu des problèmes avant mais un des locataires a hébergé beaucoup chez lui, ils étaient vingt, même plus dans la petite chambre puis la, les problèmes ont commencé, il fallait toujours vider, et ça bloquait” (TSM/087)*

“we never used to have problems before but one of the tenants invited a lot of people, they were twenty or more in the little room, and then the

<sup>29</sup> Based on 1.8kg/cap/day including water for cleansing (Strauss *et al.*, 1998)

problems started, we had to always empty (the fosse) and there were blockages”

It has been observed previously that owners may not share their sanitation facilities with tenants (Scott 2006) where in mixed owner / tenant residences the latrine was reserved for the sole use of the owner, tenants were required to use public facilities (at cost) or open defecation. It is important to note that this would remain hidden in current sanitation reporting.

What these results demonstrate is that the sanitation access level is heterogeneous between different tenure status’ and is related to the composition of households on the plot. This suggests the ‘latrine counting’ of national surveys may overlook not only the heterogeneity of sanitation access between owner-occupiers and tenants but also the implications of this for sanitation operation and developments. A shared sanitation facility introduces more complex management, shared responsibility for cleanliness and management but also shared cost of emptying. These dynamics will be looked into in a later section.

Sanitation access level		Plot living arrangement				Total
		Owner	Owner w/tenant	Tenants w/present owner	Tenants w/absent owner	
<b>Improved</b>	Count	193	6	15	17	231
	% within Par_type	91.5%	30.0%	27.3%	22.7%	64.0%
<b>Shared</b>	Count	15	14	39	55	123
	% within Par_type	7.1%	70.0%	70.9%	73.3%	34.1%
<b>Unimproved</b>	Count	3	0	1	3	7
	% within Par_type	1.4%	.0%	1.8%	4.0%	1.9%
<b>Total</b>	Count	211	20	55	75	361
	% within Par_type	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6-10: sanitation ladder\*plot type

The charts below (figures 6-1 and 6-2) present the data from this research against the MICS survey data for Senegal. The Scott (2008) data from this survey highlight a marked difference between owner and tenant access to improved facilities. The MISC data is presented first followed by the survey data.

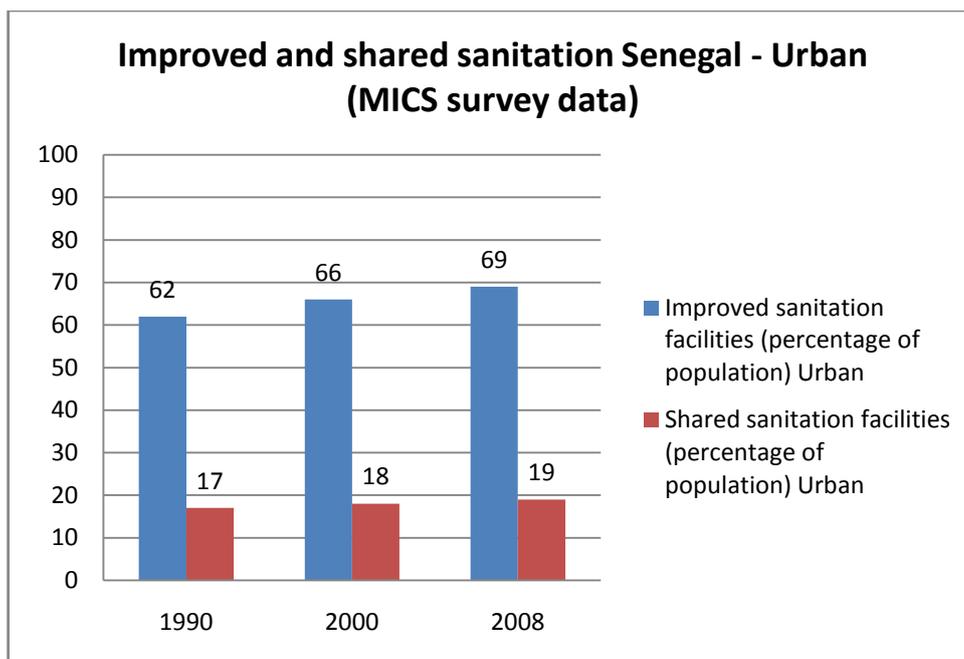


Figure 6-1: Improved and shared sanitation Senegal - Urban (MICS survey data)

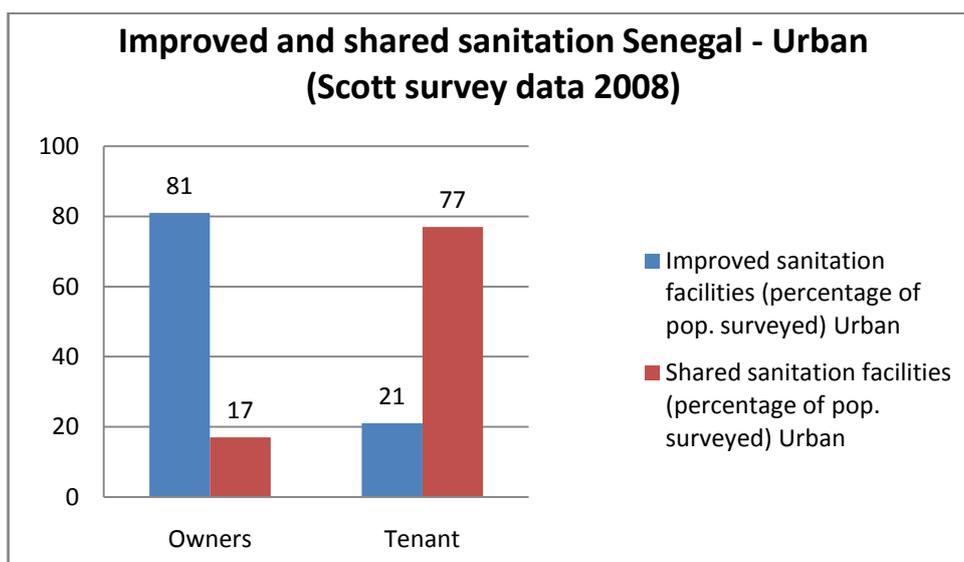


Figure 6-2: Improved and shared sanitation Senegal - Urban (Scott 2008 survey data)

**Key points:**

- **There is a significant relationship between the tenure status and access to sanitation.**
- **Tenants are much more likely to share sanitation implying that tenants are lower on the sanitation ladder than owner occupiers. Also for multiple occupancy plots (i.e. owners sharing with tenants) shared sanitation is significantly more likely.**

- This is a difference that does not occur for other basic services such as water and electricity.
- Under current sanitation reporting this reality is likely to be masked.

### 6.2.2.c. Tenure security and access to sanitation

This section addresses the relationship between tenure security and access to sanitation. Tenure security is measured based upon four proxy indicators: proof of ownership; perceived risk of eviction; length of duration of residence and plan to leave.

As described in section 5.4 tenure pluralism is a central characteristic of land arrangements and planning in Greater Dakar. Upon analysis, proof of ownership bore no relationship with access to sanitation. This underlines the importance of using additional proxy indicators to assess the tenure security situation.

Figure 6-3 shows the relationship between sanitation level and perceived risk of eviction, where the y-axis denotes the number of responses. The trend lines show that those who consider their risk of eviction to be impossible are more likely to have improved sanitation than shared sanitation. (Unimproved sanitation is limited in this case given its low incidence in the sample. The figure shows that as their perceived risk of eviction increases (moving right along the x-axis), the likelihood of improved sanitation decreases. This suggests a **very low perceived risk of eviction is a condition for achieving improved sanitation.**

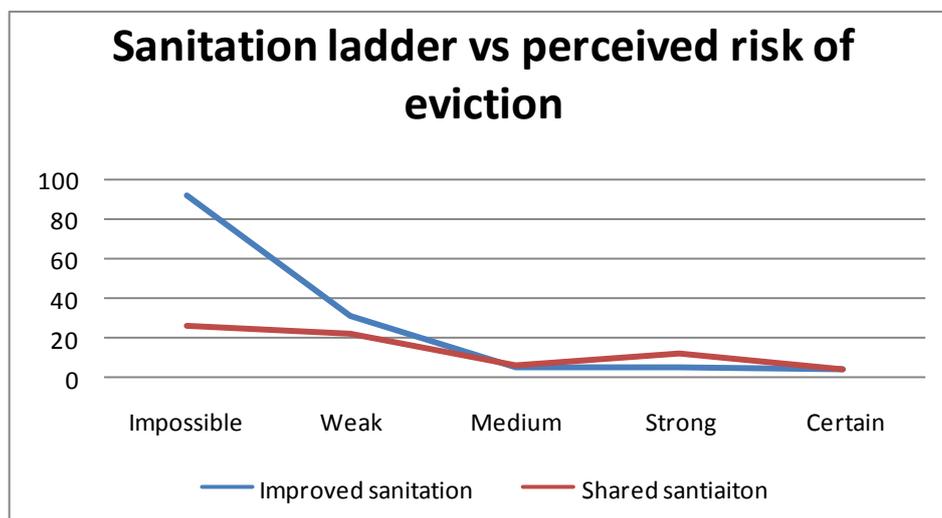


Figure 6-3: Sanitation ladder vs. perceived risk of eviction

One group of respondents surveyed were certain of impending eviction, as they had occupied land which falls under a new road construction in Dakar. Households had been

informed they were to be evicted. Whist the numbers are too small to draw any statistical argument from the data, the supporting observation data collected in questionnaire D (see appendix B) indicated that less investment in building materials and infrastructure had been made in these households.

The next proxy indicator to measure tenure security was the duration any given household had lived in their current location. The figure (6-4) below shows a positive trend between length of duration and improved sanitation. This indicates that length of duration of residency does appear to affect whether households will have improved or shared sanitation. Furthermore, households who had been resident in one place for less than six years were more likely to have shared sanitation than improved sanitation. Further investigation confirmed that high proportions (61.0%) of this population who remain below the six year threshold of the data are tenants. **These findings imply that time horizon in sanitation are important.**

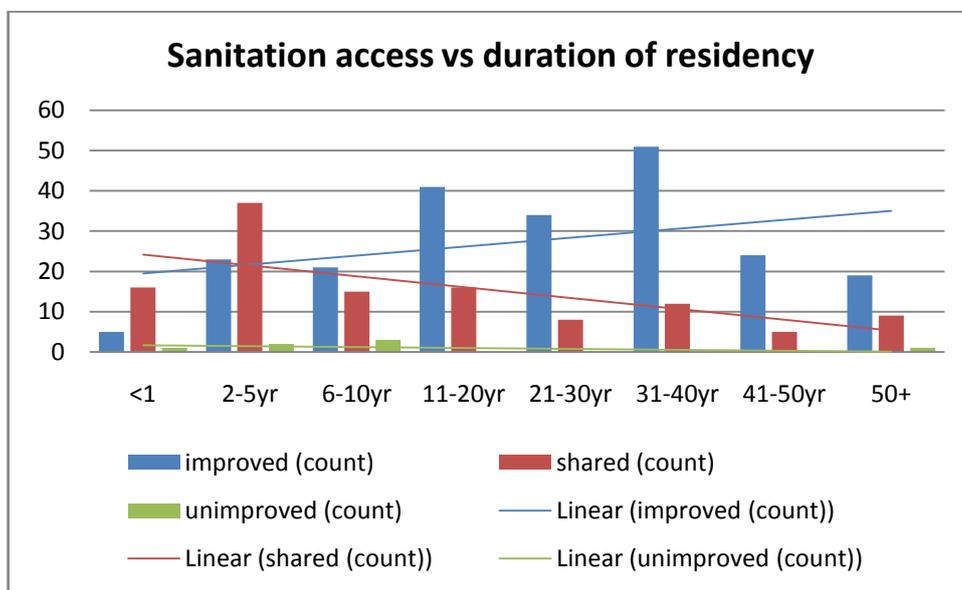


Figure 6-4: Sanitation access vs. duration of residency

Respondents were also asked if they were planning to leave their current residence in the next two years. Of those not planning to leave in the next two years, 70.9% (n=202) had improved sanitation; 28.1% (n=80) had shared sanitation and 1.1% (n=3) had unimproved sanitation. Many tenant households reflected that their continued residence was subject to the 'goodwill' of their landlord. They acknowledged that as long as they continued to meet their bills they should give no reason to be asked to leave but ultimately it was the decision and will of the landlord and out of their hands. Many respondents, however, found questions on their plans for the next few years difficult to answer decisively; they operated on a shorter time horizon, addressing immediate household needs.

In summary, several proxy indicators were used to build a picture regarding tenure security. While drawing definitive causality about sanitation developments and tenure security is difficult, the following key findings are:

- **Proof of ownership bore no relationship with access to sanitation.**
- **Improved levels of sanitation are less likely in conditions of perceived tenure insecurity.**
- **Duration of residence is also used as a proxy indicator for tenure security and the findings highlight a positive trend between length of duration of residence and improved household sanitation.**
- **There was a higher incidence of shared sanitation than private improved sanitation for households who had been resident in a place for less than six years.**
- **Households not planning to relocate in the next two years were more likely to have improved sanitation. This implies that time horizon is a key factor in household sanitation developments.**

#### 6.2.2.d. **Tenure and access to sanitation: summary**

To conclude for this sub-section the main findings regarding the interaction between tenure issues and access to sanitation are briefly outlined.

Urban literature focuses on sanitation technology type and in many cases remains biased towards sewerage sanitation as the solution for urban environments. These findings indicate that formal tenure (of one kind or another) is a necessary but not sufficient condition for households to connect to sewerage systems. The dominant form of household sanitation in Dakar and the sample studied is non-piped on site sanitation. When adopting the JMP sanitation ladder categories there is no significant correlation in the context of this study between access (as a function of household level on the sanitation ladder) and land tenure typology alone. In addition shared sanitation is a common solution across all tenure typologies.

A significant relationship between tenure status and access to sanitation was found where tenant households are much more likely to have shared sanitation than owners, effectively placing them lower on the JMP sanitation ladder. This reality is likely to be masked under current reporting mechanisms.

Tenure security proved more difficult to measure. Proxy indicators were used where formal proof of ownership bore no relationship with access to sanitation, supporting the findings of section 6.2.2.a. Perceived risk of eviction and duration of residence however did show a trend where improved levels of sanitation are less likely in conditions of perceived tenure insecurity and transient households. In addition households not planning to relocate in the next two years were more likely to have improved sanitation. This implies that time horizon is a key factor in household sanitation developments.

### 6.2.3. Tenure and user satisfaction with sanitation

This is the second of four sections to systematically address the relationship between the different aspects of tenure and sanitation. This section focuses on the user satisfaction element of sanitation and how this relates to different aspects of tenure.

#### 6.2.3.a. User satisfaction with sanitation facilities

Respondents were asked to rank their satisfaction level with their current sanitation facility, ranging from very unsatisfied to very satisfied. Less than 5% of the responses fell into each of the extreme groups i.e. *very unsatisfied* or *very satisfied*. The reasons stated for being *very unsatisfied* were i) emptying problems and high frequency ii) blockages or poor operation of the current facilities; iii) having to rely on neighbours' toilet and iv) rats and vermin problems. Over half of those who were unsatisfied with their sanitation shared their facilities. For respondents who were *very satisfied* with their sanitation, all but one household had improved private sanitation. The reasons cited for being *very satisfied* were either that they had no problems or that they were connected to the sewage system. When asked to explain this later reason further, one respondent expressed:

« on n'est plus fatigué avec des vidanges, c'est aussi plus moderne, c'est mieux »

"we don't have to be bothered with the emptying, it's also more modern, it's better."

Given that the numbers of extreme cases were relatively small; these cases were then recoded into three groups: *unsatisfied*, *OK*, and *satisfied* for further analysis. From the sample overall satisfaction levels were good with 60.3% (n=152) of households saying they were *satisfied* or *very satisfied* with their sanitation facility. Households who were *very unsatisfied* or *unsatisfied* with their sanitation facilities (n=57) stated the frequency and bother of emptying fosse (33.3%) and blockages and poor operation (29.8%) as their primary reasons for discontent. Fosse emptying was still considered a bother for 48.8% of respondents who ranked their satisfaction with their sanitation facilities as 'OK,' many saying other than the emptying they are happy. Households' primary justification for being either *satisfied* or *very satisfied* with their sanitation facility was due to having 'no problems' 79.6% (n=121). See table 6-11.

Household Perception Of Sanitation Facility									
	Unsatisfied			Ok			Satisfied		
	Count	Row N %	Column N %	Count	Row N %	Column N %	Count	Row N %	Column N %
no problems	0	0.0%	0.0%	12	9.0%	27.9%	121	91.0%	79.6%
problematic emptying	19	35.2%	33.3%	21	38.9%	48.8%	14	25.9%	9.2%
blockages / poor operation	17	70.8%	29.8%	6	25.0%	14.0%	1	4.2%	0.7%
connection to drains	2	11.1%	3.5%	1	5.6%	2.3%	15	83.3%	9.9%
ancient / dilapidated / signs of collapse	4	66.7%	7.0%	1	16.7%	2.3%	1	16.7%	0.7%
other	15	88.2%	26.3%	2	11.8%	4.7%	0	0.0%	0.0%
Total	57	22.6%	100.0%	43	17.1%	100.0%	152	60.3%	100.0%

Table 6-11: Household perception of sanitation facility

### 6.2.3.b. Tenure typology and user satisfaction

To identify if the tenure typology had any relationship to the satisfaction levels with sanitation, the study disaggregated the responses across the tenure groups. The figure (6-5) below shows how respondents ranked their satisfaction and their tenure typology. Overall satisfaction levels were good with 60.5% (n=219) of households saying they were satisfied or very satisfied with their sanitation facility. However it is clear that those in planned areas were the most satisfied, whereas those who were less satisfied aggregated in informal and spontaneous areas. This relationship is confirmed as significant by a chi-squared test (p=0.001), see appendix D for cross tabulation.

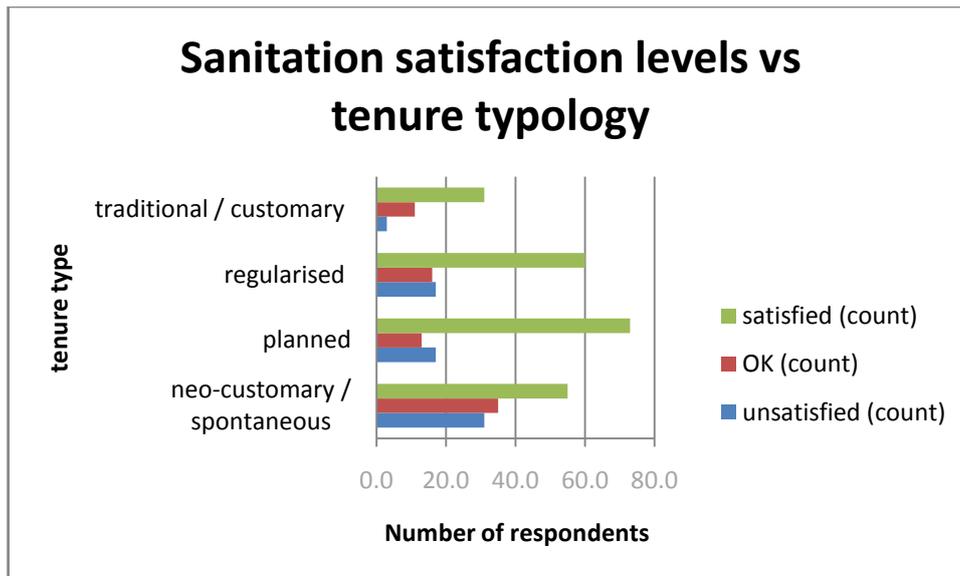


Figure 6-5: Sanitation satisfaction levels aggregation vs. tenure typology

The reasoning behind this distinction in settlement type is explained from the follow up question. Emptying of the fosse is a problem for respondents in the informal tenure group and the traditional area with 29.4% and 27.3% of participants respectively stating this as the reason behind their satisfaction rating. This is slightly higher compared to 17.1% in planned areas and 19.6% in regularised areas. Possible explanations for this are:

- limited truck access for mechanised pit emptying / limited mechanised pit emptying service
- Perception of lesser sanitation service compared to regularised area.
- The frequency of emptying required

These will be investigated in the following section (6.3) which addressed how tenure typologies affect sanitation service delivery.

**Key point:**

- **Pit emptying is a cause of dissatisfaction for households**
- **A fully functioning ‘no problems’ sanitation facility is what respondents listed as the reason for being very satisfied**

### 6.2.3.c. Tenure status and user satisfaction

The next stage to understand how tenure issues relate to user satisfaction is to consider the differences in satisfaction levels between owner occupiers and tenants. Owners tend to express a slightly higher satisfaction than tenants: 65.8% of owners are satisfied compared to 48.5% of tenants. Section 6.2.2. detailed the significant differences between owners and tenants with respect to improved private and shared sanitation, where tenant households were found to be more likely to share sanitation. The data (presented in table 6-12) shows that tenants and owners appear to share a similar a satisfaction pattern – for both groups user satisfaction improves as households ascend the sanitation ladder.

Tenure Status * Perception* Sanitation Ladder Crosstabulation						
San_ladder			User Perception			Total
			unsatisfied	OK	satisfied	
improved	Owner	Count	30	36	144	210
		% within B.CM_status	14.30%	17.10%	68.60%	100.00%
		% of Total	13.00%	15.70%	62.60%	91.30%
	Tenant	Count	4	3	13	20
		% within B.CM_status	20.00%	15.00%	65.00%	100.00%
		% of Total	1.70%	1.30%	5.70%	8.70%
	Total	Count	34	39	157	230
		% within B.CM_status	14.80%	17.00%	68.30%	100.00%
		% of Total	14.80%	17.00%	68.30%	100.00%
shared	Owner	Count	10	11	24	45
		% within B.CM_status	22.20%	24.40%	53.30%	100.00%
		% of Total	8.30%	9.20%	20.00%	37.50%
	Tenant	Count	18	23	34	75
		% within B.CM_status	24.00%	30.70%	45.30%	100.00%
		% of Total	15.00%	19.20%	28.30%	62.50%
	Total	Count	28	34	58	120
		% within B.CM_status	23.30%	28.30%	48.30%	100.00%
		% of Total	23.30%	28.30%	48.30%	100.00%

Table 6-12: Tenure Status \* Perception \* Sanitation Ladder Cross tabulation

The respondents that had expressed a preference to improve their sanitation facilities were also asked to quantify the chances that their sanitation would be improved in the next year. Tenants quantified the chance that their sanitation would be improved in the coming year as either 'weak' (61.8%) or 'impossible' (25.0%). For tenant households, the barriers to their sanitation being improved were cited as: landlords lack of finances (33.8%); absent landlords having little to do with their rented property (23.1%); and landlords not being willing to act (20.0%). Clearly these results are linked to tenants' lack of agency with respect to improving

their own sanitation. Sanitation is considered to be the landlord's responsibility: 97.5% of survey respondents stated that the landlord was considered responsible for installation and improvement; 92% for maintenance and repair. As many of the landlord-tenant contracts were informal this understanding forms the basis of the assumed responsibilities. Asking the same question about chances that they would improve their sanitation facility in the coming year to owners, a combined total of 86.4% considered it weak (69.5%) or impossible (16.9%) that their sanitation would be improved in the coming year. The predominant reasons given for this were the owners' own financial means (53.3%); because an improvement was not necessary (33.6%).

**Key points:**

- **Tenants and owners share a similar a satisfaction pattern suggesting tenants are either less likely to complain or that they accept a lower level of sanitation (i.e. shared facilities).**
- **For tenant households, the barriers to their sanitation being improved were cited as: landlords lack of finances; absent landlords having little to do with their rented property; and landlords not being willing to act. Tenants lack agency to improve their own sanitation facilities.**

#### **6.2.3.d. Tenure security and user satisfaction**

The findings of section 6.2.2 indicate that there is a significant relationship between the perceived risk of eviction and access to improved sanitation where tenants are found to share more sanitation facilities than owner occupiers.

Initial analysis of the proxy indicators for tenure security suggests that user satisfaction with sanitation remains relatively constant across the respondents implying there is no significant relationship between the perceived risk of eviction and user satisfaction. However upon further analysis it appears there may be two dynamics at play here. Firstly, as demonstrated in section 6.2.2, those rating their risk of eviction as 'impossible' or 'weak' are, more likely to have improved sanitation; and it follows that those with improved sanitation are more likely to be satisfied. Another dynamic here relates to those with a higher perceived risk of eviction: as seen previously, as perceived risk of eviction increases, the likelihood of sanitation being improved decreases. However the satisfaction level among the tenant group remains relatively constant. Possible explanations are:

- Those who are certain to leave may accept the current situation as they know they are unlikely to change it.
- Those who are vulnerable to eviction are less likely or less willing, to complain.

- When faced with fear of eviction, respondents may priorities their investment needs differently.

Additional analysis was done through chi-squared analysis of the proxy indicators of duration of stay and household plans to leave against user satisfaction shows no significant relationship between these proxy indicators and user satisfaction with sanitation facilities.

**Key point:**

- **No clear relationship was identified between tenure security and user satisfaction with sanitation.**

#### 6.2.3.e. Tenure and user satisfaction: summary

To conclude for this sub-section the main findings regarding the interaction between tenure issues and user satisfaction with sanitation are briefly outlined.

From the sample, user satisfaction levels were generally good as the majority of households had access to some sort of sanitation facility mostly private or households sharing. The primary reasons for dissatisfaction were problematic emptying of pits or blockages preventing use. Emptying is often seen as a nuisance to households. These problems are exacerbated in areas where access to the pit is difficult. This implies that it is the characteristics of the formal layouts that support emptying rather than the legal title itself which relates to user satisfaction. On the other hand, households' primary justification for being either *satisfied* with their sanitation facility was due to having 'no problems' 79.6% (n=121). This is an important point as 'flush and forget' is the sanitation service that is desired.

Whist owners may display a slightly higher satisfaction level than tenants the difference does not reflect the difference in access to private facilities seen between owners and tenants. This implies that tenants are satisfied with a lower level of sanitation facility (i.e. sharing). No significant relationship was found between any of the proxy indicators for tenure security and user satisfaction.

#### 6.2.4. Tenure and household investment in sanitation

This is the third of four sections to systematically address the relationship between the different aspects of tenure and sanitation. This section focuses on how tenure issues relate to household investment in sanitation infrastructure.

#### 6.2.4.a. Tenure typology and household investment in sanitation

Participant households were asked if they made the first investment in the household sanitation facility (i.e. did they build the first household toilet in the life time of the current head of household). This question was addressed to owner households only (n=261). 70.1% of owner household respondents answered positively to this question. Next, using cross tabulation, the data was analysed with respect to household investment and capital investment. This analysis showed that the levels of investment across the different typologies are similar and do not indicate that tenure typology affects household's decision to invest. Owner households were also asked to recall a trigger or specific reason for this first investment. Not all households identified a trigger however from those who could (n=91), 31.5% stated it was for reasons of modesty and 27.2% stated that building the household sanitation facility was at the same time as other household construction. The later was the most common response for female-headed households although overall, (given it was an open-ended question) the most common responses were similar for both male and female headed households (see table 6-13).

Main triggers for initial investment in household sanitation	Female headed household		Male headed household		Total	
	n	Valid %	n	Valid %	n	Valid %
Modesty	7	31.8%	22	31.4%	<b>29</b>	<b>31.5%</b>
At the same time as other household construction	8	36.4%	17	24.3%	<b>25</b>	<b>27.2%</b>
not to disturb neighbours / to be independent	3	13.6%	13	18.6%	<b>16</b>	<b>17.4%</b>
Importance of a sanitation facility for a Muslim household	0	0.0%	9	12.9%	<b>9</b>	<b>9.8%</b>

Table 6-13: Triggers for initial investment in household sanitation

Qualitative responses here provide some historical background to the settlements' evolution. Oral testimonies of the local leaders indicated that the Niayes areas where the settlements are now located used to be swamp and agricultural land. During the early years of occupation the settlements were less dense and were covered in forest and foliage. During this time, households without access to sanitation facilities would practice open defecation. However with the rise in urbanisation, the landscape changed, houses were built out of cement rather than wood and other temporary materials. This increase in population density and consolidation of buildings stimulated privacy and modesty to become a driving factor for household sanitation.

All respondents with household sanitation were also asked if they have made any improvements to their sanitation facilities. Using cross tabulation, the data showed no significant relationship between investment across the different typologies. This suggests that

tenure typology does not in itself affect household's decision to invest in sanitation. To examine these behaviours in more detail, respondents were asked what changes they had made to their sanitation facilities. The most common household investment in sanitation facilities, across all tenure typologies, is the reconstruction or renewal of the pit with 53.2% of all households who had made an investment (n=101). Pit renewal was most common in the regularised area where 66.0% (n=31) of sanitation investments related to the pit: renewal. Other tenure groups followed suit with 61.5% (n=16) in the traditional area and 59.4% (n=38) in the informal unplanned area respectively. A common geographical feature across these three settlements is the high water table and flooding potential during the rainy season, which would be likely to damage the pits, especially as many are not sealed septic tanks despite being called as such (interview with KI.07 ONAS PAQPUD representative). In the planned area only 30.2% (n=16) of respondents had made sanitation investments into the building or repair of a tank. In the planned area however the same number of households 30.2% (n=16) had also invested in connecting to the mains sewers.

Respondents were also asked their reason for investing the way they did in their sanitation facilities. The results show that the primary reason for investment in household sanitation is essential repair when the facility is showing signs of severe defects preventing continued use (41.5% of all responses). This was most often relating to pit collapse. These results are displayed in table 6-14. This is in line with existing knowledge that those living in flood prone areas experience damage to their pits.

Why people invest in their existing household sanitation	Frequency	Valid Percent
Essential repair (pit collapsed or imminent risk of collapse / severe malfunction)	76	41.5%
improve comfort / usability / upgrade	29	15.8%
poor operation (frequent emptying, blockages increased load on fosse)	23	12.6%
project (PAQPUD/subsidy) stimulus	19	10.4%
family / HH enlargement / tenants	18	9.8%
reorganisation / construction /new move	17	9.3%
Total responses	183	100.0%

Table 6-14: Why people invest in their existing household sanitation

**Key points:**

- Modesty and building the household sanitation facility at the same time as other construction were the primary reasons cited for households installing the first toilet.
- Pit renewal was most common investment in household sanitation infrastructure.
- The primary reason for investment in household sanitation was found to be essential repair when the facility is showing signs of severe defects preventing continued use. This was most often relating to pit collapse.

### 6.2.4.b. Tenure status and household investment in sanitation

The findings immediately above show that capital investment in household sanitation is indeed taking place but who are the investors? The survey first asked respondents who they considered to be financially responsible for different sanitation costs; respondents were asked who they deemed responsible for capital investment, repairs and emptying (where emptying is considered an operational cost rather than maintenance activity). The results are displayed in table 6-15 below. There was a strong consensus between owner and tenant households that capital investment and subsequent repairs are considered the owner's financial responsibility and emptying charges are shared between the users.

Perceived financial responsibilities for sanitation investment	
<b>for capital investment</b>	Owners 97.5% (99.6% owners agree; 91.8% tenants agree)
<b>for repairs / maintenance</b>	Owners 92.0% (95.4% owners; 83.5% tenants agree respectively)
<b>for emptying</b>	Users 83.5% (88.7% owners; 71.6% tenants agree respectively)

Table 6-15: Perceived financial responsibilities for sanitation investment

This assumed financial accountability was, on the whole, reflected in the actual sanitation investments taking place. One exception was a small group of tenant households, representing 7.6% (n=14) of all that invested in household sanitation. Qualitative data on those tenant households revealed that the majority of these investments were made once something had gone wrong (i.e. pit collapse or total failure in operation of the sanitation facility). 7 of these 14 tenant households invested their own money without receiving reimbursement from the landlord, while the others used their rent as collateral. 12 out of these 14 households were tenant plots with absent landlords and the other 2 shared the plot with their landlord but not the sanitation facility. These figures are not large enough to draw any significant conclusions but they do illustrate some of the dynamics of a small proportion of tenants who pay to maintain their sanitation facility in the absence of external support.

#### Key point:

- **Owners are considered to be financially responsible for the capital investment, repairs and maintenance in sanitation (capital and maintenance costs).**
- **Users are considered to be financially responsible for the emptying of the pits (operational costs).**

### 6.2.4.c. Tenure security and household investment in sanitation

As with the previous sections considering tenure security, a number of proxy indicators are used to consider the relationship between tenure security and household investment.

Upon analysis the data shows that legal tenure is not considered a prerequisite for investment in household sanitation facilities, as 38.5% (42/109) of all those who invested in sanitation claimed to have a legal title. This supports arguments that legal tenure alone does not stimulate investment in the home. When the perceived risk of eviction is plotted against those households who have invested a negative trend can be observed (see figure 6-6). Of all the people who had invested in sanitation, 57.6% (68/118) considered their risk of eviction impossible.

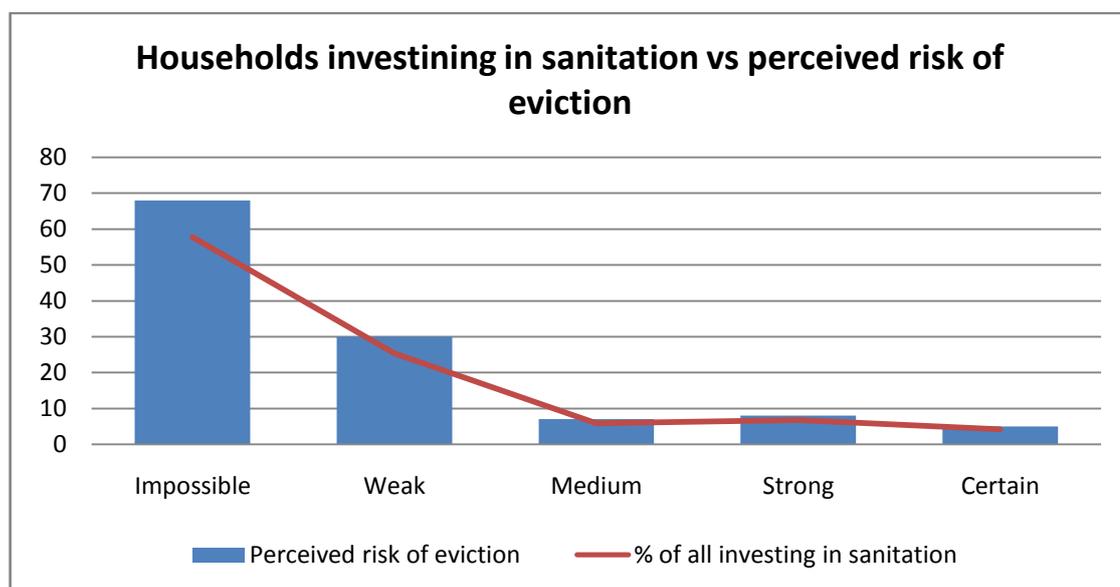


Figure 6-6: Households investing in sanitation vs. perceived risk of eviction

The results of section 6.2.2. revealed a significant relationship between duration of residency (or “length of stay”) and access to improved sanitation. This would suggest that owners may invest in their sanitation facilities after a certain time, to increase their access to sanitation. A chi squared test for independence confirms investment in sanitation is also linked to length of stay in one place ( $p=0.002$ ) where the likelihood a household has made some investment in sanitation increases over time. This thesis is in line with the self-help approach.

#### Key point:

- The likelihood of a household making some investment in sanitation increases over time.

#### **6.2.4.d. Tenure and household investment in sanitation: summary**

Before moving on, this section briefly outlines the main findings from this section regarding the interaction between tenure issues and investment in household sanitation.

The first finding of this section was that tenure typology bore no significant relationship to household investment in sanitation. The most common household investment in sanitation across all tenure typologies was the reconstruction or renewal of the pit. In the planned area (the only settlement served by a conventional sewerage system) an equal number of households who had invested to renew their pit had paid to be connected to the mains sewerage. Importantly however upgrading to household sanitation facilities, including connection to the sewerage system, occurred most often following a failure or problems of the current system. The motivating factors for building the first household sanitation facility were modesty; at the same time as other household construction or not to disturb neighbours.

The findings with respect to who is investing revealed that both tenants and owners share similar perceptions as to who is responsible. Capital and maintenance (i.e. physical repair) costs are deemed to be the responsibility of the owner, whereas emptying or operational costs are to be shared amongst user households. These responsibilities are largely adhered to in practice however some tenant households with absent landlords were found to invest their own money in repairs in some cases where the failure in operation prevented continued use.

In terms of tenure security, conventional wisdom indicates that tenure security is a necessary precursor to investment. The findings here suggest that this thesis is also true for household's investment in sanitation infrastructure. Duration of residency also demonstrated a positive relationship. On the other hand no significant relationship was found between legal tenure and household investment in sanitation suggesting that legal tenure is not a necessary precondition for investment, especially as much of the sanitation facilities in this context are self-built non-piped systems.

#### **6.2.5. Tenure and household pit emptying**

This is the fourth and final section to systematically address the relationship between the different aspects of tenure and sanitation in the household domain. This section focuses on how tenure issues relate to household pit emptying.

The survey results suggest that pit emptying is active in Dakar, with 67.5% (162/240) of plots surveyed emptying their pits once a year or more. There may be several explanations for

this: firstly that the pits are small or are experiencing higher than expected loading; secondly that the pits are not water tight and are subject to water infiltration (as mentioned previously in section 6.2.4). Both of these potential explanations are corroborated by the fact that the majority of household sanitation systems in Greater Dakar are self-build and therefore may not be designed for appropriate capacity or with adequate sealing.

There is a network of pit emptiers servicing the Dakar region using a variety of pit emptying machinery (suction trucks, tractors with trailers and manual labour<sup>30</sup>). The method used for household pit emptying was categorised in one of three ways: i) mechanical emptying, by use of a suction truck; ii) paid manual emptying service or 'Baay Pelle' or; iii) DIY as some households emptied their pits themselves. In terms of safely managing excreta, mechanical pit emptying is safer than manual emptying. The study distinguished between these three options to ascertain what sanitation services households pay for. Mechanical emptying in Dakar is only feasible for households who are either on or near an access road or within approximately 40m of one as beyond which the suction is poor (KI.11 manager of truck enterprise). Although in Dakar there is a wide variety of mechanical emptiers ranging from suction trucks to tractors with a tank which can access narrower streets, there remains several areas where vehicle access remains a problem. Alternative mechanical options such as the vagutug were, at the time of the study not used in Greater Dakar. ONAS is in possession of four UN-HABITAT vagutugs but their feasibility and operational use remain poor due to travelling distance required (KI.07 ONAS PAQPUD representative) and many households build flood defences at the entrance to their compounds in the form of a concrete step preventing access to premises (personal observation).

46.8% (110/235) of households that emptied their pits reported commissioning a suction truck; the remainder employed manual methods, either by paid "baay pelle" (32.8%; 77/235) or by the households members, called here 'DIY' (20.4%; 48/235). This division of emptying methods is illustrated in figure 6-7.

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<sup>30</sup> 85 trucks recorded by EDE/ONAS report (2007); 62 by Hydroconseil (2008).

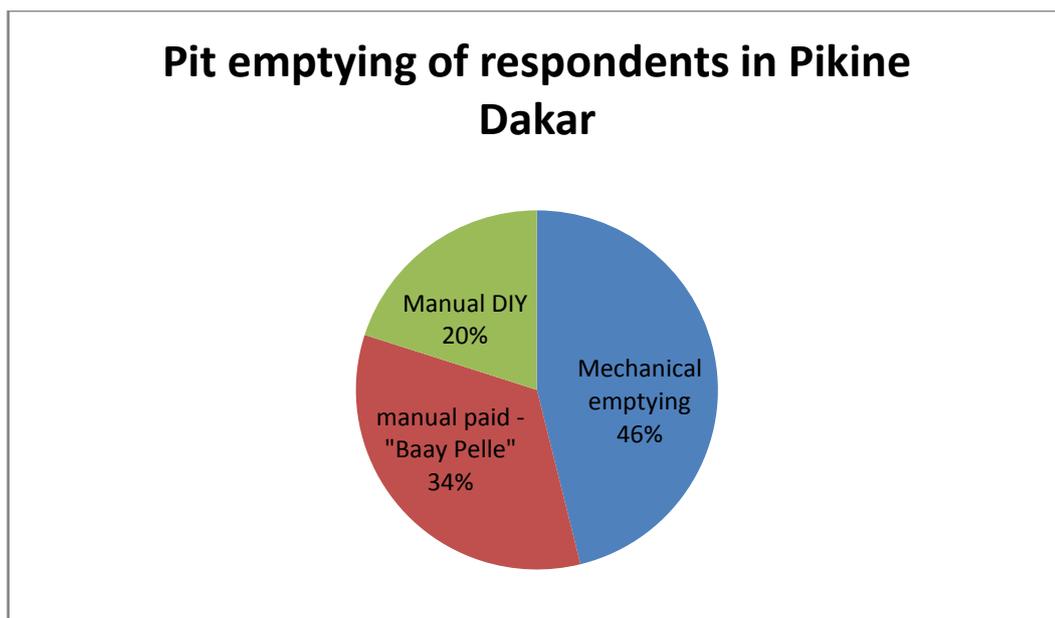


Figure 6-7: Pit emptying methods of surveyed households

For the cost of pit emptying, mechanical pit emptying service cost an average of 23,549 CFA (€36) and manual emptying service was 12,525 CFA (€19) per service however cost was not a direct function of the amount of sludge removed; this will be discussed in the findings of domain 2 that follows. The average annual costs per household were 29,490 CFA (€45) for mechanical emptying and 13,681 CFA (€20) for manual emptying. Analysis of the survey results shows that for households with an income over 200,000 CFA per month (€304)<sup>31</sup>, 69.7% (46/109) emptied their pits mechanically. It was not possible from the data collected to confirm if this threshold correlates to any specific change in sanitation technology, although most commonly larger septic tanks tend to be emptied mechanically and the simpler, smaller, pits tend to be emptied manually. Below this income threshold, mechanical emptying is less common where approximately only 35% of households in the lower income band use mechanical emptying services. Within these lower income bands the data does not show a trend towards mechanical emptying with increasing income.

#### Key points:

- **Pit emptying is active in Dakar.**
- **47% of households that emptied their pits used mechanical emptying; the remainder emptied manually, either by paid "baay pelle" (33%) or 'DIY' (20%).**
- **The average annual cost per household was €45 for mechanical emptying and €20 for manual emptying.**

<sup>31</sup> 27.1% (93/343) respondents were in this income band of 200,000 CFA / month

### 6.2.5.a. Tenure typology and household pit emptying

To continue the analysis, does the land ownership and delivery process affect the frequency and method of pit emptying in Dakar? In terms of frequency of emptying, the survey results show a relatively constant frequency across all tenure typologies. The method of emptying varies across tenure groups. This was confirmed with a chi-squared test for independence  $\chi^2(1, n=252), p=0.001$  indicating a significant relationship between tenure typology and method of pit emptying.

As shown in table 6-16, mechanised emptying was the primary choice in the planned area and the traditional area with 60.3% (35/58) and 59.0% (23/39) respectively of people living there using mechanised emptying. On the other hand for informal / spontaneous area and the regularised area, manual emptying was favoured where only 41.8% (38/91) and 29.7% (19/64) used mechanical emptying respectively.

Such a high level of mechanical emptying in the traditional area was not expected due to the small alleyways and irregular layout, since the received wisdom is that lack of truck access is a barrier to contracting mechanised emptying. Upon further consideration, however, the layout of these traditional areas tends to be an organic expansion around a central nucleus. So, while access to the centre can be very problematic, the outer concentric areas and those near access roads are obviously easier to reach, making mechanical emptying more feasible. The proportion of households in the central area in this context was relatively small; therefore this finding must be treated with care and consideration of the specific environment.

Pit emptying method * Tenure type Crosstabulation						
		Tenure type				Total
		spontaneous	planned	regularised	traditional	
<b>truck</b>	Count	38	35	19	23	115
	% within emptying method	33.00%	30.40%	16.50%	20.00%	100.00%
	% within Tenure.type	41.80%	60.30%	29.70%	59.00%	45.60%
	% of Total	15.10%	13.90%	7.50%	9.10%	45.60%
<b>Baay Pelle</b>	Count	38	17	23	8	86
	% within emptying method	44.20%	19.80%	26.70%	9.30%	100.00%
	% within Tenure.type	41.80%	29.30%	35.90%	20.50%	34.10%
	% of Total	15.10%	6.70%	9.10%	3.20%	34.10%
<b>DIY</b>	Count	15	6	22	8	51
	% within emptying method	29.40%	11.80%	43.10%	15.70%	100.00%
	% within Tenure.type	16.50%	10.30%	34.40%	20.50%	20.20%

	% of Total	6.00%	2.40%	8.70%	3.20%	20.20%
<b>Total</b>	Count	91	58	64	39	252
	% within emptying method	36.10%	23.00%	25.40%	15.50%	100.00%
	% within Tenure.type	100.00%	100.00%	100.00%	100.00%	100.00%
	% of Total	36.10%	23.00%	25.40%	15.50%	100.00%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.024	6	.001
Likelihood Ratio	21.983	6	.001
Linear-by-Linear Association	.447	1	.504
N of Valid Cases	252		

Table 6-16: Pit emptying method \* Tenure type Cross tabulation

Access alone is not the only criteria affecting household choice of pit emptying method. In the regularised settlement, where trunk access roads carve through the informal area, mechanical emptying remains low (29.7%; 19/64). One explanation is that of the cost of emptying varies with distance to the dumping site. This will be discussed in more detail in the following sections pertaining to domain 2 but despite several trunk roads being built through *Pikine Irrégulier Sud* as part of the regularisation program, access to the dumping sites remains problematic (World Bank 2002).

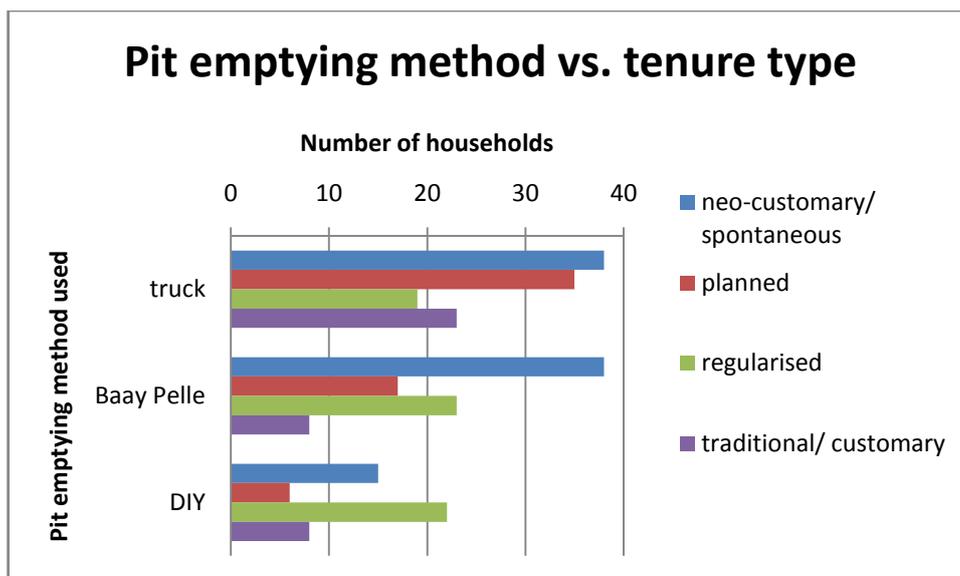


Figure 6-8: Pit emptying method vs. tenure type

The survey results also demonstrate that 20% (51/252) of all households empty their pits themselves at no cost, or “DIY”. The prevalence of DIY emptying also differs across the tenure typologies, with 43.1% (22/51) of all those practicing DIY emptying residing in the regularised area. The motivation to opt for DIY or to pay for a service is believed to be largely financial and personal choice, rather than settlement layout. These dynamics will be explored in the following section.

**Key point:**

- A significant relationship was found between tenure typology and method of pit emptying.

### 6.2.5.b. Tenure Status and household pit emptying

Do tenants or landlords have different pit emptying drivers? We have seen in previous sections that tenants are lower on the sanitation ladder in terms of access to facilities, satisfaction and agency to improve their situation with respect to sanitation facilities themselves. This section will consider if and how tenants and landlords differ with respect to their emptying behaviours and motivations.

Disaggregating the responses of tenants and owner households, it was found that **owner households are more likely to use mechanised emptying than tenants. As tenants are on average in a lower income bracket than owners, and thus tend to use the cheaper pit emptying service.** This relationship is confirmed by a chi squared independence test ( $p = 0.005$ ). See table 6-17.

Emptying method * B.Cm_Status Crosstabulation				
		B.CM_status		
		Owner / co-own	Tenant	Total
<b>truck</b>	Count	94	21	115
	% within emptying method	80.0%	20.0%	100.0%
	% within B.CM_status	50.0%	30.0%	50.0%
	% of Total	40.0%	10.0%	50.0%
<b>Baay Pelle</b>	Count	53	31	84
	% within emptying method	60.0%	40.0%	100.0%
	% within B.CM_status	30.0%	50.0%	30.0%
	% of Total	20.0%	10.0%	30.0%
<b>DIY</b>	Count	41	9	50
	% within Emptying method	80.0%	20.0%	100.0%
	% within B.CM_status	20.0%	10.0%	20.0%
	% of Total	20.0%	0.0%	20.0%
<b>Total</b>	Count	188	61	249
	% within Emptying method	80.0%	20.0%	100.0%
	% within B.CM_status	100.0%	100.0%	100.0%
	% of Total	80.0%	20.0%	100.0%

CHI-SQUARE TESTS			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.551	2	.005
Likelihood Ratio	10.179	2	.006
Linear-by-Linear Association	.560	1	.454
N of Valid Cases	249		

Table 6-17: Pit emptying method vs. tenure status cross tabulation

Considering gender differences, the results display a similar breakdown between male and female owner households where 50% of owners respectively seek mechanical emptying; 27.6% (male) or 29.6% (female) seek manual emptying services and 22.4% (male) or 20.4% (female) owner households empty the pit using family labour. For tenant households however the findings indicate some discrepancy between male and female headed households. For male-headed tenant households 43.2% seek the mechanical truck; 45.5% seek manual emptying services and 11.4% empty the pit themselves. For female-headed tenant households only 11.8% seek mechanical emptying services; 64.7% seek manual emptying services and 23.5% empty the pit with their own household labour. This implies, with the findings of section 6.2.2.b that female headed tenant households are lower on the sanitation ladder for both access and emptying than their male counterparts. However drawing robust conclusions about

this gender breakdown is not possible from this data set, given the small numbers of female headed tenant households surveyed.

The results for household emptying behaviours can also be grouped in terms of if households pay for a service (i.e. mechanical or manual) or empty the pit themselves (i.e. DIY). Whilst tenants are on average of a lesser wealth bracket, the survey demonstrates a higher percentage of owner households emptying their pits themselves, where 22% (n=41) of owner households emptied the pits themselves as opposed to 15% (n=9) of tenants. This underlines that the decision factors and willingness to pay for emptying services are not purely based on finances. **Although tenants opt for the cheaper service with respect to emptying they are not prepared to empty the pit themselves.** This difference between owner and tenant behaviours in this matter may be related to acceptability issues where tenants are much more likely to share a sanitation facility (and therefore pit) with multiple households.

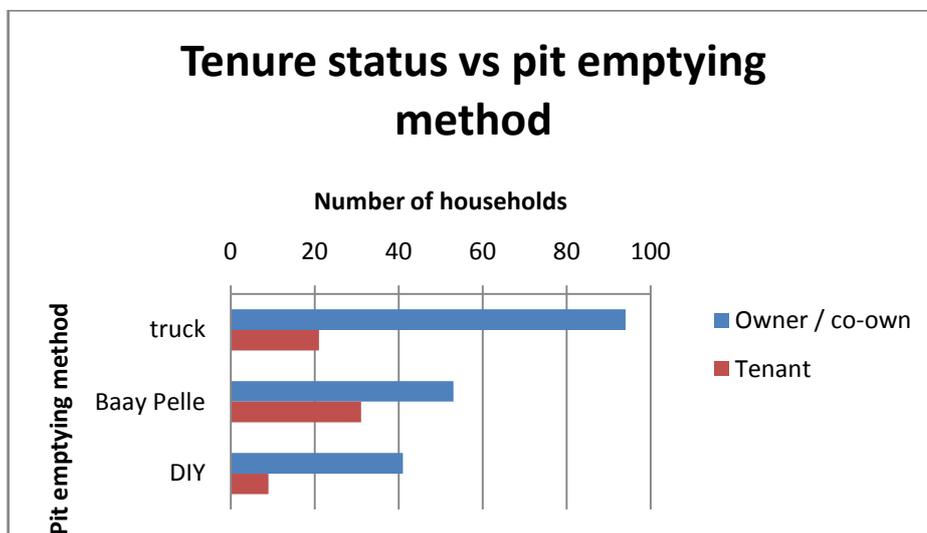


Figure 6-9: Tenure status vs. pit emptying method

In an attempt to uncover these motivating factors further, respondents were asked to state their preferred pit emptying method and the reasons for their preference. The most common responses are ranked in table 6-18 below.

Priority Rank	Decision factors for preferred emptying	Owner /occupiers	Tenants
1.	Financial	35.3%	48.2%
2.	Preferred service	31.5%	35.7%
3.	Cleanliness	31.0%	17.9%
4.	Not to annoy neighbours	30.4%	16.1%

Table 6-18: Decision factors for respondents preferred emptying method for owners and tenants

As the table shows the ranking of the most common reasons stated for preferred pit emptying method is the same for both owner-occupiers and tenants. **The two highest drivers**

**in selecting a pit emptying service are *financial and preferred service*.** In Dakar, mechanical emptying is approximately double the price of manual emptying. Finance is a priority for a higher proportion of tenants than owners. Both mechanical or manual emptying services were respondents' preferred services for different reasons; 62.8% (49/78) of those respondents who listed service as a criteria liked the ease and speed of mechanical emptying, whereas 34.6% (27/78) favoured manual emptying, claiming the mechanical suction failed to properly empty the tank<sup>32</sup>. 100% of those listing cleanliness as a decision factor, considered that the truck offered a 'cleaner' service. Finally some respondents also claimed that they did not want to annoy neighbours referring to the common practice in peri-urban Dakar of burying household faecal sludge outside the entrance to the compound<sup>33</sup>. This decision factor was stated more often for owner than tenant households, as owners may have more social ties or responsibilities with their neighbourhood than tenants.

The frequency of pit emptying for both landlords and tenants is similar at an average of once per year. This is unexpected as tenants' pits have a higher loading than owner household pits; possible explanations are:

- The higher proportion of tenant household using manual emptiers (thus full emptying of the tank) rather than partial liquid removal offered by tanks.
- Potential that tenants under report due to higher mobility.

Finally, participants were also asked how they financed their contribution to pit emptying. For both tenant and owner households the norm was for the total cost to be divided between the user households and financed through personal savings (85%; n=149). Looking individually at tenants and owner households, 17.4% (n=26) of owner households financed their pit emptying from donations from non-resident family or friends. This external support was rare in tenant households, reported only once.

#### **Key points:**

- **Owner households are more likely to used mechanised emptying than tenants. Tenants are on average in a lower income bracket than owners, and thus tend to use the cheaper pit emptying service.**
- **Although tenants opt for the cheaper service with respect to emptying they are not prepared to empty the pit themselves.**

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<sup>32</sup> These claims are supported by technological analysis of the mechanical trucks operating in Dakar. The vast majority are only capable of sucking water based sludge and fail to lift the solids at the bottom of the tanks (EDE 2007).

<sup>33</sup> Burying faecal waste is prohibited by law (Article L.81 Code of the Environment, law No 2001-01 of July 15th, 2001). This practice involves a large pit being dug in the street and filled with faecal sludge. The filled pit is then left open for a period of time to allow the water to soak away, this can take hours to days as the water table is high in many areas. Once the water has drained the pit can be covered with sand and is more stable. They are common sights in the peri-urban areas of Dakar.

- **The two highest drivers in selecting a pit emptying service are *financial and preferred service*.**

#### 6.2.5.c. **Tenure security and household pit emptying**

This section considers the question: does tenure security play a role in pit emptying? Section 4.2.1 shows that although land tenure typology is related to the method of pit emptying, this is more to do with the layout and evolution of the settlements rather than the tenure position itself. Before considering any relationship between the method of pit emptying and tenure security it is perhaps useful to consider the nature of pit emptying. The vast majority of household pit emptying services in Dakar are small private enterprises, often operating in the informal sector. It is a 'pay as you go' service without contract ties or obligations. For these reasons, it is unlikely to bear any relationship to tenure security. Chi squared tests displayed that there is no significant relationship between the method of pit emptying and the proxy indicators used for tenure security, including legal title, the perception of risk of eviction; length of stay and if respondents are planning to leave in the upcoming two years.

#### **Key point**

- **There is no significant relationship between the method of pit emptying and the proxy indicators used for tenure security**

#### 6.2.5.d. **Tenure security and household pit emptying: summary**

This concludes the final section relating to the different aspects of tenure and sanitation. Before moving on, this section briefly outlines the main findings regarding the interaction between tenure issues and household pit emptying.

The findings show that tenure typology does relate to the way pits are emptied with access for trucks being an important consideration. Vehicle access however is not the only decision factor as cost and service offered are found to be the main decision drivers for households (where mechanised emptying in Dakar is more expensive than manual emptying per household per year). DIY manual emptying is still relatively common with 20% of all households who have emptied their pit having done so themselves manually. This practice to date is largely unreported.

Disaggregating the responses of tenants and owner households, there is a significant correlation between pit emptying method and tenure status: owner households are more

likely to use mechanised emptying than tenants. Tenants are on average in a lower income bracket than owners, and thus tend to use the cheaper pit emptying service. Tenants are primarily driven by financial considerations for pit emptying, where finance and service provided are the most frequent drivers for why all households chose the pit emptying service they do. Finance is also an important decision factor for owners with respect to pit emptying; however secondary factors such as not to annoy neighbours feature in owners responses in their preferred pit emptying service.

The chosen method of household pit emptying shows no significant relationship with any of the proxy indicators used for tenure security. This is an important finding as whilst other aspects of the sanitation service chain have been found to be linked to issues of tenure security, emptying is found to be largely independent.

### 6.2.6. Domain 1: Key findings

This concludes the findings of the household survey and the data relating to domain one. The key findings that have emerged on if, and how, tenure and sanitation issues relate in the household domain are listed below. These are expressed in bold, supporting findings are also listed.

**Access:** The main findings of how access to sanitation and tenure issues relate in the household domain are:

- **Formal tenure (or formal recognition) is often a necessary but not sufficient condition for households to access sewerage sanitation.**
- **No correlation was found between land tenure typology and the sanitation access level (using the JMP sanitation ladder).**
- **A correlation was found between tenure status and sanitation access: tenant households are lower on the sanitation ladder than owner households;**
  - Tenants are more likely to share sanitation facilities.
  - Tenant only plots are more likely to have shared or unimproved sanitation
- **A correlation was found between tenure security and sanitation access: improved sanitation is less likely in conditions of tenure insecurity (using proxies of perceived risk of eviction, length of stay and plans to leave).**
  - Respondents who had lived in the same location for five years were more likely to have improved sanitation.
- Education did not relate to access levels of sanitation.
- ‘Latrine counting’ used in national surveys and JMP monitoring may overlook large inequities in sanitation access between landlords and tenants. A more accurate indicator is “households per toilet”.

- Vulnerable people live with uncertainty. This acts as a methodological barrier by preventing people from answering decisively about their future plans.

**User Satisfaction:** The main findings of how user satisfaction with sanitation and tenure issues relate in the household domain are:

- **The most common reason given for dissatisfaction with sanitation facilities was problematic or frequent emptying of the fosse**
  - Problematic pit emptying was the most prominent complaint in the unplanned, spontaneous area and the traditional village area.
- **Tenants face the barrier of lack of agency in respect to improving their sanitation facility often citing absent, unwilling or financially constrained landlords.**
- Owner and tenant households share a similar satisfaction pattern. Taking into account the significant difference in access between these groups, this implies that tenants are satisfied with, or perhaps more poignantly less likely to complain about, a lower level of sanitation.
- Satisfaction with a household latrine is when there are no problems; ‘flush and forget’ is what is desired.
- Owners cite financial constraints as the greatest barrier to improving the sanitation facility.
- Capital investment and maintenance in sanitation facilities is considered the owner’s responsibility.

**Household Investment:** The main findings of how household investment in sanitation and tenure issues relate in the household domain are:

- **For the survey respondents, legal land tenure or land tenure typology does not affect household’s decision to invest in sanitation.**
- **The most common investment for those investing in sanitation across all tenure typologies is the reconstruction or renewal of the pit (fosse).**
- **The primary trigger for subsequent investment in improving household sanitation is when the facility is showing signs of severe defects preventing continued use.**
- The drivers for initial household investment in sanitation are modesty and other construction work taking place, i.e. consolidation of housing
- In the few cases where tenant households invested in their sanitation facility, it was because something has gone wrong. In half of these cases, tenants financed the repair without receiving reimbursement from the landlord.
- The majority of those who did invest had a lower perceived risk of eviction.

- There was a strong consensus between owners and tenants that capital investment and subsequent repairs are considered the owner's financial responsibility and emptying charges are shared between the users.

**Pit emptying:** The main findings of how household pit emptying and tenure issues relate in the household domain are:

- **Pit emptying was active in the areas surveyed: 67.1% of households with emptiable pits did so once a year or more.**
- **There is a link between land tenure typology (i.e. planned / unplanned settlements) and method of pit emptying in Dakar.**
- **There is a significant correlation between pit emptying method and tenure status: owner households are more likely to used mechanised emptying than tenants.**
- **The data displays no link between tenure security and household pit emptying method.**
- **Manually emptying was found to be as common as mechanical emptying in the settlements surveyed (53.4%).**
- **Top decision making factors for pit emptying are market driven (*financial and preferred service offered*). Secondary factors are *cleanliness* and *not to annoy neighbours*.**
- Mechanical pit-emptying services were more expensive in Dakar-Pikine than manual (per year, per household.)
- Owner households are more likely to used mechanised pit emptying.
- Tenants, despite being on average, of a lesser wealth bracket, are less likely than owners to opt for DIY (free, manual) emptying; of those who empty manually there are more owners than tenants.

In tabular form for the correlations between tenure issues and sanitation issues at the household domain are illustrated below (table 6-19), where a tick indicates that the findings of the survey imply a significant relationship between those two factors. It was found that user satisfaction finding fall naturally into the other sanitation headings, and will be discussed as such in the following section.

Significant links	D1: sanitation in the household domain		
	Access	Household investment	Emptying
Tenure typology	X	X	✓
Tenure status	✓	✓	✓
Tenure security	✓	✓	X

Table 6-19: Significant relationship between tenure and sanitation

This concludes the findings section of domain one, the following section details the findings relating to the sanitation service provision including both the formal utilities and the pit emptiers who predominantly act in the informal sector.

### 6.3. Domain 2: Sanitation Service Provision

This section details the findings of the sanitation service provider domain (D2). This domain is described using data from semi-structured interviews with sanitation service providers; this includes representatives of the National Office of Sanitation for Senegal (ONAS), the water utility (SDE), local representatives and the household pit emptiers, the latter extending the scope of service provision beyond the utility to the smaller private enterprise. This data is presented in two parts, firstly the water and sanitation utilities followed by the pit emptiers. To analyse and present this data, interview transcripts and notes were coded into themes and grouped under ‘formal and informal rules and norms’ and ‘pressures and incentives’. Combinations of direct quotations and paraphrasing from interview notes are used to present these findings<sup>34</sup>. Where quotations are used they are considered as representative rather than exhaustive and are presented both in French, the language of the interview, and the English translation. Data is referenced by the key informant interview number (KI) and the transcript track mark (T). A reference list of key informants is found in appendix E. For the pit emptiers, participant observation data is included to complement the interview data which was collected through days spent with the pit emptiers on their daily work. This section is concluded by a summary of the findings of domain two.

#### 6.3.1. Water and Sanitation Utilities

This section presents the data from interviews with representatives of the water and sanitation utilities in Senegal and local representatives.

<sup>34</sup> For the pit emptiers only paraphrasing is used. At the time of data collection, operators were working extensive hours due to severe flooding as such scheduled interviews took place in the field. In this environment audio recording quality is poor therefore data is based upon notes taken during interviews.

### 6.3.1.a. Norms and rules

As detailed in chapter five, Senegal has an innovative sanitation policy and infrastructural home, the National Office of Sanitation for Senegal (ONAS). ONAS is in charge of managing the implementation of the PAQPUD (2002-2008) scheme which incorporates on-site systems (OSS<sup>35</sup>) and simplified sewerage systems<sup>36</sup>. ONAS' operations fall under the overall city planning and development strategy which is guided by a series of master planning documents (Plan Directeur D'Urbanisme PDU and the Plan d'Urbanisme Detaille, PUD). The PDU (Director's Urban plan) orientates the utility in terms of priorities for development and areas for expansion. In 2005-2006 the sewage network was expanded into selected areas of *Pikine Ancien*. When discussing this element of sanitation developments with the respondents, it is clear from the responses of the utility representatives that technical and layout conditions were the decisive factors, limiting the sewage network expansion to formally planned areas, as the following describes:

KI.04, t.3.00 « *Ça concerne que la zone régulière de Pikine parce que les réseaux on ne peut pas les mettre n'importe où. Il y a certaines conditions à régler, au point de vue urbanistique [...] Il y avait déjà une occupation régulière, la consommation d'eau était assez importante et il y avait les habitations qui montaient en hauteur. Il y avait un volume qui était assez important, alors les fosses se remplissaient très rapidement ce qui faisait qu'il fallait trouver une solution rapidement. C'est pourquoi on a ciblé cette zone, qui faisait partie des zones défavorisées. Il y avait en fait des risques de maladies.* »

“It only relates to the planned area of Pikine because we cannot put the sewage networks just anywhere. There are certain conditions that have to be met from the urban planning point of view. [...] There was already a regular layout, adequate water consumption, and there were multi-storey buildings. There was a high volume so the pits were filled very quickly. This made it necessary to find a solution quickly, that's why we have targeted this zone, which was a part of the underprivileged area. In fact, there was risk of disease.”

Service providers were also questioned if they considered formal tenure to be a prerequisite for sanitation developments. Representatives of both the main ONAS offices and the PAQOUD offices were asked this question. Respondents tended to reflect on one of two distinct types of sanitation development: either that of networked sewers or that of appropriate technologies. Representatives from the main ONAS offices spoke of the PAQPUD as the 'project', as it is funded on a fixed term, as opposed to a mainstream part of ONAS' operations. This reflects an institutional disconnect within ONAS between the networked sanitation systems of Dakar and the PAQPUD on site systems. This is potentially compounded

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<sup>35</sup> *Systèmes autonomes* in French documentation.

<sup>36</sup> *Systèmes semi-collectif* in French documentation.

by the fact that at the time of the interviews (May-September 2008) the future funding to extend the PAQPUD was under question, this has since been guaranteed. In addition the PAQPUD offices sit physically adjacent to the offices of ONAS main operations.

For the networked systems, ONAS representatives explained that for sewerred areas, ONAS uses the household water utility bill as proof of property ownership. This is regulated through aligning ONAS' account to the customer account number of the water utility to process a connection request.

KI.05, t.9.19 « *Nous avons besoin d'une attestation qui prouve que vous avez passez par l'urbanisme, on réclame la facture d'eau. Normalement avant de mettre de l'eau vous avez passé tous ça, et là on est couvert.* »

“We need a certificate which proves that you have passed by the town planning, we demand the invoice for water. Normally before installing water you have passed through all of that, so there we are covered.”

The figure 6-10 below shows the process and requirements for households to connect to a sewage system in Dakar.

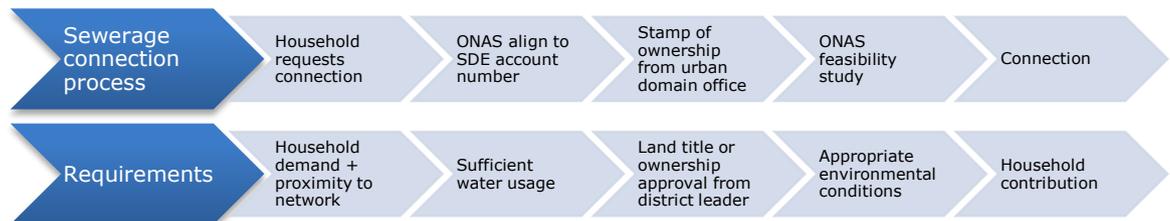


Figure 6-10: sewerage connection process and requirements

The proof of ownership required by the water utility (SDE) is regulated by the local planning offices as a precondition for each household demand. As the following quote shows the theory behind this is clear, to avoid consolidating spontaneous construction:

KI.06, t.7.18 « *il faut que l'urbanisme dit « Ok » parce que il ne faut pas que ça soit dans une zone non-ædificandi comme on le dit, il ne faut pas que nous en encourage les installations anarchiques dans les villes.* »

“the urban planning has to say “OK” because it should not be in a zone that is not destined for construction, we shouldn’t encourage anarchical occupation in the cities. “

However, the same respondent's comments later suggest that this systematic process on behalf of the utilities is, in reality, predominantly a legal safeguard.

KI.06, t.9.20 « *Voilà, au moins on est protégés. Vous savez, il est arrivé même on nous rapproche, on avait mis de l'eau quelque part alors que la personne n'était pas propriétaire, c'est arrivé. [...] C'est exactement à ça que nous faisons beaucoup attention, pour qu'on ne nous mette pas dans les litiges, qu'on ne nous convoque pas dans les dossiers qui nous ne regardent pas.* »

"You see, at least we are protected. Once it even happened that we were accused because we put water somewhere when the person was not the owner, it has happened. [...] This is exactly why we are very careful, so we are not put in a dispute, so we are not summoned for cases that have nothing to do with us."

Formerly this proof had to be *de jure*, in the form of a land title or occupational permit. In practice the prerequisite of ownership disqualified the vast majority of the peri-urban residents for connecting to the water mains. In 1991 these rules were relaxed to allow local leaders or *chef de quartier* to confirm ownership and to extend water provision:

KI. 06, t.1.15 « *l'attestation de propriété du domaine ca peut-être le délégué du quartier parce-que pour nous tous les sites ne sont pas égalisés, bien que ça devrait être un registre de titre foncier on n'a pas partout cela donc vous voyez on n'est pas très rigide. On tient compte du contexte de l'environnement.* »

"The proof of land ownership can be from the district leader because for us all the sites are not the same, although it should be a land title, we don't have that everywhere so you see we are not very strict. We take the local context into account."

This relaxation of the rules essentially provided a system for those living in unplanned areas to have access to water. Although this system is widely practised, a representative of the local urban planning office in Pikine reported that some district leaders were charging residents to testify their proof of ownership suggesting the system was open to manipulation (KI.09).

ONAS' operations are aligned to the water providers where a sanitation tax or "*redevance d'assainissement*" is levied on households regardless of whether they are connected to the sewerage network. The PEPAM strategic 2015 document (Hoang-Gia *et al.* 2004), distinguishes between households who are connected to the sewerage system charged at 70 CFA/m<sup>3</sup> of billed water and those who have on-site sanitation charged at 20 CFA/m<sup>3</sup> of billed water. In reality a flat rate of 42.7 CFA/m<sup>3</sup> is applied to the water bill across all households of sewered cities in Senegal.

Land tenure issues were encountered during the development of the semi-collective systems. Under the PAQPUD, ONAS has developed several semi-collective sewage systems which encountered several issues of land ownership. In order to develop a semi-collective sanitation system, often the network will have to pass over land which may not belong, either *de jure* or *de facto* to the state. The PAQPUD representative detailed several situations where negotiations were required to resolve land issues (KI.13). This was especially pertinent with regards to locating pumping and treatment stations. Examples of land issues are detailed in table 6-20. In each of these cases ONAS and the implementing agency AGETIP had to negotiate with the land owners and local community.

Location	Tenure Issue
Ngor, traditionnel village	Piping for semi-collective sanitation system needed to cross a residents land. ONAS negotiated with the owner and sought permission without having to compensate for land usage.
Ouakam	Pumping station to be placed on someone's private land but it was already a major passage for rainwater. ONAS and the mayor negotiated with the owners to relocate elsewhere.
Station des Niayes	To gain access to the station, negotiation was required to pass over a resident's land
Cambarène	Community opposition to proposals to construct a pumping station near a local football area used by youths. This opposition was subsequently overcome after lengthy negotiation.
Thiaroye sur Mer	Local resistance to location of treatment station effectively prevented a fully built semi-collective system being put into operation.

Table 6-20: Tenure and land issues with PAQPUD semi-collective systems<sup>37</sup>

One case in particular was highlighted, that of *Thiaroye sur Mer*; where the traditional village tenure group of the study was located. A semi-collective sanitation system was installed in a planned settlement named *Thiaroye Azure*, west of the traditional village. In addition a pumping station and treatment plant (a waste stabilisation pond system) were planned. The treatment plant was to be situated on land owned by the Nestlé corporation, who donated the land to be used free of charge. Local residents had built their homes right up against the boundary of where the treatment site was to be located. As such the houses and the waste stabilisation pond would be only two to three meters apart at some points.

Upon interviewing the representative of the opposition group (KI.08), a district councilor, it was explained that the opposition stemmed from fears of nuisance the waste stabilisation pond might create. This was particularly in the case of flooding and potential damage to their property during construction pertaining to fears regarding the instability of the land. The not-

in-my-backyard (NIMBY) resistance has, to date, prevented the construction of the treatment plant and the semi-collective sewerage system remains unused (KI.13).

Both the central and local ONAS/PAQPUD representatives expressed frustration and difficulty with regards to finding appropriate land for development. Especially in urban areas where land is rare and costs are high, finding appropriate land for auxiliary sanitation developments such as treatment and pumping stations can be problematic. ONAS, as a utility, does not have the authority to demand land and therefore must rely on negotiation with both formal and informal land authorities (KI.07).

For non-sewered systems, it is clear that on-site non-piped facilities avoid many of the proof of ownership processes required for networked systems. Under the PAQPUD scheme, households are connected based upon demand therefore do not need any proof of formal tenure to take part (KI. 07). This system permits tenants, if willing, to contribute to the cost of the improvement. Currently however there is no formal mechanism to mediate between landlords and tenants for tenant-only properties.

### 6.3.1.b. Pressures and incentives for utilities

The utility representatives interviewed refer to institutional change and the PAQPUD strategy as the enabling factors allowing them to operate in the informal residential areas and achieve higher sanitation coverage. In this quote, an interviewee from ONAS refers to the theory and practice of before and after PAQPUD implementation.

KI.04 t.2.11 *« Avant le PAQOUD il y avait seulement les idées. Il y avait un plan directeur, le plan de stratégie de Dakar et des différentes technologies mais ça n'a jamais été mis en œuvre, parce qu'avant la réforme on s'occupait seulement d'assainissement liquide avec réseau. Après la réforme on a dit que l'ONAS s'occupe même de la promotion de l'assainissement donc c'est à l'issue de ça qu'on a pris en charge tout ça. »*

*“Before the PAQPUD there were just ideas. There was the Urban Plan, the strategic plan of Dakar and different technologies but it was never implemented because before the reform we only dealt with liquid networked sanitation. After the reform, ONAS was put in charge even of sanitation promotion so it is from then, that we took over all that.”*

The adoption of a range of sanitation technologies through the PAQPUD project is seen as an important element of achieving sanitation for all, as one respondent explains.

KI.04 t.0.32. *« C'est un atout très important que nous avons capitalisé avec ce que nous avons fait avec la Banque Mondiale. Au lieu d'essayer de faire toujours le réseau d'égouts, nous nous orientons à vouloir servir toutes les personnes, toutes les ménages et pour ça nous avons développé plusieurs technologies. »*

*"It is an important feature which we have developed with the World Bank. Instead of always trying to make sewers we concentrated on wanting to serve everyone, all households, and for that we have developed several technologies."*

The PAQPUD enabled different sanitation options for different locations. In doing so provided a formal framework for the sanitation utility to operate in the informal areas.

From the service provider perspective, the technical requirements and related costs bind sanitation developments. Technically, the geological characteristics of the Dakar peninsular present a challenge to sanitation. Much of the urbanised peri-urban area lies around the Niayes (low lying sand dunes), where a high water table and seasonal flooding present difficulties for sanitation. This is compounded by the ambiguity over land ownership :

KI.05, t.10.40 *« L'autre chose aussi, pour contraintes techniques, les contraintes de terrains ; nous avons beaucoup lutté. Si c'est un commun terrain il n y a pas de problème, mais si c'est des terrains qui sont après vendu a gauche et a droite, vous savait la majorité c'est comme ca des problèmes que nous avons, »*

*« The other thing, for technical constraints, is the land constraints; we have fought a lot. If it's common land then there is no problem, but if its land that is sold left and right, you know a lot of the time it's problems like this that we have."*

The government is faced with the dilemma of the financial costs inherent in improving sanitation, whilst encouraging residents to take up new sanitation at an affordable rate. An example of this dilemma is described by one respondent in relation to the sanitation tax.

KI.04, t.4.14 *« La barrière la plus importante que nous rencontrons est surtout la couverture des charges d'assainissement. Actuellement les charges sont couvertes avec la redevance de l'assainissement. La redevance est très faible par rapport aux charges parce-que, avec le développement des ouvrages qui est arrivé, il faut prendre tous ça en charge. La redevance qui devait prendre ça en charge a été bloquée depuis 2003. C'est une politique de l'état, avec la vie qui devenait de plus en plus chère c'était difficile pour l'état d'augmenter les prix de l'eau. »*

“The most significant barrier that we come up against is especially covering the costs of sanitation. Currently the costs are covered by the sanitation tax. This is very low with regards to the costs because with the developments that we have done they are all taken into account. The sanitation tax that should have covered has been blocked since 2003. That is a state policy because, with increasing living costs, it was difficult for the government to raise the price of water.”

The sanitation tax is perceived by the utilities as too low to cover ONAS’ operating expenses thus preventing future investment. However whilst other living costs have risen with inflation, the government has kept the water rates stable. This underlines the political nature of sanitation developments in the urban context.

This concludes the data of the water and sanitation utilities. Using the same structure, the next section presents the findings of the household pit emptiers.

### **6.3.2. Pit emptiers**

This section presents the data from interviews and direct participant observation of the pit emptiers of Dakar. This includes interviews with the head of the A.A.A.S. (the pit emptier association which represents both mechanical and manual emptiers), the director of a pit emptying company and owner of several trucks servicing Greater Dakar, and pit emptying operators of that company. In addition the data here is complemented by direct participant observation of the daily work of a pit emptying truck.

#### **6.3.2.a. Norms and rules**

In 2008, ONAS signed a new contractual agreement with the state where ONAS takes a greater responsibility for faecal sludge management and treatment, including establishing a framework for the licensing of the faecal sludge entrepreneurs. At the time of the data collection, formal rules and contracts governed emptying of large septic tanks but the majority of household emptying was done in the informal sector.

The mechanical pit emptiers interviewed saw their role as a public health service, both in terms of their day to day activities but also during flood periods when they are contracted by the state to pump flood water (KI.10, KI.11). Firstly, in their household pit emptying role, they consider to offer an emptying service to the client, where the majority of the work consists of emptying the water based sludge out of the pits. The majority of trucks in Dakar are water suction only (EDE 2007). In some cases, if the client requires the tank or pit to be totally emptied, and the truck does not have the capacity to empty the sludge, one of the operators

will empty the remainder of the tank manually. This will usually be the 'apprentice' of the truck team and charged at additional cost (KI.12). Business for household emptying is often contracted through word of mouth (KI.10, KI.11) or advertising on the trucks themselves; where emptiers often service areas they know and can develop a regular clientele. Such emptying of household pits is often left to the most informal of the pit emptying entrepreneurs (Bereziat 2009), whereas the formalised larger enterprises service the formal sites (KI.10, KI.11). From the interviews with the FSM companies, they indicated a flexible pricing structure which is dependent on the capacity of the truck used (KI.11, KI.12); distance to location and a function of the affluence of the area. One example was given of this where a household in the affluent area of "Les Almadies" will be charged 60,000 CFA whereas a household in Dakar-Pikine will pay 35000CFA (KI.11). Customer service in terms of fast response to customer demand, competitive price and cleanliness is valued as a means of gaining repeat business (KI.12).

The second public health service the truck operators offer is in the case of bad flooding, which was the case in both 2005 and 2008. In advance of the rainy season, the government contracts truck operators to pump water in case of flooding, named *Plan Orsec*. This was the case during the field observations where Dakar suffered flooding during August-September 2008. Due to the increased demand for their services, from both households and the *Plan Orsec* contract, trucks operated 24 hours per day, changing driver and team members as required, pumping flood water and clearing their backlog of household clients when permitted.

No manual pit emptiers were interviewed during the research. They tend to operate in their local area in teams of two. The practice is to dig a pit either within or just outside the house boundary and transfer the faecal sludge using shovels and buckets. The pit is then left open to soak away before covering with sand (see figure 6-11). One manual pit emptier was encountered during the data collection process (see figure 6-12). The emptier was unwilling to talk as the householder expressed a fear of recrimination and fine for this illegal dumping. The observation of many recently filled pits however demonstrated that manual emptying is widely practiced in Pikine. The leader of the A.A.A.S. estimated it to be well over 50 percent in these areas.

It is important to note however that the distinction between the manual and mechanical emptying however can sometimes become blurred: interviews with the mechanical emptiers indicate that they offer a service of emptying and sludge removal, whereby they empty the bulk of a pit or tank mechanically and the final harder sludge manually. This was often in the case of new construction or renovation work when the tank had to be totally emptied (KI.12). Furthermore, the pricing for mechanical emptying is not a necessarily a linear function of quantity of faecal sludge removed (KI.11, KI.12). An explanation for this could be found in the fact the cost of emptying varies with distance to the dumping site (KI.10).



Figure 6-11: Hole in road of excreta and wastewater from household<sup>38</sup> (taken by Author 2008)



Figure 6-12: Manual pit emptier Dakar-Pikine (taken by Author 2008)

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<sup>38</sup> Pit dug in unpaved road of settlement, filled with excreta and wastewater from household pit; left open until water had subsided This open pit of blackwater was observed walking through the settlement. The owner was present and explained he had recently purchased the property. The septic tank required maintenance and therefore required emptying completely, he considered this his only option.

### 6.3.2.b. Pressure and incentives for pit emptiers

The truck operators listed several negative incentives against them continuing their work (KI.10, KI.11, KI.12). These fall under the two main points: that of high costs of operation versus return and restricted opening hours of treatment plants. Regarding the costs first, the most significant expense for the truck operators is fuel; the operators also pay to deposit their load at the treatment plants at a rate of 200 CFA /m<sup>3</sup> (€0.3/m<sup>3</sup>). In addition, operators complain of police bribes averaging to 5,000 CFA/day (€7.6/day) however during the three days of observation this was not observed. This was during the rainy season however where the FSM companies reported a change in attitude towards them as they were working to alleviate flood water problems (KI.11, KI.12). This was cited as one of the primary motivators that the A.A.A.S. initiated a dialogue with ONAS to develop a licensing scheme (KI.10, KI.11) for the emptiers.

The limited opening hours<sup>39</sup> of the treatment plants and poor traffic circulation in Dakar limited the number of return journeys that pit emptiers were able to make to the treatment plant. During data collection the average number of rotations observed (making it back to the treatment) plant was three per day. The pit emptiers however worked outside of these hours and dumped the faecal sludge on waste land. Figures 6-13/14 shows one of the trucks emptying their load during daylight hours on the outskirts of Pikine, on sandy wasteland where the railway crosses the main Dakar – Rufisque road.



Figure 6-13: Truck emptying load on wasteland (taken by Author 2008)

<sup>39</sup> Opening hours: 10:00-16:00

The emptying shown in figures 6-16/17 was away from residential areas and the truck had been called to pump flood water from a nearby location. When the driver was questioned on this discharge he simply replied that this was their only option since the treatment plant was closed and their work was not over (KI.12).



Figure 6-14: Truck emptying load on wasteland (taken by Author 2008)

### 6.3.3. Sanitation Service Provision: Summary

In the domain of sanitation service provision there is a difference with respect to tenure issues between networked and non-networked sanitation systems. Before the institutional reform of the utilities, this line was clearly drawn where the utility provided sanitation services of piped systems and the private pit emptiers provided sanitation services for the non-piped systems. The reform and implementation of the PAQPUD sanitation strategy has introduced a range of sanitation solutions including simplified systems (as appropriate for the environmental conditions and lower cost) and non-piped systems. Improved non-piped sanitation systems now also fall under the remit of the national sanitation utility, ONAS. Whilst legacies of the previous system remain, the PAQPUD strategy provides a formal framework for the sanitation utility to operate in informal areas. This institutional restructuring of the utilities is recognised by all as a major enabling factor in creating an important link between the sanitation strategy and appropriate sanitation systems for Greater Dakar.

This said networked sanitation systems (both conventional and semi-collective) follow a systematic process for implementation which inevitably encounters land issues. These include: proof of ownership for physical household connection; finding appropriate and available land for urban sanitation development (for sewerage networks and auxiliary pumping and

treatment stations) and; NIMBY resistance to sewerage and wastewater management facilities near residential areas. Non-piped systems avoid many of the land issues encountered for networked systems. Under the PAQPUD scheme, households are connected based upon demand and do not need any proof of formal tenure to take part. A range of sanitation technologies is considered an important element of achieving sanitation for all.

Household pit emptying, the operational activities that ensure a sanitation service for many households is tenure neutral. Pit emptiers operate across formal and informal boundaries of the city and serve households with or without legal tenure, landlords or tenants and those with a range of tenure securities without discrimination. They are governed largely by informal norms and the pressures that are felt are largely their direct or indirect operational costs. The pit emptying market is diverse and its operators flexible so allowing pit emptiers as a sanitation service provider to respond easily to ad hoc customer demand. This presents a very different model to the sanitation utility, where for many circumstances tenure issues matter.

Key points:

- There is a clear difference in how tenure issues manifest between piped and non-piped sanitation services
  - where non-piped sanitation service providers (i.e. pit emptiers) offer a tenure neutral service, meaning they can operate across the boundaries of formal and informal land tenure, for both tenants and landlords and, being a cash service, the tenure security of the household bears no relation to the service they offer.
  - networked sanitation systems (both conventional and semi-collective) follow a systematic process for implementation which inevitably encounters land issues
- The institutional reform of the water and sanitation sector (and PAQPUD project) is recognised by all as a major enabling factor in creating an important link between the sanitation strategy and appropriate sanitation systems for Greater Dakar
- Household pit emptying is governed largely by informal norms and the pressures that are felt are largely their direct or indirect operational costs. The pit emptying market is diverse and its operators flexible so allowing pit emptiers as a sanitation service provider to respond easily to ad hoc customer demand.

#### **6.4. Domain 3: City Planning and Urban Management**

This section details the findings of the city planning and urban management domain (D3). This domain is described using data from semi-structured interviews with city officials and key informants involved in the urbanisation process. Interview transcripts and notes were coded into themes and grouped under formal and informal land arrangements; restructuring operations and pressures and incentives for urban planning. Combinations of paraphrasing and direct quotations are used. Where quotations are used they are considered as

representative rather than exhaustive. Quotations are presented both in French and English. Quotations are referenced by the key informant interview number (KI) and the transcript track mark (T).

### 6.4.1. Formal land arrangements

The Ministry of City Planning works in accordance to the Urban Planning Code (law no.88-05 29 June 1988) and a series of Master Planning documents (*Plan Directeur D'Urbanisme* PDU and the *Plan d'Urbanisme Détaillé*, PUD) which determine the rules of city planning and land use.

The PDU strategic plan was referred to on several occasions during the interviews with urban planners, notably the systematic organisation of land and different zonings stated in the PDU reserved for different activity types. What is clear from each of the interviews from the representatives of the Municipal Urban Planning Department (MUAT) is that appropriate land use and management is considered a precursor to further urban developments and underpins the whole of city planning, as the quote from one interviewee explicitly states.

KI.01, t.3.30 « *La première chose à faire c'est de régler les questions foncières.* »

“The first thing to do is to sort out the question of land management.”

The importance of sorting out land management arrangements was emphasised several times throughout the interviews. Land management and formalised tenure was considered important in terms of regular layout and space to build public works. One respondent explains:

KI.01, t.6.40 « *on ne peut pas faire de l'assainissement, ni de l'approvisionnement de l'eau si on ne règle pas le problème foncier parce que pour mettre les réseaux d'assainissement il faut de l'espace<sup>40</sup>* »

“We cannot do sanitation, nor water provision if we do not sort the land management problem because sanitation networks need space.”

The importance of formalized tenure was also reinforced in relation to a resident's right to access public services where, in theory, if a resident does not have a real right to the land they do not have a right to connect to the public networks, illustrated in the quotes below.

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<sup>40</sup> The term '*réseau assainissement*' is used interchangeably for rain drains and sewers. As flooding is a problem during the rainy months in Dakar, flood management is considered a priority. However the '*réseau assainissement*' also refers to sewer systems

KI.01, T.33.05 « *le foncier est un vrai problème. Si vous n'avez pas de titre, ou d'autorisation de construire vous ne pouvez pas connecter aux systèmes d'assainissement, on ne peut pas connecter à l'eau, vous ne pouvez pas avoir de l'électricité.* »

"Land management is a real problem. If you don't have a land title, or authorization to build you cannot be connected to the sanitation networks, you cannot connect to the water, and you cannot have electricity. "

And

KI.01, T.34.54 « *si vous n'avez pas un droit réel sur le terrain vous ne pouvez pas bénéficier de raccordement, officiellement vous n'avez pas le droit de connecter à un réseau publique. Il faut avoir le droit que l'état vous à conseillé pour affecter à un réseau publique soit tiré d'un service publique.* »

"If you don't have a real right of the land you cannot have a connection, officially you do not have the right to connect to a public network. You must have the state given right to connect to a public network or to gain from a public service. "

When questioned about households who may have water and electricity without formal land title in Pikine, one interviewee considered them to be illicit connections,

KI.01, T.34 :00 « *non ils font du piratage, ils ne sont pas très contrôlés* »

"No, it is illicit. They are not very controlled."

As the quotes above demonstrate basic services are perceived as publically owned physical entities, to connect to which requires an agreement from the state. Anything outside of this is considered illicit.

From these statements regarding these urban services it is clear that from an urban planning perspective tenure is considered a prerequisite in order to benefit from networked public services. The disparity between this expectation and the reality of service provision in irregular zones however is widely acknowledged, as the following quote illustrates:

KI.02, t.16.02 *Normalement avec l'eau et l'électricité ils sont censés être dans un zone régulière, c'est aussi une manière de contrôler l'occupation du sol, et qu'on n'encourage pas une occupation anarchique pour que l'urbanisme est au courant de ce qui se passe dans leur zone, mais en réalité ce n'est pas le cas,* »

“Normally with water and electricity they are supposed to be in a regular area, it’s also a way of controlling the occupation of land, and so we do not encourage an anarchic occupation so that the department of urbanisation knows what is going on in their area, but in reality this is not the case.”

## 6.4.2. Informal Land Arrangements

### 6.4.2.a. Spontaneous occupation

Although the PDU document is held as the basis of urban development, all interviewees admit that the rapid spontaneous development outpaces these plans and challenges their applicability. The rate of change and illegal occupation is considered a challenge as illustrated in the following quotes:

KI.02, t.4.10 « *avant d’attendre ces cinq années tout cet espace va être occupé par des gens justement, des irréguliers. Voilà déjà, rien que cette aspect montre comment le fait des occupations remet en cause notre politique de développement, alors dans ce cas nos plans n’ont plus des raisons d’être.* »

“Before five years all this space will be occupied by people, precisely ‘irregulars.’ You see, even this aspect shows how these land occupations question or development policies, so in that case our plans have no meaning.”

KI.03, t.-0.35 « *mais l’occupation urbaine n’est pas souvent conforme à cette planification [...] face au rythme accéléré des migrations vers les villes, c’est ça qui pose problème, il y a un décalage.* »

“But the urban land occupation does often not conform to the planning [...] faced with the accelerated rate of migration into the cities, that’s what causes the problem, there is a gap.”

Irregular developments are seen as problematic both in terms of occupation of land and in terms of failure to follow construction norms (KI.01, t.11.40). One of the urbanisation departments (BSCOS) is dedicated to the prevention of occupation of informal areas since to the extent that the irregular occupations was challenging the country’s policy of development (KI.02, t1.00). Whilst the BSCOS is charged with managing both eventualities, much of their resources are consumed with illegal construction on state land (KI.02, t. 14.00). The task of controlling the spontaneous development often goes beyond the resources of the urbanisation officials as even just guarding one small area clearly takes up a lot of time and resources as the following quote illustrates:

KI.02, t. 14.30 « *Il a des zones sensibles ou vraiment il a y de l'urbanisation qui est en cours, les zones convoitées ou parfois des zones où on a interdit des constructions et on nous demande de veiller effectivement sur ça, vous voyez le conflit qu'il y a alors qu'on est obligé de marquer quotidiennement notre présence sur le terrain.* »

“There are sensitive areas where there is really urban development taking place, desirable areas or sometimes areas where construction is prohibited and we are asked to watch those areas specifically. You see the conflict which there as we are to be obliged to mark daily our presence on the ground.”

The consequences of settlements arising in inappropriate areas are a major concern. The ‘Niayes’ areas of Dakar were historically marsh lands for farming; however they have since been occupied spontaneously as informal extensions of *Pikine Irrégulier*. These are some of the most notable cases where in 2005 and 2008 thousands of homes were flooded during the rainy season.

KI.01, t. 12.00 « *il y a des zones d'inondation parce que les gens ont occupé les zones néfastes, on ne peut pas construire les habitats sur ces zones.* »

“There are flood prone zones because people occupied dangerous areas; you can't build houses on these areas. “

This frustration is framed however by the tension that city planners and officials acknowledge that there is little space for development, which is forcing people to occupy areas unsuitable for development (KI.01, T14.10).

#### **6.4.2.b. Customary Land Tenure Arrangements**

The original land owners of Dakar are considered to be the ‘Lebous’ members of the original fishing communities before Dakar became urbanised. Traditionally, Lebous land would be allocated. However with the advent of land speculation and demand; many of the Lebous sold parcels of their land thus forming the origin of the informal or informal land markets. Despite the acknowledgement of the formal urbanisation systems and planning, the Lebous are respected historically and culturally as the land owners of the Dakar region. This is apparent in the interviews where respondents expressed consideration towards the Lebous’ customary rights:

KI.01, T31.15 « *Les Lebous, ils réclament le droit d'âge, c'est-à-dire c'est leur histoire, [...] Il faut tenir comptes de ces droits la et l'histoire. C'est des droits coutumiers qu'il faut respecter. »*

“The Lebous, they demand their age-old right, it is their history. [...] It is necessary to take into account these rights and the history. They are customary rights that should be respected.”

The customary rights relate to the rights of clearance, the traditional systems of land administration in rural areas, which arise from the clearing of land either by cutting or by fire for cultivation. The tension between this customary rights and the municipal rights are recognised by the municipal representatives:

KI.03, t.7.42 « *Nous sommes dans une région qui a été habitée essentiellement par des Lebous dont les ancêtres ont acquis ce terrain soit en débroussaient par le droit du feu ou en coupant les arbres, par le droit de la hache. [...] Mais ici les Lebous n'ont jamais accepté le droit municipal, pour eux c'était un sorte d'expropriation, »*

“We are in a region that was essentially lived in by the Lebous whose ancestors acquired this land either in clearing it by the right of fire or in cutting trees, the right of the axe. [...] But here the Lebous have never accepted the municipal law, for them it was a type of expropriation.”

This suspicion of the Lebous towards the formal land tenure systems remains, and is inflated by increasing land speculation. The Village Chief of *Thiaroye Sur Mer*, who discussed many other topics openly, refused to speak on land issues.

Maintaining this pluralism in land management means for a complex system where even for public services seek authorisation or cooperation from the Lebous ( KI.01,T31.20).

### **6.4.3. Restructuring and regularisation strategies**

The phenomenon of irregular urban development is widely acknowledged within the ministry of urban planning, and led to an inter-ministerial consultation, dedicated to addressing the phenomenon of spontaneous construction and informal land occupation. The Horizon 2025 plan is attempting to address this by encompassing a curative urbanism approach in regularising the informal areas and to limit the uncontrolled expansion by addressing the land use and ownership issues at the fringes of urbanisation (KI.01, t.11.30).

As detailed in chapter five Senegal is undertaking a comprehensive slum upgrading and restructuring program with GTZ funding. The *Fondation Droit à la Ville* (FDV) was established to act as an intermediary and implementation body to manage the process of restructuring informal settlements.

It appears the motivation behind this is to improve overall living conditions through improving basic living conditions. However the market dynamics of improving the overall area and the type of inhabitant is not overlooked as the quote below demonstrates

KI.01, t.40.00 *« Il faut créer des conditions d'élever la vie dans le monde, de faire l'assainissement dans les zones sales et insalubres. Il faut éviter que les gens ne soient exposés à des risques majeurs, donc il faut investir dans les villes. C'est correcte, pour que les gens puisse avoir accès à l'eau à l'assainissement, si on a ces conditions ça créera des conditions de vie meilleur qui va attirer une catégorie de personne. »*

"It is necessary to improve living conditions in the world, to make sanitation in the dirty and unhygienic zones. It is necessary to avoid that people are not exposed to major risks, thus needs to invest in cities. It is correct, so people can have access to water, to sanitation. If we have these conditions it makes living conditions better which will attract a certain type of person."

In addition there is an understanding within the regularisation project that providing intermediary land titles will increase the opportunities for bank loans, which in turn will generate finance for building renovation and household expansion

KI.03, t.-1.11 *« c'est vrai qu'auparavant ils n'avaient pas le titre de propriété mais avec la restructuration ils arrivèrent à avoir une sorte de titre qui peut aujourd'hui pouvoir prétendre à des prêts bancaires et d'améliorer leur habitat. »*

"It is true that previously they had no title deed but with the restructuration they have a type of land title which they can now lay claim to bank loans and to improve their house."

Criticism of the project highlights the contradiction between the governments accepting that certain areas are unsuitable for residency whilst at the same time the PIS regularisation project is targeting such an area (KI.09).

Under the initial remit of the former land of occupation authority (BSCOS), dissuasion was used as the means to prevent illegal occupation. Owing to the extent of the problem in Dakar, both in terms of numbers and geographical area, this tactic proved ineffective (KI.02, t. 6.30). The service lacked capacity and the general public knew this which meant illegal and

spontaneous development was easily done. The BSCOS is now run by the military and acts upon a politic of dissuasion and fear, with the right to confiscate building materials and capital assets (KI.02, t. 9.00). Whilst their remit is strengthened by their military strength, their capacity in view of the extent of the problem remains weak as cases can be lengthy and time consuming.

#### **6.4.4. Pressures and incentives for city planning and urban management**

##### **6.4.4.a. Urban population growth**

Urban population growth is perceived as a major stimulus to the informal land markets. Over the last few decades Greater Dakar's urbanisation has witnessed a rapid urbanisation, notably in the Pikine commune, which initially housed residents relocated by force from the Plateau city centre area due to overcrowding (1952). Occupations extended north or and east of the planned area, in addition to the expansion of Lebous villages.

As with many cities of the South, the rate of urbanisation and irregular land occupation in Dakar has clearly outpaced the land management's capacity. The vast majority of urban growth in the Dakar region has occurred in the informal areas thus year on year exacerbating the problem, allowed to some extent by a 'laissez-faire' attitude of government (KI.02) In the time it takes for a new planning document to be formed, the lay of the land and the population have changed (KI.03, t.-0.35).

##### **6.4.4.b. Informal settlements acting as a barrier to development**

A fundamental motivation for addressing the informal settlements of Dakar and Senegal as a whole is that the irregular and spontaneous building is seen to act as barrier to the economic development of the country. This vision is thwarted by the continuous informal urban development which occurs not only at the urban periphery but also on unoccupied land located more centrally. As one interviewee states, projects to develop basic services such as sanitation, can be "wasted" if the fundamental urban structures are not adhered to (KI.01, t.2.45). The lack of documentation and basic service infrastructure, the lack of access roads, sanitation and draining (P0.03, t1.48) are perceived as barrier to the Horizon Vision of Dakar 2025. The problem is compounded by the lack of available and acceptable space for restructuring operations to take place (KI.03, t.13.00).

KI.02, t. 5.30 « Vous voyez aujourd'hui les conséquences, ce que ça nous coute, point de vu cout pour l'état. Et voila donc les conséquences des ces occupations irrégulières. »

“You see the consequences today, what it costs us, from the State’s point of view. So you see the consequences of these irregular land occupations.”

#### 6.4.4.c. Government responsibility for public health and accountability to mass electorate

Government officials also mention the motivation of preserving public health and security as a reason to work to the city plans. There is a consensus and acknowledgement that there are some areas which are unsuitable for human residency, due to being exposed to environmental and industrial risks and poor living conditions. During the time of data collection (2008) flooding was a pertinent concern, due to heavy flooding in the area. (KI.02, t. 5.20).

KI.02, t. 5.20 « *Les cas les plus pertinents aujourd’hui c’est les zones d’inondations, tout ça c’était les zones à haut-risque, c’était des zones qui n’était pas censé être occupées, c’était les zone non ædificandi qui on fait l’objet d’occupation. »*

“The most pertinent cases today are the flooded zones, they were all high risk areas, they are zones which were not supposed to be to occupied or built on that were the object of occupation. “

Developments on informal land are not only seen as detrimental to the residents living in them but also as a danger to public safety and security (KI.02, t4.40). Where planning regulations are scarcely enforced, poor building standards persist, and houses are expanded vertically without the correct foundations or soil type to support the construction (KI.01, t.11.30).

Accountability to the mass electorate was also an issue raised by respondents. Whilst informal settlements are considered as problematic by the ministry of urbanisation, it is in these informal settlements where a significant portion, if not the majority, of the mass electorate reside. This political incentive was underlined by the respondents; especially in view of the poor living conditions which when stressed can exacerbate civil unrest.

KI.01, T45.00; « *La démocratie - il faut jouer le jeu. »*

“Democracy – you have to play the game.”

KI.02, t. 18.03 « *il faut comprendre un peu que c’est des voteurs (sic.) de masse, surtout dans la banlieue la majorité est là, ils ont leurs doléances, donc il faut comprendre un peu la politique. »*

“You have to understand that this is the mass electorate, especially in the peri-urban suburbs the majority are there, they have their grievances, so you have to understand a little the politics.”

#### **6.4.5. Urbanisation, City planning and urban management: Key Points**

The key points emerging from the findings on tenure issues in relation to urbanisation and city planning are:

- From an urban planning perspective, land tenure is considered a prerequisite in order to benefit from networked public services. This echoes the designated land management which forms the basis of the PDU.
- There is a consensus that the rapid spontaneous development outpaces urban strategic development plans and challenges their applicability.
- The extent of spontaneous occupation is a major concern for city planners
  - Occupation of flood prone and unsuitable areas.
  - Informal settlements act as a barrier to economic development.
- Tenure pluralism dominates the tenure systems of Dakar; the Lebous are respected historically and culturally as the land owners of the Dakar region and informal development is the norm for land delivery.
  - Maintaining this pluralism in land management means for a complex system where even for public services seek authorization or cooperation from the Lebous.
- There is an understanding that regularisation will increase the opportunities for mortgage bank loans.
- Pressures and incentives for city planning and urban management are:
  - Rapid urban population growth
  - Informal settlements act as a barrier to economic development
  - Government responsibility to safeguard public health
  - Government accountability to mass electorate

This concludes the findings of domain three (D3) the city planning and urban management domain. What follows is a summary of the chapter covering the three domains in turn, from the households; the sanitation service provision and the city planning and urban management.

### **6.5. Summary of Findings Chapter**

This chapter presents the findings of the research. Guided by the research framework it is separated into three distinct parts relating to the three decision making domains of the city.

Domain one (D1) relates to the household domain, where the associated section of this chapter (section 6.2) presents the findings of the household survey. The main findings imply that for household decisions legal tenure in itself does not relate to households access to sanitation nor does it relate to household investment decisions with respect to sanitation developments. A correlation was found between legal tenure and household pit emptying method and this is understood to be largely related to settlement layout, where small alleyways prevent vehicular access. The survey also considered differences between landlords and tenants with respect to sanitation. The findings imply that tenants are on average lower on the sanitation ladder than owners and tenants are less likely to invest in sanitation infrastructure, given that it is a fixed asset. The findings demonstrated that the decisions for what type of pit emptying method was used were financial and a preferred service, where tenant households were more likely to opt for the cheaper service (which in the study context was manual emptying). In terms of tenure security, correlations were found between access to sanitation and household investment in sanitation, where those with lower tenure security were less likely to have improved sanitation or invest in fixed assets of sanitation. Interestingly however tenure security bore no relation to how pits were emptied, implying that household with lower tenure security may access improved pit emptying (i.e. mechanised services).

Domain two (D2) relates to the decision making domain of the sanitation service provision. The relevant section of this chapter is section 6.3. The data shows a clear disconnect with respect to tenure issues between piped and non-piped sanitation services where non-piped sanitation service providers (i.e. pit emptiers) offer a tenure neutral service, meaning they can operate across the boundaries of formal and informal land tenure, for both tenants and landlords and, being a cash service, the tenure security of the household bears no relation to the service they offer. The institutional reform of the utility companies introduced a scheme to build on-site systems as part of the national sanitation strategies. There has also been a rapprochement between the private entrepreneurs and the utility (through dialogue on licensing). These two factors effectively allow the utility to extend their sanitation services and scope of their activities into the informal residential areas.

Domain three (D3) relates to the decision making domain of the city planner. The relevant section of this chapter is section 6.4. The data shows a strong influence of tenure first and land management perspective of the city planning documents. This said a tension exists between the formal planning and the reality of urbanisation, where urbanisation and spontaneous occupation has outpaced city planning. Plural land delivery systems characterise Dakar's land management which creates a complexity in urban planning decisions. Moreover decisions at this level are tied up in political pressures of balancing public opinion and economic development.

This chapter has presented the decisions present in each of the domains and how they are made. In chapter seven, these findings will be discussed in relating to the research questions.

# 7. Discussion of Findings

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## 7.1. Chapter Outline

This chapter will discuss the findings of the research against the wider sanitation and urbanisation discourse. Under the research framework the sanitation system is interrogated in three distinct decision making domains: the household (D1); sanitation service provision (D2); and city planning and urban management (D3). Each of these domains relate to a sub-research question. The research questions are addressed in turn. The chapter concludes with an analysis of how the findings aggregate upwards to answer the overarching research question: **What are the relationships between tenure issues and sanitation and to what extent do they affect urban sanitation development?**

## 7.2. Addressing RQ1: The Relationship Between Tenure and Sanitation Issues in the Household Domain.

The research framework guides the discussion to begin by understanding how decisions are made in the household domain. The first research question is:

**In the household domain (D1), do tenure and sanitation issues interact? If so, how do they affect household sanitation decisions?**

The findings of this research suggest that whilst tenure can in some cases act as both a real and perceived barrier to sanitation developments; it is not a blanket conclusion across all the different aspects of tenure, nor across the entire sanitation system. The following matrix (table 7-1 also presented in section 6.2) highlights where interactions between tenure and sanitation issues were identified from the household survey data. The subsequent discussion addresses formal tenure; tenure status and tenure security in turn. By addressing these relationships this chapter will seek to demarcate these relationships.

Significant links	D1: sanitation in the household domain		
	Access	Household investment	Emptying
Tenure typology	X	X	✓
Tenure status	✓	✓	✓
Tenure security	✓	✓	X

Table 7-1: Correlations between tenure and sanitation at the household level

### **7.2.1. How tenure typology interacts with household decisions**

This section discusses tenure typology in relation to access to sanitation, household investment and emptying as a first step to answer research question one.

#### **7.2.1.a. Non-piped on-site sanitation can be improved sanitation**

The findings indicate that tenure typology bears little or no correlation with respect to accessing sanitation in the household. This data shows that in the surveyed areas, the settlement without formal land title achieved similar levels of improved sanitation coverage as the adjacent settlement with title. This is because non-piped on-site sanitation can be improved sanitation.

It is a common pitfall where 'sanitation' is often interpreted as one technology. Access to sanitation in the literature is often interpreted to mean access to a sewerage network, much in the same way as access to water means connection to a tap. This is especially true where sanitation is one of several grouped basic services. For example, the Almansi *et al.* (2003) report cites lack of (legal) tenure acting as both a real and perceived barrier to accessing water and sanitation services in informal areas. The barrier of 'tenure' is discussed in relation to technical and administrative barriers a household without title would face in the connection process to the sewerage network. The findings of this study indicate that, in the Senegal context, two factors removed legal tenure as a barrier to sanitation provision. (These are discussed in further detail in section 7.3.1 but are relevant to mention briefly in reference to the legal tenure situation). The first was the ruling of 1991 to extend basic services to informal areas of Dakar. This removed the administrative barriers by attributing authority to the local leaders and allowing them to authenticate *de facto* ownership locally. However in practice, this had a much greater impact on services of electricity and water rather than networked sanitation as the extension of sewerage faces additional barriers including significant capital cost, space, irregular water flow. Furthermore there is little incentive for ONAS to extend the sewage network given that the sanitation tax is already billed via the water bill regardless of connection to sewerage or drains. Therefore, whilst the findings do not conflict with the fact that, in practice, formally recognised land is generally a prerequisite for households to connect to the conventional sewage systems in Greater Dakar (as that is where they are likely to be available) this is largely irrelevant to the reality of urban sanitation in this context where on-site non-piped systems are the norm (Strauss, Koné & Saywell 2007). Moreover, it is important to note the possibility of connection to the sewage network does not necessarily imply that households will connect. The findings imply that approximately half of the households who could have connected to a sewer chose not to and continued to pay annual frequent emptying costs. This suggests their motivation is not solely financial. The second and perhaps more relevant change in Senegalese policy was the implementation of the PAQPUD scheme specifically targeting low income areas, where legal tenure was not a prerequisite for beneficiaries.

The bias towards defining sanitation as one technology exposes how different interpretations of sanitation can lead to false conclusions about the role of legal tenure. This research adopted the JMP categorisation of sanitation, (i.e. how well a system separates and manages excreta) as opposed to defining sanitation as a technology and in doing so is able to highlight the non-correlation between legal tenure and access to sanitation. This underlines the difference in perspective between adopting a conventional technology lens (a common perspective of urban planners) and the lens of the JMP 'sanitation ladder' (i.e. improved, shared, unimproved and open defecation). To many sanitation practitioners this may perhaps be a moot point; however the institutional bias towards sewerage sanitation and defining sanitation as a singular technology in urban planning discourse remains. When sanitation is conceived as a technology as opposed to a service, this bias acts as a barrier to service provision to informal settlements. Non-piped sanitation effectively avoids many of the pitfalls and barriers inherent in the provision of and the access to piped sanitation in informal areas.

This argument does not suggest that sanitation coverage is likely to be the same citywide, from a slum to an affluent area, but these results do question the assumption evident in the findings of some urban planners that tenure formality is a necessary precondition to achieve improved sanitation levels. Moreover as Collignon (2000: 24) observed, the majority of African urban residents appear to self-manage their sanitation solutions. This research supports this observation, where the majority of household sanitation systems in the survey were self-built and self-managed. Therefore for households formal tenure has little significance in terms of access or investment behaviours with respect to sanitation.

#### **7.2.1.b. Access for emptying?**

Almansi *et al.* (2003) suggested a second barrier to service provision to informal settlements was irregular layout. Formal planning favours regularised layout which facilitates urban development activities including the development of good road networks. The findings of this study indicate that that tenure typology does relate to the way pits are emptied, with access for trucks being an important consideration. Thus, irregular layouts present more complex environments for households to access sanitation emptying services. This is an important element for a functioning sanitation system, as problematic and frequent emptying is a primary reason for dissatisfaction with household sanitation facilities.

The findings of section 6.2.5. confirm that vehicle access is indeed a major factor in the availability of mechanised emptying services for households. Household pit emptying where poor, narrow, or no road networks prevent access to households is a known dilemma in urban sanitation but the sanitation sector has failed to find appropriate and scalable solutions to date. Without an affordable, accessible and available emptying service, the sanitation system breaks down as faecal sludge is disposed of into the immediate environment. Lack of vehicular access is often stated as a barrier in faecal sludge management in high density areas.

Proposed solutions to overcome this challenge are technologies designed to access a pit in a high density environment where a larger vehicle cannot pass. Examples of these include the UN VACUTUG and MAPET. Both are small (200-500litre) vacuum tanks which are capable of removing sludge either by motor or hand-pump. Sometimes access for these units can be problematic due to very narrow passages, flood defenses at the entrance to houses or poor terrain (as seen in section 6.2.5). Other examples are the Gulper developed by Steve Sugden of London School of Tropical Hygiene and the de-sludging hand pump which are both effectively manual hand pumps to suck faecal waste up out of a pit and into an adjacent container (see appendix G for details of these technologies). One must question, however, given the active pit emptying markets worldwide, why so few of these technologies have gone to scale? There is very limited independent empirical evidence to support their effectiveness.

This author would argue that 'access' in the context of household pit emptying has a secondary component. In addition to truck access to households, the second element of access is how the emptying vehicle can then access the greater faecal sludge management and road network to dispose of the waste. Both the mechanical and manual technologies such as the VAGUTUG and MAPET, given their limited capacity, have limited range, therefore they only offer one element of the overall solution. Whilst they may improve accessibility to the household where larger vehicles cannot reach, on their own they do not offer a viable solution in terms of an accessible faecal sludge network to transport the sludge away. The need for additional transfer stations to make these technologies viable are often overlooked. One solution adopted in eThekweni South Africa, as part of a municipal project to provide sanitation services to the peri-urban communities, suggests that mobile transfer stations (or hoppers) which are temporarily connected to a sewer are the most practical and cost-effective method (Macleod 2005). In this system manual emptiers and mobile drums are used to empty household pits into the mobile hopper which is managed by small businesses and financed through a franchise mechanism (*idem.*). This is an example of a sanitation system operating in informal areas without the need to build permanent infrastructure which is where legal tenure becomes an issue. Here again, there is a lack of independent empirical data to support the effectiveness.

To conclude this section, due to the nature and prevalence of on-site sanitation in Dakar, formal tenure bears little relevance on household decisions regarding access and investment in sanitation. Limited vehicular access caused by narrow roads and irregular layouts, a characteristic of some informal settlements, does impede mechanised pit emptying and alternative solutions are needed. Essentially the absence of formal tenure limits the scope of choice households have regarding sanitation but does not itself rule out potential access to improved sanitation. Whilst formal tenure in itself does not impact upon how decisions are made within the household domain, the planned layout favoured by formalised settlements does. As will be discussed in the sections that follow, the dynamics of tenure status and tenure security have a much greater impact upon household sanitation decisions.

## 7.2.2. How tenure status interacts with household decisions

This section discusses tenure status in relation to access to sanitation, household investment and emptying as a first step to answer research question one.

### 7.2.2.a. Tenants are lower on the sanitation ladder

The research found that, with regards to tenure status and access to sanitation, tenants are lower on the sanitation ladder than owner occupiers. This is explained by the findings of section 6.2.2. where 77 percent of tenants shared their sanitation facilities (with two or more households) as opposed to 17 percent for owners. On average the tenant households surveyed were sharing their sanitation facility with 3.2 households (an average of 20.4 people) compared to 1.2 households (or 14.4 people) for owners. This inequity is not captured in the current sanitation reporting which reports household sanitation access for a homogenous urban population.

Shared sanitation is recognised as a predominantly urban phenomenon and has been largely overlooked until its recent inclusion in the 2006 and 2008 JMP reports (WHO, UNICEF 2008). It is a common sanitation solution across Sub-Saharan Africa, with Ghana recording the highest incidence of shared sanitation in urban areas at 70 percent (WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation 2010). The model of shared sanitation encountered in this research (where several households share one facility) is notably different from shared public toilets which operate on pay per use basis; however under JMP and national survey reporting, both these models of shared sanitation fall unto the same category. Population surveys for Senegal report that 19 percent of the total urban population share sanitation facilities (MICS 2008). With respect to tenants, the national surveys indicate that tenant households represent between 36 percent (1992)<sup>41</sup> to 48 percent (2004)<sup>42</sup> of the total population of Greater Dakar. This said, many of the tenants in Dakar are informal, and anecdotal data suggests that tenants may sub-let to further residents<sup>43</sup>. As such tenant occupancy figures may be significantly under-reported in national surveys. Whist this survey undertaken in this research is not statistically representative of Greater Dakar, it does present data from a random cluster sample of households in Dakar-Pikine that reports on both tenant and owner households independently. Therefore it is plausible to argue that given the results of a higher incidence of shared sanitation for tenants, the approach of national surveys and the potential of hidden informal tenants, the realities of shared sanitation and loading of

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<sup>41</sup> Antoine *et al.* (1992)

<sup>42</sup> ESAM (4004)

<sup>43</sup> A reporting constraint here is that residents may not report or underreport transient lodgers or informal tenants. This applied to both research and census data gathering as researchers are often seen as government representatives conducting a census or other.

urban households' sanitation facilities may be higher than reported. Moreover, the dynamic of inequity in levels of sanitation access between landlord and tenant observed in this research is clear. The comparison between the MICS national survey data and this survey are shown in table 7-2. These findings support the necessity of including the shared sanitation in JMP reporting but also of gaining a better understanding of the dynamics of shared sanitation facilities in the urban context.

This author would argue that this obscurity in reporting of services for tenants falls into the bigger pattern of neglect of tenants in development discourse (UN-HABITAT 2003a). The most common form of rental in Africa is self-help landlords, where rental housing is significant at 61 percent of the overall housing in Africa (UN-HABITAT 2003a: 107).

Use of sanitation facilities (percentage of population) Urban		
MICS survey data (2010)	Improved	Shared
<b>1990</b>	62	17
<b>2000</b>	66	18
<b>2008</b>	69	19
Scott survey data (2008) (percentage of pop. surveyed) Urban		
<b>Owners</b>	81	17
<b>Tenant</b>	21	77
<b>Total</b>	65	34

Table 7-2: Improved and shared sanitation MICS and Scott data compared

It is also noteworthy that shared sanitation is not restricted to developing countries; all over the world, tenants of shared dwellings (e.g. bedsits, hostels, students) operating economically independently (i.e. as independent households) may share sanitation facilities. Whilst shared sanitation in terms of JMP monitoring is considered lower on the sanitation ladder, the findings of this research were that the satisfaction levels of tenants were not markedly different from that of owners. This implies that tenants may accept shared sanitation as satisfactory. This does however raise the question: is shared sanitation an appropriate sanitation solution for tenants?

Wegelin-Schuringa and Kodo (1997) suggest that shared sanitation is indeed the best option for tenants (and others who are unwilling to invest). An important conclusion of the Wegelin-Schuringa study is that the management model depends on how clearly the user-group can be defined. Wegelin-Schuringa and Kodo (idem.) conclude that the sustainability of the public sanitation facility is dependent on its management, operation and maintenance. Shared facilities mean shared management arrangements. Burra *et al.* (2003) support this suggestion by underlining 'defined ownership' as the common factor that unites the management models of public and community toilet blocks. Defining the user-group is emerging as a key factor for shared sanitation, but is yet to be visible through current sanitation reporting. Shared sanitation has been discussed as a common sanitation solution for tenants, but is shared sanitation the only option for tenants – do they have an alternative?

The Jenkins and Scott (2007) survey in Ghana found that tenants are unlikely to invest in household sanitation improvements. The reasons for this were that they had little or no control over the sanitation infrastructure where they live, so effectively they lacked agency to improve their sanitation situation. This data from Dakar-Pikine support the Jenkins and Scott findings, where tenants of Dakar-Pikine were often unwilling to pay for infrastructural changes and physical improvements to their sanitation facilities. From the survey the onus of responsibility for infrastructural changes lies with the owner; however being responsible for and actually investing in improving sanitation are not the same thing. Little literature explores this issue, reflecting the bias towards the owner-occupier in development discourse. Tenants induce heterogeneity in the urban population which, with the trends in urbanisation and population, present increasingly complex sanitation challenges. There is significant overlap between tenants and tenure security and the discussion here shares many common points with that on tenure security and sanitation. This discussion will be taken up again in section 7.2.3 on tenure security. What follows is a discussion the willingness of urban residents to invest in sanitation.

#### 7.2.2.b. 'Willingness to invest' and 'ability to pay' for sanitation

The study's findings support UN-HABITAT (2003a) in that tenants are likely to be more transient as a population and therefore they are often not in the position to reap the benefits of any long term investment. These dynamics question the appropriateness of discussing *willingness to pay* for basic services (Whittington *et al.* 1993). When urban sanitation is conceived as a system (i.e. considering downstream operations), the difference between *willingness to pay* for a sanitation service and *willingness to invest* in fixed asset becomes pertinent. This author argues that it may be more relevant to differentiate between a household's *willingness to either pay* for a service or *invest* in an asset.

Both tenure groups in the study (i.e. tenant and landlords) place the onus of responsibility for structural changes of the dwelling, including sanitation, on the landlord. Sanitation development initiatives are often focused on investing in fixed assets, and investment implies a return on what is invested - where the return should outweigh the cost. If a landlord is unable to charge higher rent for improving sanitation infrastructure, what is his or her incentive for doing so? Tenants too have little incentive or willingness to invest in infrastructure. In addition tenants lack agency in respect to improving their sanitation facility citing absent, unwilling or financially constrained landlords in this survey as barriers to improve their sanitation. These are not new concepts: Whittington's reports from Kumasi, Ghana "*Tenant households cannot act independently; the landlord would decide whether or not to improve sanitation for the entire building*" (Whittington *et al.* 1993). Given that sanitation infrastructure is a fixed asset, tenants' ability to change or improve their circumstances is difficult. Furthermore absent landlords, live-in landlords and tenant households have different *willingness to invest* in sanitation. A potential source of financing

improvements could be to use the rent payment. The findings on this issue confirm what is already known and common in many low income countries; the landlord-tenant relationships are most often informal. Therefore the tenants surveyed consider being consistent with their rent as essential to maintaining a good relationship with their landlord. This confirms recent findings of Schaub-Jones (2009), who observed timely and complete payments of rent guarantee tenants' tenure security. For tenants to use their rent as a down payment for physical improvements to the dwelling could be effectively reducing their tenure security.

This complexity is compounded by households' *ability to pay*, or rather lack thereof. *Ability to pay* differs from *willingness to pay*. The first aspect of *ability to pay* relates to affordability and the financial capacity of a household to pay. However there is a second dynamic: it is widely accepted that the provision of networked services (water, electricity and less commonly sewage connection) can provide security of tenure in the form of formal recognition where legal tenure may be lacking. In informal settlements, a utility bill or agreement can be the only form of formal recognition of the household, therefore providing much more than just a service (Almansi *et al.* 2003). What this can mean for tenants however is that landlords are unwilling to permit their tenants to improve the basic services themselves under their own name as it could effectively increase the tenure security of the tenant and not that of the landlord. Whilst for most utilities there are provisions for tenant account holders to be recognised as such, this formalisation of residence can make absent owners nervous due to tax and informal tenancy arrangements. In some cases landlords forbid tenants to connect to formal services.

In this research, tenant households have demonstrated their ongoing *willingness to pay* for their sanitation service in regular emptying of their pits. The findings of the research demonstrate that owner households are more likely to use improved mechanical emptying services than tenants but tenants continue to pay for manual emptying as opposed to emptying the pit manually for free, which is more common for owners. From the households' surveyed the annual cost of pit emptying was more expensive mechanically (41,748CFA) compared to manually (24,266CHF) therefore there must be additional incentives driving pit emptying decisions for those that chose mechanical. It would also be false to assume that mechanical emptying offers the better service as wide reports state that the majority of mechanical emptying in Dakar is only able to suction the liquid sludge whereas manual emptying usually empties the pit fully. Given the responses of this study, the decision factors are a combination of owners not wanting to annoy their neighbours (coercive) and a preferred service. The *willingness to pay* literature indicates that for sanitation services, *willingness to pay* is principally a function of household income, current expenditures and satisfaction level with current sanitation facilities (Whittington *et al.* 1993). Whilst this may be true regarding capital investment, this data implies that tenants' *willingness to pay* for pit emptying or non capital investment services may be different. Tenant households are less willing to invest in fixed assets, which i) do not belong to them and ii) are considered to be the responsibility of the landlord, but this research demonstrates tenants' *willingness* and *ability* to pay for the

service of sanitation (albeit the cheaper option) to ensure their sanitation facility remains operational.

These nuances between *willingness to invest* or *willingness to pay*, *affordability* and *ability to pay* are often overlooked in donor frameworks and therefore these gaps are reflected in development sanitation strategies. A recent example is the WSP SaniFOAM framework (Devine 2009) which carefully considers the differences between *affordability* and *willingness to pay* but omits to recognise the differences between investment and paying for a service in addition to when households lack the ability and / or agency to connect to a service. The characteristics of tenants as not wanted to invest, although not documented in great detail in the literature, are predictable; the problem is that they are often overlooked in developing sanitation strategies.

In summary, tenure status does affect household decisions; landlords and tenants have different priorities and agency with regards to sanitation. Landlord and tenant households' *willingness to invest* in fixed assets and their *willingness* and *ability to pay* for sanitation services are not the same and these nuances can often be overlooked in sanitation strategies. Tenure status and tenure security share similar features with respect to investment behaviours; as such the following discussion on tenure security and sanitation, is a natural continuation.

### **7.2.3. How tenure security interacts with household decisions**

This section discusses tenure security in relation to access to sanitation, household investment and emptying as a third step to answer the above research question (RQ1).

#### **7.2.3.a. The link between sanitation and housing: investment behaviours matter**

Formal market mechanisms have failed to meet the housing needs of Dakar's growing population, which has led to the proliferation settlements on informally owned land. As such, the majority of housing development is spontaneous and self-build, where houses are modified within the occupants' means and needs (World Bank 2002, Precht 2003). Observation and results from the survey show that houses in Dakar are built slowly, over many years, brick by brick, wall by wall, room by room, as finance, time and energy are available. Permanent structures often start with interlaced blocks, to create the basic structure with a zinc roof. Later the corners are filled with concrete and strengthened with steel. In this way new rooms and new storeys are added. Roof top terraces, initially used for storage and livestock, later become living space and/or rental space, through the addition of a roof. Furthermore, household sanitation for low and middle income cities is often autonomously

built<sup>44</sup>. When we look at the urban sanitation in Dakar-Pikine, the reality of self-build as the dominant form of household sanitation is clear. Considering households' investment and self-build processes in this way suggests the relevance of a link between sanitation and the housing and shelter debate. This is supported by the findings of section 6.2.4. where households tend to invest in sanitation facilities at the same time as making other physical improvements to their homes. From the plots surveyed, the initial toilet was often installed when the house was first constructed in permanent materials.

Drawing this link between housing and sanitation is not new: Choguill (1999) argues that housing and infrastructure follow a similar mechanism of development and suggests three primary conditions which need be met to demonstrate the link. The first condition to satisfy this link should be that the local residents are capable of improving their own facilities. This is true for on-site sanitation as it presents very different characteristics to that of water, electricity and networked sanitation; the former is the only one that is not networked physically, allowing it to be independently managed and improved by the household. The second condition, according to Choguill (1999), is that the infrastructure, like housing, can be 'progressively improved.' The research survey results from Dakar Pikine demonstrate systematic improvements by the households, thus confirming that household sanitation facilities can, and indeed are, progressively improved. Choguill's final condition for linking infrastructure to housing is that the basis for these improvements is tenure security<sup>45</sup>. In other words, Choguill argues a parallel development path for housing and infrastructure, where security tenure is a necessary precondition for both. Choguill's (1999) argument implies that household urban sanitation may share common ground with the investment and property rights debate. The property rights thesis suggests that those without tenure security are unwilling to invest. The key finding of this study is that this argument is true of sanitation – tenure security matters for household investment in sanitation.

The property rights literature deliberates between *de jure* or *de facto* tenure arrangements as the necessary precondition for housing investments (Payne, Durand-Lasserve & Rakodi 2007) – in this survey *de facto* tenure security was found to be a necessary and sufficient condition for household investment in sanitation. This finding should be understood in context, where the majority of sanitation systems are on-plot, non-networked, systems which avoid the administrative barriers as discussed in section 7.1. Nevertheless, in this context households with lower tenure security were less likely to have invested in sanitation infrastructure.

Choguill's (1999) argument is based upon anecdotal evidence of project case studies but fails to offer any level of empirical evidence or any analysis beyond the selected development

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<sup>44</sup> The direct translation of 'on-site sanitation' in French is 'autonome' i.e. autonomous sanitation.

<sup>45</sup> Choguill (1999) later goes on to warn that land tenure rather than tenure security is a prerequisite for infrastructural developments. This is most undoubtedly due to the traditional bias that tenure security can only be provided through formal tenure.

projects. Furthermore, Choguill's interpretation of tenure security is limited to *de jure* (legal) land tenure. Nevertheless, this study's findings support Choguill's argument with empirical evidence: according to the conditions set out by Choguill (1999), urban sanitation development can be linked to housing and fundamentally: tenure security matters for household investment in sanitation.

This study proposes an extension to this argument as Choguill's conditions are not relevant for some urban residents; specifically those who are not willing to invest. The findings of this study argue that there is a difference between willingness to invest and willingness to pay; whilst tenure security affects willingness to invest it does not mean people with insecure tenure are unwilling to pay for sanitation services. This raises the question: how can urban sanitation be improved for tenants or those with lower levels of tenure security?

### **7.2.3.b. Disconnect between sanitation strategy and household investment logic**

Choguill suggests that security of tenure acting as the basis for improvement in sanitation infrastructure is a 'common sense conclusion' (1999). Indeed, this argument is the cornerstone of the property rights debate. Stephen Mayo (1993) states that lack of security of tenure is one of the greatest known impediments to voluntary resource mobilisation for housing. Karmel Kar, the founder of the CLTS movement, and his colleague Pasteur emphasise this point in noting that "*occupation rights are insecure in most slums and so people do not want to invest when they may be evicted or moved on at any time*" (2005). Mulenga and Fawcett (2003) and Rakodi (1999) argue too that marketing approaches fail to meet those with limited choice or do not have the incentive to invest.

Despite these examples, this logic may have been overlooked in sanitation strategy as the bias in urban sanitation development focuses on stimulating household investment; but there has been little distinction between investment in fixed assets and paying for a service. Household sanitation facilities are fixed infrastructure, and many of the low income urban households are averse to sinking their capital into fixed assets. Investment behaviours are inherently linked to tenure security, and where current sanitation strategies incite households to invest in sanitation, the relationships between the different dimensions of tenure and sanitation cannot be ignored. Great advances have been made in appropriate sanitation technologies; however no matter how appropriate a new technology is, under current sanitation strategy there are limited solutions for those who cannot or are unwilling to invest.

This also raises questions regarding time horizon projections in sanitation programming. Those lacking tenure security operate under a shorter time horizon; a monthly, weekly or daily basis. With all infrastructural investments, sanitation is framed on long term horizon; many transient households, or those lacking tenure security, interviewed in this study found

answering questions about the future difficult or impossible. If someone is not able to answer a question 'will you still live here in two years' they are unlikely to be willing to invest in any way. It is clear that vulnerable people live with uncertainty. This acts as a barrier, preventing people to answer decisively about their future plans. The survey found that households who had lived in the same location for more than five years were more likely to have improved sanitation than those who had lived there for less time. In addition, the findings presented in section 6.2.4. show that the majority of households tend to invest in sanitation at times when essential repair is needed (i.e. pit collapsed or imminent risk of collapse / severe malfunction). Rebuilding or repairing the tank or pit was the most common investment. This brings the focus of sanitation costs to the operation and maintenance issues of sanitation rather than the initial investment costs. Operating in an environment of tenure insecurity requires an improved understanding of short term, with minimal planning horizons. There are few financial simulations for sanitation developments that take this into account.

The arguments outlined above present a significant disconnect between the dynamics of urban contexts and current sanitation strategies, especially pertinent in urban sanitation developments given the high numbers of households in the developing world that lack tenure security. It appears little consideration has been given to the problematic of sanitation for those lacking tenure security. Furthermore, given that dynamics of urban population growth likely to occur in both tenants groups and in the informal areas, we must question how appropriate are the current sanitation strategies in addressing future growth.

### **7.2.3.c. Sanitation services for those without tenure security?**

The prior discussion has questioned how appropriate are current sanitation strategies in addressing the urban sanitation problematic and how can urban sanitation be improved for tenants or those with lower levels of tenure security?

To answer this question, Kar and Pasteur (2005) suggest that, in cases of insecure tenure, the potential for investment is likely to be in operational activities rather than investment in physical assets and construction. The findings of this study show that emptying behaviours were not affected by the tenure security of a household, thus supporting Kar and Pasteur's argument. This is an important finding as it implies that operational services of sanitation (for example pit emptying) are tenure neutral; it suggests sanitation developments for tenants and those living with insecure tenure are more likely to be applicable if they focus on operational activities rather than investment in physical assets.

#### 7.2.4. Conclusions for RQ1

This concludes the discussion on the first research question which sought to understand if tenure and sanitation interact and how that influences household decisions on sanitation. The findings and the discussion thus far have demonstrated that whilst tenure can in some cases act as both a real and perceived barrier to sanitation at the household level, it is not a blanket conclusion across all the different aspects of tenure, nor across the entire sanitation system. Understanding the boundaries of these interactions provides an improved understanding of the urban sanitation problematic.

The main points to answer RQ1 are:

- For urban sanitation in the context of developing countries, where many household sanitation systems are self-built, **it is *de facto* rather than *de jure* tenure security which matters for household investment in sanitation** in other words formal tenure is not a prerequisite whereas tenure security is for households' investment.
- **Some household sanitation options<sup>46</sup> can be precluded by informal tenure and irregular settlement layout.**
- **Tenure status and tenure security have a greater influence** on household sanitation decisions than legal tenure.
- **Tenants are lower on the sanitation ladder.**
- There is a **parallel development path of self-build sanitation and housing.**
- Some urban households are **not willing to invest but are willing to pay** for sanitation services.
- Sanitation strategies need to distinguish between **willingness to invest, willingness to pay and ability to pay and affordability.**

The next section will then consider how these effects influence the second domain of the city: sanitation service provision.

### 7.3. Addressing RQ2: The Effect of Tenure Issues for Household Sanitation on Sanitation Service Provision

The second research question, related to the domain of sanitation service provision, asks:

**How does the effect of tenure issues on household sanitation (D1) impact on sanitation service provision (D2)?**

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<sup>46</sup> i.e. sewage networks, vehicular emptying

To answer this question, it is helpful to understand how sanitation services are actually delivered. To do this, this analysis applies two different components of the research framework:

- The relationship between household and service provider
- How sanitation services are delivered along the sanitation system

The first applies the concept of decision making domains and considers the relationships and interfaces between domains one and two. The second applies the concept of the system of sanitation and traces the pathways of faecal sludge through different sanitation systems.

### **7.3.1. How sanitation services are delivered – the domain view**

In Dakar, sanitation services are delivered across a spectrum of solutions including utility and household managed systems. This is a similar challenge faced in most low and middle income cities where sanitation solutions in use range across the sanitation ladder, from no sanitation i.e. open-defecation then ranging from unimproved sanitation, to shared and improved systems (WHO, UNICEF 2008). This presents a complex challenge to utilities and governance bodies who traditionally are only concerned with service provision managed by utilities. This is the first of two sections that will discuss how sanitation services are delivered in Dakar. The discussion that follows considers how the changes in the sanitation strategy of Senegal has created additional interfaces between service provider and the household, and thus is able to deliver sanitation services to a wider urban population.

Figure 7-1 shows the relationships of the household to the two types of service providers considered in this research. The findings imply a disconnect between networked and non-networked pit emptiers; the households' relationship with a pit emptier is very different to that of a conventional sanitation utility. For many utilities, as was true in Dakar prior to the PAQPUD program, utility managed sanitation systems equal networked systems. In this conventional model of sanitation provision, the household interfaces with the service provider through a service contract and a physical connection to the sewerage network. As previously discussed in relation to domain one, households living without formal tenure are often excluded from this type of sanitation either through real or administrative barriers. This effectively precludes the vast majority of residents of a city from receiving that sanitation service. On the other hand the independent service providers, often operating informally, interface with households in a very different way; by a demand-responsive, pay-as-you-go service. Moreover, as the findings of this study have shown, a household can interface with this sanitation service regardless of the tenure typology of where they live; if they are a landlord or tenants and if they have lower tenure security. The relationship between the household and accessing a pit emptier is tenure neutral. Dakar has three official dumping and treatment sites for faecal sludge (Cambérène, Yarakh and Rufisque). These treatment sites, in

turn, act as an important interface between the (informal) household emptying activities and the (formal) treatment by ONAS.

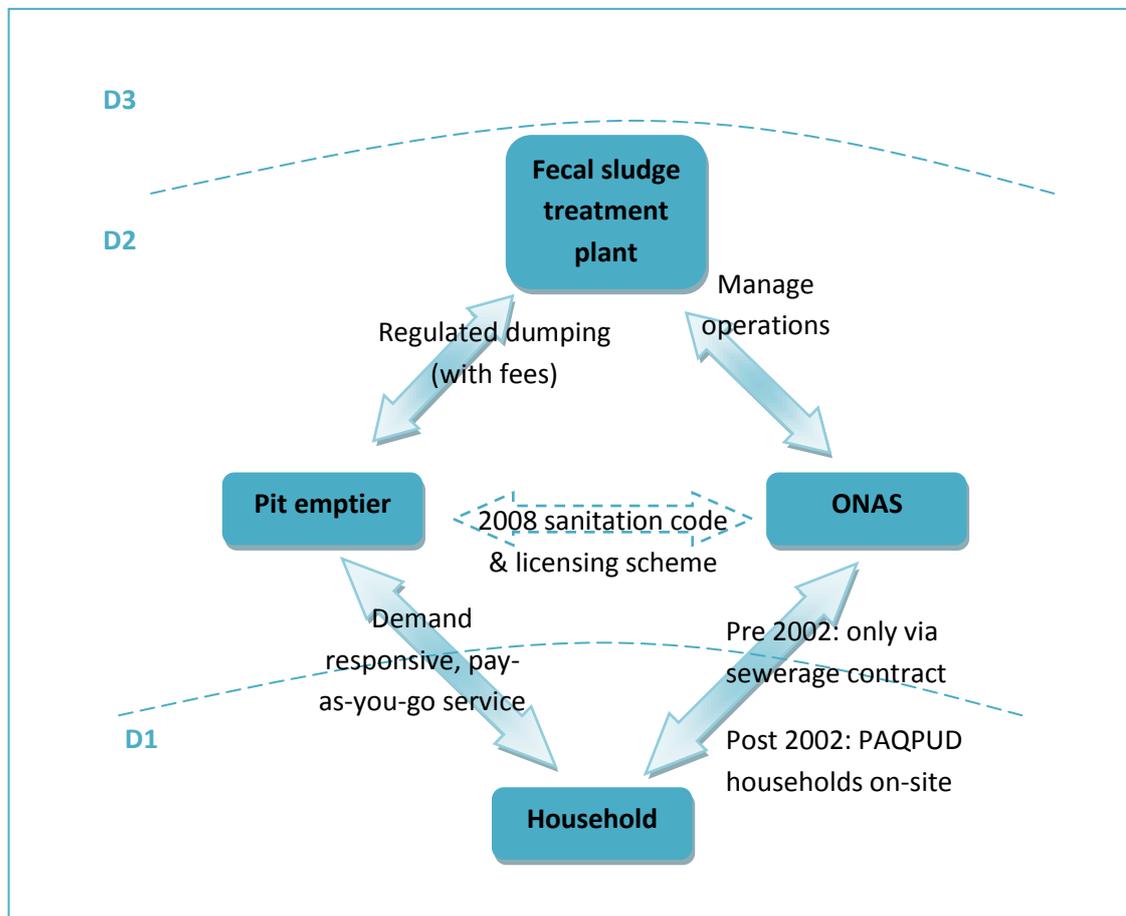


Figure 7-1: Interfaces and relationships between the household and sanitation service providers

Senegal has taken policy measures that remove barriers to service provision to the population. Another way of conceiving this is that it has increased the number of opportunities for service providers to interface with households. These measures are as follows:

- The first relates to the relaxation of rules in 1991 which allowed services to be delivered to areas without legal title. In practice however this had a little impact upon sanitation and was more relevant to the extension of the water and electricity networks.
- The second measure is the implementation of the PAQPUD program in 2002, specifically designed to improve sanitation for low-income households in the (informal) peri-urban areas of Greater Dakar. The PAQPUD was an innovative strategy offering a catalogue of grey water and excreta disposal options. Participant households were required to invest but capital costs were subsidised up to 75 percent.

- The third measure is the rapprochement of the utility to the pit emptiers. This began as part of the PAQPUD's objective to develop the faecal sludge treatment sites in Greater Dakar. More recently, this has been formalised in the simultaneous inclusion in the revised legal framework and the discussions regarding licensing. The latter took place after the field work data collection was complete. The former however has had a dramatic increase in the level of regulated dumping and treatment of faecal sludge in Greater Dakar (Toukara 2007)

In summary, considering how households and service providers meet shows that interfaces between domains are important as they can allow formal to meet informal in a controlled environment. By creating additional interfaces between sanitation service providers and households in this way, the PAQPUD has increased sanitation coverage and increased the level of regulated dumping and treatment of faecal sludge in Greater Dakar. The PAQPUD program has had wider implications too in raising the awareness of on-site sanitation and the downstream operations of faecal sludge management – a point considered in more detail in the next section.

### 7.3.2. How sanitation services are delivered – the sanitation systems view

This section considers the different sanitation services of Dakar looking along the sanitation system from the household to disposal. The discussion that follows illustrates the pathways of how faecal sludge is managed, from the household via transport, to treatment and final disposal.

To illustrate the scope and distribution of sanitation services and the system view, this study proposes a *sanitation cityscape tool*, using an adaptation of the Collignon and Vézia (2000) model detailed in section 3.1.7. The stages of user-interface, collection and storage / treatment, conveyance, centralised treatment and use/disposal of the sanitation system (Tilley *et al.* 2008) are represented in levels. The model below (figure 7-2) essentially traces amounts of faecal sludge through the different sanitation systems across Dakar. Data, where available, is taken from the official sources (Hoang-Gia 2004, EDE 2007, Hydroconseil 2008). For parts of the system data is not available - for example the breakdown of household manual and mechanical emptying, the figures from this research fill these gaps and populate the flow<sup>47</sup>.

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<sup>47</sup> This model relates to Greater Dakar whereas this research only collected data on emptying behaviours in the commune of Pikine of Greater Dakar. It would be expected that in certain areas of Dakar these figures would vary however in the absence of other data these figures are the best estimate to illustrate the model.

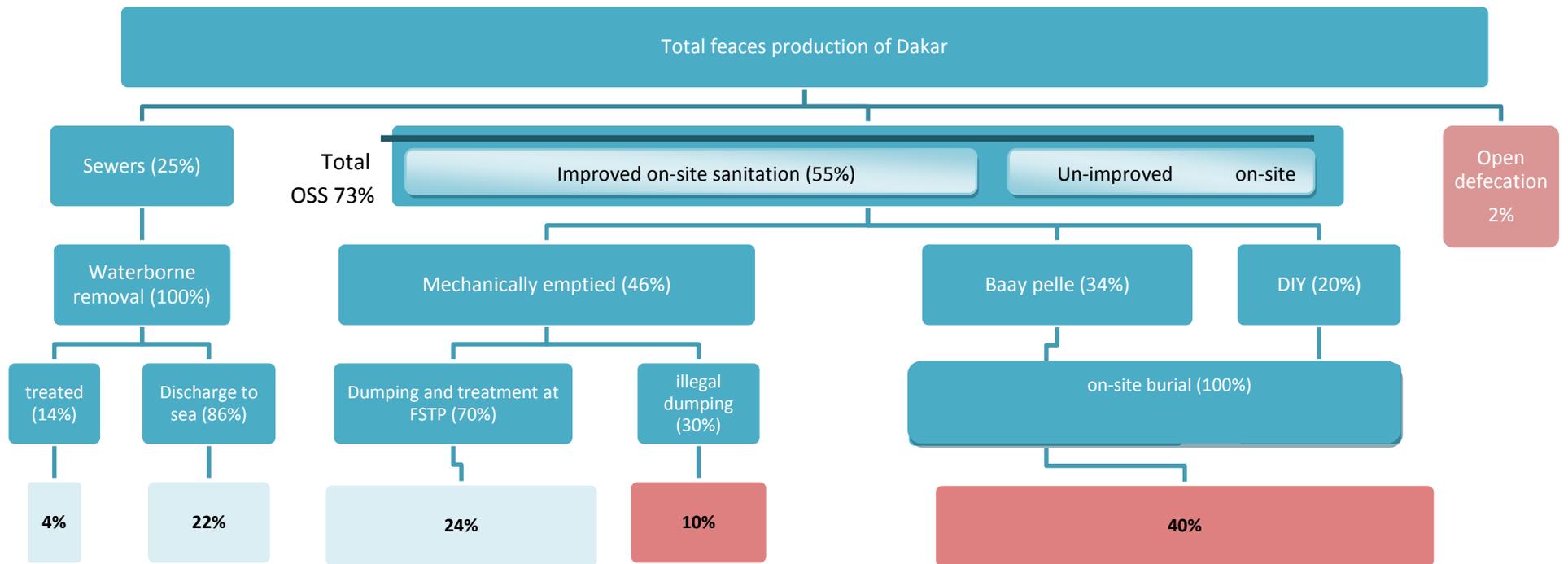


Figure 7-2: Sanitation cityscape of faecal sludge flows

Starting from the top, we consider how much human waste an entire city produces. This can be calculated in terms of total production per capita or be attributed an overall value of one. The second line of the model, moving from the user-interface to the collection and storage stage, presents the type of sanitation system that contains the faecal sludge, either sewerred or non-piped systems and finally open defecation. The percentage of each type of the level above is represented by the size of the block. At this stage it becomes clear that non-piped sanitation is by far the norm for the residents of Greater Dakar. In addition, the type of sanitation at the household level implies the nature and type of the downstream operations.

The next level of the model relates to the conveyance of the faecal waste away from the household. This can either mean sewers (for conventional systems) or mechanical or manual pit emptying. For the manual pit emptying this has also been disaggregated into paid emptying services by the “baay pelle” or DIY by the householders themselves. The fourth level of the model relates to the disposal of the waste. The figures of sewerage treatment are taken from the PEPAM documents although it is expected a higher proportion of sewage is treated at Cambarène post its expansion. For the faecal sludge collected by the mechanised trucks, an estimated 70 percent (Toukara 2007) is taken to one of three official faecal sludge dumping and treatment sites, whilst the remainder is discharged on wasteland. Figure 7-3 shows a map of the concentration of faecal sludge across Greater Dakar. The highest concentration, shown in red is centred in the commune of Pikine where the most prominent form of sanitation is non-piped on-site systems. The lorry icon displays authorised faecal sludge dumping sites; the blue circles are where the known illegal dumping sites are found.

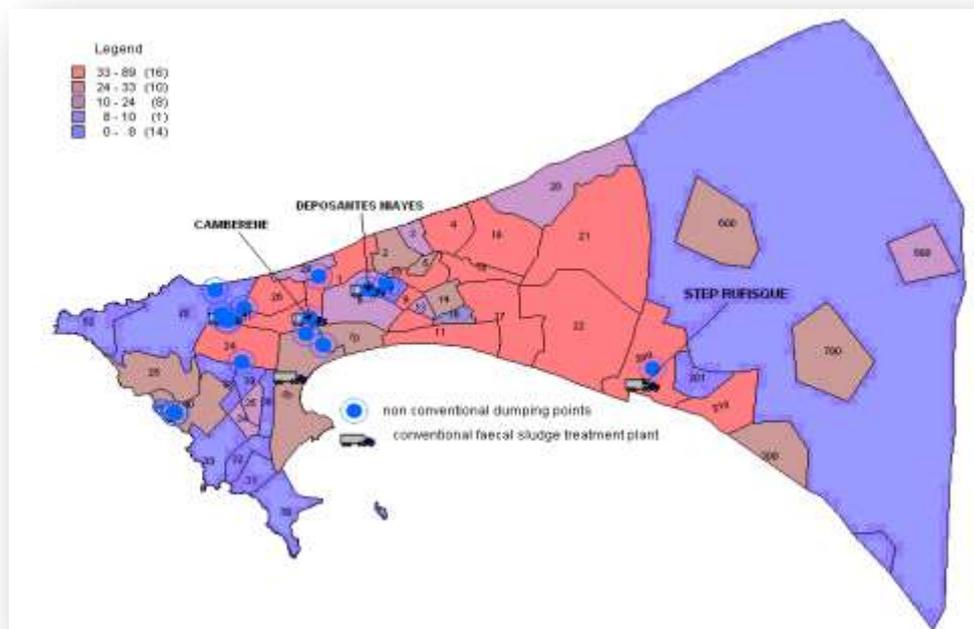


Figure 7-3: Mapping of FS production in Dakar (Toukara 2007)

Whilst the commune of Pikine displays the highest concentration of faecal sludge production it is also a desert of location suitable for dumping of faecal sludge. This would imply that to strengthen the faecal sludge management across Greater Dakar, additional treatment sites, closer to the demand for emptying would be appropriate.

For pits that are emptied manually in Dakar it is most common for the waste to be buried locally in the street. Little data is reported on the prevalence of this practice in Dakar. For this reason the findings of the research inform the model here and fill an important gap as high incidence of manual emptying was recorded in this research.

The final line of the model is a reference to the final disposal of the faecal matter. The size of the bar gives an indication of how much of the total sludge production follows that particular pathway.

This model and taking the sanitation systems view on how services are delivered highlights several interesting points:

- The first and most obvious point is the prevalence of on-site sanitation compared to sewered systems. The findings of this research detail a bias within ONAS of some representatives to conventional sanitation approaches. For those not directly involved in PAQPUD, the activities may be considered a project rather than a long term sanitation strategy. This said, the findings also suggest that there is widespread recognition within the organisation that the advent of PAQPUD opened new opportunities to deliver sanitation services to those who were previously inaccessible for the utility. Raising the profile of on-site sanitation systems to policy makers, politicians and within ONAS is considered a significant achievement of the PAQPUD, as on-site systems form a crucial part of meeting the Millennium Development Goals for Senegal (Guène, Diop & Trémolet 2010). This is an important step to redress the institutional bias and legacy of networked based solutions.
- Another part of the model highlights a further achievement of the PAQPUD – the level of faecal sludge collected mechanically that reaches a faecal sludge treatment site (Guène, Diop & Trémolet 2010). Of all pits that were emptied mechanically, it is estimated that 70 percent reaches a controlled dumping or treatment site. This is largely thanks to the work of ONAS and Sandec who have since 2006 worked to build the faecal sludge treatment site and worked with the pit emptiers association to improve illegal dumping (Strauss, Koné & Saywell 2007).
- The prevalence of manual emptying and on-site burial is largely ignored and rarely discussed. On-site burial of faecal waste from pits that have been emptied manually is however the largest tab along the bottom line of the model. If the estimates in pit emptying behaviours are correct, this accounts for 40 percent of the total faeces produced in Dakar. This suggests that despite improvements towards interfacing with the mechanised emptiers of Dakar, the issue of manual emptying has been neglected.

By taking a sanitation system and flow approach, this model illustrates the distribution of faecal sludge flows in Dakar. In other words it highlights the extent in terms of volume that crosses numerous interfaces between the household and service provider along the sanitation chain. It highlights that the majority of the sanitation solutions are on-site non-piped systems and that manual emptying remains a common method of pit emptying. Many sanitation improvement strategies concentrate on the second layer of this model; attempting to elevate the level of sanitation (i.e. from open-defecation to improved sanitation). In areas where levels of open-defecation or unimproved sanitation are high, this is a very relevant strategy. For cities like Dakar, who already enjoy a relatively high level of improved sanitation coverage, attention can move elsewhere and further downstream (as it did for the ONAS / Sandec improvement of faecal sludge treatment plants). Moreover, this model also demonstrates what areas can be targeted as a priority given the amounts of faecal sludge follow each pathway. The study found that the motivations for choosing one emptying service over another were *financial* and *preferred service*. This suggests that the pit emptying market is responsive to the needs, means and preferences of the customers. Nkansah (2009) reports on a study of faecal sludge management in Tamale, Ghana that for manual emptying price varies depending on a wide range of issues negotiation skills of the users, familiarity with emptiers, pit size, and foreign objects obstructing emptying. Similarly in this study, the price is set by the emptiers as a function of distance; location; negotiation ability and the size of the truck.

There are limitations of this model: for simplicity this model does not include the small bore sewerage systems that have been built in ten areas of Dakar (Norman, Scott & Pedley 2011). Also faecal sludge varies with hygiene behaviours and diet and can often include foreign materials (Strauss, Koné & Saywell 2007). The faecal sludge removed from on-site sanitation systems may be different depending on the method, as few mechanised trucks in Dakar can lift solids (EDE 2007). Also the wastewater collected via the sewage networks contains a higher composition of water. This means measuring quantities of total faecal sludge is more complex than the model suggests. In addition the model could be extended further to consider agricultural re-use. This said, the strengths of using this model lie in it providing a dashboard of the city wide sanitation status and how sanitation services are delivered throughout a city. An important feature of this model is that it starts at the total production and therefore forces all types of sanitation services and pathways to be considered.

In summary, the systems view is one of two ways this discussion considers how sanitation services are delivered across Dakar. The sanitation cityscape model gives a city wide dashboard of the realities of sanitation systems. It highlights the prevalence of on-site systems and the extent that for many residents of Dakar self-build and self managed systems are entirely independent from any kind of sanitation treatment infrastructure. This systems view lends some insight into priority areas in improving sanitation service provision; whilst the domain view suggests where interfaces can be made. These issues are then taken forward to consider how tenure impact upon sanitation service provision.

### 7.3.3. How tenure issues impact on sanitation service provision

The research question two (RQ2) asks how does the effect of tenure issues on household sanitation impact on sanitation service provision? RQ2 can be answered as follows:

**the effect of tenure issues on household sanitation decisions demand a wider scope of sanitation service provision, including non-networked systems and a greater emphasis on downstream operational activities.**

We can begin to understand the impacts of household tenure issues upon sanitation service provision through the changes in peri-urban Dakar-Pikine of how services are provided. Figure 7-4 presents how the changes in Dakar’s sanitation strategy respond to the ways that tenure was found to affect households sanitation decisions from domain one.

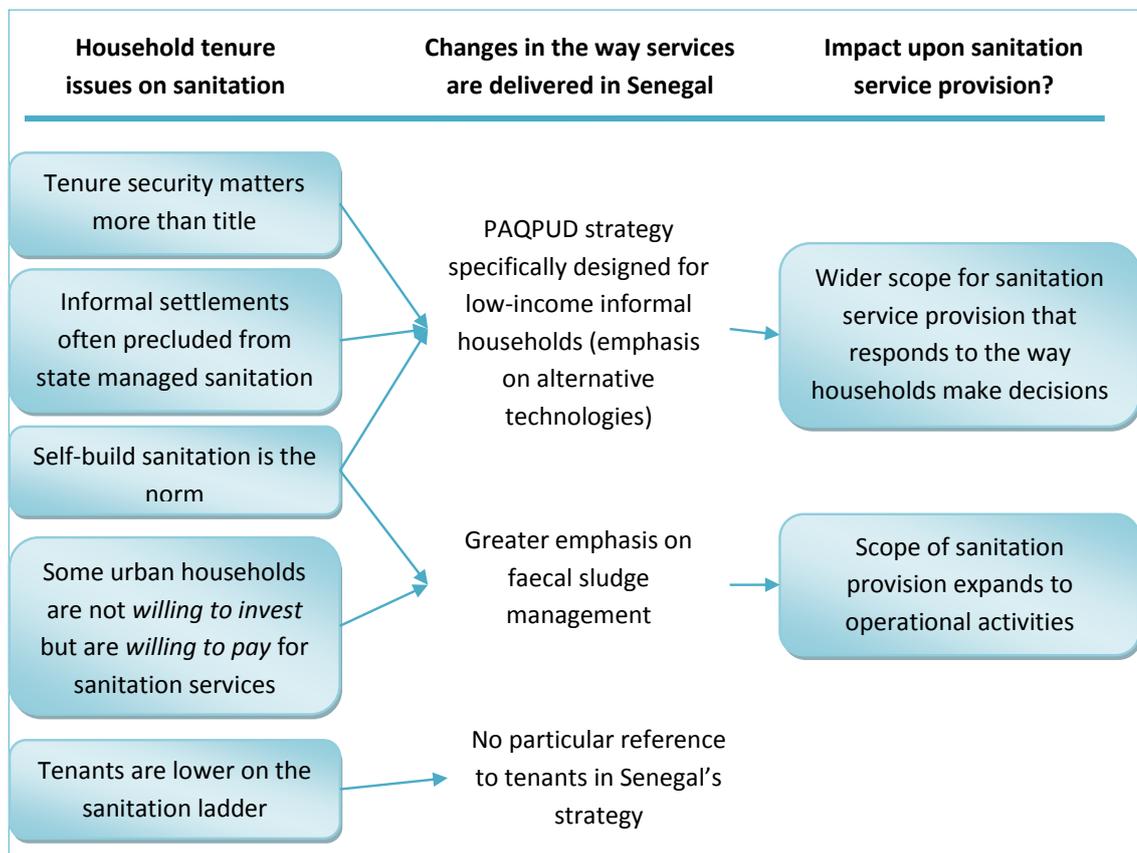


Figure 7-4: How the changes in Senegal's sanitation strategy respond to the D1 issues

In Senegal, the revised sanitation strategy was developed specifically for the peri-urban informal areas and introduced alternative sanitation technologies to national sanitation

strategy. A catalogue of wastewater and excreta managed options were available to households to meet their needs and means. This effectively provided a framework for ONAS (the utility) to interface with all households regardless of their legal tenure status or location; it widened the scope of service provision to the informal areas through appropriate technology.

This said the findings and discussion relating to domain one caution that providing alternative technologies is not a complete solution – there are those who are unwilling or unable to invest in sanitation assets. This group includes tenants and those lacking tenure security. Furthermore, tenants may lack agency to improve their own sanitation facilities even if they are willing. The findings for this segment of the population suggest that they are willing to pay to access sanitation services. This puts a greater emphasis on the operational aspect of sanitation. Whilst the main element of the PAQPUD scheme targeted household investment, a greater emphasis was placed on faecal sludge management operations. This demonstrated how an interface can work between the formal utility and informal pit emptiers. Any sanitation strategy wishing to improve sanitation for tenants or those with low tenure security must create new interfaces to reach them. This is a weak or non-existent area for most urban sanitation strategies.

#### **7.3.4. Conclusions for RQ2**

The findings and discussion thus far indicate that the effect of tenure issues on household sanitation decisions demand a wider scope of sanitation service provision, including non-networked systems and a greater emphasis on downstream operational activities. Without changes in the way sanitation services are delivered, urban sanitation strategies have limited reach as they cannot respond to the ways that households in low and middle income countries currently make decisions with respect to sanitation. Without making changes that consider tenure, there can be no sanitation for all.

Key points from this section are:

- To respond to the way tenure influences household decisions, the scope of sanitation service provision needs to be widened.
- Importance of creating new interfaces between sanitation service providers and households.
- Mapping sanitation systems and quantities can help identify which interfaces are priorities.

The next section will then consider how these effects influence the third domain of the city: city planning and urban management.

## **7.4. Addressing RQ3: The Effect of Tenure Issues for Household Sanitation and Sanitation Provision on City planning and urban management**

The third research question, related to the domain of city planning and urban management, asks:

**How does the effect of tenure issues on the household (D1) and service provision (D2) impact upon city planning and urban management (D3)?**

To answer this question, it is helpful to understand how city planning and urban management integrates with sanitation service provision in Dakar. To do this, this analysis applies two different components of the research framework:

- The formal and informal relationships between household, service provider and urban planning
- The city wide view of sanitation using a systems perspective

The first applies the concept of decision making domains and considers the interfaces of domains one and two and how they link to three. It also highlights the differences in perceptions across these domains. The second applies the concept of the system of sanitation and reflects upon the city wide view of sanitation and scope of service providers.

### **7.4.1. City planning and urban management – the domain view**

This section will consider the nature of the relationship between the city planning and urban management and the sanitation service providers and the household. As discussed in the previous section (7.3), the scope of sanitation systems present in the urban context challenge governance bodies. Section 7.3 considered the relationship and interfaces between the domains of the household and the service providers; this section extends this to the city planning and urban management domain. Drawing the links between the domains of the household and the service providers and the urban planning however is more difficult. The discussion that follows demonstrates that in reality, urban sanitation developments and provision happen largely under the radar of formal city planning and urban management; that the sanitation service provider may vary and there are few interfaces that actually connect the city with the majority of the urban population, especially the urban poor.

### 7.4.1.a. Different perspectives

The relationship between the government and the utility charged with providing sanitation services is formal and explicit, detailed in a performance contract between ONAS and the Ministry of Urbanisation. A second relationship between the government and the mechanical pit emptiers was also identified during the research: a contract of the Plan Orsec to assist pumping flood water during the rainy season<sup>48</sup>. The findings also highlighted an informal relationship between the pit emptiers and the police; that of traffic bribes. These were reported to be less frequent when the trucks were carrying out the work of the *Plan Orsec*. These relationships are illustrated in figure 7-5.

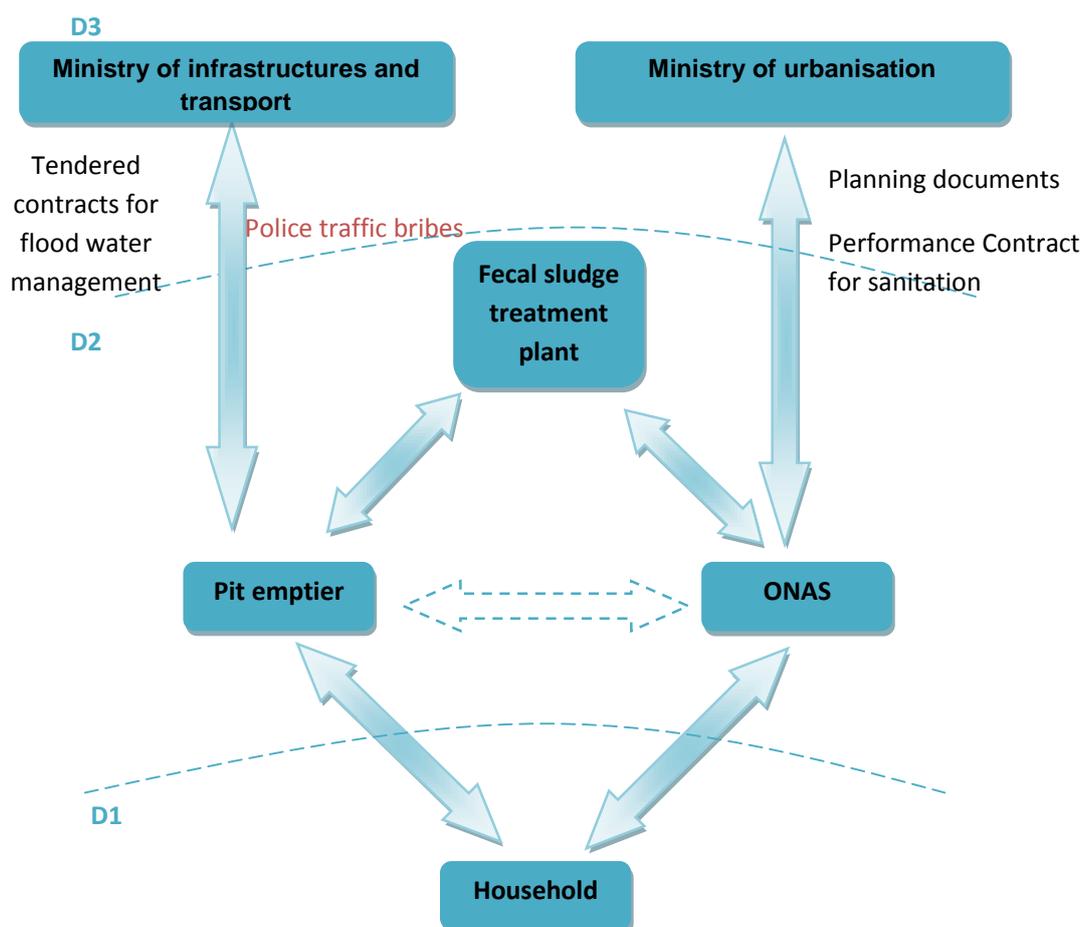


Figure 7-5: Relationship and interfaces between the sanitation service providers and the city planners

<sup>48</sup> The findings of the research suggest that the truck operators considered this an important surplus income and enhanced their role in offering a public health service. In a recent study on the socio-economic profile of the faecal sludge companies of Dakar diversification of income of outside the domestic emptying market could potentially lead to a 32% drop in emptying fees (Mbaye Mbeguere *et al.* 2010).

From the perspective of city planning and urban management, the findings show that the urban planning documents clearly act, as is their purpose, as a strategic compass for urban development. This approach to urbanisation is underpinned by a ‘tenure first’ approach, where zones are allocated to respective urban activities. Controlling land tenure is a method to control urban development. These master plans tend to inform sanitation strategies that favour centralised large scale investments such as networked systems. Nevertheless, representatives interviewed from the Ministry of Urbanisation acknowledged the disparity between this expectation of master plan land-use strategy and the reality of irregular zones and informal and customary land arrangements. In terms of sanitation provision, it is precisely these approaches that informed the generation of strategic sanitation approaches (SSA) of Albert Wright (detailed in section 3.1). MUAT interviewees are largely aware that most common sanitation facility across Greater Dakar is on site sanitation, but when questioned on the role of sanitation in urban planning, it is clear that the legacy of conventional networked systems remains in the mindset. Even whilst alternative technologies are acknowledged, from an urban planning point of view ‘tenure first’ is emphasised as a necessary precondition to benefit from public services.

This is in stark contrast to the way households make their decisions with respect to sanitation. Households operate under different rules: for households it is tenure security and tenure status that matter rather than legal tenure. For the vast majority of urban residents, households’ sanitation providers are a combination of themselves, landlords and local independent operators, not the utility. Furthermore with respect to accessing land, large quantities of urban households attribute power to a different land authority other than the State, through the informal markets and systems. This dynamic is by no means isolated to Senegal and the lack of appropriate and practicable urban growth policies that deal with the current realities is known (Collignon 2000: 51). This is discussed by Leitmann and Baharoglu (1998) who found that the formal rules of those living in the *informal settlements* of Turkey were largely irrelevant. The findings of this study suggest this is true too for sanitation decisions of those living in Dakar-Pikine; as expressed by Leitmann and Baharoglu “*the informal rules!*” (1998).

The figures 7-6 and 7-7 illustrate the ‘outside in’ and ‘inside-out’ perspectives on sanitation of the city planning and urban management and the household respectively. From the city planning and urban management perspective, the tenure first perspective leaves many households invisible. In the context of Dakar this has been improved through the PAQPUD scheme, but as discussed in RQ2 section 7.3 sanitation services to tenants do not feature.

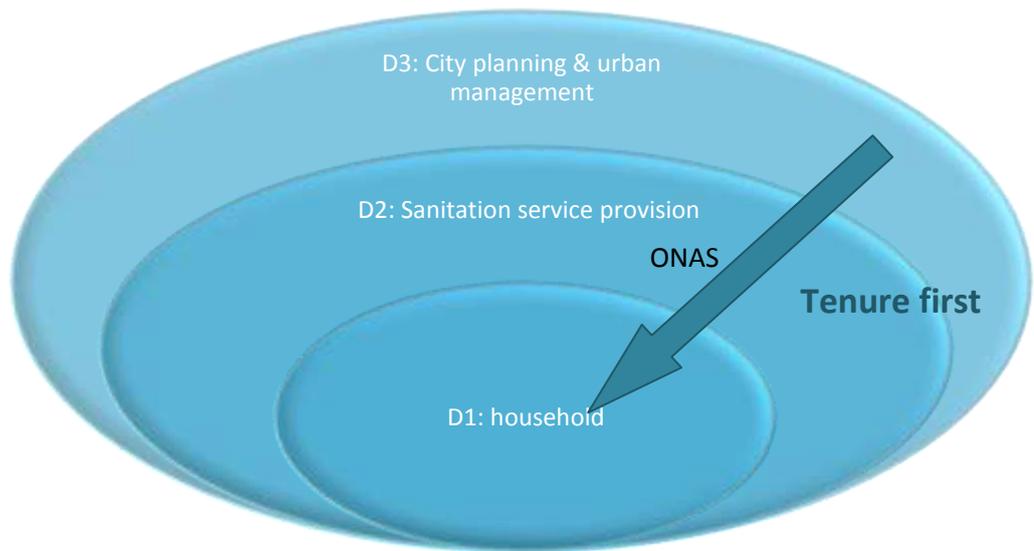


Figure 7-6: Tenure aspects from the city planning and urban management perspective

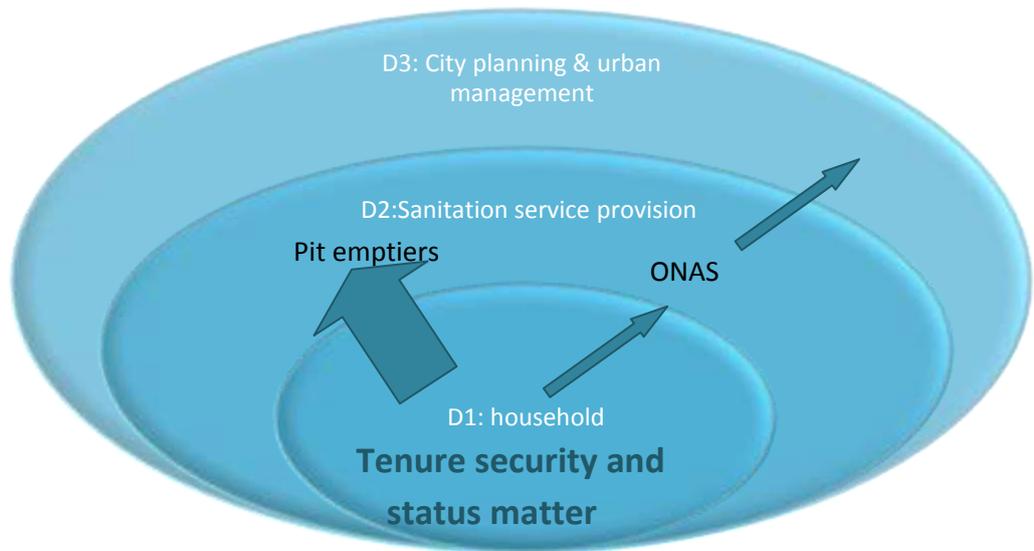


Figure 7-7: Tenure aspects from the household perspective

#### 7.4.1.b. Who is the sanitation service provider in the urban context?

UN-HABITAT (2003) warns that on rental markets it is the divergence between the practices and perceptions of the formal-informal interface that act as a barrier to service provision to informal settlements. What this research shows is that there is a difference in opinion in

terms of who actually is the sanitation service provider. This in turn influences how decisions are made with respect to the wider urban environment. Whilst from a (theoretical) city planning and urban management perspective conditions such as lack of space, high water tables, the risk of contamination of shallow aquifers, unstable land, sandy soils or high incidences of flooding are justifiable reasons to preclude on-site systems (Evans 1995) in practice, where the sanitation service provider is the owner, the landlord, or the informal operator decisions are made based on needs and means. Considering the unconventional sanitation providers (i.e. landlords, households) is an emergent issue in sanitation literature, supported by Schaub-Jones (2006) and Allen *et al.* (2008).

#### 7.4.1.c. Irregular layouts, land availability and NIMBY resistance

The reality is that sanitation developments happen outside the strategic direction of city planning and urban management; either by informal service providers or, as in the case of the PAQPUD, where action plans are developed outside of the overall strategic urban plan. This is not ideal and encounters several barriers because of this. Two key issues were highlighted during the research: irregular layouts and lack of land availability. The findings support previous findings that *irregular layouts* present both real and perceived barriers to providing services in informal areas (Almansi 2003). For pit emptying, informal service providers have overcome these barriers by providing manual emptying services to households. The example of eThekweni Sanitation Program (discussed in section 7.2) demonstrates how municipal intervention through supporting and franchising emptiers, can enable improvements in emptying without direct consolidation of infrastructure but accessing the households of irregular areas.

The research also found land availability issues to be problematic. In urban areas where occupation density and demand for land is already high, finding adequate and appropriate land for the placing of treatment and pumping stations can be difficult. The case of *Thiaroye sur Mer* (described in section 4.1.7.a.) highlights that cost and difficulties of finding available urban land forced the PAQPUD project to locate a treatment plant on land which was available through donation rather than land which was necessarily appropriate. As a result the project ground to a halt and a simplified sewage system remains unusable. This type of NIMBY opposition to infrastructural developments is not new, nor are they limited to the developing world. Changes to neighbourhoods can spark strong resistance in defence of the home and family, and can quickly lead to conflict situations. Whilst on-site systems may avoid many of the difficulties of land management, siting local treatment plants may also share similar problems. The case of *Thiaroye sur Mer* described in the findings suggests that land issues and availability should be considered early in the planning stages of urban sanitation developments.

Informal and small scale sanitation providers are not equipped or have the strategic knowledge or agency to manage sanitation as a public service hence the state still plays a key role in guiding the strategic sanitation for all types of sanitation service providers.

### **7.4.2. City planning and urban management - the sanitation systems view**

Section 7.3.2. considered the urban sanitation system in terms of how sanitation services were actually delivered in the urban context. This section considers how this is applicable to the city planning and urban management domain. Applying the domain view highlighted that there are very few links between the conventional planning and the realities of urban sanitation provision; from the conventional perspective many households remain invisible. The discussion that follows demonstrates that by considering urban sanitation from a systems view, i.e. starting at the user, these invisible networks become apparent. In addition, the system view frames sanitation under a dynamic lens which adheres to the dynamic nature of cities.

The 'invisible' sanitation networks are likely to belong to the 'invisible' populations of informal settlements missed in official reporting (Satterthwaite 2005). Whilst it is the way data are recorded that explains this oversight of informal settlements, it cannot be ignored that there are strong political incentives not to address this. Mapping faecal sludge pathways can help highlight to some extent the invisible sanitation networks. It starts from a basis of total population, which in itself is vulnerable to biased interpretation, but forces all potential pathways to be considered. For example, this research documented a high incidence of manual emptying operations of Dakar. This activity is largely overlooked and did not feature in a report commissioned by ONAS on the faecal sludge management networks of Dakar (EDE 2007) which focused solely on mechanised operators.

The pace of change is clearly a primary concern to urban planners where rapid spontaneous development outpaces urban plans and challenges their applicability. Conventional sanitation systems are particularly vulnerable to this given the large scale infrastructural developments they involve. What is needed is a more dynamic approach to planning that can reflect the dynamic nature of a city as it changes. Viewing sanitation as a system can support this as it alludes to the nature of sanitation services being dynamic as opposed to a one off construction of a latrine. The systems view also underlines the importance of faecal sludge management in the urban context. A recent assessment on faecal sludge management in Asia (AECOM, SANDEC 2010) states that a key challenge is the limited awareness of policymakers about faecal sludge management and the corresponding need for

policy setting, funding allocation, and enforcement<sup>49</sup>. Policymakers are unequipped to address what is being increasingly recognised as an essential part of urban sanitation. This study emphasises the importance of faecal sludge management in informal areas and areas lacking tenure security in the urban environment.

Taking a systems view provides a dashboard of the faecal sludge flows for an entire city. Using such a tool forces the city wide sanitation service chain to be considered, including the unimproved sanitation and the informal downstream operations. In doing so this gives a better understanding of the incentives behind urban sanitation behaviours and will give insight to how current (and often hidden) sanitation networks operate. Applying models that map sanitation systems and faecal sludge quantities can help prioritise what changes might have the greatest overall impact. For example, in an informal urban settlement, built on precarious land occupied largely by transient populations, the findings of this research support the growing bias of literature that marketing sanitation may not be appropriate for all. The findings of this research suggest that the scope for marketing household sanitation for household investment may be limited. What could be most appropriate here is strengthening the operational side of sanitation. The Wegelin-Schuringa and Kodo (2007) report suggests that the only viable option in this setting is public toilets. Another option could be improving the faecal sludge management. Specific examples of this would be in areas such as Kibera where flying toilets are widely used. Whilst no government is likely to condone this, their continued use reflects how they meet the means and needs of a population. Governments are challenged with the unsanitary conditions they create due to the poor management of excreta. Rather than try to change the investment logic of a population, other potential improvements can be appropriate storage and containment technologies. Tools that provide this type of dashboard illustrating the prevalence of non-conventional sanitation are therefore potentially strong advocacy tools to redress the institutional bias.

Political buy-in to sanitation can be a difficult issue. Improvements in household sanitation are largely invisible and the long term health benefits of such programs may occur beyond the political time horizon. This is compounded by the taboo of sanitation. The interviews with the city planners however did reveal an impression of responsibility and accountability to public health and security. There is recognition that the mass electorate resides in informal areas and there is a pressure to keep them on side. This implies that political opportunities could be exploited in the sanitation service chain.

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<sup>49</sup> This study evaluated septage management in Asia however it is understood that many cities of the South face similar challenges.

### **7.4.3. How tenure issues impact on city planning and urban management for sanitation provision**

The research question three (RQ3) asks how does the effect of tenure issues on household sanitation and sanitation service provision impact upon city planning and urban management? This question proved difficult to answer as, for the majority of urban residents, there is a disconnect between the formal rules of urban planning and the informal norms that guide household decisions. As such, RQ3 can be answered as follows:

**Urban sanitation development and provision happens largely under the radar of formal city planning and urban management, via multiple formal or informal service providers.**

A greater link is needed between urban planning and sanitation development and can be found through extending the scope of formal sanitation service provision.

### **7.4.4. Conclusions for RQ3**

Drawling the link between the first two domains and the third proved difficulty mainly as the reality of urban sanitation development and provision happens largely under the radar of formal city planning and urban management, via multiple formal or informal service providers.

- Few interfaces actually connect the city with the majority of the urban population, especially the urban poor
- Urban master planning approaches favour a ‘tenure first’ view as a necessary precondition to benefit from public services
- Segments of the urban population attribute land management and sanitation service delivery to authorities other than the state
- Urban sanitation is characterised by multiple service providers
- Lack of land availability and irregular layouts are real barriers to urban sanitation developments
- The invisible sanitation pathways need to be understood

## **7.5. Tenure in Urban Sanitation Development**

This section aggregates the findings and discussion thus far to answer the overall research question of this study:

**What are the relationships between tenure issues and sanitation and to what extent do they affect urban sanitation development?**

To answer this question, six statements from the finding and discussion thus far are used to demarcate the relationships between tenure issues and sanitation.

- 1. Formal tenure is not a prerequisite for improved sanitation.**
- 2. Tenure security matters for household investment.**
- 3. Tenants are lower on the sanitation ladder (and are often invisible)**
- 4. Some urban households are not willing to invest but they are willing to pay for sanitation services.**
- 5. There is a need to widen the scope of formal sanitation service provision to include tenure neutral options (i.e. operational and downstream).**
- 6. It is important to create new interfaces with sanitation service providers (mapping sanitation systems and quantities can help identify which interfaces are priorities).**

Particular thought is then given to the each of these statements in the urban context with respect to the three transitions that frame the urban context (Jones 2003): urbanisation, urbanisation of poverty and the increased focus on property rights on the development agenda.

### **7.5.1. Sanitation developments and urbanisation**

In terms of urbanisation dynamics, the changing nature of the urban landscape and population is of relevance for urban sanitation developments. Boundary statements three and four are directly relevant to this point and are discussed here in context of the overall urbanisation process.

The type of urbanisation being witnessed in developing countries is characterised by the majority of the growth and expansion being in informal settlements (UNCHS 2003). In addition, urbanisation is expected to lead to growing concentrations low income populations and tenants (WHO & UNICEF 2006b).

Urban planning imposes a land management and ‘tenure-first’ view, where under the conventions of urban planning public services are provided to the city dwellers. Governments are often reluctant, for a vast array of reasons, to support infrastructural developments and provide services to informal and spontaneous urban areas. Political aversion to consolidating informal settlements through providing services is a strong barrier alone, but higher perceived costs of operating in an informal environment and fears about cost recovery also act as significant disincentives. Furthermore, in the urban planning perspective of sanitation, the legacy and bias towards conventional sanitation means physically networked systems tends to dominate urban planning thinking. As a result the urban poor are often precluded from being considered in formal sanitation provision.

Alternative sanitation technologies are promoted as being more appropriate for urban environments in the developing world, as non-standard layouts of settlements and complex land management arrangements can act as barriers for conventional sanitation. The findings of this study imply that some of these barriers may also apply to the appropriate technologies. For example, whilst a non-standard layout may be negotiated more easily with small bore systems (a technical option promoted as the cheaper alternative to conventional sanitation suited to high density areas) issues of land ownership remain for both the network and processing sites (Norman, Scott & Pedley 2011). Other than the aforementioned review of the semi-collective systems in Dakar, land issues are largely absent from the literature that advocates semi-collective systems for urban sanitation in low income cities. The lessons from the PAQPUD project in Dakar detailed in (*idem.*) suggest that they are an important consideration.

The study proposes that non-piped on-site systems avoid many, but not all, of the complications of networked systems as they do not require physical connections. Nevertheless for an on-site system to work effectively emptying is often required<sup>50</sup>. Access roads, both in terms of reaching the household but also to provide access to the dumping or treatment site are often limited. Whilst this research suggests that with good access roads and active faecal sludge management, on-site sanitation can reach similar levels of improved sanitation as conventional systems; where this is not the case the sanitation system breaks down.

The profile of downstream sanitation activities has, until recently, been low. To support the growing awareness of these activities this research furthers understanding on (in the context of Dakar) household decisions and drivers for their choice of emptying method. Manual emptying, much like unimproved sanitation facilities, is often underreported and poorly understood. This research identifies that rather than a simple distinction between manual and mechanical emptying, the reality is less black and white. In addition to the “Baay Pelle” paid manual emptiers of Dakar, some households empty their own pits. Mechanical emptiers sometimes empty the solid sludge manually, which cannot be removed by the water suction trucks, for an additional fee. The decision factors for households to chose pit emptying services are found to be financial and service driven, implying that the behaviours in pit emptying choice are driven by market dynamics: the service offered and the price. This raises the issues that the emptying services may respond to marketing interventions.

This brings the discussion to the changing nature of the composition of urban populations a greater proportion of low income populations and tenants also has impacts for urban sanitation developments. Boundary statement three (*tenants are lower on the sanitation ladder*) is directly relevant to this point.

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<sup>50</sup> Especially where the toilet is self-built so it may not be ‘designed’ and operate in the same way a sanitation engineer would assume.

Tenants are a largely urban phenomenon and are often overlooked in development discourse. This is also true for sanitation research. This research has demonstrated that shared sanitation, which has only recently appeared on the JMP sanitation ladder, is a common sanitation solution for tenant groups. Under the JMP classification tenants are therefore lower on the sanitation ladder than owners. Sharing facilities raises different management implications than privately owned facilities. Investment in sanitation infrastructure for tenant households is a major issue. Tenants are unwilling to invest themselves and can lack the agency to demand their landlord to improve their sanitation. The onus of responsibility for this falls to the landlord; however landlords lack incentives to invest in infrastructure that does not provide return on investment. This raises the importance of distinguishing between *users* and *owners* of sanitation systems and their roles and responsibilities.

This supports the limited knowledge in this area that in order to provide sanitation for all, specific consideration is needed to meet the sanitation needs of tenant households. This also links to boundary statement four (*some are not willing to invest but they are willing to pay*). Tenants (as a group who lack tenure security) are less likely to invest in the fixed assets required for sanitation which is a reflection of the dynamic of the urbanisation of poverty discussed next.

### **7.5.2. Sanitation developments and the urbanisation of poverty**

The boundary statement four aligns to the characteristics of the urbanisation of poverty, where the urban poor live and work in cash economies. Income is often not regular and the urban poor have to juggle competing priorities for very limited resources. The urban poor are vulnerable to shocks and live with uncertainty. They operate on short time horizons and are unable to answer decisively about their future plans. This also may prevent the urban poor from accessing formal sanitation services even if they are available to them.

Taking the systems view of sanitation, this study considers both the capital and operational service and costs of sanitation. For the majority of the study participants, and characteristic of cities of the south, to maintain the use of their household sanitation, regular emptying costs are incurred. This study has shown that even those living with lower tenure security and tenants are willing to pay for the emptying of their pits. Whilst tenants will and do pay for emptying services, they tend to opt for the cheaper service. In Dakar-Pikine this is manual emptying. This means that tenants are not only lower on the sanitation ladder in terms of access to sanitation facilities, but given their financial constraints they are more likely to use a less hygienic emptying method. Statement six respond to this point where mapping sanitation systems can help identify where current and potential interfaces with sanitation service providers, where a flexible and wider breadth of sanitation service provision may meet the needs and means more appropriately.

For areas of lower tenure security the willingness to pay for sanitation services implies a greater emphasis in urban sanitation should be paid to the operational and downstream activities such as pit emptying and faecal sludge management. Thus, the role of the 'sanitation service' returns to its fundamental objective of getting excreta away from human contact to break the faecal-oral route.

### 7.5.3. Sanitation developments and property rights

The first and second boundary statements (*formal tenure is not a prerequisite for improved sanitation and tenure security matters for household investment*) essentially frame urban sanitation development in the property rights thesis and link it to housing and shelter. The research has found that in the context of Dakar-Pikine, it is *de facto* tenure rights, from customary and informal tenure systems, rather than *de jure* (legal) that provide adequate tenure security to invest.

This is a consequence of informal urban development where in the context of cities in the developing world, significant urban populations live outside the formal system. The boundary statement one is underpinned by two important points: i) in the developing world context *tenure security* and *formal tenure* are not necessarily the same thing (Durand-Lasserve, Royston 2002) and ii) non-networked sanitation can be improved sanitation (WHO & UNICEF 2006a). These are two points that are often overlooked in the literature.

The research framework and findings highlight that the majority of urban sanitation transactions take place outside the formal system. Moreover, there are multiple service providers including both the small businesses and householders themselves. Antwi and Adams (2003) suggest that "*informal transactions may predominate precisely because this may be better attuned to available opportunities.*" This is an important point and it is thought that improved understanding of these dynamics would shed light on the way decisions are made and how sanitation transactions arranged (Williamson, 2000).

Linking sanitation to the property rights thesis presents a real challenge in meeting the needs of those who are either unwilling, or unable, to invest. Current urban sanitation strategies tend to target households where sanitation professionals, practitioners and governments use a combination of stimulated investment and appropriate technologies to target beneficiaries. Whilst these are indeed more relevant than conventional sanitation engineering, they are not appropriate for those who do not have some form of tenure security<sup>51</sup> where long-term investment is simply not an option. Urban populations in need of sanitation are increasingly living outside the scope of formal and conventional service provision, many lack security of tenure and are therefore unlikely to invest in fixed assets. This

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<sup>51</sup> Either de jure or de facto

is a known truth of urban upgrading (Jenkins, Scott 2007, Hardoy, Mitlin & Satterthwaite 1992, Durand-Lasserve, Royston 2002) but this study draws this link to household sanitation developments. This presents a dilemma as an integral part of the efforts to improve sanitation coverage targets individual households to install and maintain their private sanitation facilities.

The acknowledgement that the property rights thesis is indeed relevant for investment in sanitation infrastructure essentially demands that the scope of urban sanitation strategy is widened (boundary statement five). This study suggests that no matter how appropriate a new technology is, we do not really have a solution for those who cannot or are unwilling to invest. Moreover, as urbanisation increases, current sanitation strategies fundamentally overlook this significant and growing proportion of urban populations who cannot invest, thus failing to provide a sanitation strategy that can meet their needs.

Where tenure insecurity is acting as a disincentive to household investment, the focus of sanitation developments needs to change. This does not mean though that those without tenure security are inevitably faced with unimproved sanitation. To serve those without tenure security, the focus needs to move towards improved operational services and well managed shared facilities, whereby the onus moves from the technical towards good logistics and management. A key role of the outer domain (i.e. urban planning) under this new paradigm is to facilitate these activities.

These conclusions contribute to the advancement of knowledge by identifying that the scope of current urban sanitation strategy, often solely focused on 'building latrines' is too narrow to meet the needs of all urban residents

#### **7.5.4. Main conclusions**

The overarching research question for this study was

**What are the relationships between tenure issues and sanitation and to what extent do they affect urban sanitation development?**

The findings and debate thus far lead to six boundary statements to describe the relationships between tenure issues and sanitation. These were then considered against the transitions that describe the urban context: of urbanisation, urbanisation of poverty and the increased focus on property rights on the development agenda (Jones 2003).

This analysis informs the following conclusions:

- Given that in the context of this research (and common to many low and middle income countries) urban sanitation development and provision happens largely under the radar of formal city planning and urban management; it is *de facto* rather than *de jure* tenure rights that provide the security for household investment in sanitation. Tenure security is a necessary precondition for household investment.
- Current urban sanitation strategies tend to target households to invest, albeit in appropriate technologies. Few urban sanitation strategies cater for those who are unwilling or unable to invest. This is a fundamental oversight in current sanitation strategies of the population segments who cannot invest, thus failing to provide a sanitation strategy for all. Moreover, this is of growing concern given the type of urbanisation being witnessed in developing countries which is characterised by growing concentrations of low income populations and tenants.
- Those who are unwilling to invest may be willing to pay for sanitation services. This places a greater emphasis on downstream and operational sanitation activities. These services offer a tenure neutral option, not only for the households, but also in terms of city planning and urban management and formal service provision.
- There are multiple service providers and the majority of urban sanitation transactions take place outside the formal service provision.
- There is a need to widen the scope of formal sanitation service provision to include tenure neutral sanitation options (offering operational sanitation services) to reach the needs of tenants and those living with poor tenure security.

## 7.6. Chapter Summary

This chapter discusses the findings of the research against the wider knowledge framework. It explicitly addressed each research question in turn and concludes with addressing the overarching question of the research.

The research question one related to the first domain of the research framework: the household. RQ1 asked if tenure and sanitation interact and how that influences household decisions on sanitation. The discussion proposed that tenure can in some cases act as both a real and perceived barrier to sanitation at the household level; however this is not a blanket conclusion across all the different tenure issues, nor across the entire sanitation system. These boundaries were identified.

The research question two related to the second domain of the research framework: the sanitation service providers. It was found that the effect of tenure issues on household sanitation decisions demand a wider scope of sanitation service provision, including non-networked systems and a greater emphasis on downstream operational activities. The discussion argued that without changes in the way sanitation services are delivered, urban sanitation strategies have limited reach as they cannot respond to the ways that households in

low and middle income countries currently make decisions with respect to sanitation; without making changes that consider tenure, there can be no sanitation for all.

The research question three asked how does the effect of tenure issues on household sanitation and sanitation service provision impact upon city planning and urban management? This question proved difficult to answer as, for the majority of urban residents, there is a disconnect between the formal rules of urban planning and the informal norms that guide household decisions. Urban sanitation development and provision happens largely under the radar of formal city planning and urban management; via multiple formal or informal service providers. The discussion in this section highlighted a disconnect between formal city planning and urban management and the realities of urban sanitation, where the perspective of who is the land authority and the service provider are very different from the city planner and household perspectives.

The discussion then addressed the overarching research question. To answer this, six statements from the finding and discussion thus far are used to bound the relationships between tenure issues and sanitation. Particular attention was given to the each of these boundary statements in the urban context with respect to urbanisation, urbanisation of poverty and the increased focus on property rights on the development agenda. The chapter concludes with the explicit statement of the main conclusions of the research. These implications of the findings and these conclusions are considered in chapter eight.

# 8. Implications of Findings

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This chapter will address the wider research problem considering the implications of these results with respect to the wider sectoral theory and practice.

## 8.1. Conceptual and Theoretical Implications

The findings and discussion thus suggest the following modifications in how urban sanitation is defined and conceptualized.

### 8.1.1. The domain and systems view for conceiving urban sanitation

Lüthi *et al.* (2009) suggests that the key to sustainable urban sanitation is to develop a better understanding the characteristics of the urban context. There are several urban planning frameworks that help frame sanitation in the urban context (detailed in chapter 3). The framework applied in this study borrowed heavily from HCES and Sanitation21 in how the urban context was framed, in using decision-making domains where the household is located at the centre. The later point aligns to the wider development shift to place people at the centre (Chambers 1997). In the HCES and Sanitation21 models, the domains are specified as *household-neighbourhood-government* and *household-peri-domestic-ward-city* respectively. The study framework was informed by a sanitation system approach where the urban context was broken down into the domains of *household-service provider-city planning and urban management*. The aim of departure from HCES and Sanitation21 was to gain a greater insight into how sanitation systems work across the city and how they fit into the overall urban development process.

What follows are the insights and limitations of the chosen framework for this study:

- The domain view worked for this tenure analysis in so far as it is able to identify the tenure issues that are at work in different domains. It places the focus at the household level which supports wider development dynamics, but is able to consider the household within the wider urban context.
- This research also suggests that urban sanitation is largely self-managed and ad-hoc which supports nominating the second domain as the service provider (as opposed to the social or geographical neighborhoods of the HCES or Sanitation21 models). This also questions the notion of neighbourhood in the urban context.
- This also allows for the overlay of the sanitation system onto the domain framework; this combination highlighted different aspects of the urban sanitation problematic:
  - The domain view lent itself to highlighting whether interfaces between different domains existed (or were absent). This underlines an important conceptual point

that the existence of a relationship between stakeholders of one zone and the next cannot be assumed (as it is with HCES). The domain view also highlights that from the conventional perspective, many households and the sanitation service networks accessible to them remain invisible.

- The systems view uncovers these invisible networks and places them adjacent to formal sanitation networks offering a citywide perspective. The system view lends some insight into the distribution of sanitation networks and highlights priority areas in improving sanitation service provision. The systems view can also cope with the dynamic nature of the urban context.
- A development of this model to better understand how urban sanitation governance could be informed could consider the information flows and transactions between the different domains.

### 8.1.2. Boundarying tenure with respect to urban sanitation

This study has untangled the different aspects of both tenure and sanitation and how they relate. This provides a deeper understanding of both concepts; where tenure security can be constituted of both formal and informal rights and legal tenure is not the same as tenure security. The findings imply that tenure is an important consideration for urban sanitation but care must be taken to understand where these interactions take place. It is useful in terms of considering sanitation and tenure to understand what aspects may be relevant to any given context. The matrix below (table 8-1) presents nine statements which are conceptually relevant to the way tenure features in conceptualising the urban sanitation problematic.

	D1: sanitation in the household domain		
	Access to sanitation	Household investment	Emptying behaviours
Tenure typology	Non-piped sanitation can be improved	The majority of sanitation systems in low and middle income cities are self-build	Irregular layouts and narrow streets do preclude mechanised emptying in some areas.
Tenure status	Tenants are lower on the sanitation ladder	Tenants are unlikely to invest in sanitation infrastructure	Emptying decisions are informed by cost and service offered. Tenants opt for the cheaper service (manual) but are willing to pay as opposed to DIY
Tenure security	Those with lower tenure security are less likely to have improved sanitation	Those with lower tenure security are less likely to invest in sanitation	Emptying services are tenure neutral (if layout / access problems are overcome). Those without tenure security may rely on operational sanitation.

Table 8-1: How tenure features in conceptualising the urban sanitation problematic

## **8.2. Implications for Policy and Practice**

The findings of this study also have some practical implications. These are outlined below.

### **8.2.1. City wide sanitation planning**

The findings of this research suggest that in order to manage effective urban sanitation in the dynamic urban context, city-wide sanitation approaches are needed. The pressures of urbanisation and population growth mean that resources are often stretched and limited. To assist policy makers and sanitation practitioners to allocate resources appropriately, decisions need to be made on the reality of the situation. One of the main conclusions of this study is that given the nature of urbanisation in developing countries, to strive to meet the sanitation needs of all requires a broader scope of formal sanitation service provision. The following steps will help generate an improved understanding of the urban sanitation cityscape to profile cities and understand where to best target:

- Use tools such as the sanitation cityscape (as demonstrated in section 7.3.2) to get a realistic view of the scope of urban sanitation systems (including improved / unimproved and formal / informal services)
- Identify the urban sanitation service provider(s)
- Segment the target population (in terms of willingness to invest, willingness to pay).
- Identify which area of the sanitation cityscape to target (for example: reduce manual pit emptying)
- Develop tenure neutral strategies and policies
- Target interventions appropriately: create new interfaces for the formal and informal to meet / strengthen existing ones (for example: promote mechanical emptying).

The findings and discussion imply that when the formal and informal service providers are considered together, further sanitation service providers come to light; in addition to the utilities and the small-scale providers acknowledged in sanitation discourse, landlords or the households themselves are found to assume the role of service provider. Furthermore in the case of the informal landlord-tenant relationship, the onus of responsibility of sanitation service provision often falls to the landlord. However there is little incentive and no legal framework for the landlord to adopt this role. The example of tenants relates to the wider problematic of all urban residents lacking tenure security: quite simply those lacking tenure security are unwilling or unable to meet their own sanitation needs, often do not have a sanitation service provider, therefore require special consideration.

What is needed is the ability to cope with the dynamic urban environment and urban sanitation. Tenure insecurity is a feature of current cityscapes and will remain so in the future. Urban poor have competing priorities; the role of sanitation planners is to understand these priorities and identify and target appropriate sanitation programs. Representing the citywide

sanitation system as a whole has several strengths. Firstly it strengthens the strategic decision-making process by identifying which aspects of the sanitation chain could be improved to have the greatest impact. Secondly, it raises the profile of downstream activities.

### **8.2.2. Tenure neutral sanitation options**

Another finding of the research is that households who are unwilling to invest may be willing to pay for sanitation services such as emptying, thus supporting the growing focus on downstream sanitation activities. One feasible example of how to do this is to support faecal sludge management activities. There is limited awareness of policymakers about sanitation services outside the conventional perspective of sewered systems and therefore there is a need for policy makers and planners to develop an improved understanding of faecal sludge management activities. Faecal sludge management operations can be supported by the following:

- Provide interfaces where the formal and informal emptying markets can meet (for example: allow informal emptiers to dump at treatment plants)
- Use mobile transfer stations - for example the hoppers of eThekwini (see Macleod 2005).
- Support these entrepreneurs with access to finance, business model support, marketing strategies to build their business, licensing etc.
- Apply marketing and hygiene promotion to promote the service and regulate customer demand based on how households make decisions
  - One of the reasons stated for using mechanical emptying was that residents did not want to annoy neighbours by burying the faecal sludge in the immediate environment)
  - Seasonal events (i.e. flooding) could be used to promote mechanical emptying as a desirable and improved service.

Through improved understanding of the whole city-wide sanitation service chain and inherent constraints, sanitation interventions can be improved to either target the household themselves or the downstream (operational) activities.

### **8.3. Implications for Methodology**

The study highlighted that the realities of some aspects of urban sanitation remain obscured with current reporting. This section highlights the implications of these findings for sanitation research methodologies.

### 8.3.1. Improved measuring in sanitation

Increasing coverage of improved private (i.e. household) sanitation is the ultimate focus of efforts to meet targets ten and eleven of the 7th Millennium Development Goal: to halve, by 2015, the proportion of people without sustainable access to safe drinking water and sanitation. Adopting a systems view of urban sanitation evidently extends the required measurement of sanitation beyond this basic indicator of *access to improved sanitation*.

Moving beyond what is happening at the household to the city-wide issues, the fundamental aim of sanitation is to safely contain and remove human excreta from human contact. Effectively this means breaking the faecal-oral route. Therefore tools to monitor how well this is being achieved need to go beyond the household indicators. This is where tools such as the sanitation cityscape can be useful.

In an attempt to capture the downstream and diverse management systems, the indicators used during the household survey were:

- Sanitation access level (private, shared, unimproved, open defecation)
- Number of households per sanitation facility
- Emptying frequency
- Annual cost of emptying per household
- Emptying method
- Define the users and owners of sanitation facilities
- Willingness to invest.

This study highlights the high incidence of shared sanitation, especially for tenant households. This introduces new complexities to the way sanitation is measured and monitored. This study proposes the indicator of *number of households (or people) per sanitation facility* is critical to understand for numerous reasons. Firstly, the number of people is a direct measure of the loading of any given sanitation facility, which given the systems view of sanitation is a significant consideration for adequate faecal sludge management. These findings also support Wegelin-Schuringa and Kodo's (1997) suggestion of defining user groups of sanitation facilities. This study found it useful to differentiate between and adopt the terminology of, *users* and *owners* with regards to sanitation facilities.

Households were defined in the study as an economic unit (in terms of the survey question this was defined as who cooks and eats together.) Care must be taken, especially in urban environments where living arrangements can be complex, that households are not grouped as one unit because they live under the same roof. Urban households may eat of different plates but share one sanitation facility. This is of particular relevance to landlord and tenant households where the management and upkeep of the sanitation facility may be more complex. Section 2.3.4. discussed the negative incentives acting on both landlords and tenants against improving sanitation for tenant households. It has also been noted that the living

arrangements (i.e. if the landlord lives on plot or is absent) is a key factor in investment in sanitation (Eales, Schaub-Jones 2005), Scott (2007)<sup>52</sup>, Schaub-Jones (2005).

There has been much discussion with respect to investment in this thesis, where it has been demonstrated that investment behaviours are indeed relevant for sanitation developments. Section 5.1.2.a considered the differences between *ability to pay*, *willingness to pay* and *willingness to invest* which are likely to be different for populations of different tenure status and security. Disaggregating these behaviours amongst an urban population, using such tools as the sanitation cityscape, may help to identify which aspects of the sanitation value chain are the most appropriate to target for any given population.

## 8.4. Chapter Summary

This chapter considers the implications of findings of this research on the wider research problem. It is divided into conceptual and theoretical implications, implications for policy and practice and implications for methodology. The findings suggest the relationships between tenure and sanitation in the urban context can be bounded by nine statements, each relating to a nexus on the tenure-sanitation matrix. This presents a future framework to test in different tenure and sanitation situations. A second conceptual implication stems from the lens of domains and sanitation systems adopted in the analysis. The two perspectives complement one another; where the systems view has strength in uncovering invisible networks as it forces the analysis to consider the whole sanitation system; the domain view highlights relationships and interfaces between different urban stakeholders. The superimposing of the two is a strong development to conceptualising urban sanitation. A third implication for urban sanitation is regarding the question raised in chapter seven regarding who is the service provider.

Implications for policy and practice centred on improving the targeting of urban sanitation developments by targeting appropriately and widening the scope of service provision to support faecal sludge management operations. Finally implications for methodology include suggestions to improve measurement of sanitation, as this study revealed statistics that are obscured in current reporting (such as shared sanitation).

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<sup>52</sup> Beth Scott personal communication

# 9. Conclusion

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## 9.1. Chapter outline

This chapter concludes the thesis. It reiterates the objectives of the research and briefly outlines the research process that led to the key research findings, which are explicitly stated. The overall contributions to the body of knowledge of urban sanitation are stated with respect to how the findings that have been presented here challenge existing thinking. The limitations of the research are also discussed. The chapter then makes specific recommendations which have become apparent as a result of the work. They are divided into those aimed at policy makers, those aimed at practitioners and suggestions for future research. Finally, an overall summary statement concludes the thesis.

## 9.2. Introduction

The title of this thesis borrows a concept of *unbundling* from Dr. Albert Wright's vision of sanitation. This study has sought to unbundle the relationship between tenure and sanitation; and to demarcate how one influences the other. This research has explored the different components of tenure issues: legal tenure, tenure security and tenure status (i.e. landlord or tenant) and their associated implications for sanitation developments. The study considers urban sanitation as a system spanning the household and an array of service providers contained within an urban context.

Rapid urbanisation, the urbanisation of poverty and the increased focus on property rights in development discourse are contextual factors which frame contemporary research and policy activities in the urban environment (Jones 2003); each of these factors has major implications for urban development and service provision. This research addresses the nexus between tenure issues, a central element in these urban dynamics, and sanitation service provision.

The research considers two areas that have in the past been neglected. Sanitation has not been a priority development issue and consistently lags behind water on the development agenda. Whilst the 2008 International Year of Sanitation did raise the profile of sanitation, the legacy of the past neglect is evident in terms of funding allocation, lack of mature understanding of the reality of the problem and the sheer number of people still living without adequate sanitation.

Tenure issues are a second area which is often avoided as they are considered to be ingrained in complex and political histories. The development community has tended to

separate land reform and tenure regularisation from other forms of urban upgrading due to these inherent complexities. Tenants have also been ignored in development discourse; despite their prominence across urban landscapes of the south, the needs and drivers of tenants are often overlooked in favour of owner occupiers.

A review of the literature found that the explicit relationship between tenure and urban sanitation is not addressed in great detail. Several authors have sought to understand the relationships of land tenure with respect to basic services; few have isolated the very different nature of sanitation service provision in the context of the low income urban environments. Little investigation has sought to boundary this issue. A critical review of the literature revealed a significant lack of evidence and enquiry as to how and where tenure and sanitation relate. The following were identified as gaps in knowledge.

Weaknesses in the urban planning literature reflect the legacy of sanitation being twinned with water, and the differences in sanitation from other basic services are often overlooked. Urban planning literature is often biased towards physically networked sanitation whereas in reality this accounts for a small proportion of sanitation services for the urban population. Sanitation is often grouped as one of several basic services in urban upgrading discourse. There is little consensus on the impacts of titling on infrastructure but does formal tenure matter for sanitation?

Both tenure and sanitation bodies of literature were found to fall victim to the wider lack of data in development studies on differences in tenure status (i.e. owner or tenant). Differences exist between landlords and tenants in urban sanitation but how do tenants feature in urban sanitation systems? In sanitation discourse, recent strategies target the development of individual household sanitation facilities, but evidence on the incentives and implications of tenure security on these investment behaviours is weak.

Finally there is limited knowledge of faecal sludge management activities. These have until recently been widely neglected in sanitation literature. The body of evidence on the motivations and behaviours regarding the household decisions and drivers for pit emptying remains scarce.

This research presents data from a study conducted in peri-urban Dakar, Senegal during 2008. Using survey data taken from 340 plots, the research has considered sanitation access, household investment and emptying behaviours. The survey covered four different land tenure groups and both tenant and owner households in peri-urban Dakar. This was complemented with a series of interviews held with service providers and city planners to build a more comprehensive view of urban sanitation networks.

### 9.3. Conclusions of the Study

To address the identified gaps in knowledge the study was framed around three domains: the household, the sanitation service provision and the city planning and urban management. The framework guided the research to place the household at the centre where the study first addressed if there was an interaction between tenure and sanitation issues in this domain. The findings were that **whilst tenure can in some cases act as both a real and perceived barrier to sanitation at the household level, it is not a blanket conclusion across all the different tenure issues, nor across the entire sanitation system.**

In the household domain several key points were raised:

- Formal tenure is not a prerequisite for improved sanitation
- Tenure security matters for household investment
- Tenants are lower on the sanitation ladder
- Some urban households are not *willing to invest* but are *willing to pay* for sanitation services.
- Some household sanitation options<sup>53</sup> can be precluded by informal tenure and irregular settlement layout.
- There is a parallel development path of self-build sanitation and housing.

The research then proceeded to address how these relationships impacted upon the next domain in the urban context – the domain of sanitation service providers. It was found that **the effect of tenure issues on household sanitation decisions demand a wider scope of sanitation service provision, including non-networked systems and a greater emphasis on downstream operational activities.**

In relation to this domain, several key points were raised:

- It is important to create new interfaces between sanitation service providers and households.
- Mapping sanitation systems and quantities can provide a visualisation of the sanitation cityscape and help prioritise

Finally the research then moved to consider the outer domain of the research framework - city planning and urban management. It was found that **urban sanitation development and provision happens largely under the radar of formal city planning and urban management; via multiple formal or informal service providers. A greater link is needed between urban planning and sanitation development; this can be achieved through extending the scope of formal sanitation service provision.**

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<sup>53</sup> i.e. sewage networks, vehicular emptying

In relation to the domain of the city planning and urban management, several key points were raised:

- Few interfaces actually connect the city with the majority of the urban population, especially the urban poor
- Urban master planning approaches view 'tenure first' as a necessary precondition to benefit from public services
- Segments of the urban population attribute land management and sanitation service delivery to authorities other than the state
- Urban sanitation is characterised by multiple service providers including households and landlords
- Lack of land availability and irregular layouts are real barriers to urban sanitation developments
- The invisible sanitation pathways need to be understood.

The overarching aim of the research sought to understand how tenure issues impacted upon urban sanitation developments. The study concludes that

- *De facto* rather than *de jure* tenure rights are sufficient to provide the security for household investment in sanitation. Tenure security is a necessary precondition for household investment.
- Few urban sanitation strategies cater for those who are unwilling or unable to invest. This is a fundamental oversight in current sanitation strategies for the population segments who cannot invest, thus failing to provide a sanitation strategy for all.
- This is of growing concern given the type of urbanisation being witnessed in developing countries which is characterised by increasing concentrations of low income populations and tenants. Urban sanitation strategies need to distinguish between *willingness to invest*, *willingness to pay* and *ability to pay*. Those who are unwilling to invest may be willing to pay for sanitation services. This places a greater emphasis on downstream and operational sanitation activities (i.e. tenure neutral options).
- There are multiple service providers and majority of urban sanitation transactions take place outside the formal service provision. The formal and the informal need to be considered; giving meaning to these informal transactions can offer insight into improved governance for urban sanitation.
- There is a need to widen the scope of formal sanitation service provision to include tenure neutral sanitation options to reach the needs of tenants and those living with poor tenure security.

## 9.4. Contribution of this Work

This work has contributed to knowledge in several ways. It is the first to explicitly address and unbundle the relationships between tenure, urban sanitation and their inherent connection. In doing so it has placed boundaries on where tenure is, and is not, a barrier to urban sanitation developments. It has untangled for the sanitation reader the differences between legal tenure, tenure status and tenure security with respect to urban sanitation, terms that are often used interchangeably. For the reader not familiar with sanitation, it has distinguished sanitation services from other basic services and from the inherent legacies of conventional sewerage. In doing so this study has underlined how current urban sanitation strategies are failing to meet the needs of the urban poor. It suggests that for those who are unwilling or unable to invest the focus of sanitation interventions should move to operational sanitation activities, where a distinction has been made between willingness to pay and willingness to invest. The study also proposed a *sanitation cityscape* tool, placing the formal and informal sanitation networks together to visualise the often hidden networks of sanitation service provision at a citywide level. This approach raised the profile of operational aspects of urban sanitation (such as faecal sludge management) and also the scope and diversity of sanitation service providers in the urban environment. The study also provides empirical data of under-reported elements of urban sanitation, notably differences with respect to sanitation of landlord and tenants; the prevalence of urban households sharing sanitation; the household motivations for choosing pit emptying services and the prevalence of manual emptying in the study context. In addition, the study makes a contribution to the conceptual representation of the sanitation problematic; it applies a combined domain and systems views of sanitation in one model specifically relevant to the urban context. This model highlights different, but complementary, aspects of the urban sanitation problematic. A final contribution of this work is to detail practical recommendations towards improved urban sanitation development and further research.

## 9.5. Limitations of the Study

The study has made an important contribution to how tenure and sanitation issues relate in the urban context. This said, several limitations of the research are recognised.

Firstly, tenure security in Greater Dakar is relatively good, based upon strong customary rights and a move away from government forced evictions. The survey of this study took place in Dakar-Pikine, which accommodates approximately half of the Greater Dakar's residents and much of the urban expansion. The tenure typology groups selected for survey were chosen to maintain comparability and to represent the main land delivery mechanisms; they did not however include squatter settlements with very low tenure security. There are methodological difficulties in comparing a settlement with very poor tenure security with a settlement of formal tenure as the socio-economic characteristics are so diverse. This said, there are a small number of settlements with temporary shack dwellings in both Dakar proper and the Pikine

commune of Dakar. It would be interesting to test the emergent theory of this work at the lower end of the scale of tenure security, to see if there are similar dynamics.

A second limitation to the research is that no manual emptiers were interviewed. A different research approach may be necessary to approach this group. Manual emptiers are a somewhat hidden and fragmented group who operate under fear of reprisal or fines; it could take time to uncover and approach them for in-depth research. This may be feasible and indeed very appropriate for a study specifically focused on emptying operators or faecal sludge management, but was beyond the time restraints and broader scope of this study. This research has demonstrated that manually emptying is as prevalent as mechanical services and a largely hidden service which is in need of further research.

Thirdly, this study applied the JMP categorisation of the sanitation ladder for the data analysis as opposed to specific technologies. This was done for two reasons: the first was to capture 'shared' sanitation in the analysis as it became apparent how prevalent it was for the tenant group. The second was due to the variance of sanitation facilities encountered in the survey. It was found that, as many of the systems were self built and in various states of repair, that classification by detailed technology was often irrelevant<sup>54</sup>. Instead the technologies were classified broadly: pour flush, simple pit etc. Given that the aim of this research was to identify how excreta are being managed at the city level, it was found the categorisation of improved, shared or unimproved was less ambiguous than adopting potentially misleading technology categories.

A fourth limitation found in the research, as reflected in Senegal's sanitation targets, was that many of the households in this study already had some kind of sanitation system. This study is therefore primarily concerned with investment and upgrades of one system to the next (i.e. from a simple pit to an improved facility). Given this context it does not address two issues: firstly, the behavioural change necessary for people who practice open-defecation to use a facility and secondly how to get landlords to make an investment for tenants. An extension of this point is that neither open-defecation nor public toilets are common in Dakar. It would be interesting to test this model in contexts where the sanitation cityscape looks very different.

A fifth limitation is that the scope of this study did not extend to a gender analysis. This is by no means through lack of acknowledgement of the importance of gender in both sanitation and property rights but this study was exploratory hence limited the scope to the interaction of the different aspects of tenure and sanitation systems. Drawing robust conclusions on gender differences was not possible given the type of data set of this study as the sub-groups were too small. The findings indicate that for owner households there are few differences with respect to gender, there may be some differences between male and female headed tenant

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<sup>54</sup> For example: is a once improved facility still improved when the owner has dug a hole at the side of their pit to allow excess water to drain leaving the pit open? Photos are shown in appendix E.

households, although these trends are not conclusive. To consider the gender dynamics in greater detail it is recommended to use quota sampling, specifically to ensure sufficient representation of female headed tenant households. In the context of the research however, there were two factors that are less likely to exacerbate gender divisions: the relatively high de facto tenure security and the high coverage of household sanitation systems. Gender analysis and inequity is expected to be more pertinent where tenure security is low and there is a higher incidence of public toilets and open defecation, both of which affect women negatively and show a gender imbalance more prominently.

Some of the limitations listed above may suggest possible extensions of this research or further complementary studies. It is through the acknowledgement of these limitations that this study provides credible and reliable investigation into how tenure and sanitation issues relate.

## **9.6. Recommendations**

Recommendations which have become apparent as a result of the work are divided into those aimed at policy makers and practitioners followed by suggestions for future research.

### **9.6.1. Recommendations for policy and practice**

In light of the findings and conclusions of this research the following suggestions are made for policy and practice of urban sanitation:

- To strengthen the capacity of utilities and governments to work in the dynamic urban environment. This research proposes a shift towards citywide urban sanitation planning, where the city is considered as a whole which includes planning for piped and non-piped sanitation systems. Several recommendations to support this are:
  - Create sanitation profiles for cities using cityscape tools to visualise hidden sanitation networks and learn from similar environments
  - Segment the urban population and target sanitation interventions appropriately.
- A recommendation of the research is to widen the scope of formal sanitation service provision by increasing interfaces between sanitation service providers and government. In practice this could relate to a reinforcement of faecal sludge management networks. Of direct relevance to the Dakar context, the faecal sludge dumping site at Cambarène was identified as an interface between the informal sanitation service providers and the utility. A simple way of broadening this interface would be to maximise the opening hours of the faecal sludge dumping sites. Additional recommendations would be to create (mobile) faecal sludge transfer stations to serve settlements that are far away.

- A further recommendation of this study is to develop tenure aware and neutral sanitation policies. In the first instance this is being aware in policy and practice of how different tenure aspects may impact upon urban sanitation developments. In more practical terms this could include the following:
  - Develop sanitation strategies specifically for tenants and for those without tenure security; identify ways to broker the relationship between landlords and tenants
  - Shift sanitation planning to include operational activities (i.e. emptying)
  - Make operational sanitation affordable
  - Use marketing to promote emptying services and raise their profile
  - Consider land and tenure issues at planning stage of sanitation (land availability for all components of the sanitation system; NIMBY resistance; land ownership complexities; cost of urban land in budgeting).

### 9.6.2. Suggestions for future research

A natural extension of this study would be to test this tenure analysis in different urban environments and at different stages of the tenure continuum or sanitation ladder. This would refine the tenure boundary statements presented in this study. So the first recommendation for future research would be:

- To validate or reject this tenure analysis in different urban contexts (for example high tenant ratio, low tenure security; areas of lower sanitation coverage).

In addition, the following suggestions are made for future research:

- This research has found that there are multiple sanitation systems and pathways in the urban context. Further empirical research of these urban sanitation networks and small scale providers would be valuable contributions to knowledge. Specifically, business and operating models of informal and small scale sanitation providers would be useful. Also, studies to develop and test appropriate and robust technologies to improve and replace manual emptying of pit latrines are critical. In addition, potential lessons may be learnt from solid waste management models elsewhere. For example, the ancient quarters of several European cities have narrow streets which prevent vehicular access; solutions in use for solid waste management include a fleet of smaller, narrower vehicles designated for the narrow streets which interface with larger vehicles at outskirts of the city. The operational models of these systems may offer some insight into improved faecal sludge management.
- This research has also found that shared sanitation is a common sanitation solution for tenant households. This reality is obscured by current sanitation reporting and as such little is known about different shared management models. Empirical studies to identify the acceptability of shared sanitation and other sanitation options for tenant households

would be a useful contribution to knowledge. A relevant consideration highlighted in this research is the importance to determine the *user-group* and distinguish between *users* and *owners* of shared sanitation systems.

- This research supports Collignon's (2000) argument that there is a lack of appropriate urban growth policies to deal with the current reality. An important contribution would be to develop and test an appropriate paradigm of African urbanisation with organic urban growth.
- This research has found that it is the *de facto* rights that constitute household decision with respect to investment in household sanitation. A conceptual development of this research would be to align this work to the concepts of new institutional economics (NIE) and to apply the theory of transaction costs. NIE offers a comprehensive approach to understanding economic behaviours by shifting the focus from the *de jure* to the *de facto* property rights where transaction costs help to understand the 'play of the game' (Williamson, 2000). NIE introduces concepts such as transaction costs, bounded rationality and imperfect information; terminology rarely used in the sanitation specific discourse. This analysis would provide a focus on getting the governance structures right as opposed to concentrating on how the tenure security is constituted. In other words understanding the transaction costs of urban sanitation markets would be the next step towards improved governance in sanitation.

## 9.7. Closing Statement

This thesis begins with an extract from Amartya Sen's (1999) 'Development as Freedom.' The first line of this extract reads:

*"As competent human beings, we cannot shirk the task of judging how things are and what to needs to be done"*

This thesis supports a growing body of evidence that informs us '*how things are*' with respect to the realities of urban sanitation. It specifically brings to light issues that have long been obscured in the contributions to knowledge with respect to urban sanitation and tenure neutral sanitation solutions. It contributes to an improved understanding of how urban sanitation works. Sen's challenge is to apply this improved understanding to determine '*what needs to be done*'. In this respect the contributions of this thesis suggest that it can be too easy to readily accept the notion that improved sanitation requires legal tenure. What this research has demonstrated is that whilst *de facto* tenure security is a prerequisite for sanitation developments both on the household and city planning and urban management scale, a distinction can be made between asset-based and operational sanitation. By demarcating the sanitation problem along tenure lines, this research has demonstrated that even if tenure security is acting as a barrier to investment in sanitation, people are still willing to and do pay for operational sanitation solutions, thus shifting the onus to operational sanitation services.

These are feasible and practicable solutions for immediate to mid-term urban sanitation development.

In July 2010 the UN General Assembly declared clean water and sanitation fundamental basic human rights (United Nations General Assembly 2010). This declaration presents an opportunity to build a case of neglect towards government and the development community in their failure to meet the sanitation needs of 2.6 billion people. This research has contributed modestly towards a more insightful paradigm of urban sanitation, specifically considering the plight of those living without tenure security, with the aim to improve future urban sanitation developments for all.

# 10. Appendices

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- Appendix A: Advantages and limitations of data collection techniques (compiled from Bryman 2003)
- Appendix B: Questionnaires
- Appendix C: Database summary
- Appendix D: Cross tabulation user satisfaction
- Appendix E: Key informant interview reference codes
- Appendix F: Photos of surveyed settlements
- Appendix G: Pit emptying / FSM technologies

## Appendix A: Methods

Data Collection Methods	Data Type	Advantages	Limitations
Structured interviewing (in person)	Quantitative or qualitative	Good response rates Good repeatability Both open and closed questions Can collect subsidiary information on observation.	Time consuming Costly given resource requirements Interviewers to be trained to reduce variability
Structured interviewing (by phone)	Quantitative or qualitative	Good response rates Cheaper & quicker than in person Reduced potential bias of interviewer.	Sampling bias to those known via sampling frame Interviewers to be trained to reduce variability Less appropriate for sensitive topics Cannot collect subsidiary information on observation. Inferior data quality than face to face interviews
Self-administered survey (post)	Quantitative or qualitative	Cheaper than surveys administered in person	Lends itself to a formal sampling frame Poor response rates Predominantly closed questions
Participant Observation	Qualitative	Immersion – qualitative rich data Non-verbal data can be recorded Ability to observe deviant and hidden activities often sensitive to other techniques.	Possible reactive effects Ethics and issues of intrusion
Focus group	Qualitative	Rich, in depth data on specific topics Good for different perspectives	Concerns with joint production of meaning less control, inaudible elements, not appropriate for sensitive data Practicalities of availability of respondents at a specific time.
Semi-structured interview	Qualitative	Interview guide with flexibility Interviewer has flexibility to follow up on certain issues	Only verbal data recorded Interviewer can introduce bias
Oral-history interview	Qualitative	Rich in qualitative data Reflective about past events Gives voice to marginalised groups or untold history.	Largely unstructured Possible bias introduced by participants memory

Advantages and Limitations of data collection techniques (compiled from Bryman 2003)

## Appendix B: Questionnaires

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The following pages contain the various questionnaires used in this research. They are as follows:

- Section A – Plot questionnaire
- Section B – Owner occupier questionnaire
- Section C – Tenant questionnaire
- Section D – Observation living environment

Date: |\_\_|\_|\_|\_|\_|\_|\_|\_|\_|\_| (jj /mm/aa)

Questionnaire #: |\_\_|\_|\_|\_|\_| A

DR : |\_\_|\_|\_| Quartier :

Commune d'arrondissement :

## SECTION A : TOUS LES MENAGES

CHERCHER LA PERSONNE LA PLUS CENTRALE POUR REpondRE AUX QUESTIONS

- DEMANDER LE PROPRIETAIRE / CHEF DE FAMILLE
- SI C'EST UN BATIMENT OU C'EST SEULEMENT DES LOCATAIRES, CHERCHER S'IL Y A UN LOCATAIRE PRINCIPALE, SINON SELECTIONNER AU HASARD.

### 1 : CARACTERISTIQUES DU LOGEMENT

1. Nom du répondeur : \_\_\_\_\_

2. Statut dans le logement (c.à.d. lien par rapport au chef de famille / propriétaire)  
\_\_\_\_\_

3. Préciser le nombre de ménages dans la parcelle / logement [INDIQUER LE NOMBRE]

	Nombre de ménages
Propriétaire(s) & famille	
Locataire(s)	
Hébergé(s)	
<b>Total:</b>	

4. Type de logement ? \_\_\_\_\_

- |  |   |                              |
|--|---|------------------------------|
| 1. Propriétaire et famille                 | > | Effectuer les sections A + B |
| 2. Propriétaire avec locataires / hébergés | > | Effectuer les sections A+B+C |
| 3. Locataires avec le propriétaire présent | > | Effectuer les sections A+B+C |
| 4. Locataires sans le propriétaire         | > | Effectuer les sections A + C |

### 2 : SERVICES DE BASE DU LOGEMENT

5. Est-ce que la parcelle est alimentée en électricité? 1. Oui 2. Non \_\_\_\_\_

6. Robinet privé? (Fonctionnel) \_\_\_\_\_

1. Oui, à l'intérieur du logement.
2. Oui, dans la cour
3. Non

7. Où déversez-vous vos eaux usées d'habitude ?

	1. Puisard
	2. Fosse (WC)
	3. Egout ouvert
	4. Dans la cour
	5. La rue (extérieur du logement)
	6. A la mer
	7. Autre (à préciser) _____
a. Linge	
b. Cuisine	
c. Bain	

8. Où déversez-vous vos déchets solides d'habitude ? \_\_\_\_\_

1. Camion / calèche de ramassage
2. Incinération
3. La rue (extérieur du logement)
4. La mer
5. Autre (à préciser) \_\_\_\_\_

9. Est-ce qu'il y'a des toilettes ou latrines dans la parcelle ? |\_\_\_|  
 1. Oui                    2. Non **Si Non, ALLEZ AU SECTION B (propriétaires) OU C (locataires)**
10. Quel est le type de toilettes ou latrine ? |\_\_\_|  
 1. Chasse a l'égout **> ALLEZ AU SECTION B (propriétaires) OU C (locataires)**  
 2. Chasse a l'égout faible diamètre **> ALLEZ AU SECTION B (propriétaires) OU C (locataires)**  
 (Semi collectifs)  
 3. Chasse a fosse septique  
 4. Chasse a fosse simple  
 5. Latrine améliorer a fosse ventilée  
 6. Latrine simple couvert  
 8. Latrine a seau  
 9. Autre (à préciser) \_\_\_\_\_
11. Est-ce que la fosse a été vidée ? |\_\_\_|  
 1. Oui **> ALLEZ AU Q.13**  
 2. Non **> ALLEZ AU SECTION B (propriétaires) OU C (locataires)**  
 3. Ne sais pas **> ALLEZ AU SECTION B (propriétaires) OU C (locataires)**
- 12a. Vous devez vider la fosse / bac à quelle fréquence ? \_\_\_\_\_  
**(SI C'EST JUSTE UNE FOIS, NOTEZ QUANT EST CE QUE)**
- 12b. Si c'est plus d'une fois par an chercher à découvrir s'il y a des réponses différents pour  
 La fréquence en saison sèche ? \_\_\_\_\_  
 La fréquence pendant l'hivernage ? \_\_\_\_\_
13. Moyen de vidange d'habitude ? |\_\_\_| |\_\_\_|  
**INDIQUER PLUSIEURS SI APPLICABLE**  
 1. Camion citerne  
 2. Baay Pelle  
 3. Manuelle par personnes de famille (c.à.d. non-frais)  
 4. Autre (à préciser) \_\_\_\_\_
14. Combien est ce que ça vous coûte pour chaque vidange? \_\_\_\_\_ FCFA
- 15.a. Qui participe d'habitude aux frais de vidange ? |\_\_\_| |\_\_\_| |\_\_\_| |\_\_\_|  
**INDIQUER PLUSIEURS SI APPLICABLE**  
 1. Le propriétaire  
 2. Les autres ménages (de la famille du propriétaire)  
 3. Les locataires  
 4. Hébergés  
 5. Autre
- 15.b. Qui prend en charge la vidange ? \_\_\_\_\_
16. Est-ce que ça vous arrive de vider la fosse d'une autre manière? |\_\_\_|  
 1. Oui **> Pourquoi ? \_\_\_\_\_**  
 2. Non **> ALLEZ AU SECTION B (propriétaires) OU C (locataires)**
17. Moyen de vidange alternatif? |\_\_\_| |\_\_\_|  
**INDIQUER PLUSIEURS SI APPLICABLE**  
 1. Camion citerne  
 2. Baay Pelle  
 3. Manuelle par personnes de famille (c.à.d. non-frais)  
 4. Autre (à préciser) \_\_\_\_\_

Date: | | | | | | | | (jj/mm/aa)

Questionnaire # : | | | | | | | | B

**SECTION B : POUR UN MENAGE DE PROPRIETAIRE / COPROPRIETAIRE****1. DETAILS DU MENAGE****18. Détails du Chef de Ménage [ECRIRE LE CODE]**

Statut	Age	Sex	Ethnie	Education	Secteur d'occupation
1. Propriétaire 2. Copropriétaire	1. 10-19 2. 20-29 3. 30-39 4. 40-49 5. 50-59 6. 60+	1. M 2. F	1. oulof / Lebou 2. sérère 3. peulh ou toucouleur 4. mandingue / socé 5. diola 6. Autre (à préciser)	1. Aucun 2. Ecole Arabe/ Coranique 3. Primaire 4. Secondaire 5. Supérieur 6. Professionnelle	1. Salarié du public 2. Salarié du privé 3. Professionnels libérales 4. commerçant du secteur formel 5. commerçant du secteur informel 6. journalier 7. chômeur 8. retraité 9. autre à préciser)

**19. Préciser les habitants actuels dans le ménage [INDIQUER LE NOMBRE]**

Adultes (20+)		Adolescents (10-19)		Enfants (<10ans)	TOTAL
M	F	M	F		

**20. Quelle est moyen revenue mensuelle du ménage ? (Chercher la moyenne par mois)**

[ECRIRE LE CODE]	1. < 50 000 FCFA 2. 50 000 – 99 000 FCFA 3. 100 000– 149 000 FCFA 4. 150 000 – 199 000 FCFA 5. 200 000 – 249 000 FCFA 6. 250 000 – 299 000 FCFA 7. 300 000 + FCFA 8. Ne sais pas
Revenus mensuels du ménage	
Revenues transferts	
Revenue mensuelle des locations	
TOTAL Revenues du ménage	

**21. Les biens du ménage (en état de marche) [INDIQUER LE NOMBRE]**

TV	Radio	Téléphone fixe	Téléphone portable	Bicyclette	Frigo	Voiture	Pirogue

**2. HISTORIQUE D'INVESTISSEMENT DANS L'HABITAT**

22. Est ce que c'est vous (dans la vie du CM courant) qui avez construit cette maison? | | | |

1. Oui  
2. Non > ALLEZ A Q.24

23. Si oui, comment vous l'avez construit? | | | |

1. Toute à la fois (2< ans)  
2. Par des étapes « Ndanka ndanka » (2+ans)

24. Comment avez vous financé la construction initiale ou l'achat de votre maison? [CODE]

Financement	Si emprunt, durée d'emprunt ?	Si emprunt, garantie d'emprunt ?
1. Epargne personnel 2. Epargne de communauté (tontine) 3. Donation des autres membres de la famille / amis 4. Financement d'un projet / ONG 5. Emprunt à des autres membres de la famille / amis 6. Emprunter a un tiers 7. Emprunt à la banque 8. Emprunt à une agence de micro crédit 9. Autre (à préciser) [vous pouvez indiquer jusqu'à 2 réponses]	0. n/a 1. <3 mois 2. 3-6 mois 3. 7-12mois 4. 1-2ans 5. 3-5ans 6. 6-9 ans 7. 10+ ans	0. n/a 1. aucun 2. Salaire 3. Document foncier (titre, droit de superficie, permis d'occupation) 4. Hypothèque de commerce 5. Autre (à préciser)
		10-224

25. Avez-vous fait des modifications physiques à la structure de votre habitation depuis que vous êtes là ? **ECRIRE LE CODE**

Modification	Année	Raison / motivation	Financement	Si emprunt, durée d'emprunt	Si emprunt, garantie d'emprunt
1. Aucun 2. Ajout des étages [R +1; R+2; R+3] 3. Ajout des pièces [1; 2; 3; 4...] 4. Modification de la structure de la construction (non-dure en dure) 5. Amélioration de la structure de la construction (améliorations des matériaux durs existantes.) 6. Modifications cosmétiques (c.à.d. peintre...) 7. Autre (à préciser) [vous pouvez indiquer jusqu'à 3 modifications]	Ecrire l'année	1. Élargissement de la famille 2. Pour la location 3. Amélioration de l'habitat 4. Pour la commodité 5. Pour la sécurité 6. Pour les raisons de santé / hygiène 7. Pour conformer aux normes de construction 8. Pour éviter l'empiétement des voisins 9. Pour se protéger contre la pluie / vent / soleil 10. Pour se protéger contre le déguerpissement 11. Autre (à préciser) [vous pouvez indiquer jusqu'à 3 raisons]	1. Epargne personnel 2. Epargne de communauté (tontine) 3. Donation (membres de la famille / amis) 4. Financement d'un projet 5. Emprunter a un tiers 6. Emprunt à la banque 7. Emprunt à une agence de micro crédit 8. Autre (à préciser) [vous pouvez indiquer jusqu'à 2 réponses]	0. n/a 1. 3< mois 2. 3-6 mois 3. 7-11mois 4. 1-2ans 5. 3-5ans 6. 6-10 ans 7. 10< ans	0. n/a 1. aucun 2. Salaire 3. Document foncier (titre, droit de superficie, permis d'occupation 4. Hypothèque de commerce 5. Autre (à préciser)
1ere modification :  __		1. [ ] 2. [ ] 3. [ ]			
2eme modification :  __		1. [ ] 2. [ ] 3. [ ]			
3eme modification :  __		1. [ ] 2. [ ] 3. [ ]			

### 1. LES SERVICES DE BASES en détail

26. Quelles sortes de toilettes utilisez-vous habituellement? |\_\_|

1. Toilette ou latrine du ménage / concession ALLEZ AU SECTION 3b (Q34)
2. Toilette ou latrine du voisin (autre parcelle) ALLEZ AU SECTION 3a (Q27)
3. Edicule publique ALLEZ AU SECTION 3a (Q27)
4. Dans la nature ALLEZ AU SECTION 3a (Q27)
5. Autre (à préciser) \_\_\_\_\_ ALLEZ AU SECTION 3a (Q27)

### 3a. POUR CEUX QUI N'UTILISE PAS DES TOILETTES / LATRINES DANS LEUR PARCELLE

27. A présent, est-ce que la toilette / latrine que vous utilisez fonctionne bien ? |\_\_|

1. Oui
2. Non

28. Comment trouvez-vous votre situation (par rapport aux toilettes) ? |\_\_|

1. Très insatisfait
2. insatisfait
3. OK
4. Satisfait
5. Très satisfait

Pourquoi ? \_\_\_\_\_

\_\_\_\_\_

29. Si la toilette que vous utilisez d'habitude est non-disponible / non fonctionnelle / autre raison, est-ce qu'il vous arrive d'aller ailleurs?

0. N/a
2. Autre toilette ou latrine du voisin (autre parcelle)
3. Edicule Publique
4. Dans la nature
5. Autre à préciser \_\_\_\_\_

30. Est ce que vous désirez une toilette ou une latrine chez vous?

1. Oui
2. Non

31. Pourquoi? **[DÉTAILLÉ LES RAISONS MAJEURES]**

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32. Si Oui à Q.30 quelles sont vos chances de construire un toilette ou latrine chez vous dans un an ?

1. Fort
2. Moyen
3. Faible
4. Aucun

33. Pourquoi? **[DÉTAILLÉ LES RAISONS MAJEURES]**

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### 3b. POUR CEUX QUI UTILISE DES TOILETTES / LATRINES DANS LEUR PARCELLE

34. Combien de ménages vivant dans la parcelle utilise la même toilette que le vôtre?

- Nombre de ménages dans la parcelle ? **(Se référer à Q.3 –SECTION A)**
- Nombre de toilettes (WC) dans la parcelle ?
- Nombre de fosses (qui sont utilisés) pour l'eau du WC dans la parcelle ?

35. A présent, est-ce que la toilette / latrine que vous utilisez fonctionne bien ?

1. Oui
2. Non

36. Si la toilette que vous utilisez d'habitude est non-disponible / non-fonctionnelle / autre raison, est-ce qu'il vous arrive d'aller ailleurs?

1. N/a / non
2. Toilette ou latrine du voisin (autre parcelle)
3. Edicule Publique
4. Dans la nature
5. Autre à préciser \_\_\_\_\_

37. Comment trouvez-vous votre situation (par rapport aux toilettes) ?

1. Très insatisfait
2. insatisfait
3. OK
4. Satisfait
5. Très satisfait

Pourquoi ? \_\_\_\_\_

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## 1. INVESTISSEMENT DANS LES SERVICES DE BASES

Est-ce que c'est vous (dans la vie du CM courant) qui avait fait la première installation des équipements (eau, électricité, toilette) pour votre ménage ? - c'est-à-dire qu'il n'avait pas auparavant.

**[ÉCRIRE LE CODE]**

Premier branchement / installation ?	Si oui, année	Si oui, Raison / motivation	Financement	Si emprunt, durée d'emprunt	Si emprunt, durée d'emprunt
0. n/a 1. Oui 2. Non 3. Ne sais pas  <b>[Si n/a, non ou nsp passer a la suite]</b>	Ecrire l'année	1. AU même temps de construire le logement initial 2. Élargissement de la famille 3. Pour la location 4. Amélioration de l'habitat 5. Pour la commodité 6. Pour la sécurité 7. Pour les raisons de santé / hygiène 8. Pour conformer aux normes de construction 9. Pour se protéger contre le déguerpissement 10. Autre (à préciser)  <b>[vous pouvez indiquer jusqu'à 3 raisons]</b>	1. Epargne personnel 2. Epargne de communauté (tontine) 3. Donation des autres membres de la famille / amis 4. Financement d'un projet (c.à.d. ONG, ONAS, branchement sociale) 5. Emprunt à des autres membres de la famille / amis 6. Emprunter a un tiers 7. Emprunt à la banque 8. Emprunt à une agence de micro crédit 9. Autre (à préciser)  <b>[vous pouvez indiquer jusqu'à 2 réponses]</b>	0. n/a 1. 3< mois 2. 3-6 mois 3. 7-12mois 4. 1-2ans 5. 3-5ans 6. 6-9 ans 7. 10+ ans	0. n/a 1. aucun 2. Salaire 3. Document foncier (titre, droit de superficie, permis d'occupation 4. Hypothèque de commerce 5. Autre (à préciser)
38. Premier branchement d'eau du ménage ?  __		1. [        ] 2. [        ] 3. [        ]			
39. Premier branchement d'électricité du ménage ?  __		1. [        ] 2. [        ] 3. [        ]			
40a. Première installation des toilettes / latrine privées.  __		1. [        ] 2. [        ] 3. [        ]			

40b. **Si OUI a Q40a** : chercher en particulier si il y'avait des événements de déclanchements

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41. Depuis que vous êtes ici, est ce que vous avez fait des modifications ou améliorations de vos toilettes / latrine ou fosse WC? |\_\_|

1. Oui                      quand (année) ? |\_\_| |\_\_| |\_\_| |\_\_|  
 2. Non                      > ALLEZ A Q. 45

- 42a. Quelles étaient les modifications apportées aux toilettes ou fosse (WC)?
1. Ajouter une ou plusieurs toilettes / latrines de plus.
  2. Amélioration du type / technologie (détail) \_\_\_\_\_
  3. Réparation de fosse
  4. Autre (à préciser) \_\_\_\_\_

42b. Si oui à Q.41, Pourquoi?

**[DÉTAILLÉ LES EVENEMENTS DE DECLANCHEMENT OU RAISONS MAJEURES]**

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43. Comment avez-vous financé les travaux de modifications ou d'améliorations de vos toilettes /latrine?

**[ECRIRE LE CODE]**

Financement	Si emprunt, durée d'emprunt	Si emprunt, garantie d'emprunt
1. Epargne personnel	0. n/a	0. n/a
2. Epargne de communauté (tontine)	1. 3< mois	1. aucun
3. Donation des autres membres de la famille / amis	2. 3-6 mois	2. Salaire
4. Financement d'un projet (c.à.d. ONG, ONAS, branchement sociale)	3. 7-12mois	3. Document foncier (titre, droit de superficie, permis d'occupation)
5. Emprunt à des autres membres de la famille / amis	4. 1-2ans	4. Hypothèque de commerce
6. Emprunter a un tiers	5. 3-5ans	5. Autre (à préciser)
7. Emprunt à la banque	6. 6-9 ans	
8. Emprunt à une agence de micro crédit	7. 10+ ans	
9. Autre (à préciser)		
<b>[vous pouvez indiquer jusqu'à 2 réponses]</b>		

- 44a. Est-ce que vous prévoyez des modifications de toilette (WC) ou fosse (WC)?
1. Oui
  2. Non
  3. NSP

Si Oui, détaille: \_\_\_\_\_

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- 44.b Si Oui à Q.44a quelles sont vos chances de faire ceci d'ici un an ?
1. Fort
  2. Moyen
  3. Faible
  4. Aucun

44c. Chercher à découvrir les raisons (opportunités ou contraintes).

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45. Est-ce que vous participez aux frais de vidange de fosse de la toilette que vous utiliser?
0. n/a ALLEZ AU Q. 50
  1. Oui
  2. Non ALLEZ AU Q. 50

46. Comment avez-vous financé votre contribution aux frais de vidange ?
1. Epargne personnel
  2. Epargne de communauté (tontine)
  3. Donation des autres membres de la famille / amis
  4. Emprunt (détail) \_\_\_\_\_
  5. Autre (à préciser) \_\_\_\_\_

47. Quelle méthode de vidange de fosse préférez-vous ?
1. Camion citerne
  2. Baay Pelle
  3. Manuelle par personnes de famille (c.à.d. non-frais)
  4. Autre (à préciser) \_\_\_\_\_

48. Quelles sont les raisons majeures pour ceci ?

**INDIQUER JUSQU'A 3 RAISONS**

|\_|\_| | |\_|\_| | |\_|\_|

1. Ils sont le plus apte à faire le travail
2. Ils sont les seuls qui peuvent faire le travail
3. Raisons financières
4. Commodité pour le ménage
5. Sécurité pour le ménage
6. Santé / hygiène pour le ménage
7. Propriété pour le ménage
8. Pour ne pas causer tort aux voisins
9. Pour ne pas causer tort à l'environnement
10. Autre (à préciser) \_\_\_\_\_

49. Avez-vous une idée de l'endroit où les déchets (les boues des toilettes) sont déversés?

<b>[ECRIRE LE CODE]</b>	<ol style="list-style-type: none"> <li>1. Dans la nature</li> <li>2. Dans la mer</li> <li>3. Canal / égout ouvert</li> <li>4. Egout (fermé)</li> <li>5. Enterrement dans la rue</li> <li>6. Station d'épuration / de traitement</li> <li>7. Autre</li> <li>8. Ne sais pas</li> </ol>
Réponse camion	
Réponse Baay Pelle	

50. D'après vous qui est responsable pour...

<b>[ECRIRE LE CODE]</b> <b>VOUS POUVEZ INDIQUER JUSQU'A 4 REPONSES</b>	<ol style="list-style-type: none"> <li>0. Propriétaire du logement</li> <li>1. Locataires</li> <li>2. Hébergés</li> <li>3. Tous ce qui habite dans le logement</li> <li>4. Autre (à préciser) _____</li> </ol>
50. l'installation / l'amélioration des toilettes au ménage?	_ _     _ _     _ _     _ _
51. Des réparations et l'entretien des toilettes si nécessaire ?	_ _     _ _     _ _     _ _
52. Le vidange de la fosse ?	_ _     _ _     _ _     _ _

### 1. LE STATUT FONCIER

#### INFOS DU CHEF DE MÉNAGE COURANT

53. Depuis quand est ce que vous habitez ici?	54a. Avant d'être ici où habitez vous?	55. Quelles étaient les raisons principales pour votre déplacement ?	56. Dans votre logement précédent vous étiez
<ol style="list-style-type: none"> <li>1. Ne sais pas</li> <li>2. Depuis naissance</li> <li>3. &lt;1ans</li> <li>4. 1-5ans</li> <li>5. 6-10ans</li> <li>6. 11-20ans</li> <li>7. 21-40ans</li> <li>8. 41-50ans</li> <li>9. 50+ans</li> </ol>	<ol style="list-style-type: none"> <li>0 n/a</li> <li>1 Même quartier</li> <li>2 Autre quartier mais même commune</li> <li>3 Autre commune mais dans le même département</li> <li>4 Autre département dans la région de Dakar.</li> <li>5 En dehors de la région de Dakar</li> <li>6 A l'étranger</li> </ol>	<ol style="list-style-type: none"> <li>0 n/a</li> <li>1 Raison d'accès aux terrains ou propriété foncière</li> <li>2 Sécurité de personnes</li> <li>3 Proximité / rapprochement de lieu de l'emploi</li> <li>4 Chercher opportunités d'emploi</li> <li>5 Accès aux services de bases (santé, éducation...)</li> <li>6 Raisons financières (loyer, cout de vie....)</li> <li>7 Mariage / raisons familiales</li> <li>8 Autre (à préciser)</li> </ol> <p>[indiquer jusqu'à 3 raisons]</p>	<ol style="list-style-type: none"> <li>1. n/a</li> <li>2. Vivait chez les parents / la famille</li> <li>3. Hébergé (chez non-famille)</li> <li>4. Locataire</li> <li>5. Copropriétaire</li> <li>6. Propriétaire</li> <li>7. Autre</li> </ol>
		<ol style="list-style-type: none"> <li>1. [            ]</li> <li>2. [            ]</li> <li>3. [            ]</li> </ol>	
	54b. Détaillé :		

57. Est-ce que vous prévoyez de vous déplacer dans les 2 ans à venir ?
1. Oui Si oui, pourquoi ? \_\_\_\_\_
  2. Non
  3. Ne sais pas
58. Est ce que ce terrain vous appartient ?
1. Oui (propriétaire)
  2. Oui (copropriétaire)
  3. Non
  4. Ne sais pas
59. Par quelle voie avez-vous obtenu votre terrain ou votre maison?
1. Héritage > ALLEZ A Q.63
  2. Achat
  3. Droit coutumier
  4. Donation / allocation
  5. Ne sais pas
  6. Autre (à préciser) \_\_\_\_\_
60. C'était en quelle année? |\_\_|\_\_|\_\_|\_\_| (si ne sais pas marquer 0000)
61. Est-ce vous avez paye pour obtenir le terrain / maison?
1. Oui, combien? \_\_\_\_\_ FCFA
  2. Non
  3. Ne sais pas
62. Vous avez obtenu votre terrain ou votre maison de qui ?
1. Membre de la famille
  2. Coutier foncier
  3. Chef coutumier
  4. Le cadastre / la Marie
  5. Un tiers
  6. ne sais pas
  7. autre (à préciser) \_\_\_\_\_
63. Est-ce que vous avez un justificatif de propriété pour votre terrain / logement?
1. Titre foncier
  2. Droit de superficie
  3. Permis d'occupation administratif
  4. Bail
  5. Certificat d'héritage
  6. Acte de vente écrite
  7. Autorisation verbale > ALLEZ A Q.66
  8. Ne sais pas > ALLEZ A Q.66
  9. Non > ALLEZ A Q.66
64. En référant à la réponse de Q.63, le document est au nom de qui ?
1. Chef de ménage courant
  2. Autre (à préciser par rapport au CM) \_\_\_\_\_
  3. Ne sais pas
  4. C'est un document général du quartier
65. Est-ce que vous connaissez votre numéro de parcelle ?
1. Oui, c'est quoi ? |\_\_|\_\_|\_\_|\_\_|
  2. Non

66. Si applicable (c.à.d. qu'il n'ont pas), est-ce que vous chercher soit un droit de superficie ou un titre foncier ?
- 0. n/a ALLEZ A Q.69
  - 1. Oui
  - 2. Non
  - 3. Ne sais pas ALLEZ A Q.69

67. Quels sont les motivations ou raisons majeurs pour ceci ? [DÉTAILLÉ]

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68. Est-ce que vous avez déjà fait des cotisations pour obtenir le droit de superficie ou titre foncier ?
- 1. Oui
  - 2. Non
  - 3. Ne sais pas

69. POUR LE CHERCHER : EST-CE QUE VOUS AVEZ VU LE DOCUMENT ?   
(Bail, certificat d'occupation administratif, droit de superficie ou titre foncier)
- 1. Oui
  - 2. Non

## 1. PERCEPTIONS DE SECURITE FONCIERE

70. A DEMANDER SI LE REPONDEUR A DEJA FAIT OU PREVOIT DES MODIFICATIONS (se référer aux Q. 25, Q.38-40)

- Est-ce que vous croyez que ces modifications vous sécurise plus ici ?
- 0. n/a ALLEZ A Q.72
  - 1. Oui
  - 2. Non
  - 3. Ne sais pas ALLEZ A Q.72

71. Chercher à découvrir pourquoi ?

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72. Selon vous quelles sont les possibilités qu'on puisse vous déguerpir de chez vous, dans les 5 ans qui viennent ?
- 0. Ne sais pas ALLEZ A Q.74
  - 1. Impossible
  - 2. Faible
  - 3. Moyen
  - 4. Fort
  - 5. Certain

73. Chercher à découvrir pourquoi ?

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74. Est-ce que ça vous est déjà arrivé d'être déguerpi ?
- 1. Oui, > préciser l'année
  - 2. Non > ALLEZ A Q.76
  - 3. Ne sais pas > ALLEZ A Q.76

75. Chercher à découvrir pourquoi ?

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## 6. COMMENTAIRES / QUESTIONS

76. Est-ce que vous avez des commentaires additionnels ou des questions ?

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**SECTION C : MÉNAGE LOCATAIRE / (HEBERGES)****1. DETAILS DU MENAGE****77. Détails du Chef de Ménage [ECRIRE LE CODE]**

Statut	Age	Sex	Ethnie	Education	Secteur d'occupation
1. Propriétaire	1. 10-19	1. M	1. ouolof / Lebou	1. Aucun	1. Salarié du public
2. Copropriétaire	2. 20-29	2. F	2. sérère	2. Ecole Arabe/ Coranique	2. Salarié du privé
3. Locataire	3. 30-39		3. peulh ou toucouleur	3. Primaire	3. Professionnels libérales
4. Hébergé	4. 40-49		4. mandingue / socé	4. Secondaire	4. commerçant du secteur formel
	5. 50-59		5. diola	5. Supérieur	5. commerçant du secteur informel
	6. 60+		6. Autre (à préciser)	6. Professionnelle	6. journalier
					7. chômeur
					8. retraité
					9. autre

**78. Préciser les habitants actuels dans le ménage [INDIQUER LE NOMBRE]**

Adultes (20+)		Adolescents (10-19)		Enfants (<10ans)	TOTAL
M	F	M	F		

**79. Quelle est le revenu moyen mensuel du ménage ? (Chercher la moyenne par mois)**

[ECRIRE LE CODE]	
	1. < 50 000 FCFA
	2. 50 000 – 99 000 FCFA
	3. 100 000– 149 000 FCFA
	4. 150 000 – 199 000 FCFA
	5. 200 000 – 249 000 FCFA
	6. 250 000 – 299 000 FCFA
	7. 300 000 + FCFA
	8. Ne sais pas
Revenus mensuels du ménage	
Revenus transferts	
Revenu mensuel des locations	
TOTAL Revenus du ménage	

**80. Les biens du ménage [INDIQUER LE NOMBRE]**

TV	Radio	Téléphone fixe	Téléphone portable	Bicyclette	Frigo	Voiture	Pirogue

**2. LES SERVICES DE BASES en détail**

81. Quelle sorte de toilettes utilisez-vous habituellement? |\_|\_|

1. Toilette ou latrine du ménage / concession ALLEZ AU SECTION 2b (Q93)
2. Toilette ou latrine du voisin (autre parcelle) ALLEZ AU SECTION 2a (Q82)
3. Edicule publique ALLEZ AU SECTION 2a (Q82)
4. Dans la nature ALLEZ AU SECTION 2a (Q82)
5. Autre (à préciser) \_\_\_\_\_ ALLEZ AU SECTION 2a (Q82)

**2A. POUR CEUX QUI N'UTILISE PAS DES TOILETTES / LATRINES DANS LEUR PARCELLE**

82. A présent, est-ce que la toilette / latrine que vous utilisez fonctionne bien? |\_|\_|

1. Oui
2. Non

83a. Comment trouvez-vous votre situation (par rapport aux toilettes)? |\_|\_|

1. Très insatisfait
2. insatisfait
3. OK
4. Satisfait
5. Très satisfait

83b. Pourquoi ? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

84. Si la toilette que vous utilisez d'habitude est non-disponible / non-fonctionnelle / autre raison, est-ce qu'il vous arrive d'aller ailleurs?

- 0. N/a
- 2. Autre toilette ou latrine du voisin (autre parcelle)
- 3. Edicule Publique
- 4. Dans la nature
- 5. Autre à préciser \_\_\_\_\_

85. Est ce que vous désirez une toilette ou une latrine chez vous?   
1. Oui                      2. Non

86.. Pourquoi / pourquoi pas? [DÉTAILLÉ LES TROIS RAISONS MAJEURES]

1.	
2.	
3.	

87. Est-ce que vous avez demandé à votre propriétaire d'installer une toilette pour votre ménage?

- 1. Oui
- 2. Non
- 3. Ne sais pas                      ALLEZ A Q.89

88. Pourquoi / pourquoi pas? [DÉTAILLÉ LES TROIS RAISONS MAJEURES]

1.	
2.	
3.	

89 Quelles sont vos chances qu'une toilette ou latrine soit construite chez vous dans un an ?

- 1. Fort
- 2. Moyen
- 3. Faible
- 4. Aucun

90. Pourquoi? [DÉTAILLÉ LES TROIS RAISONS MAJEURES]

1.	
2.	
3.	

91. Est-ce que vous seriez prêt à payer ou à participer pour l'installation d'une toilette pour votre ménage?

- 1. Oui                      > quelle montant \_\_\_\_\_ FCFA (pour le cout initiale)
- 2. Non
- 3. Ne sais pas >ALLEZ A Q.100

92. Pourquoi? [DÉTAILLÉ LES TROIS RAISONS MAJEURES]

1.	
2.	
3.	

**2b. POUR CEUX QUI UTILISE DES TOILETTES / LATRINES DANS LEUR PARCELLE**

93. Combien de ménages vivant dans la parcelle utilise la même toilette que le vôtre?

Nombre de ménages dans la parcelle ? (Se référer à Q.3 –SECTION A)

Nombre de toilettes dans la parcelle ?

Nombre de fosses (qui sont utilisés) pour l'eaux du WC dans la parcelle ?

94. A présent, est-ce que la toilette / latrine que vous utilisez fonctionne bien ? |\_\_\_|  
 1. Oui                      2. Non

95. Si la toilette que vous utilisez d'habitude est non-disponible / non-fonctionnelle / autre raison, est-ce qu'il vous arrive d'aller ailleurs? |\_\_\_|  
 1. N/a ou non  
 2. Toilette ou latrine du voisin (autre parcelle)  
 3. Edicule Publique  
 4. Dans la nature  
 5. Autre à préciser \_\_\_\_\_

96. Comment trouvez-vous votre situation (par rapport aux toilettes) ? |\_\_\_|  
 1. Très insatisfait  
 2. insatisfait  
 3. OK  
 4. Satisfait  
 5. Très satisfait

Pourquoi ? \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

97. Comment est ce que la situation (par rapport aux toilettes) pourrait être améliorée ?

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

98. Quelles sont les chances que la toilette que vous utiliser soit améliorée de la façon que vous désirez dans un an ? |\_\_\_|  
 1. Fort  
 2. Moyen  
 3. Faible  
 4. Aucun

99. Pourquoi? [DÉTAILLÉ LES TROIS RAISONS MAJEURES]

1.	
2.	
3.	

**3. HISTORIQUE D'INVESTISSEMENT DANS L'HABITAT**

100 Est-ce que vous avez jamais participé aux financements des modifications de structure ou équipements de votre logement ? |\_\_\_|  
 1. Oui  
 2. Non                      > ALLEZ A Q.102

101. Si oui à Q.100 [DETAILLE]

Modification	Motivation	Somme de contribution	Moyen de financement	Détails d'emprunt (si applicable)

102. Est-ce que vous avez participé aux frais de vidange de fosse de votre logement? (c.à.d. en dehors du loyer normal) ?

- 0. n/a > ALLEZ AU Q.106
- 1. Oui
- 3. Non > ALLEZ AU Q.104
- 4. Ne sais pas > ALLEZ AU Q.104

103. Comment avez-vous financé votre contribution aux frais de vidange ?

- 1. Epargne personnel
- 2. Epargne de communauté (tontine)
- 3. Donation des autres membres de la famille / amis
- 4. Emprunt (détail) \_\_\_\_\_
- 5. Autre (à préciser) \_\_\_\_\_

104. Quelle méthode de vidange de fosse préférez-vous ?

- 1. Camion citerne
- 2. Baay Pelle
- 3. Manuelle par personnes de famille (c.à.d. non-frais)
- 4. Autre (à préciser) \_\_\_\_\_

105. Quelles sont les raisons majeures pour ceci ?

**INDIQUER JUSQU'A 3 RAISONS**

- 1. Ils sont les plus aptes à faire le travail
- 2. Ils sont les seuls qui peuvent faire le travail
- 3. Raisons financières
- 4. Commodité pour le ménage
- 5. Sécurité pour le ménage
- 6. Santé / hygiène pour le ménage
- 7. Propriété pour le ménage
- 8. Pour ne pas causer tort aux voisins
- 9. Pour ne pas causer tort à l'environnement
- 10. Autre (à préciser) \_\_\_\_\_

106. Avez-vous une idée de l'endroit où les déchets (les boues des toilettes) sont déversés?

<b>[ECRIRE LE CODE]</b>	<ul style="list-style-type: none"> <li>1. Dans la nature</li> <li>2. Dans la mer</li> <li>3. Canal / égout ouvert</li> <li>4. Egout (fermé)</li> <li>5. Enterrement dans la rue</li> <li>6. Station d'épuration / de traitement</li> <li>7. Autre</li> <li>8. Ne sais pas</li> </ul>
Réponse camion	
Réponse Baay Pelle	

107. D'après vous qui est responsable pour...

<b>[ECRIRE LE CODE]</b> <b>VOUS POUVEZ INDIQUER JUSQU'A 4 REPONSES</b>	<ul style="list-style-type: none"> <li>1. Propriétaire du logement</li> <li>2. Locataires</li> <li>3. Héberges</li> <li>4. Tous ce qui habite dans le logement</li> <li>5. Autre (à préciser) _____</li> </ul>
107. l'installation / l'amélioration des toilettes au ménage?	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
108. Des réparations et l'entretien des toilettes si nécessaire ?	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
109. Le vidange de la fosse ?	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

#### 4. LE STATUT FONCIER

##### POUR LE CHEF DE MENAGE

110. Depuis quand est ce que vous habitez ici?	111a. Avant d'être ici vous habitez où ?	112. Quels étaient les raisons principales pour votre déplacement ?	113 Dans votre logement précédent vous étiez
1. Ne sais pas 2. Depuis naissance 3. <1 ans 4. 1-5 ans 5. 6-10 ans 6. 11-20 ans 7. 21-40 ans 8. 41-50 ans 9. 50+ ans	0 n/a 1 Même quartier 2 Autre quartier mais même commune 3 Autre commune mais dans le même département 4 Autre département dans la région de Dakar. 5 En dehors de la région de Dakar 6 A l'étranger	0 n/a 1 Raison d'accès aux terrains ou propriété foncière 2 Sécurité de personnes 3 Proximité / rapprochement de lieu de l'emploi 4 Access aux services de bases (santé, éducation...) 5 Raisons financières (loyer, cout de vie....) 6 Mariage / raisons familiale 7 Autre (à préciser) [indiquer jusqu'à 3 raisons]	0. n/a 1. Vivait chez les parents / la famille 2. Hébergé (chez non-famille) 3. Locataire 4. Copropriétaire 5. Propriétaire 6. Autre
		1. [            ] 2. [            ] 3. [            ]	
	111b. Détaillé :		

114. Est-ce que vous prévoyez de vous déplacer dans les 2 ans à venir ?

1. Oui Si oui, pourquoi ? \_\_\_\_\_

2. Non

3. Ne sais pas

115. Est ce que vous payez un loyer pour cette habitation?

1. Oui

2. Non ALLER A Q.118

3. Ne sais pas ALLER A Q.118

116. Si oui à Q115

a. combien \_\_\_\_\_ (FCFA)

b. tous les \_\_\_\_\_ (fréquence)

117. Est-ce que vous avez un bail écrit pour votre logement ?

1. Oui

2. Non

3. Ne sais pas

118. Est-ce que vous participez aux factures en dehors du loyer normal ?

[ECRIRE LE CODE]	1. Oui (facture privée du ménage) 2. Oui (facture partagé avec autres ménages) 3. Non
a. Factures d'eau	
b. Factures d'électricité	

#### 5. PERCEPTIONS DE SECURITE FONCIERE

119. A DEMANDER SI LE REPONDEUR A DEJA FAIT OU PREVOIT DES MODIFICATIONS (se référer à Q101)

Est-ce que vous croyez que ces modifications vous sécurisent plus ici ?

0. n/a ALLEZ A Q.121

1. Oui

2. Non

3. Ne sais pas ALLEZ A Q.121

120. Chercher à découvrir pourquoi ?

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121. Selon vous quelles sont les possibilités qu'on puisse vous déloger de chez vous, dans les 5 ans à venir ?

- 0. Ne sais pas > ALLEZ A Q.123
- 1. Impossible
- 2. Faible
- 3. Moyen
- 4. Fort
- 5. Certain

122. Chercher à découvrir pourquoi ?

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123. Est-ce que ça vous est déjà arrivé d'être délogé ?

- 1. Oui, > préciser l'année
- 2. Non > ALLEZ A Q.125
- 3. Ne sais pas > ALLEZ A Q.125

124. Chercher à découvrir pourquoi ?

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## **6. COMMENTAIRES / QUESTIONS**

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125. Est-ce que vous avez des commentaires additionnels ou des questions (notez tous) ?

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Quel est le nom du chef de quartier : \_\_\_\_\_

Date: |\_\_|\_|\_|\_|\_|\_|\_|\_|\_| (jj /mm/aa)

Questionnaire #: |\_\_|\_|\_|\_|\_|\_| D

DR : |\_\_|\_|\_|\_|

Commune d'arrondissement :

Questionneur :

Observateur:

SECTIONS DU QUESTIONNAIRE QUI DOIVENT ETRE COMPLETEES : |\_\_|\_|\_|\_|\_|\_|\_|\_|\_|

Raison si un section n'a pas pu être complétée \_\_\_\_\_

**SECTION D: OBSERVATION TOUS LES MENAGES****1. LE LOGEMENT**

Type d'habitat |\_\_|\_|\_|\_|

1. Maison
2. Concession
3. Immeuble d'appartements
4. Autre (à préciser) \_\_\_\_\_

Rez-de-chaussée + |\_\_|\_|\_|\_| étages.

**2. MATERIAUX DE CONSTRUCTION**

Toiture |\_\_|\_|\_|\_|

1. Ciment / dure
2. Tuiles
3. Ardoise
4. Zinc
5. Bois / Tôle
6. Autre (à préciser)

Sol dans la cours |\_\_|\_|\_|\_|

1. Ciment / dure
2. Carrelage
3. Sable / nature
4. Autre a préciser

Rue immédiatement dehors |\_\_|\_|\_|\_|

1. Ciment / Pave
2. Sable / nature
3. Autre (a préciser)

Murs |\_\_|\_|\_|\_|

1. Ciment / dure
2. Zinc
3. Bois / Tôle
4. Autre (à préciser)

Etat du logement |\_\_|\_|\_|\_|

1. Excellent.
2. Moyen
3. Dégradé

Sol (a l'intérieur du logement) |\_\_|\_|\_|\_|

1. Ciment / dure
2. Carrelage
3. Sable / nature
4. Autre à préciser

Construction en cours |\_\_|\_|\_|\_|

1. Oui
2. Non

Observer le logement et ses environs

		1. Oui 2. Non
LA CONSTRUCTION DU LOGEMENT	Grand fissures aux murs	
	Fenêtres non sécurisé (c.à.d. juste une ouverture à l'extérieure)	
	Fenêtres cassées ou absentes (qui laissera la pluie rentrer facilement)	
	Trous dans le plafond / plafond incomplet	
	Porte d'entrée non sécurisé	
LA SITUATION ENVIRONNEMENT ALE IMMEDIATEMENT AUTOUR L'HABITAT – 10M	Petites ruelles (c.à.d. qu'un voiture/camion ne peut pas accéder au logement)	
	Petits passages (couloirs) entre les maisons, habitations très denses,	
	Construction de rues et maisons irrégulières	
	Maison localisée dans les zones d'inondation	
	Maison localisée au bord de la mer	

## Appendix C: Database summary

Overall 363 households on 340 plots with a total of 261 owners; 97 tenant and 5 guest households were surveyed. Guest households were treated as (non-paying tenants). Surveys were conducted in four areas of peri-urban Dakar. All areas were in the Department of Pikine.

Survey Area	Name	Code	Sample
Unplanned Settlement	Thiaroye Kao	A	100 Plots
Planned Settlement	Pikine Ancien	B	100 Plots
Regularised Settlement	Pikine Irrégulier Sud	C	100 Plots
Traditional Settlement	Thiaroye Sur Mer	D	40 Plots

Semi-structured interviews were conducted with representatives of city planning and urban management, water and sanitation institutions and organisations (n=15) and local leaders of the residential settlements (n=32).

PARTICIPANT	ROLE	METHOD	NUMBER
Area Delegate	Local representative	Structured interview	32
ONAS PAQPUD	Head of PAQPUD project	Semi-structured interview	1
ONAS, Direction of Commerce	Director	Semi-structured interview	1
ONAS, Direction of works and research	Director	Semi-structured interview	1
Sénégalais des Eaux, Direction of Works	Director	Semi-structured interview	1
Sénégalais des Eaux, Direction of Customer services	Director	Semi-structured interview	1
Direction of observation and control of land occupation (MUAT / BSCOS)	Director	Semi-structured interview	1
Direction of Urbanism and Architecture (MUAT / DUA)	Director	Semi-structured interview	1
Direction of Organisation of Territory (MUAT / DAT)	Director	Semi-structured interview	1
FDV regularisation project	Target specialist group	Semi-structured interview	1
Urbanisation Office of Pikine	Tenure officer	Semi-structured interview	1
ONAS (TSM resistance)	Local representative	Semi-structured interview	1
Civil society (TSM resistance)	Locally elected leader	Semi-structured interview	1
Faecal sludge management (AAAS, trucks)	President of AAAS (truck emptier association)	Semi-structured interview	1
Pit emptying truck company	Operators	Semi-structured interview	1

## Appendix D – Cross tabulation data

### Tenure typology and user satisfaction

Tenure.type \* B.WC\_perceptionsimplified Crosstabulation

Count

		B.WC_perceptionsimplified			Total
		unsatisfied	OK	satisfied	
Tenure.type	neo-customary/spontaneous	31	35	55	121
	planned	17	13	73	103
	regularised	17	16	60	93
	traditional/customary	3	11	31	45
Total		68	75	219	362

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.005 <sup>a</sup>	6	.001
Likelihood Ratio	23.301	6	.001
Linear-by-Linear Association	10.149	1	.001
N of Valid Cases	362		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.45.

## Appendix E - Key informant reference code

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- KI.01: MUAT Representative from the department of land management (DAT)
- KI.02: MUAT Representative from the department of control of land occupation (BSCOS)
- KI.03: MUAT Representative from the department of urbanisation (DUA)
- KI.04: ONAS infrastructure representative
- KI.05: ONAS marketing representative
- KI.06: SDE representative
- KI.07: ONAS PAQPUD representative
- KI.08: Opposition representative in Thiaroye sur Mer
- KI.09: Local government representative (Pikine commune)
- KI.10: A.A.A.S. representative, pit emptying association
- KI.11: Trucker emptier (manager)
- KI.12: Trucker emptier (operator)
- KI.13: PAQPUD / AGETIP liaison representative, Thiaroye sur Mer

# Appendix F – Photos of surveyed settlements

## *Thiaroye Kao*



Figure 10-1: Thiaroye Kao street next to flood basin (taken by author 2008)



Figure 10-2: Typical street of Thiaroye Kao (taken by author 2008)



Figure 10-3: Narrower street of Thiaroye Kao (taken by author 2008)

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*Pikine Ancien*



Figure 10-4: Typical tertiary street of Pikine Ancien (taken by author 2008)



Figure 10-5: Market in Pikine Ancien (taken by author 2008)



Figure 10-6: Example of heterogeneity of buildings in Pikine Ancien (taken by author 2008). Tenants lived in the wooden dwelling.



Figure 10-7: Regularised area, road built through project (taken by author 2008)



Figure 10-8: Regularised area, flooding in road (taken by author 2008)



Figure 10-9: Border of SamSam1/2 in dry season (Regularised) (taken by author 2008)



Figure 10-10: Border of SamSam1/2 in rainy season (regularised area) (taken by author 2008)



Figure 10-11: Regularisation plan for Pikine Irrégulier Sud demonstrates the planned roads and infrastructure



Figure 10-12: Flooded septic tank Pikine Irrégulier Sud (taken by author 2008)<sup>55</sup>.

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<sup>55</sup> In this dwelling the owners moved upstairs and rented the ground floor rooms. A mother with three young children lived three metres away from this tank



Figure 10-13: Typical larger street of Thiaroye sur Mer (taken by author 2008)



Figure 10-14: Typical narrower street of Thiaroye sur Mer, with septic tank built in the middle (taken by author 2008)



Figure 10-15: Passage to concessionary housing in Thiaroye Sur Mer (taken by author 2008)



Figure 10-16: Pit broken to allow overflow in Thiaroye sur Mer (taken by author 2008)

## Appendix G – Pit emptying / FSM technologies



Figure 10-17: VAGUTUG (taken by author in 2008 Dakar)<sup>56</sup>



Figure 10-18: Sludge gulper (Photo by Dr Jean Meadly) taken in Dar es Salaam date unknown.

<sup>56</sup> destined for narrow passageways of Dakar but difficult to implement due to large distance to travel and problematic access.



Figure 10-19: Hopper mobile transfer station (eThekweni) MacLeod 2005



Figure 10-20: FS treatment centre Cambarène Dakar, worker manually removing foreign material from grate (taken by author 2008 Dakar)



Figure 10-21: Foreign material collected in FS (taken by author Dakar 2008)



Figure 10-22: Truck emptier emptying a full household septic tank (taken by author 2008)

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