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THE UNIQUE CHALLENGES OF IMPROVING PERI-URBAN SANITATION

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by

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Voices From the City. March 1993. Newsletter of the Peri-Urban Network on Water Supply and Environmental Sanitation. WASH Project.

Water Supply Issues in the Peri-Urban (Informal) Sector. Field Report 355, May 1992. Prepared by Richard McGowan, Jonathan Hodgkin, and Paul Kaplan.

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ACRONYMS

A.I.D.	Agency for International Development
CHF	Cooperative Housing Foundation
DVC	Dual vault composting latrine
ESA	External support agencies
NGO	Nongovernmental organization
O&M	Operations and maintenance
PF	Pour-flush toilet
UNDP	United Nations Development Program
USAID	United States Agency for International Development
VIP	Ventilated improved pit latrine
WASH	Water and Sanitation for Health Project
WG/U	Working Group on Urbanization of the Water Supply and Sanitation Collaborative Council
WS&S	Water supply and sanitation

EXECUTIVE SUMMARY

An estimated 600 million people in urban areas of developing countries now live in life- and health-threatening homes and neighborhoods, primarily in peri-urban settlements. Peri-urban areas are characterized by uncertain land tenure, inferior infrastructure, low incomes, and lack of recognition by formal governments. The rapid growth and informal status of these high-density population areas have resulted in low levels of sanitation services. These communities tend to be ignored by municipal authorities, who find themselves overwhelmed by the informal sector=s sheer numbers and needs, which far outstrip the capacity of the local planners and government. A lack of basic servicesXin particular the lack of adequate excreta managementXthreatens the public health and the environment of peri-urban settlements and urban areas as a whole. This segment of the population, therefore, should be a focus of concern, but even the few institutions that recognize the problem and want to do something about it find that there exists little knowledge or experience about how to address this problem.

This document is intended to be an informational tool that helps project designers better understand and confront the problems in improving sanitation in peri-urban areas. It is not meant to be a technical design manual, nor is it a comprehensive reference document on existing technologies. The ultimate goals of the report are to provide the reader with some key questions to ask, with information to gather as part of the planning and design process, and with suggestions about what basic approach to follow in setting up peri-urban sanitation projects.

Peri-urban areas present unique challenges to sanitation improvement activities. Most challenging are the characteristics that set these areas apart from the urban and rural sectors: poor site conditions, unreliable water availability, high population density, the heterogeneous nature of the population, and the lack of legal land tenure. These characteristics are much more complex than those typifying rural and formal urban areas. The ?standard≅ technical and social solutions for low-cost sanitation currently used in rural communities are not necessarily appropriate for improving community sanitation in peri-urban areas.

Conventionally, most community sanitation problem assessments and project design efforts focus primarily on the technical feasibility of the various technical intervention options. Experience to date suggests that these technology-driven projects often fail to meet their objectives. This report suggests that the complexities of peri-urban settlements require that a more comprehensive interdisciplinary approach be used to clarify the problem before attempting to design a project that will address peri-urban community sanitation needs. This document reviews the key public health, environmental, social, financial, economic, legal, and institutional issues that many of these settlements face and must be understood before developing a program designed to improve a peri-urban community=s sanitation services. To address these problems, the project designer must deal not only with engineers but also with legal specialists, financial analysts, social scientists, urban planners, and a wide range of institutions, such as the water and sanitation utility, the Ministry of Health, urban development authorities, and the municipality.

The document should be particularly useful for those project officers in the Agency for International Development (A.I.D.) and other international organizations who come to the urban sector with ?generalist≅experience, or with previous experience in providing water and sanitation in either developed countries or in rural areas of less developed countries. The paper also should be helpful for technical specialists who assist with project development, particularly in ensuring that they become aware of issues in a wide range of subject areas other than their specialty.

The sanitation challenges peri-urban areas present are unique, and they demand that difficulties in providing appropriate excreta disposal systems be confronted head-on. In some ?impossible situations,≅ no technical solution will prove viable. To create new solutions, project leaders must challenge the status quo at the municipal and national levels of developing countries, which continue to deal with urban sanitation in a conventional way. By necessity or choice, in the foreseeable future, government institutions, bilateral and multilateral aid organizations, the engineering sector, and NGOs, all will be compelled to shift more of their attention and resources to the sanitation needs of peri-urban populations.

1

INTRODUCTION

1.1 Defining the Peri-Urban Sector

Third World cities are divided into two distinct sectors: formal and informal, or urban and peri-urban. Peri-urban and informal sector settlements are also commonly referred to as squatter settlements, marginal settlements, shantytowns, urban slums, or illegal settlements. A consensus definition of peri-urban areas or urban informal sectors has been difficult to achieve among practitioners and researchers; however, there is general agreement to include settlements that are marginal to the physical and regulatory boundaries of the formal city. In other words, local and national governments consider the urban formal sector legitimate, but do not approve of peri-urban/informal sector settlements.

Peri-urban settlements largely develop outside of government control and do not follow strictly formal and traditional urban planning and development processes. It is important to note, though, that the peri-urban sector is not monolithic and, more often than not, ?informal settlement development≅is a hybrid of formal and informal systems.

Peri-urban areas are characterized by uncertain or illegal land tenure, minimal or no infrastructure, low incomes, and lack of recognition by formal governments. Families who live in informal settlements build on the cheaper land outside city limits, on land within city limits that is not zoned for housing, on land that has not been ?urbanized≅ with infrastructure, or on land considered dangerous or environmentally fragile. Many informal settlements begin as land invasions with families illegally squatting on the land. Other informal settlements begin with the legal landowner illegally subdividing and selling the land without formal land registration or basic service provisions. Families often pay the former owner or occupant the full purchase price, but receive in return no registered title to the land. They generally do not participate in local government and are unconnected to the municipal service network. Finally, they tend to be ignored by municipal authorities, who find themselves overwhelmed by the informal sector=s sheer numbers and needs, which far outstrip the capacity of the local planners and government.

The peri-urban population should, therefore, be a focus of concern. Spatially, peri-urban areas are growing much more rapidly than formal urban districts; in many cities, the peri-urban sections are already bigger than the formal areas. Their rapid growth and informal status have resulted in low levels of sanitation services. The lack of these servicesXin particular, inadequate excreta (human waste) managementXthreatens the public health and environment of the peri-urban settlement, as well as the urban area as a whole. But even the few institutions that recognize the problem and want to do something about it find that little knowledge or experience exists about how to address this

problem constructively.

1.2 Purpose of the Report

The purpose of this report is to increase the understanding of the serious and growing problem of inadequate disposal and management of human excreta in the exploding peri-urban areas of cities throughout the developing countries. To this end, the paper does the following:

- Summarizes the most common conditions of peri-urban settlements, highlighting what sets them apart from rural and formal urban areas
- Reviews key technical, social, economic, and other issues facing many of these settlements
- Highlights the existing technologies that may be most applicable in peri-urban areas
- Provides suggestions regarding the questions that project designers should ask to clarify and better understand the problem before designing a strategy to address peri-urban sanitation needs

In summary, this document is meant to be an informational tool that helps project designers begin to understand and confront the problems in bringing better sanitation to peri-urban areas. It is not meant to be a guideline or design manual, nor is it a comprehensive reference document on existing sanitation technologies. The ultimate goals of the report are to provide the reader working in a specific country with some key questions to ask and information (such as legal land tenure data) to gather, the results of which should be incorporated into an appropriate planning and design process.

1.3 Development of the Report

This report was initiated with the recognition that the knowledge and experience resulting from sanitation interventions in peri-urban areas are limited, this document draws on this limited experience. The report should be seen as forward looking, not as a lessons-learned document. Some clear lessons learned can be shown in perhaps two or three years, and this report then can be revised accordingly.

This report was developed in three phases. As part of the first phase, researchers reviewed the current literature on sanitation in developing countries and conducted individual interviews with key sanitation experts representing several international organizations. The outcome of this phase identified major issues commonly affecting peri-urban sanitation and the provision of improved sanitation infrastructure in developing countries.

The second phase of the report=s development comprised a discussion and analysis of the issues raised in phase one. This took the form of a one-day workshop held in Washington, D.C., in June 1992. The workshop was attended by 18 urban and sanitation specialists, including some of the individuals interviewed during phase one. (The list of workshop participants and the organizations

they represent is shown in Appendix A.)

The third phase of the report, writing and review, resulted in a first draft that incorporated the results of previous work in phases one and two. The draft was reviewed within WASH, and externally by selected reviewers. This final document incorporates the results of the review process.

Continuing feedback and experience should result in new conclusions and contribute to a more comprehensive document in several years.

1.4 Organization of the Report

Chapter 2 is intended to help clarify the characteristics of peri-urban areas that set them apart from rural or formal urban areas, and show why these characteristics present some unique challenges for sanitation project interventions. Chapters 3, 4, and 5 identify the most important considerations when planning sanitation improvement activities in peri-urban areasXpublic health, environmental, social, financial, legal, institutional, and technical considerations. Chapter 6 contains the report=s recommendations.

1.5 Intended Users

This document is intended to help project design officers in A.I.D. and other international organizations better understand the problems of inadequate disposal and management of human excreta in the peri-urban areas of cities throughout the developing world and therefore enable them to design more effective peri-urban sanitation strategies and programs in the future. The paper should be particularly useful to those A.I.D. officers who come to the urban sector with ?generalist≅ experience, or with previous experience in providing water and sanitation in either developed countries or in rural areas of less developed countries. The report also should help technical specialists who assist with project development, particularly in ensuring that they become aware of issues in a wide range of technical areas other than their specialty. Finally, the authors hope that urban planners and municipal administrators in developing countries, and officials in other donor organizations, will find this document useful in increasing their knowledge of issues affecting peri-urban sanitation.

2

CHARACTERISTICS AND SANITATION CHALLENGES OF PERI-URBAN AREAS

This chapter identifies the common characteristics of peri-urban areas, especially those that distinguish them from rural and formal urban areas. It also identifies common sanitation practices in peri-urban settlements. The chapter begins with background information about the magnitude of the problem and the significance of inadequate sanitation in peri-urban areas.

2.1 Background: Magnitude of the Need for Peri-Urban Sanitation

An estimated 600 million people in urban areas of the Third World now live in life- and health-threatening homes and neighborhoods, primarily in peri-urban settlements. These homes and neighborhoods share two characteristics that bear serious potential health effects:

- The presence of pathogenic micro-organisms (especially those in human excreta), caused by lack of infrastructure and related inadequate water supply to remove them
- Crowded, cramped housing conditions

The removal and safe disposal of excreta and wastewater from washing, bathing, and other domestic uses in peri-urban settlements are critical health and environmental needs. Many rivers in Third World cities are literally large open sewers. Surface and groundwater contamination is widespread in many developing countries, and the resulting environmental degradation is more and more apparent along rivers and seacoastal areas.

2.1.1 Impact on Health and the Environment

Health Effects

Most urban areas (both informal and formal) in Africa and Asia, including many cities with one million or more inhabitants, have no effective means of off-site disposal of excreta (for example, waterborne sewage systems or collection and treatment systems for latrine contents). Rivers, streams, canals, gullies, and ditches are the destinations of most untreated human excrement and household waste. Such waste accumulates on streets, in open spaces between houses, in stagnant pools of water, and on wasteland.

Latin American cities are a little better off. The formal urban areas in most of these cities have some collection and distribution systems; however, most existing systems are in disrepair. The recent cholera epidemic in Latin America, for example, has been partly attributed to the contamination of water distribution systems by adjacent leaky sewage pipes. In addition, most waterborne sewage collected is disposed untreated into rivers that also serve as sources of water for drinking, bathing for families living in peri-urban settlements, and irrigation for farmers living downstream. Moreover, as in Africa and Asia, the growing peri-urban areas throughout Latin America, which often make up more than 50 percent of a city=s population, lack sewerage or latrine collection systems (Table 1).

Table 1

Estimated Percentage of Third World Urban Populations Without Sanitation Services (1987)

City	*Country*	*Percent urban population without sanitation services*
Luanda	Angola	71
Lusaka	Zambia	66
Karachi	Pakistan	51
Bogotá	Colombia	45
Manila	Philippines	35
Nairobi	Kenya	35
Lima	Peru	33
Caracas	Venezuela	30
Mexico City	Mexico	30
Tunis	Tunisia	30
Ankara	Turkey	24
São Paulo	Brazil	22

Source: United Nations Centre for Human Settlements (Habitat), *Global Report on Human Settlements* (Oxford University Press, 1987), and World Health Organization, *The International Drinking Water Supply and Sanitation Decade Review of Mid-Decade Progress* (Geneva, 1987).

The crowding of large numbers of people in peri-urban areas creates conditions very favorable to the rapid spread of a variety of infectious diseases, often in the form of disastrous epidemics such as the previously cited cholera outbreak in Latin America. Indeed, an increasing volume of literature suggests that health problems resulting from a lack of sanitation facilities (among other factors) are greater among the urban poor living in overcrowded peri-urban settlements than they are either in the rest of the urban areas or in rural areas. A recent World Bank study suggests that, in contrast to higher-income urban dwellers and some rural populations, the urban poor have a lower life expectancy at birth and a higher infant mortality rate (Bradley et al., 1992). A variety of intestinal parasites is usually present in poor urban populations, with roundworms and whipworms often observed at higher levels of incidence than in corresponding rural populations. Likewise, the accumulation of wastewater as a result of the limited soil area to absorb it in densely settled urban areas has led to increased transmission of filariasis in many cities (Hardoy et al., 1990). Figure 1 gives example comparisons of infant mortality rates between rich urban and poor urban areas.

Figure 1: Comparisons of Infant Mortality Rates Between Rich and Poor Areas Within Various Third-World Cities

Bombay and Delhi: In some low-income settlements (bustees) in Delhi, the child mortality rate was 221 per 1,000 but reaches nearly twice this rate among poorer castes within these settlements. In Bombay, the crude death rate on Bombay island (the central city area) was twice as high as that of the suburbs and three times that of the extended suburbs.

Bangladesh: In 1978, the infant mortality rate in "urban slums" was 208.5 per 1,000 (live) births, more than twice the rate for "non-slum" areas.

Urban Areas in Guatemala: Infant mortality rates for different population groups in urban areas vary from 113 per 1,000 for the children of illiterate women in the poorest socio-economic group to 33 per 1,000 in the richest economic group.

Kabul: The infant mortality rate in the old city (slum area) was observed to be 1.5 times that of the rest of the city.

Panama City: A study in 1979 found that of 1,819 infants with diarrhoeal diseases, 68 percent came from those living in slums or shanties with zero infection rates observed among children in better quality housing.

Port-au-Prince (Haiti): In the slums, one in five infants die before their first birthday, while another one in ten die between their first and second birthdays; this is almost three times the mortality rates in rural areas and many times the rate in the richer areas of Port-au-Prince where infant and child mortality rates were similar to those in urban areas of the United States.

Porto Alegre (Brazil): In 1980, a study examined differentials in health between those living in shanty towns (one fifth of Porto Alegre's population) and those living elsewhere. Infant mortality rates among residents of shanty towns were three times as high as among the non-shanty town residents. Neo-natal mortality rates were twice as high and post-neonatal mortality more than five times as high. Mortality from pneumonia and influenza was six times higher in shanty towns and from septicaemia eight times higher.

Source: Drawn from Chapters 1 and 6 of Hardoy, J.E., Cairncross, S., and Saterthwaite, D. *The Poor Die Young: Housing and Health in Third World Cities*. London: Earthscan Publications 1990.

The fundamental reason for undertaking urban sanitation improvement programs is to improve health, but in general it has been difficult to demonstrate a causal relationship between the two, although a recent WASH study (Bateman and Smith, 1991) concluded at least that sanitation interventions in urban areas had a higher health impact than do water supply interventions.

In addition to threatening health, the lack of excreta management systems in Third World cities is having a tremendous negative effect on the environment contaminating surface and groundwater with organics, nutrients, and solids. Because of their current and growing size and density, and their lack of adequate infrastructure, peri-urban areas are the largest source of fecal contamination in cities. Men, women, and children often defecate on open ground. Their feces wash down the hillsides through various neighborhoods or through low-lying floodplains to a river or other water source. Many cities are literally awash in excreta. Figure 2 gives various examples of inadequate sanitation polluting an urban environment.

Even in communities where widespread use of pit latrines has been achieved, human waste can still harm the environment. Unlike sparsely settled rural areas, peri-urban settlements have high population densities, and the sheer numbers of closely spaced latrines can overwhelm the carrying capacity of soils and pollute underground aquifers.

The lack of adequate sanitation systems for families living in these growing peri-urban areas is a major contributor to water pollution in the city. Removing and disposing of excreta in ways that prevent human contact are central to reducing the burden of disease and environmental degradation. This degradation—uncontrolled and far reaching—is in itself as compelling a justification for action as the impact of inadequate sanitation on health.

2.1.2 Population Growth in Peri-Urban Areas

The world is becoming increasingly urban. Urban areas of developing countries are growing faster than either the urban areas of developed countries or the rural areas of the developing world. Figure 3 compares the urban growth in developing countries with that of developed countries.

The population of some urban areas doubled during the International Drinking Water Supply and Sanitation Decade (1981-90). Between 1980 and the year 2000, 85 percent of the world=s urban growth is expected to take place in developing countries. According to United Nations data, 1.3 billion people, or approximately 25 percent of the Third World population, now live in urban centers; by the year 2020, it is anticipated that more than 50 percent of the population in the developing world will be living in cities. The estimated annual growth rate of the developing world=s urban areas will range from 1.5 percent in Latin American cities to 4.8 percent in African cities. Between 75 and 90 percent of this growth will take place in the peri-urban or informal sector. Figure 4 illustrates the percentage of peri-urban populations in selected cities.

Figure 2: Environmental Effects of Inadequate Sanitation in the Third World: Various Examples

Accra, Ghana: There is a central sewage system but much of the population is not connected to it because of high connection charges; an estimate in 1985 suggested that only 30 percent of the population was connected. New residential areas often use septic tanks for sanitation, while in other unconnected areas pan or bucket latrines are used, with their contents emptied into night soil containers provided by the city council. These are then emptied at a shoreline tipping station. In many poor settlements, there are very few public or private sanitation facilities, even in settlements with many thousand households. The city's open drainage system collects surface runoff, domestic discharges (other than sewage), and some industrial discharges (often illegally), and in some areas may also (unofficially) receive waste from latrines.

Bangkok: Only 2 percent of the population is connected to a sewer system; human waste is generally disposed of through septic tanks and cesspools, with their effluents, as well as wastewater from sinks, laundries, baths, and kitchens, discharged into stormwater drains or canals.

Dar es Salaam: From a survey of 660 households drawn from all income levels in 1986-87, only 13 percent of dirty water and sewage is adequately disposed of. Of the 660 households, 89 percent have simple pit-latrines. Most households must share sanitary facilities. Overflowing latrines are a serious problem, especially in the rainy season, and provision to empty septic tanks or latrines is inadequate.

Jakarta: More than half of all dwellings have no indoor plumbing, and much of the population must use drainage canals for bathing, laundry and defecation. The city has no central waterborne sewage system. Septic tanks serve about 68 percent of the population. Another 17 percent rely on pit latrines or toilets that discharge directly into ditches or drains, 6 percent use public toilets (generally with septic tanks) and about 9 percent have no formal toilet facilities.

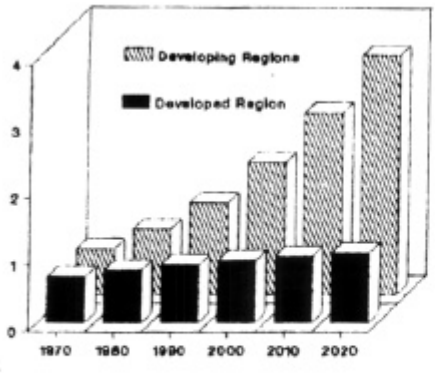
Kampala: Most inhabitants do not have piped water available close to their homes; a household survey in 1981 found only 18 percent of households with potable water within 100 meters. Many people must rely on springs, streams, or wells, many of which are polluted by human waste or wastewater from drainage channels. Very few have adequate sanitation systems; the survey showed that 81 percent of the population used pit latrines, and, in some poor neighborhoods, up to 40 persons use each latrine.

Khartoum: The municipal sewage system serves only about 5 percent of the Khartoum urban area. Even that system is susceptible to breakdowns when waste is discharged either directly into the river or onto open land.

Kinshasa: Kinshasa, with an urban population of 1.5 million people, has no sewage system.

Metro Manila: Only 15 percent of the population is served with sewers or individual septic tanks. Some 1.8 million people lack adequate sanitary services.

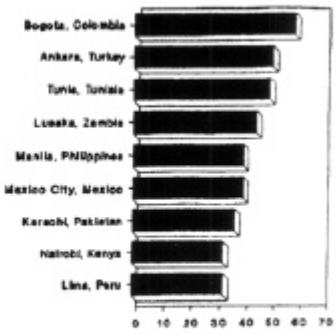
Source: Adapted from Environmental Problems in Third World Cities: An Agenda for the Poor and the Planet. Jorge E. Hardoy, IIED America Latina (Buenos Aires) and David Satterthwaite, IIED (London).



Urban population is growing rapidly, and most of this growth is occurring in the Third World. (Source: United Nations Population Division, *World Population Prospect 1988*, United Nations, New York, 1989.)

Figure 3

Urban Population 1970-2020



Source: United Nations Centre for Human Settlements, *Global Report on Human Settlements* (Oxford University Press, 1987) and World Health Organization, *The International Drinking Water Supply and Sanitation Decade Review of Mid-decade Progress* (Geneva, 1987).

Figure 4

Percent Urban Population

By the year 2000, the exploding growth in Third World settlements that do not benefit from formal urban infrastructure could result in as many as one billion people living without adequate excreta disposal (World Resources Institute 1991, and United Nations Centre for Human Settlements 1991).

2.2 Characteristics That Set Peri-Urban Areas Apart

Peri-urban settlements have a number of unique characteristics that distinguish them from formal urban and rural areas; these characteristics are outlined below.

2.2.1 Poor Physical Site Conditions and Complicated Site Layouts

Poor urban families searching for a plot of land on which to build a home are strongly influenced by the existing market prices for urban land; inevitably the land that is most desirable for residential construction is the most expensive. The more affordable sites are areas that are undesirable for formal development, such as those located on steep slopes, along gullies and ravines, on soil that is too rocky to excavate easily, in desert lands, or in areas prone to flooding. Poor families move on to these lands because they are relatively cheap to purchase or because illegal occupation of such sites is less likely to be challenged.

Since informal urban settlers lack technical know-how and assistance, they often develop their areas haphazardly, without allowing adequate space for installing infrastructure lines. Urban settlers in

parts of Africa and Asia build their houses according to village traditionsXthat is, patterned according to family formation, with houses directly abutting their neighbors on all sides, with no room left for service right-of-ways.

2.2.2 Limited Water Availability

Most peri-urban settlements do not generally have piped water; instead, increasingly they have water vendors who sell water at market cost, which is significantly higher than what families in the urban formal sector pay. Not only is the cost higher on a per-liter basis, but it also consumes a higher percentage of family household income.

The vended water in peri-urban areas is mostly of poor quality, and because of its high cost, families can buy only a limited amount of it. The limited availability of water leads to major sanitation problems when purchasers are forced to set priorities that may compromise public health; for example, peri-urban families are not apt to purchase water to flush a toilet.

Some peri-urban families have access either to a standpipe nearby or to water piped into the house. But, in either case, this water is usually limited in quantity and is erratic in flow. This leads to low levels of personal and domestic hygiene and thus favors the transmission of excreta-related infections.

2.2.3 High-Density Population

Demographic data are lacking for peri-urban areas. Because these communities are illegal and for the most part are not recognized by the formal sector, municipal tax, health, or other records do not exist for most of them. Typically, however, peri-urban settlements have a high population densityXoften greater than 400 people per hectare. High population density without basic infrastructure entails greater health and environmental risks than those found in rural and formal urban areas. Moreover, a growing number of peri-urban areas (especially in the Middle East) have vertical construction, that is multifamily, multistory housing that increases population density dramatically.

2.2.4 Organization of Communities and Social Characteristics

Peri-urban settlements, in general, are not homogeneous with respect to ethnic background, income level, language, and social norms. Residents have migrated to these settlements from various parts of a region or country or, in many cases, from other countries. This heterogeneity often leads to misunderstandings and distrust among neighbors and may result in minimal contact between neighbors. Consequently, a broad-based sense of community often is lacking in peri-urban settlements. Nevertheless, community organizations can and do exist, often formed around an issue of universal interest to the settlement, such as school construction.

Among important forms of organization, at least in the early stages after a peri-urban community is established, are the neighborhood associations created in response to the problems connected with the establishment of the communities, that is, the need for security of land tenure and for basic urban services. These associations serve the dual functions of coordinating neighborhood self-help activities and of providing the link between the communities and government authorities.

In cases of settlement by organized invasion, the makings of such organizations already exist before the communities themselves are formed. In cases of settlement by encroachment and purchase, individuals initially make what arrangements they can with respect to transportation, lighting, water supply, excreta disposal, and so on. Eventually, small groups and communities begin to form to address common concerns, as the settlers realize that without organization they stand little chance of obtaining services from the government or any other outside agency. An important aspect of the sociodemographic composition of peri-urban populations is the fact that a large number of households are headed by women. A disproportionate number of these female-headed households also fall in the lowest-income brackets. In addition, a significant percentage of peri-urban populations is made up of children.

2.2.5 Legal Land Tenure and Lack of Government Recognition and Services

In most countries, a strict application of development regulations denies the legality of land and buildings developed in peri-urban communities. Laws governing property rights, land acquisitions, registration and transfer of titles, development regulations, taxation of real estate, and municipal institutions often were introduced by former colonial rulers. These laws and urbanization standards were essentially adaptations of European models of urban planning that may no longer suit modern conditions in developing countries. In most developing countries, the existing legal, formal land development market is gridlocked by overregulation and its corresponding costs. This has been a major contributing factor to the creation of an illegal informal land market that is unencumbered by controls.

Because prohibitive costs lock them out of formally developed areas, in most peri-urban communities, occupants are in violation of tenure laws and/or development regulations. Residents of peri-urban areas often do not have legal land tenure, and, in most cases, the site itself has not been legally urbanized. Therefore, governments generally do not recognize the legality of these settlements.

2.2.6 Low Income Levels and Reliance on the Informal Economy

As noted above, families settle in peri-urban areas for rational reasons, primarily because land prices or rents are low. A significant percentage of the population of Third World cities cannot afford the formal sector=s housing, even when costs are cut to a bare minimum. The economic crisis in many developing countries has reduced the purchasing power of low-income families and limited

even further their ability to pay for formal sector housing or services. Many households in peri-urban areas do not enjoy a regular income, and large numbers of peri-urban households are headed by single women who in turn tend to have the lowest income levels of all workers.

Families in rural areas are for the most part not in the cash economy. Their life is more agricultural subsistence. In contrast, in formal urban areas, most families do operate in the cash economy as workers and have access to steady jobs, pay taxes, and so on. In peri-urban areas, families are also in the cash economy but their workers rely mainly on the informal economy (for example, carpenters working out of their backyards or women selling tortillas in the market). Though poor, they nonetheless make and spend money. Because cash in the informal economy is unsteady and unreliable, residents are not deemed creditworthy and cannot get conventional bank loans.

2.2.7 The Role of Informal Businesses

Informal businesses play a significant role in the construction and urbanization of peri-urban settlements, whereas in rural areas, the community provides ?self-help≅ (free or donated labor) for construction (for example, the digging of latrine pits). Sometimes a local nongovernmental organization (NGO) is hired to do the construction, or a local formal sector contractor is hired. In peri-urban areas, the existing practice is that most sanitation infrastructure is built by local private builders or manufacturers in the informal sectors. For example, a local manufacturer might produce toilet seats in the family=s backyard workshop, and local carpenters or masons might be hired to construct latrines.

2.2.8 Limited Political Influence

Because peri-urban settlements are not recognized as legal areas, their community leaders and residents have limited political influence. People living in peri-urban areas are not illegalX their houses are, but even though the people living in these settlements are not illegal residents per se, they are mostly economically poor, marginalized, and uneducated, and historically have held limited political power. Residents in formal urban areas, on the other hand, enjoy the status of being recognized as constituents to whose needs politicians must respond in order to stay in office.

A political change is beginning to occur in peri-urban areas, however. Peri-urban residents can represent an enormous voting block and can have a major influence on elections. Yet, after elections, their political clout becomes limited because they do not know how to use the system by organizing into political pressure groups. Furthermore, given the heterogeneous nature of most peri-urban settlements, the united strength and community organizing around local issues that are visible in many rural and formal urban areas are not as apparent in peri-urban areas. Peri-urban residents in most places are less visible and vocal to municipal leaders.

In theory, decentralization and democratization should give informal settlements greater leverage and visibility. Also, in theory, once the urban poor have voting rights and representation, they will keep in office those politicians who manage resources wisely and respond to their needs. At present,

however, those holding leadership positions in most peri-urban settlements do not necessarily represent the interests of the wide range of subgroups in these settlements.

Figure 5 encapsulates many of the characteristics that set apart peri-urban areas from rural and formal urban sectors. It portrays a typical Third World slum in Santo Domingo, Dominican Republic.

Figure 5. La Zurza: A "Typical" Urban Slum

Of all the slums in Santo Domingo, the worst are situated along two rivers (Ozama and Isabela) that run through the city. Close to 400,000 people live in low-income barrios along these rivers. La Zurza, one of the barrios along this strip, is extremely crowded, with a population density of close to 650 people per hectare. Most homes are small, poorly constructed, and perched precariously on land prone to landslides.

The 50,000 residents of La Zurza suffer from health problems caused by poor water quality, inadequate garbage collection, lack of human waste disposal systems, deficient sanitary and living conditions, insufficient quantities of nutritious foods, and other problems common to Third Word urban squatter settlements. Unemployment or underemployment is high, literacy levels are low, and health care is inadequate.

The only characteristic of La Zurza that distinguishes it from other slums is that 54 industries dump their chemical wastes into a ravine that runs through La Zurza. This creates additional health hazards to the people who live there, especially since they use this water for everything except drinking.

Slum dwellers are subjected to harsh physical, social, and economic conditions. There are no guarantees of land tenure, no protection from the violence of youth gangs and thieves, and no guarantees of a secure or comfortable future for themselves or their children. Mechanisms do not exist within the present sociopolitical system to voice their opinions, aspirations, desires, or needs.

These conditions affect the psychological state of the people in the slums, where a sense of frustration and desperation is almost universal. People feel exploited and rejected by the government and mainstream Dominican society. This is reflected in their attitudes about life and how they maintain their communities.

Life in the slums is so fragile that the slightest spark, such as government price hikes or food scarcities, can develop into full-blown crises. The urban poor are most seriously affected by disasters, riots, or strikes, making the quality of life in the slums even worse.

Source: *Voices from the City*, newsletter of the Peri-Urban Network on Water Supply & Environmental Sanitation. March 1993.

2.3 Common Sanitation Practices

Peri-urban communities overwhelmingly lack adequate arrangements for waste disposal. Wastewater from bathing and washing is typically spilled right outside shelters, where it may soak into the ground or form stagnant pools in poorly drained areas. Where sewers exist, they are virtually always open drainage canals. The ground by the side of the shelters or in alleyways serves as a frequent substitute for urinals. In general, residents have improvised sanitation systems in peri-urban areas to satisfy their perceived needs (privacy and convenience, for example), and as materials and labor become available.

Some of the most common sanitation practices in peri-urban areas are described below.

- *No system:* Defecation occurs in open areas within the settlement, on the perimeter of the settlement, or in drainage ditches. The lack of any planned waste disposal system is characteristic of most peri-urban areas.
- *Latrines:* Use of latrines is the second most common sanitation practice in peri-urban regions. A wide range of latrines can be found in peri-urban areas, including bucket latrines, pit latrines, and ventilated improved pit (VIP) latrines. In Asia, some systems for excreta removal from latrine pits exist, either through buckets or vacuum trucks, but in other areas excreta removal is not common. Latrines in peri-urban areas are often poorly designed and maintained and may not be used by all family members.
- *Pour-flush toilets/septic tanks:* In peri-urban settlements experiencing regular or even irregular water supplies, pour-flush toilets with soak-away or septic tanks may exist, relying either on household or community septic tanks. However, the septic tanks often are poorly maintained or undersized.

2.4 Peri-Urban Sanitation Challenges

Why should peri-urban areas be distinguished from rural and urban areas for sanitation improvement activities? This section addresses this question and presents the unique challenges to sanitation improvement in peri-urban areas.

2.4.1 Demand-Driven Sanitation Interventions

A major difference between urban and peri-urban program design challenges is that the former are ?supply driven≅ and the latter are ?demand driven.≅ ?Supply driven≅ is used here to denote the traditional/conventional urbanization process whereby a supply of housing stock is developed and then offered to the public for sale. This process can be summarized as follows:

- Land use rights are legally transferred (usually sold).
- The land ?use≅is changed (usually from agricultural to residential).
- The land is subdivided into plots or parcels.
- The land is registered in the new owner=s name.
- The land is ?developed≅ by installing basic urban services such as water, sewage and drainage, roads, and electricity.
- A house is built on the land.
- The house is put on the market and sold.
- The house is occupied by a family.

In a supply-driven urbanization process, the human factor does not enter into the equation until the end of the process.

?Demand driven≅is used here to denote the more common urbanization process that exists in peri-urban areas. This process can be generalized as follows:

- Individual families or a large group of families need housing.
- Unserviced but affordable land is ?acquired≅either through invasions or through informal purchases.
- Individual houses are built, usually with rustic building materials (these initial houses usually do not meet building standards and usually have no provision for basic sanitation).
- Families use their new home base to enter into the informal economy and start accumulating capital.
- The houses are incrementally improved according to household priorities and available capital; this stage may include the construction of an improved latrine.
- Communities get organized and start ?demanding≅that municipal authorities provide them with basic urban services such as electricity, roads, water, and sewage.
- After infrastructure is installed, land is then legalized and registered by municipal authorities.

In this demand-driven process, people move in before the water supply, sanitation, and other infrastructure exist. Once they are on the land and have a house, their ?demand≅for infrastructure evolves.

In the peri-urban sector, a controlled supply-driven process is not possible; people reside in the areas before any formal development takes place and they live in overcrowded conditions. Sanitation improvements are more critical in crowded urban areas where population densities are

very high, diseases are more common, and the assimilative capacity of the environment has been exceeded. These areas require a demand-oriented government response, which is quite different from the controlled and orderly process of most formal urban planning and development. The government action should be responsive to the demands and needs of families already living in peri-urban areas and be tailored to the conditions of the settlements.

It is important to keep in mind, however, that the demand (as opposed to need) by the community for sanitation improvements may be low compared with the demand for water, electricity, drainage, roads, or solid waste removal. Residents in peri-urban settlements often have higher priorities than excreta disposal to which to allot their scarce financial and other resources.

2.4.2 Political Motives

To address these features and the peculiar needs they elicit, the project designer and implementer must deal with engineers, legal specialists, financial analysts, social scientists, urban planners, and a wide range of institutions, such as the water and sanitation utility, the Ministry of Health, urban development authorities, and municipalities.

Because of the high visibility of these urban slum areas, and their higher numbers of people, the involvement of politicians is greater than it is in rural or formal urban sectors. The result can be a scenario involving a clash of valuesXfor example, the A.I.D. development planner or NGO community organizer who favors assistance to peri-urban areas versus the politicians who prefer to help formal developments. Therefore, the choice of intervention sites can become politicized. In other words, political interest can become a criterion in site selection, rather than need or feasibility.

2.4.3 A Conflict of Interest or Goals

Similar to motives that surface in political conflicts, the donor=s interest or goal may be to improve sanitation for peri-urban residents, whereas municipal authorities may see a sanitation intervention in an illegal settlement as counter to their interest. In most cases, this interest is *not* to formalize peri-urban settlements and thereby make them more permanent.

The fundamental issue is this: Unless project designers can in the beginning of the process get a political commitment from the mayor or other key decision-maker to agree to sanitation interventions in illegal settlements, or to make illegal settlements legal, any further work on project design could prove to be fruitless.

2.4.4 Lack of Data

In contrast to rural and formal urban areas, statistics relating to residents of peri-urban areas (and their needs) are not gathered in many Latin American and African countries. Thus it becomes

extremely difficult to analyze overall data about peri-urban settlements. Without bank mortgages or building permits, who can say how many houses are built each year? When people in these settlements do not show up on employers=payrolls, how can one tell how many are employed or what incomes they earn? Without health records, who can detect their mortality or morbidity rates? When they pirate water from public aqueducts, buy it from vendors, or use homemade septic tanks or pits, how can their water consumption and level of sanitation be assessed?

A lack of real data makes it difficult to determine how many peri-urban houses lack access to sanitation systems and what kinds of systems would be most appropriate to introduce.

2.4.5 Cheap Land/Expensive Infrastructure

Ironically, for very rational reasons the urban poor settle on the cheapest land, which also requires the most expensive infrastructure. It is more costly to put low-cost systems on steep slopes or in floodplains than to put them on dry, flat ground. Even pit latrines, a very low-cost option, can be more expensive to construct in peri-urban settlements than in rural areas.

2.4.6 Limited Technologies Appropriate to Peri-Urban Areas

Because of the unique characteristics of peri-urban areas, as outlined in Section 2.2, the technological lessons learned from sanitation interventions in rural and formal urban areas are not always applicable to peri-urban sites. To date, construction of latrines has been the main sanitation intervention funded by external support agencies, including for projects in peri-urban areas. Latrines, however, have been shown to have serious limitations in the peri-urban sector. They usually are not feasible at population densities above 250 to 350 persons per hectare, and most peri-urban areas have population densities above 350 persons per hectare. For this reason, technologies appropriate to peri-urban areas are limited. In many high-density informal settlements, there will be little, if any, space available to dig a new pit after the existing one fills up. Often, not enough space exists for even the first pit. Pit latrines also are impractical for multistory housing. In addition, soil conditions in most peri-urban settlements are often too rocky or too steep, contain too much clay, or have too high a water table to make latrines feasible.

3

PUBLIC HEALTH, ENVIRONMENTAL, AND SOCIAL CONSIDERATIONS

Improving community excreta sanitation in peri-urban areas is a complex endeavor. Choosing and building the right technology is only one of the areas that must be addressed in this process. Other concerns that must be considered include health, the environment, and social/community organization.

3.1 Sanitation-Related Health Benefits

One of the more compelling justifications for improving community sanitation is improving health, yet the health benefits associated with improved sanitation are difficult to quantify. While this can be said about any location, it is particularly true in peri-urban areas. Part of the problem, as noted in the previous chapter, is that baseline health information usually does not exist for peri-urban areas. Municipal governments usually do not keep records on peri-urban settlements, including information on current health status, environmental conditions, or existing sanitation coverage.

Another part of the problem is that certain environmental factors, such as intermittent water supply and poor drainage, interfere with accurate predictions of health effects of improved sanitation. Figure 6 lists the many environmental determinants that can have an impact on health in urban areas. The consequent lack of clear information and conclusions makes it difficult to rank the desirability of improving sanitation on the basis of health benefits. Therefore, if the justification for a peri-urban sanitation project is improved health, it will be complicated and expensive to measure health improvement resulting from a proposed peri-urban sanitation project.

3.1.1 Degree of Health Benefits as a Factor of Sanitation Level

Beyond the question of how improved sanitation improves health is the question of the relationship between the stages of improved sanitation and the degrees of improved health. Peri-urban sanitation improvements tend to evolve in rather large steps: from nothing to pit latrines to pour-flush toilets to full sewerage. Bateman and Smith=s 1991 WASH study showed that the proportion of children stunted in Guatemalan urban areas was directly associated with the level of sanitation service (Figure 7). Stunting was lower in children who had access to a flush toilet when compared with those with access to latrines and to those without access to sanitary services.

Figure 6: Environmental Determinants of Health Problems

I. Determinants of ingested health problems
    1. Domestic
    2. Sanitation: excreta disposal
    3. Hygienic
    4. Food hygiene
    5. Markets
    6. Slaughterhouses
    7. Cooking facilities
    8. Fuel
    9. Industrial pollutants

II. Determinants of other infectious organisms
    1. Drainage
    2. Surface water
    3. Solid wastes

II a. Consequences, especially of infectious organisms, in the environment
    1. Rodents
    2. Insect vectors
    3. Nuisance insects
    4. Intermediate host snails

III. Determinants of inhaled health problems
    1. Crowding
    2. Domestic air pollution: stoves
    3. Community air pollution
    4. Industrial air pollution
    5. Transport-related air pollution

IV. Proximal determinants of environmental stress
    1. Household temperature
    2. Household humidity
    3. Protection from rainfall
    4. Protection of possessions
    5. Transport facilities: vehicles and roads

V. Determinants of the bases of I, II, III, and IV
    1. Weather

VI. Determinants of trauma and toxicity
    1. Transportation systems
    2. Availability of weapons
    3. Industrial activities and pollution

VII. Determinants of nutritional state
    1. Food: availability, access, and cost

VIII. Other environmental health problems
    1. Domestic animals

IX. Modifiers of the effects of the above
    1. Health care facilities

Source: Bradley, David, Sandy Cairncross, Trudy Harpham, and Carolyn Stephens. 1991. *A Review of Environmental Health Impacts in Developing Country Cities.* Washington, D.C.: The World Bank.

The same WASH study showed that stunting was also associated with community levels of

sanitation. Individual household sanitation improvements did not have a significant health impact if the surrounding households also did not improve their sanitation. The authors found that sanitation coverage of 75 percent or more of a densely populated community is needed before a health impact is apparent. Therefore, the project approach to sanitation improvement in peri-urban areas should focus on community-wide improvements, not on individual households. By contrast, in rural areas, where houses are further apart, the approach to sanitation improvement has largely been toward households.

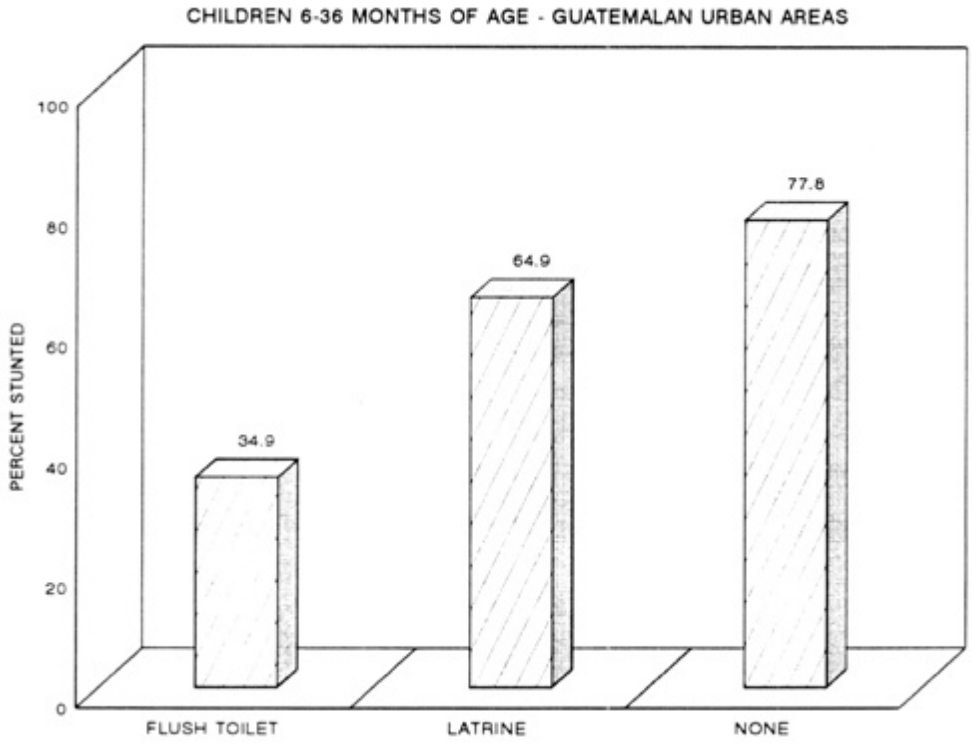


Figure 7

Percent of Children Stunted in Relation to Individual Level of Sanitation Service

The study found that children with access to flush toilets in their household but who lived in a community with a low level of sanitation coverage had 1.67 times the risk of stunting compared with those living in a community with high levels of sanitation coverage (Figure 8). More remarkable was the finding that children with no individual access to a toilet and living in a community with a high level of sanitation coverage have no increased risk of stunting compared with children with individual access to a toilet living in a community with a high level of sanitation coverage. These findings indicate that community measures of sanitation are better indicators of health risk than is individual access to improved sanitation.

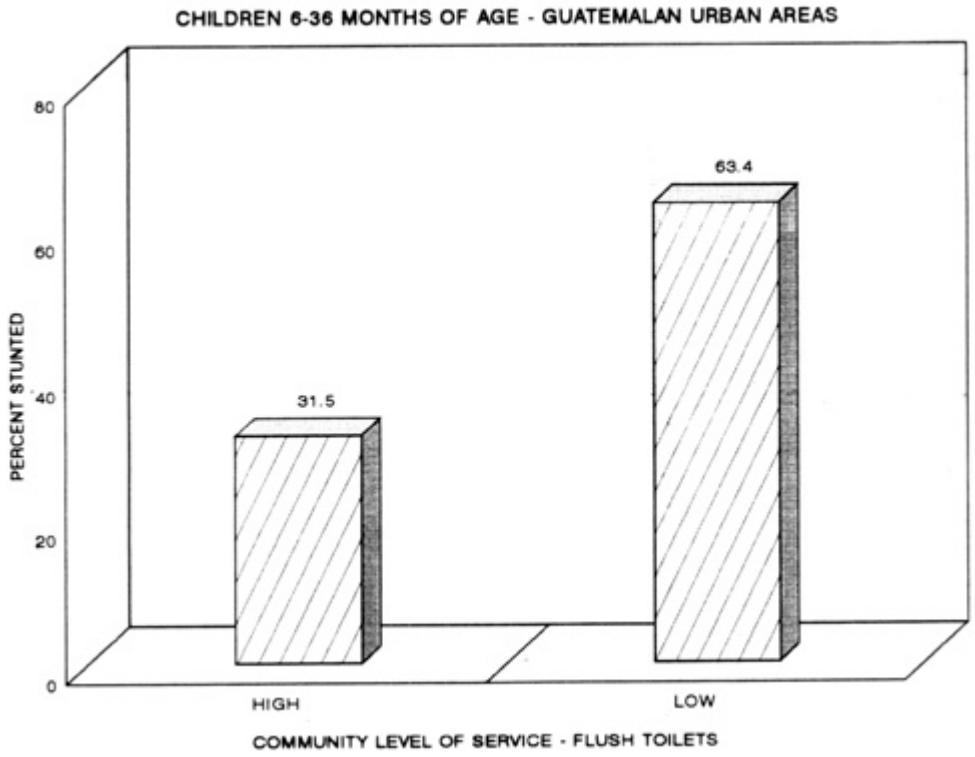


Figure 8

Percent of Children Stunted in Relation to Community Level of Sanitation Service

From a program point of view, in a peri-urban water and sanitation program that expects to improve health, sanitation should receive the same degree of attention and resources as water supply. Further, to increase the health benefits of sanitation improvements, the most important goal and evaluation indicator is not improved individual level of service, but improved community sanitation to the point that at least 75 percent of the community has access to adequate sanitation services and uses them properly.

3.1.2 Transferring Excreta Off-Site

In examining the health effects of sanitation technologies, one must also evaluate threats posed by systems that transfer excreta off-site. Cartage systems and waterborne sewage, for example, result in the transfer of health risks off-site along with the excreta (if the waste is not treated, as it usually is not).

The health risks related to transferring excreta off-site can be reduced or increased depending on the situation. If sewage, for example, is treated and disposed of in a river away from people, health risks

Figure 9: Baldia Squatter Settlement Revisited

Baldia, a squatter settlement on the periphery of Karachi, maintains a very successful low-cost sanitation program based on the provision of twin-pit pour-flush toilets. A closer evaluation of this settlement, however, reveals serious problems in sullage disposal.

Although water to the settlement is provided only through standpipes, the fact that no provision was made for sullage disposal means that sullage is discharged into the streets. Because the streets are not surfaced, many became inaccessible to pedestrians and soon the residents were obliged to seek the Karachi Municipal Council's (KMC) assistance in installing open drains. The settlement was provided with open drains.

With the advent of the open drains, most people now found a convenient place to discharge not only their sullage, but also their toilet wastewater. Those who had any form of vault or septic tank discharged the contents of these into the drains to eliminate the need to have them emptied, which can cost $US20 to $US30 each time. Even those who had constructed pour-flush latrines under the sanitation program and were not conversant with their proper mode of operation soon overflowed the pits into the nearest open drain. The drains also became receptacles of household refuse, as there was no regular refuse-collection service. Consequently, the drains, which were not designed to facilitate dry-weather flow, soon became the focus of complaints from residents. These complaints addressed not only the odor from the drains and public-health nuisance they present, but also the physical danger they pose to children, some of whom had fallen into them. The fact that most drains were also located at the front of the houses only served to reinforce the complaints.

In the final analysis, when adding the cost of the complementary investments in open drains to the original cost of providing sanitation to the settlement, the twin-pit pour-flush latrines proved to be much more expensive than they seemed.

Source: Sinnatamby, G.S. 1990. "Low-cost Sanitation" in Hardoy et al., *The Poor Die Young: Housing and Health in Third World Cities.* London: Earthscan Publications.

probably will be reduced. On the other hand, if untreated sewage is disposed of directly into a river that serves as an untreated drinking water supply, risks will likely be higher than if no sanitation improvements were made. Similarly, if sewage and night soil collected from latrines are discharged in the local environment or used untreated, the health risks are simply transferred and not necessarily reduced. Figure 9 gives an example of a project that succeeded in providing improved sanitation to individual households but failed to dispose of the sullage. The result threatened the community with perhaps a more serious health problem than what existed before the project began.

3.2 Environmental Issues

The lack of adequate peri-urban sanitation provisions has grave environmental consequences that indirectly jeopardize human health. Peri-urban areas are the largest nonpoint source of fecal contamination in a given city. The inadequate disposal of human waste contaminates surface and groundwater with organic compounds, nutrients, and solids. Organic compounds decompose in receiving waters, depleting oxygen and harming some aquatic life. Nutrients can be toxic to fish and humans and can cause eutrophication (the excessive growth of algae and aquatic plants utilizing the nutrients which can lead to decreased oxygen concentrations when the algae and plants die and decay). Solids decay using up oxygen and can harm benthic organisms living at the bottom of water bodies.

Reducing such environmental contamination via improved sanitation technologies can be more compelling to development decision-makers than is improving general health, as can be seen in the following example from Kumasi, Ghana. A year study by the World Bank (Whittington et al., 1993) on sanitation in Kumasi estimated that 24,100 cubic meters of fecal waste was generated by Kumasi=s 600,000 people every month. The types of sanitation technologies used by the Kumasi population included public latrines, bucket latrines, flush toilets (into septic tanks), pit latrines, and nothing (bushes). Independent of the type of sanitation technology or disposal system, the World Bank study showed that 21,600 cubic meters of the total fecal waste (90%) eventually flowed untreated into the underground aquifers and streams (Figure 10). The environmental effects of such a quantity certainly would impress upon decision-makers the need to re-examine the sanitation system on hand.

3.3 Social Considerations

3.3.1 Community Organization and Participation

Citizen involvement has been found to be a key ingredient in the success of peri-urban sanitation projects. Community participation can lead to cost reductions, increased cost recovery, and more effective operation and maintenance of systems. The Working Group on Urbanization (WG/U) of the Water Supply and Sanitation Collaborative Council, an international organization, recently reviewed 271 documents describing 67 peri-urban water supply and sanitation (WS&S) projects. Thirty-one of the 67 projects were reported to have been successful; 19 of these attributed a major role in their success to citizen participation.

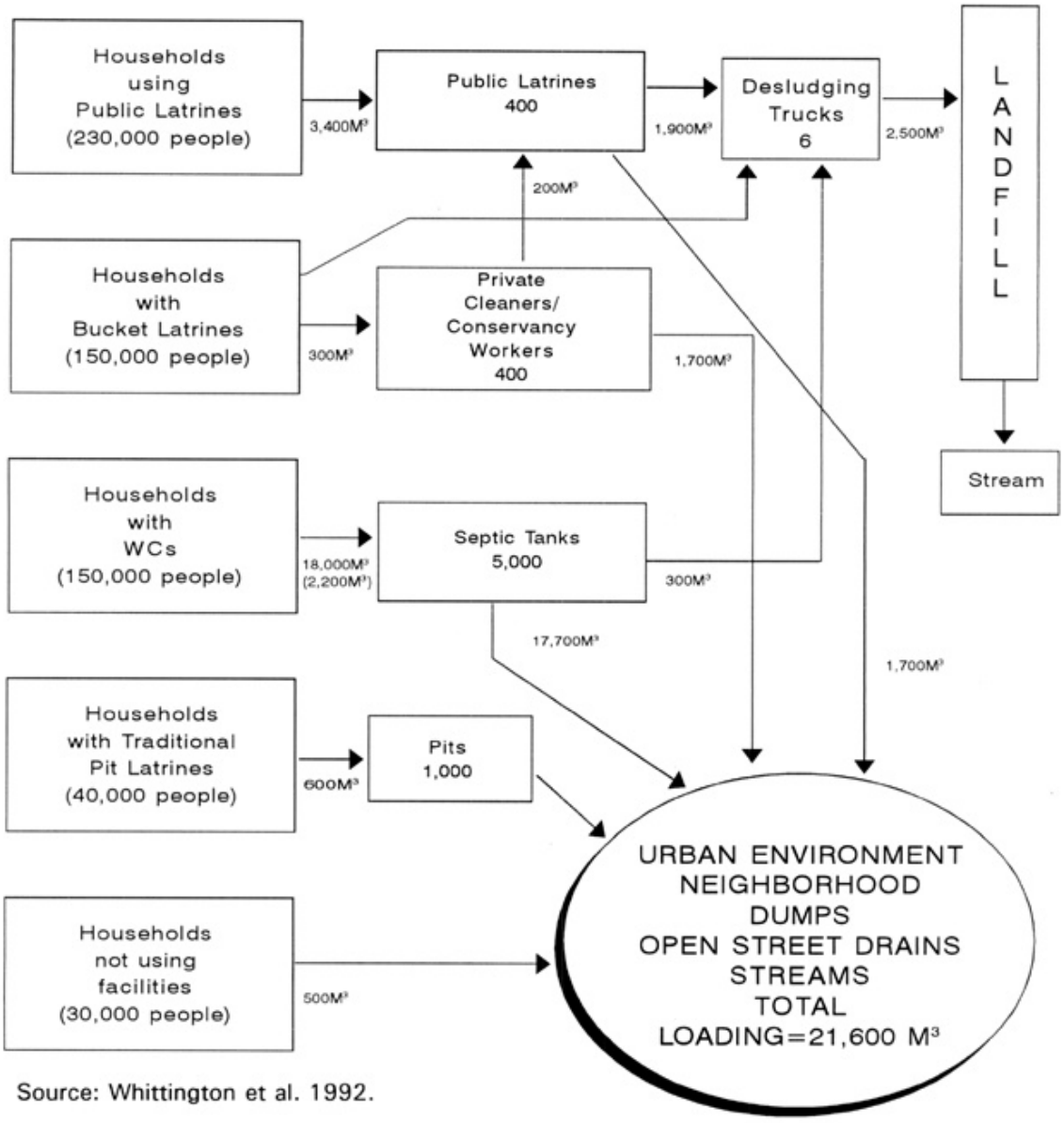


Figure 10

Monthly Flows of Fecal Waste in Kumasi, Ghana

The lack of a common social composition in peri-urban areas can make organizing for community participation difficult, however. The major shared feature of peri-urban inhabitants is their place of residence. People in these areas are likely to come from different ethnic groups, speak different languages, have different religions, and earn a wide range of incomes. Nevertheless, it is imperative to include from the start the users in peri-urban areas because their heterogeneous nature increases the complexity of sanitation improvement approaches. Figure 11 describes two success stories that

resulted from effective citizen participation in peri-urban settlements. One occurred in Zambia, the other in Kenya.

Community participation usually does not begin spontaneously and it rarely continues without enormous work and patience, which eventually must be rewarded financially. Often barriers exist that prevent organization of local institutions in peri-urban communities. Residents may lack the free time to organize, or the knowledge and experience in how to organize in a sustainable way. Most community members cannot survive by ?working≅ as full-time volunteers. However, communities can still be highly organized. For example, they may have carried out an invasion of the land to form the settlement in the first place.

To organize residents effectively, project planners need to explore opportunities for bridging cultural and other differences within peri-urban settlements early on in the planning of sanitation improvement activities. Residents of peri-urban settlements have shown they are willing to organize around specific issues. Identifying and working through an informal power structure, or through an NGO or other community group, can help overcome cultural or social differences within a settlement.

Organizations that have grown out of other development activities may turn their attention to sanitation projects. For example, community efforts to legalize land rights can lead to organizing to get water into the community, followed by organizing for a sanitation program. Based on the WG/U review of the 67 peri-urban WS&S projects noted above, Figure 12 identifies aspects and elements that are conducive to the success of citizen participation in sanitation programs.

A related institutional issue is that economic rather than social project components often are seen as determining project viability or success. There is widespread belief that peri-urban sanitation projects are essentially technical in nature, with social aspects, including community participation, considered less important for a project=s success. Consequently, the technical departments of the implementing agency have much more power and status than those dealing with social aspects, if the latter exist at all (Moser, 1992 in *Voices from the City* 1993).

In most countries, engineers who control the technical departments are mainly senior men, while community development and social workers in the social division tend more to be junior women. Sexual inequalities reinforce the attitude among bureaucrats that the social components of projects are less important. A lack of recognition that community participation requires specialized training also hinders citizen involvement (Moser, 1992), as does the longer

Figure 11: Success Stories

Attributed to Citizen Participation

In the town of Kamanga, Zambia, near Lusaka, citizen participation played a key role in implementing WS&S and social services.

A study of the area reveals that participation was implemented in six stages. The first stage was to identify community leaders. The second stage was to hold public meetings to illustrate the spirit and purpose of the project, with an aim toward setting up a Residents' Development Committee (RDC). The third stage was to assign priorities to the various needs expressed in public meetings. This was followed by briefing sessions with dwellers of tenement groups, seminars for local leaders (for training in management techniques), and follow-up sessions.

The study emphasizes that in addition to providing the services planned, participation fostered a strong sense of solidarity among residents and the significant participation of women. The study also notes, however, that constant support from the implementing agency was required, especially with regard to supplying information on work progress and the future of the project.

The study goes so far as to identify people who could have prevented the success of the project, specifically some local politicians who tried to manipulate the project to their own advantage: this problem was solved by a public debate between these politicians and the local community.

A minor "crisis" owing to the heavy workload of some members of the RDC was solved by the creation of subcommittees, which also led to greater delegation of powers and decentralization of project activities.

In the sanitation project in Maina, Kenya, there was at first strong local opposition to the projects, which had been conceived by the implementing agency on a purely technical basis. Thus, a second stage was undertaken, seeking greater local cooperation. This led to the setting up of an umbrella organization and a self-help committee, which went on eventually to undertake independent initiatives in the field of health care.

Source: Water Supply and Sanitation Collaborative Council (WSSCC) Working Group on Urbanization (WG/U). March 1993. "Working Document #2: Citizens' Participation." Rome: MAE/DGCS and CERFE.

time frame required for implementation of projects based on participatory approaches. The latter implies higher initial up-front costs as well, further discouraging the process.

Figure 12: Positive Aspects of Citizen Participation

The WG/U studies especially mention **positive aspects and elements conducive to the success of citizens' participation**, which include the following:

* Creation of new citizens' organizations, which may lead to further independent and self-help projects
* The role of local NGO networks in providing credit to the poor
* The role of NGOs in effectively reaching the urban poor and working with municipal authorities
* Implementation of initiatives based on the recognition of local leadership and support to existing organized groups
* Involvement of existing human resources on-site
* Constant interaction between project and community
* Organization of regular public meetings
* Involvement and establishment of mechanisms for coordination between different local, national, and international organizations
* Identification of specific "loci" for community participation (existing or future local organizations)
* Clear definition of roles and identification of ways in which the community can participate (division and execution of work, financial management, selection of areas for implementing projects, definition of priorities, documentation of works, and so forth)
* Granting to citizens' organizations a degree of administrative control
* Institution of "upgrading companies," that is, intermediaries between local stakeholders and WS&S agencies or municipalities whose function is to manage projects and secure an adequate level of user consensus
* Institution of administrative committees or service cooperatives, composed by representatives of the communities concerned, for the security and maintenance of the installations

Source: Water Supply and Sanitation Collaborative Council (WSSCC) Working Group on Urbanization (WG/U). March 1993. *Working Document #2: Citizens' Participation.*

3.3.2 Behavioral Factors

Other major social considerations to focus on in planning improved peri-urban sanitation services center around the recipients= hygiene behavior. Hygiene modifications are essentially the changes in people=s behavior that, over time, improve health. One way behavioral change is demonstrated is by the ways people use improved infrastructure. Usage and sustainability are critical to the success of sanitation projects. Unless facilities are suitable for the people using them and unless the technologies are affordable and efficient, the facilities will remain unaccepted and underused. WASH studies have shown that health benefits associated with peri-urban sanitation projects require that changes in hygiene behavior accompany infrastructure improvements (Yacoob et al. 1992).

Peri-urban sanitation planners have often given too little scrutiny to the types of technologies acceptable to a given community, or to hygiene education needed to support the chosen option. Behavioral components are often neglected. Because peri-urban areas often lack a common social makeup, however, such information about ?high-risk= sanitation behavior can be difficult to acquire.

High-risk behavior can be defined as action by men, women, and children that allows exposure to human excreta. Two sets of information involving high-risk sanitation behavior are required as a basis for determining the appropriate sanitation intervention: identifying existing high-risk sanitation behavior and practices in a community, and specifying behavioral changes the community must undertake to improve health. In peri-urban communities, identifying and drawing conclusions about this information are difficult because of the cultural, ethnic, and religious mix typical of these settlements.

In all communities, barriers exist to changing high-risk behavior. (A barrier as used here signifies a belief, norm, attitude, or condition that either reinforces the high-risk behavior or limits the modified behavior.) Barriers may be religious, cultural, social, economic, or technological in nature and may not be readily observable. For example, a crumbling slab or a dark latrine is a condition that may cause people to fear using the latrine, or religious beliefs may dictate that women and men cannot use the same latrine. Similarly, a community norm may allow a certain abandoned field or lot to be considered an acceptable place for children to defecate.

With the cultural, social, and economic diversity common to many peri-urban areas, high-risk sanitation behaviors and barriers to changing them will likely vary widely among inhabitants. This makes surveys and other approaches to information gathering complicated and very difficult, especially compared with a more homogeneous rural community. Because of the great variation in residents, a large sample size is needed for a survey of preferences or behaviors to be useful and truly indicative of a large, diverse community.

4

FINANCIAL, LEGAL, AND INSTITUTIONAL CONSIDERATIONS

In peri-urban areas, various societal factors may limit the range of acceptable, appropriate sanitation interventions. Chief among these are individual citizens=priorities, cost, institutional capabilities, and legal constraints. In addition, the appropriateness of on-site systems in peri-urban areas will be subject to the user=s perception of land availability, the maturity of the community, income levels, and other perceived priorities. (In peri-urban areas, where so much is needed, the perceived need for sanitation improvements may be low compared with the demand for water, electricity, dispensaries, schools, drainage, roads, or solid waste removal, for example.)

4.1 Cost of Improvements, Cost Recovery, and Willingness to Pay

4.1.1 Costs of Improvements

The costs of peri-urban sanitation programs can vary significantly and include labor, material, management, operation, hygiene education, training, legalizing land, and community organizing. Location, site characteristics, and density also play a major role in cost. Bad soils and steep topography can double the cost of sewerage, for example, and high densities can preclude lower-cost options even where buildings are only one story high. Additionally, off-site connections can cloud estimates of project expenditures because their cost depends on their distance from existing trunk lines. (This cost is presumed to be recovered from general taxation and user fees and is not directly charged to residents in upgraded areas.) Site variability also leads to difficulty in evaluating feasible options and monitoring project implementation. Ironically, because peri-urban families have settled on the cheapest land, they often require the most expensive sanitation infrastructure by the very nature of the terrain=s physical condition. As a result of the degree to which the above factors can vary, cost overruns are common in upgrading programs and range from 50 to 200 percent.

Many budgeting difficulties also arise involved in working within an existing social setting. Land tenure issues, rights-of-way problems, inaccurate reference maps, and inadequate soil investigations are common causes of delay and cost overruns (Serageldin, 1991). Figure 13 lists some of the cost variations that can occur during the life of a peri-urban upgrading project.

Figure 13: Common Cost Variations in the Life of a Peri-Urban Upgrading Project

Average implementation time of an urban upgrading program can stretch over eight years, 50 to 100 percent longer than initially anticipated. During this time, cost variations are bound to occur. These can include the following:

? Inflation in the construction industry tends to diverge from projected rates.

? Successive adjustments of designs to unanticipated field situations become increasingly costly.

? Exchange and interest rates fluctuate.

? Densities in the project area mount.

? Administrative costs and interest payments on loans accumulate and account in the end for 50 percent or more of cost overruns.

Source: Serageldin, M. 1991. "Financing Infrastructure Upgrading Programs." Paper presented at the Workshop on Infrastructure Finance, March 20, 1991, held by USAID Office of Housing and Urban Programs. Cambridge, Mass.: Unit for Housing and Urbanization, Harvard University Graduate School of Design.

4.1.2 Cost Recovery

Cost recovery schemes rely on two basic instruments to recover the capital costs of sanitation infrastructure improvements: direct charges to property owners benefitting from the improvements, and indirect charges to users through water or other utility rates.

In general, worldwide experience at full cost recovery for water supply and sanitation projects has not been very successful. In rural areas, recovery of capital costs mostly has not been tried, and even attempts at recovering simple operations and maintenance costs have had mixed results. Recent concern over spiraling public debt in developed and industrialized countries alike, coupled

with growing awareness that water is a limited resource and that the majority of institutions responsible for providing water-related services cannot cover their costs, has led most governments and external support agencies (ESAs) to conclude that water and sanitation services should be recognized as an economic good for which it is appropriate to pay. Thus, the cost of WS&S services should be considered chargeable first and foremost to individual users, and not to the public at large. This means that service coverage should be extended on the basis of an assessment of effective demand; that is, the level of service for which potential users are willing to pay.

Cost recovery has devoted great attention to the ability of beneficiaries to pay for the improvement provided. Too little attention has been given to willingness to pay and capacity to collect (Serageldin, 1991).

Figure 14: Kumasi's First Step to Better Sanitation
A Willingness-to-Pay Survey

Roughly 75 percent of Kumasi's population does not have adequate sanitation facilities: 40 percent relies on overused public latrines, another 25 percent uses unhygienic pan latrines, 5 percent uses traditional pit latrines, and about 5 percent defecates in the open. Moreover, about 90 percent of the waste removed from public and domestic pan latrines is being improperly disposed of in nearby streams, drains, and vacant lots within the city.

A first step to better sanitation is a willingness-to-pay survey implemented by the Kumasi Sanitation Project, a $1.1-million initiative funded by the United Nations Development Program (UNDP) and executed by the World Bank. The survey was conducted among more than 2,000 representative residents to determine their preferences for various sanitation technologies and their financial resources to support new systems. Three findings were most revealing:

- Families on average were willing to pay about the same amount for sanitation ($1.60 per month) as they paid for electricity or water.
- The poorest people who used "pay for use" public latrines were spending more for sanitation than those with household systems.
- The poor would be willing to pay even more for improvements in their homes.

A multidisciplinary team of specialists from the Ministry of Health, Department of Community Development, Kumasi Metropolitan Authority, and the UNDP-World Bank project then began work on a home latrine program to test whether people in three varying neighborhoods would be willing to invest their own money in new and improved facilities.

With this new market-oriented approach, the city under the leadership of the Kumasi Metropolitan Authority and with support from the UNDP and the World Bank plans to provide its entire population with improved sanitation services by the end of the decade. Unlike previous approaches, the new program will employ a range of technological solutions—from conventional and simplified sewerage to Kumasi ventilated improved pit (KVIP) latrines—to address various economic and demographic conditions.

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* Source: "Kumasi's People Pay for Better Sanitation," *Source*, UNDP, July 1992.

4.1.3 Willingness to Pay

To help determine the appropriate level of service for a given peri-urban community, a willingness-to-pay survey designed specifically for sanitation improvements in peri-urban areas must be devised. Willingness-to-pay surveys have been used successfully with water supply projects, but very few have been applied to peri-urban situations. Peri-urban residents may be less willing to pay for sanitation improvements than for water supply; a survey would reveal whether this is so.

Willingness-to-pay surveys also help identify technologies that are acceptable and affordable to a community. They also can help determine feasible methods of financing. Cost indexing of options, in fact, can be presented to users as questions in willingness-to-pay studies. Figures 14 and 15 illustrate the results of a willingness-to-pay survey in Kumasi, Ghana, and highlight the important components such a survey contains.

Figure 15: Important Components in a Willingness-to-Pay Study

A well-designed willingness-to-pay study will achieve the following:

- Assess household decision-making and resource allocation, given users' limited time and money.
  - What types of technologies do people want?
  - What are they willing to pay to build, operate, and maintain a system?
  - Who within the household makes the decisions?
  - Who controls the resources?
- Determine the financial resources available from the user group, and for what use they are intended.
- Clarify cost recovery issues.
  - How are costs to be divided among users?
  - What is the acceptable time frame for cost recovery?
  - What subsidies, if any, are needed?
- Define the appropriate level of service based on technical and institutional options, recognizing that the design process takes time and requires user participation.

Source: Whittington et al. 1992.

4.1.4 Credit Programs

In some peri-urban sanitation programs, access to credit should be considered as a mechanism for mobilizing the economic resources of peri-urban inhabitants. Significant constraints to this access may exist, however, including high transaction costs, lengthy approval processes, high interest rates

and loan security requirements, legal land registration, mortgage requirements, and an insufficient number of personnel allocated to serve customers in low-income brackets. Figure 16 provides two examples of NGOs that are successfully overcoming many of these barriers to provide peri-urban dwellers with access to credit for sanitation improvements.

Figure 16: Two NGO Success Stories: Offering Credit to Improve Sanitation

CHF and UNICEF Provide Options for Peri-Urban Sanitation

In Honduras, the Cooperative Housing Foundation (CHF) and UNICEF hope to improve unhealthy sanitary conditions through a sanitation loan program for low-income families.

The program aims to increase interest in using credit to make sanitation improvements, and to raise awareness of the need for better environmental sanitation. Loans are available to participating families to build shower stalls, construct water storage tanks and wash stands, implement rooftop rainwater collection systems, or make other improvements, such as devising an appropriate way to dispose of human excreta. People have the option of building alternatives to simple pit latrines, including ventilated improved pit (VIP) latrines, dry compost latrines, and pour-flush toilets. Loans also can be used to make a legal connection to a city's waterborne sewerage system when possible.

By offering a variety of options in a broader price range and linking them to well-managed credit programs, CHF and UNICEF hope to increase the demand for urban sanitation.

Source: Excerpt from "Voices from the City" Vol.1, No. 1, May 1992.

Grameen Bank: Sanitation Loans for the Poor

The Grameen Bank has gained international acclaim for its novel approach to economic development and poverty reduction in Bangladesh—making small loans at commercial rates to groups of poor people in rural areas. Today, it has nearly one million borrowing members in over 24,000 communities; nine out of ten borrowers are women from families that are landless and without assets.

Each individual who receives a loan must agree to the bank's "Sixteen Principles," one of which states, "We will not defecate in the open. We will use pit latrines." To date, more than 100,000 latrines have been financed. A subsidiary loan program also has been developed through which a latrine can be purchased with a US$14 loan repayable over a one-year period.

Source: "Matching Technology to People's Needs and Means," *Source*, UNDP, July 1992.

4.2 Uncertain Legal Status of Peri-Urban Areas

The underlying legal issue for peri-urban settlements is that they lack official recognition as legal residential areas because the land they occupy usually has not been zoned for housing or is considered dangerous or environmentally protected. Either the residents occupy the site without legal land tenure or they buy it from the landowner, who in turn has not legally urbanized the land (that is, legally registered the land or plots and installed or brought in municipal services such as electricity and water). In both cases, governments are reluctant to provide sanitation infrastructure to a settlement because that would imply that they recognize the settlement=s legality. In many developing countries, government officials hold biases against squatter areas and providing assistance to them.

In peri-urban settlements, households also may be reluctant to invest time and money in infrastructure improvements that may not benefit them in the long run. Because unstable land tenure means residents can eventually lose the land, they often are less willing make home improvements. Moreover, in these cases, lenders may decline to lend money for such improvements.

Politicians can hardly be blamed for their tough stand against peri-urban settlements. As elected or appointed officials, they are responsible for enforcing codes and laws. Unless project designers can get a political commitment from the mayor or other authorized key decision-maker to agree to sanitation interventions in illegal settlements, it makes little sense to go any further in the project design process.

The challenge to project designers and local authorities, who likely have different though equally legitimate interests, is to find a mutually acceptable resolution of their conflicts. Recognition of these inherent conflicts is important, and facilitated meetings often can help smooth the way for a continuation of the design and implementation process.

Specific legal issues that may need to be assessed when designing a sanitation improvement project include land tenure, plot registration with municipal authorities, and the applicability and appropriateness of building codes, design and construction standards, and environmental regulations. Figure 17 describes a successful peri-urban infrastructure project that focused on legalization as one of its first key stages. Indeed, sanitation improvement projects can help to accelerate the natural transformation of peri-urban areas into formally recognized communities. Conversely, when an area obtains legal land tenure, residents have more impetus to demand infrastructure.

4.3 Interaction between Formal Institutions and Peri-Urban Settlements

An insufficient number of formal institutionsXgovernment and privateXpossess the motivation, mandate, experience, or capability to implement peri-urban sanitation programs. As noted above, governments do not want to condone the existence of informal communities

Figure 17: Legal Status Success Stories

The program called "PROFAVELA," implemented in Belo Horizonte, Brazil, from the mid-80s onward, had two objectives: facilitating integration of the "favelas" into the "formal city" with the provision of public infrastructure, and improving the income levels and quality of life of poor families. The project was undertaken under "Legislacao do Programa Municipal de Regularizacao de Favelas," comprising law 3532/83 and its Decreto Regulamentar 4762/84.

"Profavela: O morro ja tem vez," the report on the project published in 1988 by URBEL (the municipal company that coordinated the project), makes the point that effectively tackling the issue of the legal status of an area of favelas is linked first of all to the regularization of the legal status of the land, and subsequently to granting legal tenure to occupants of subdivisions of occupied land. Two specific objectives of legal recognition are thus set out in this case study: first, recognizing the occupation of land by spontaneous settlements; second, making it possible for inhabitants of the favelas to obtain legal tenure.

The project included a planning stage and mapping the de facto land subdivision. The "Decretos de Aprovacao de Parcelamento" and the "Normas de Uso e Ocupacao do Solo" then assimilated the "favelas" into the city's legal framework. URBEL also provided inter-institutional coordination (on the federal, state, and municipal levels), as required for legal recognition. The case study lays out the benefits of taking the legal recognition approach, including the number of people who benefited (13,529 inhabitants); the favelas with subdivision maps approved for land use and occupation (eight areas); and favelas in the process of being legalized (10 areas, with a population of 21,000 inhabitants). The case study also highlights the active participation of the community in the various stages of settlement upgrading.

Also of interest was the use of information technology to facilitate the collection and cataloging of data on the informal settlements. The Italian NGO, AVSI, is operating a CAD laboratory using applications that simplify the management of cadastral and socio-economic data. These data, which are used to issue property titles to settlers in favelas under the PROFAVELA program, are also made available to URBEL. Thanks to information technology, URBEL and AVSI can work closely with the community, deciding together on intervention priorities and modalities.

Source: Water Supply and Sanitation Collaborative Council (WSSCC) Working Group on Urbanization (WG/U). March 1993. "Working Document #1: Legal Status." Rome.

for many reasons. Some municipalities cannot even provide services in more affluent areas; they are overwhelmed in general and do not want to recognize new areas and increase their responsibilities.

As noted previously, demand-driven urbanization infrastructure involves a different process than does formal, supply-driven urbanization. Yet existing institutions have been set up for supply-driven urbanization infrastructure. They are not organizationally structured and prepared to carry

out demand-driven urbanization. These institutions have their own laws and regulations, institutional mission statements, goals, objectives, personnel, and methods. People hired by such institutions are trained at universities that are still supply-oriented in their approach to urban planning. As a result, when it comes to peri-urban areas, institutional staff are often confused about their institutional and personal responsibilities.

Another problem that can surface between formal institutions and the peri-urban community concerns the kind of skills needed to initiate sanitation interventions in peri-urban settlements. Standard technology and approachesXas applied in developed countries and in planned urban neighborhoods of developing countriesXwill not work in peri-urban areas because of the latter=s physical conditions, heterogeneous population, and population density. Consequently, formal institutions, in working with peri-urban settlements, must in the future be prepared to offer creative solutions and alternative technologies. They also must be willing to engage the community in the decision-making process from the beginning. Today, unfortunately, there exists in many places a professional bias among engineers and planners against alternative technologies and community participation. Strong local institutions thus are needed to implement and sustain projects in peri-urban areas, and engineers and planners in these institutions must be able and willing to identify and work with existing community leaders.

Formal institutions also must learn to cooperate with organizations from a variety of different sectors. For example, multiple ministries may require coordination, such as the Ministry of Health, the water and sewerage authority, and the Ministry of Planning. Regulations are needed for health and construction, and a tariff-setting authority is necessary to establish rates and collect fees. Project designers therefore should consult with each of these institutions. In most cases, the institutions have no clear mandates about their role in providing services to peri-urban settlements, given the latter=s illegal status. A key issue for project designers, then, is to assess whether the government staff members responsible for urban sanitation have the skills, experience, and institutional commitment necessary to change their approach to peri-urban communities.

4.4 NGOs As Intermediary Organizations

NGOs can serve as useful bridges in overcoming the lack of recognition informal settlements suffer from government organizations. For example, it may be easier for NGOs to organize the community at first, followed by outreach to the formal institutions.

NGOs, in working with the community, usually can help find more economical solutions that are acceptable to all residents, ones that involve residents= contributionsXin kind or in laborXin building their own infrastructure. Although communities may be limited in resolving their own infrastructure problems, cases of locally built and managed aqueducts are known.

With NGO assistance and community labor and pressure, the cost and red tape involved in acquiring infrastructure can generally be reduced, and government support and recognition can be fostered.

Figure 18 gives an example of an NGO in the Dominican Republic that is working with families living in peri-urban areas.

Figure 18: Serving as Intermediary in Dominican Peri-Urban Communities

Instituto Dominicano de Desarrollo Integral, Inc. (IDDI), a private, nonprofit Dominican institution created in 1984, is the largest NGO working in the development of peri-urban areas in the Dominican Republic. IDDI operates on the holistic concept of participatory, integral development. Part of its philosophy is that effective programs must focus on the multiple causes of a community's problems.

IDDI's 75-person staff and 220 community-based health promoters work principally in the squatter slums of the capital city of Santo Domingo, serving 60,000 people. Through its training and technical assistance programs, IDDI has helped hundreds of community groups in dozens of low-income, urban barrios carry out projects in community organization, formal and informal education, water and environmental sanitation, housing and infrastructure improvements, preventive health, and microenterprise development.

IDDI has assisted in the formation of 20 community-based organizations, several of which have become autonomous, legally recognized institutions with their own funding sources. It has also channeled credit to nearly 2,000 microentrepreneurs through its small business loan program.

IDDI works in coordination with the community to develop greater political control and social responsibility.

Source: "Voices from the City," newsletter of the Peri-Urban Network on Water Supply and Environmental Sanitation. March 1993. Volume 2. WASH Project.

5

TECHNICAL CONSIDERATIONS

The decision of which technology or combination of technologies to use for peri-urban sanitation intervention will perhaps be one of the most challenging for project designers to make. Tried and true sanitation technologies for either rural areas or formal urban areas have, for the most part, been found to be inappropriate for peri-urban settlements. In recent years, new and more appropriate technologies for peri-urban sites have been developed by engineers working with social scientists, but actual experience with using these technologies is still relatively minimal.

When choosing and designing a sanitation technology, engineers traditionally focus primarily on physical site characteristics such as slope, water table, soils, and so on. In peri-urban areas, physical site characteristics are indeed very critical considerations, but project planners, engineers, and other sector professionals must also consider the full range of areas discussed in Chapters 3 and 4, including health, environmental, social, economic and financial, legal, human, and institutional resources.

As mentioned in the last chapter, perhaps one of the most important points project planners must keep in mind is that the current range of sanitation technologies that might be considered for peri-urban areas is limited. In many peri-urban areas, the combination of harsh physical conditions, high population densities, extreme poverty, and the inability or unwillingness of governments to provide significant subsidies may lead to the conclusion that no existing technology is an appropriate solution. These ?impossible situations≅ will likely become more common as the explosive rapid urbanization process continues. Recognizing that there very well may be no ?magic bullet≅ technology will liberate project planners to explore alternative, nontechnological approaches to addressing peri-urban sanitation.

5.1 Site Limitations

The physical limitations imposed by a peri-urban site can be the predominant constraint to upgrading the area. Cities and towns are often built on land that is unsuitable for productive use, such as farming. As discussed earlier, peri-urban settlements are almost always found on land with the cheapest value, which in turn usually indicates that the land has unattractive physical attributes such as extremely steep slopes or swampy conditions, or that it is subject to frequent flooding. These types of physical site conditions can increase design and construction costs by 100 percent or more compared with what the same technology would cost on land more suitable for urbanization.

Operations and maintenance costs will also be more expensive on difficult terrain. Many peri-urban

areas have soil that is either rocky, sandy, or clayey. Rocky soil makes even pit latrines difficult and expensive to build; sandy soil may require expensive lining of pits to prevent cave-ins or make contamination of underground aquifers very likely; clayey soils make infiltration difficult, resulting in the quick filling of pit latrines. These not uncommon conditions can make even the ?lowest-cost≅ and simplest technologies either technically infeasible or unaffordable for many poor families living in peri-urban areas.

5.2 Institutional and Community Costs of ?Low-Cost≅ Technologies

The term ?low-cost technologies≅ usually refers to low capital costsXespecially the capital required for materials. From an institutional and community perspective, however, low-cost technologies can be far more labor intensive than conventional technologies. Project planners designing a peri-urban sanitation program need also to consider the additional costs of the corresponding labor when comparing technologies. For example, employees of the institutions implementing a peri-urban sanitation project usually must devote a significant number of days or even months to the ?soft≅ side of appropriate technologies. Depending on the technology and community context, this process can be very labor intensive and may include activities in community organizing, attending meetings, construction training, operations and maintenance training, hygiene education, monitoring and evaluation, managing credit programs, and so on. These labor costs can be significant for the implementing institution and need to be recovered if a program is to be sustainable. Nonetheless, they often are not factored into the comparison of costs corresponding to a given technology. Planners need to cost out the level of effort required to meet these tasks and consider these costs when comparing the technologies.

Lower-cost technologies also usually require more labor from community members than do other technologies. Many peri-urban sanitation project designs require communities to provide much of the construction labor, including digging pit latrines, digging trenches for sewage pipes, or building on-site latrine superstructures. Many low-cost technology sanitation schemes also require the community to play a significant role in the operation and maintenance of the systems, including cleaning out latrines, unplugging small-diameter sewer pipes, or emptying septic tanks. Despite this degree of community labor, project planners usually assign it no value or zero cost when comparing technologies.

In reality, labor provided by a community represents real and significant costs to the community and its members. In peri-urban areas, families are by and large in the cash economy and usually need to work very long hours in order to make enough money to meet their basic needs. The axiom ?time is money≅ is very real to families living in peri-urban settlements. Contrary to the prevailing assumptions on the part of many project planners, labor provided for a peri-urban sanitation project by a community is not ?free.≅ In many peri-urban sanitation projects, families that are required to contribute labor either lose an opportunity to be earning money or, more often than not, hire a lower-cost laborer to provide ?their≅ labor

contribution. As a result, many peri-urban sanitation projects that have used a ?low-cost≅

appropriate technology have been stalled or have failed because the beneficiary families living in peri-urban settlements could not afford to ?donate≅ their labor. Project planners must consider the real cost to a community of a given technology in deciding what is most affordable and appropriate. They should also be prepared to conclude that even ?low-cost≅ appropriate technologies may be unaffordable to a given community.

5.3 Design Standards and Engineers

In choosing a sanitation technology, project planners should use with caution existing selection and design guidelines. Although peri-urban sanitation needs typically are assessed using selection guidelines developed for rural or formal urban areas, these tools are not always appropriate for peri-urban areas. (One notable exception may be found in Cotton and Franceys=1991 study, *Services for Shelter*.) Rural and formal urban guidelines do not include new, alternative technologies such as condominial, shallow, and simplified collection systems, nor do they consider some of the constraints (such as lack of legal tenure) unique to peri-urban areas.

Local engineers, and often their expatriate advisors, prefer to use sanitation systems with which they are familiar. These systems are usually the most modern and are often based on the adoption of engineering design and construction standards for conventional sanitation technologies in developed countries, which in turn are based on the industrialized nations=own health standards and institutional capabilities. These systems often turn out to be unsuitable for the difficult topography, soils, lack of water, and other conditions found in peri-urban settlements. In particular, such conditions can make installation of conventional sanitation infrastructure extremely costly.

Two factors that contribute to engineers= overreliance on conventional sewage systems is the existing legal framework that has legally codified foreign engineering standards, and the traditional curricula and corresponding textbooks used in developing-country engineering schools that were often founded by expatriate engineering professors or local engineering professors who first received their training overseas. Even in urban areas where more than 50 percent of the city is considered peri-urban, it is very rare to find engineering students who take even one course dealing with peri-urban sanitation.

Another important constraint to servicing peri-urban areas, noted earlier, is that lower-cost technologies usually require a much higher level of user involvement than conventional technology to function properly. Yet engineers, who traditionally play a major role in the formulation of sanitation projects, often have little training or regard for the social mechanics of projects, such as mobilizing communities and involving future users, and they have little patience for the sheer time it takes to address them.

Some instructive examples from around the world offer simple and ingenious solutions to providing sanitation under the adverse conditions found in most peri-urban areas. Of particular note are condominial or simplified sewers which are described in Figure 19. These options have also turned out to be much cheaper than conventional systems. Nevertheless, for the most part, the world engineering community (in both developed and developing countries) is either unaware of their

existence or, because of a lack of hands-on experience, remains distrustful of and reluctant to consider these alternatives.

Finally, it should be pointed out that the conceptualization, design, and construction of ?simplified≅ sewerage systems that are appropriate for peri-urban areas pose extremely complicated engineering challenges that require skilled, experienced, innovative engineers working on interdisciplinary teams with social scientists, economists, and others.

5.4 Sanitation Technologies

Sanitation technologies can be divided into two general classes: on-site and off-site.

5.4.1 On-Site Technologies

On-site technologies rely on the disposal of excreta at the point of defecation. Material is not removed from the site, although liquids may leach into the ground and eventually be carried off-site. Latrines are an example of on-site systems. The pit of a pit latrine is covered when full, and the excreta stays in place. Composting latrines are emptied, but the composted material is used on-site or nearby.

Peri-urban situations present both advantages and disadvantages for on-site systems. The on-site system=s lower cost and minimal institutional requirements match well with the lower incomes and weak institutional capabilities often found in informal settlements. However, peri-urban population densities frequently are too high to accommodate latrines, and site conditions often are inappropriate as well, leading to pit flooding or groundwater contamination.

Latrines

To date, construction of latrines has been the main sanitation intervention funded by external support agencies (ESAs), including for projects in peri-urban areas. Dry, nonflushed latrines can be built with a small initial investment, mainly labor, and require little operating skill. They are also inexpensive to maintain. They are suitable for use in areas where water is in short supply and where land is available to dig new pits when old ones fill up. If no land is available, provision for cartage and treatment must be made. If piped water is provided to an area, provisions must be made for proper drainage away from the latrine, and care must be taken to prevent groundwater contamination from latrine leachate.

Experience to date has shown that latrines have serious limitations in peri-urban areas. For one, they usually are not technically feasible at population densities above 350 persons per hectare, and most peri-urban areas have population densities that significantly exceed that rate. In many high-density peri-urban settlements, little, if any, space exists to dig a new pit after the existing one fills up. Space may not even be available to build the first pit.

Figure 19: Condominial Sewers: An Intermediate Option for Peri-Urban Sanitation

The condominial sewer system can be a cost-effective solution for peri-urban sanitation. Conventional sewers are generally too expensive for use in peri-urban areas. The cost-savings of condominial (also called condominium or shallow) sewers over conventional systems have ranged from 20 to 70 percent.

As the name suggests, the condominial sewer system is essentially a horizontal version of plumbing in a condominium. The layout provides a shorter grid of smaller and more shallow "feeder" sewers.

Condominial sewers carry both liquid and solids through pipes, as in conventional sewers. However, the sewers can be shallow since there is no vehicular traffic above them, and they can use small-diameter pipes (typically 100 mm). Pipes run along the backyards of houses, and simple inspection boxes (rather than manholes) are built at each house connection. The wastewater of an entire block discharges into the trunk main at a single point connection for the block rather than for each house.

Once the shallow sewer emerges from the block, it can be discharged directly to a treatment facility, connected to a conventional or simplified sewerage system, or sent to a communal septic tank, depending on the size of the system and site conditions.

Condominial sewers do not rely on large quantities of flush water but rather on a high frequency of wastewater passing through the gravity-driven system. These sewers accept all household water. If any solids settle, wastewater builds up behind the deposit until the pressure is great enough to get it moving again. The high volume of wastewater in densely populated areas helps reduce the number of blockages from deposited solids.

Communities must be actively involved in operating and maintaining the "feeder" infrastructure of condominial sewers. Where community and organizational involvement has been missing, the technology has worked poorly or not at all. Individual households are responsible for maintaining the feeder sewers, with the formal agency tending only to the trunk mains. Misuse of any portion of the feeder system soon shows up as a blockage of a neighbor's segment of the sewer. The consequence is rapid and direct feedback to the abuser. This results in fewer blockages than in conventional systems.

Families can choose to continue with their current sanitation system, to connect to a conventional waterborne system (which usually means a holding tank discharging into an open street drain), or to connect to the condominial system. In most cases, families that initially choose not to connect eventually change their minds, either because of heavy pressure by their neighbors, or because they find the buildup of wastewater in and around their homes becomes intolerable.

Since 1980, when the condominial system was first developed, more than 20,000 people in low-income neighborhoods in northeast Brazil have benefited from this technology. Slightly modified versions have also been used to benefit more than 600,000 people in Organi, Pakistan, and PDR Yemen, where the technology is known as sweeper passage sewerage.

Source: "Voices from the City," newsletter of the Peri-Urban Network on Water Supply and Environmental Sanitation. March 1993. Volume 2. WASH Project.

Additionally, latrines are impractical for multistory housing. Settlements with many high buildings may have insufficient circulation of air streams normally required to blow over the tops of the vent pipes of ventilated improved pit (VIP) latrines. Finally, latrines used in high-density areas run a high risk of contaminating nearby wells and underground aquifers.

Double pit latrines may be an appropriate solution for many settlements until off-site technologies become feasible. Double pit latrines share many of the advantages of single pit latrines, but in addition, they last longer. These advantages, however, are countered by higher initial costs, the need for more user education, and more complex construction requirements.

Compost latrines: One current alternative that is currently in vogue as an ?appropriate technology≅ for many ESAs is the dual vault composting (DVC) latrine. Unlike pit latrines, composting latrines have their contents composted and emptied. As with pit latrines, actual experience with the DVC latrine in peri-urban areas has been generally unsatisfactory. The DVC only makes sense if there exists a market for the compost and a community tradition for human waste reuse.

Composting toilets require significant and conscientious user care and operation, which peri-urban inhabitants are unlikely to maintain unless the implementing agency provides significant and continuous extension work. The more typical scenario, in which implementing agencies do some up-front promotion of compost latrines, provide materials for their construction, and then move on to another site without providing ongoing education to reinforce proper maintenance of the latrines has consistently resulted in 50 to 80 percent of the latrines either being misused or not used at all.

Communal latrines: Communal sanitation facilities can be an appropriate interim solution for peri-urban areas. In general, communal latrines address the major constraints commonly found in peri-urban areas:

- Low water availability
- Site conditions inappropriate for latrines
- Unwillingness to pay by users who have no legal land tenure or have very low incomes
- Population densities too great for individual household latrines
- Institutional capabilities insufficient to support off-site systems
- Social factors that make the reuse of excreta implausible

Communal latrines address this combination of constraints by reducing the land area required for sanitation facilities, minimizing cost, and requiring little water. However, project planners should use caution when considering this option because examples abound of such facilities that are not maintained because of ambiguity as to who owns the latrine (the community or the government) and who is responsible for its maintenance. In these situations, communal latrines fall into disrepair or become unsanitary and therefore are not used.

Pay-per-use communal latrines have been successful in some cases for those people who can afford it, but even when most users can pay, subsidies may still be necessary for those who cannot pay, to

ensure more complete coverage of the entire population.

Septic Tanks

Septic tanks are another on-site sanitation system, although partially treated solids must be disposed of and further treated off-site. Septic tanks offer two particular advantages. They provide better treatment of waste than pit latrines and can be used to dispose of gray water, and they are simple enough to include the participation of the users, the community, and the local or regional governments.

The disadvantages of septic tanks versus latrines are the larger investment they require, their higher operating costs, the need to clean them, their land usage, and the higher level of water supply they require. In high-density areas, the same space constraints that affect pit latrines also affect technologies such as pour-flush toilets, which require soak pits or septic tanks. Water to flush the toilet may also be too costly, too cumbersome to carry from the public tap, or only intermittently available.

Dual soak-away pits, which are shared by several households, are a variation of the above. In this scheme, several households=pour-flush toilets are connected to a common pair of soak-away pits. Cooperation must be assured among users to prevent blockage and ensure the cycling and the cleaning of the pits.

5.4.2 Off-Site Technologies

Off-site systems dispose of waste away from the user. A simple bucket latrine is one example of an off-site system. The more complex waterborne sewage collection system is another example.

Off-site sanitation interventions often solve sanitation-related health problems by isolating the excreta from the user, only to fail ultimately by contaminating groundwater or by exposing downstream populations to disease. In the long term, cities must develop environmentally sustainable methods to treat and dispose of waste.

Conventional Sewage Collection Systems

Conventional sewage collection systems have a high initial construction cost (including a high foreign exchange requirement for certain materials and equipment) and require skilled labor for installation. These systems often include pump stations and screening equipment, which need trained maintenance personnel and moderate operation and maintenance expenditures. Maintenance of the sewer lines consists of the periodic cleaning and removal of obstructions.

Rights of way are required for the initial construction of and maintenance access to conventional

sewerage systems. They also require a significant water supply (75 liters per capita per day) to minimize plugging of sewage lines. The overwhelming majority of peri-urban settlements around the world do not have the required amount and reliability of water supply for the proper operation of conventional sanitation systems. The most significant constraint, however, is the inability of the majority of peri-urban areas to afford conventional sewage systems.

Alternatives to Conventional Sewerage

Alternatives to conventional sewerage include simplified, condominial, and small bore systems.

Simplified sewerage: Design standards for conventional sewerage are altered; sewers can be built with smaller pipes, shallower trenches, and fewer appurtenances.

Condominial sewers: Simplified sewerage can be built and maintained by users and located between houses, rather than in streets or other rights of way.

Small bore sewers: Septic tanks can be connected to small-diameter pipes that carry the solids-free effluent.

All of these alternatives have significantly lower initial and operating costs and a lower requirement for amount and reliability of piped water supply than do conventional systems. However, project planners should recognize that even though these alternatives are much lower in cost, they may still be unaffordable to many peri-urban communities. Similarly, peri-urban areas may not have the required minimum piped water system to accommodate these technologies. In addition, project planners must realize that these alternative sewerage systems require more labor-intensive installation and increased maintenance. Unlike conventional sewerage, with its large pipes, the small pipes used in alternative systems frequently clog up. The increased maintenance needed to unclog the pipes is the responsibility of individual households and the community, and requires ongoing community organization and extension work by the implementing agency.

A clogged pipe at a household in unconventional sewers affects a significant portion of the community, since these systems are more interdependent in their piping. Clogging at one household blocks up the pipe for everyone else using the system. As discussed earlier, these systems are not as common as conventional sewerage; therefore, there is relatively little operational data for engineers to use as a basis for rational design and planning.

Pit Latrines with Cartage Systems

Under certain conditions, single pit latrines can work as a short-term intervention—even in densely populated peri-urban areas—to create a physical barrier between residents and excreta. As discussed above, in high-density areas, latrines must be emptied periodically because land is not available to dig another pit. Unfortunately, technologies for latrine emptying and excreta treatment that are appropriate for peri-urban areas are not yet widely known or available. The example in Figure 20,

however, presents one approach to overcoming the latrine emptying and collection problem that is proving successful in Nairobi.

Figure 20: A Latrine Emptying Service in Kibera-Nairobi

Roughly half of Nairobi's population of two million resides in overcrowded informal settlements. By the year 2000, it is estimated that up to 60 percent of the city's projected four million residents will live under similar overcrowded conditions. The Kibera community of Nairobi, the largest unplanned settlement in the city, it has a population of 400,000 crowded in only 110 hectares of high-density rental housing. Twenty years ago the population was less than 20,000.

There are few economic incentives for landlords to improve the basic infrastructure and living conditions in Kibera. But now a coalition of more than one dozen Kenyan NGOs is involving poor residents in Kibera and other rapidly expanding informal settlements in community self-improvement actions. The Kenya Water for Health Organization (KWAHO) has taken the lead in addressing water and sanitation problems.

Kibera residents have received KWAHO assistance in two key activities: constructing ventilated improved pit latrines, and establishing a latrine emptying service that extends limited service to all nine sections of Kibera. A special suction truck, provided with support from the Norwegian Agency for Development, can negotiate the narrow and difficult pathways winding through the community and remove the dense sludge from pit latrines. The vehicle is managed by a 13-member community management team and operated by a crew of 3. During the first half of 1991, more than 6,000 households paid the US$9 advance fee to have their home latrines emptied.

Source: "Bringing Village People into Planning: KWAHO? s Urban Challenge," *Source*, UNDP, July 1992.

5.5 Wastewater Treatment

As discussed above, condominial and small bore sewers offer significant initial cost savings over conventional sewage collection while still providing the advantages of waterborne sewage systems. These alternatives, however, must include wastewater treatment to increase health and environmental benefits, and they require cartage capabilities to empty septic or interceptor tanks, if used. Septic tanks have been used as a treatment receptacle for block sewers. However, innovative on-site treatment technologies, such as anaerobic filters, need to be tested on peri-urban applications. Decentralized treatment technologies have not yet been applied to peri-urban areas.

Conventional high-technology wastewater treatment systems are usually too expensive to build and operate for peri-urban areas. Some of the small-scale, low-technology wastewater alternatives worth

considering are the following:

- Stabilization ponds
- Constructed wetlands
- Duckweed ponds
- Up-flow anaerobic sludge blanket reactors
- Communal septic tanks/anaerobic filters
- Oxidation ditches

An important disadvantage of many of these alternatives is their requirement for a large area of land, which can be expensive, especially in urban areas.

5.6 Summary and Comparisons of Technologies

The relative characteristics of the technologies discussed in this chapter are summarized and illustrated in Table 2.

Table 2

	Total Initial Costs	Construction Labor Required as fraction of total cost	Operating Costs	Land Requirements	O&M Skill Level	Degree of Treatment	Possible Participation
Onsite systems							
VIP Latrines	low	high	low	moderate (if superstructure is moved when pit is full)	low	low (unsuitable with high water tables)	users, community, government
Double Vault Above Ground Latrines	low to moderate	high	low	low	low	moderate	users, community, government
Batch Composting Latrines	low	high	low	low	low	moderate (unsuitable for high water tables)	users, community, government
Continuous Composting Latrines	moderate	moderate	low	low	low	moderate (unsuitable for high water tables)	users, community, government
Onsite Liquid Disposal with Offsite Solids Disposal							
Pour Flush Toilet with Soakaway	low to moderate	moderate	low	moderate	low	low (unsuitable with high water tables)	users, community, government
Pour Flush Toilet with Septic Tank	moderate	moderate	low	moderate	low	moderate	community, government
Cistern Flush Toilet with Septic Tank	moderate to high	moderate	high	high	low	moderate	community, government
Offsite Disposal							
Vault or Pit Toilet with Cartage	low to moderate	high	moderate	low	low	depends on final disposal	users, community, government
Bucket Latrine	low	high	moderate	low	low	depends on final disposal	users, community, government
Water Borne Sewage Collection							
Simplified	moderate	moderate	low	moderate	low	none	government
Solids Free	moderate	moderate	moderate	moderate	low	none	community, government
Condominial	low to moderate	High	low	low	low	none	users, community, government
Conventional	high	moderate	high	moderate	high	none	government

6

SUMMARY AND RECOMMENDATIONS

This final chapter summarizes the key principles identified in this document, the key questions to ask and information to gather in planning and designing peri-urban sanitation projects, and the basic approaches that should be considered when devising project strategies for improving community excreta sanitation in peri-urban areas.

6.1 Key Principles

Improving the health of the rapidly growing number of families living in peri-urban areas and protecting the urban environment are urgent needs and compelling program objectives that host country governments, as well as external support agencies such as the Agency for International Development, must address. In reaching these objectives, improving community sanitation should be accorded the same (if not higher) priority as water supply.

To improve health in densely populated peri-urban areas, sanitation programs must target the community rather than individual households. Individual households with improved sanitation will not experience improved health if their neighbors are still disposing of fecal matter in ways that contaminate the general environment of a peri-urban settlement. In addition, improved community excreta sanitation may not improve health if other environmental factors such as solid waste disposal and drainage are not also considered.

The current planning paradigm for formal urbanization, which begins with the installation of basic urban services, does not coincide with the actual peri-urbanization process, which begins with the informal and/or illegal settlement by poor urban families on land that has not been urbanized. The peri-urbanization process is a reality for 50 to 80 percent of most cities in developing countries. Therefore, authorities must recognize that providing sanitation services to existing densely populated peri-urban settlements must follow a different paradigm than that of traditional urbanization. Additionally, officials must acknowledge the need to reform existing service provision agencies to coincide with the particular needs of the peri-urban sector.

The economic, social, legal, and physical conditions generally found in peri-urban areas present unique challenges to WS&S sector specialists attempting to improve community sanitation. In large measure, conventional engineering approaches and standard technical solutions used for formal urban and rural sewerage systems must be significantly modified or even rejected for peri-urban areas.

Installing a sanitation technology can be done relatively rapidly. Setting up and implementing a

long-term sustainable peri-urban sanitation program that successfully improves community health and protects the environment takes significantly more time.

To improve health, changing individual and community behaviors that cause fecal-oral contamination is at least as important as constructing new sanitation facilities. For efforts to change behavior to succeed, projects must be designed around a thorough and correct understanding of existing knowledge and hygiene practices in the community and a thorough knowledge of the social, cultural, and religious context in which high-risk behavior takes place. Moreover, efforts to change behavior must be institutionalized and enjoy strong support from donors, governments, and other key actors.

Recognizing that improving peri-urban community sanitation is a complex process, project planning should involve the many institutional actors that influence or have responsibility for peri-urban sanitation, including the respective agencies that handle sanitation, the agencies responsible for hygiene education, and nonhealth agencies such as municipalities, urban planning agencies, and credit institutions. The most effective way to ensure that cooperation is elicited from the widest possible range of agencies and institutions is to take an inclusive, participatory approach to the planning process.

Peri-urban sanitation projects should not be solely technology driven. Successful sanitation interventions should also consider health, economics, social, legal, and institutional factors.

The conceptualization, design, and construction of peri-urban sanitation systems pose extremely complicated engineering challenges that require skilled, experienced, and innovative engineers working on interdisciplinary teams along with planners, social scientists, environmentalists, lawyers, economists, and others.

Citizen involvement and community participation are critical to successful peri-urban sanitation programs. Community participation can lead to initial cost reductions, increased acceptance of program interventions, increased cost recovery, and more effective operation and maintenance.

Institutions providing peri-urban sanitation services should seek to recover as much of their costs as possible in order to reach some level of financial sustainability and be able to expand services to other peri-urban areas. Individual households should be expected to pay for the real value of the sanitation services. Providing access to credit can greatly facilitate peoplec=s ability to pay for the services. If subsidies are necessary to reach the extremely poor, they should be clearly accounted for. Successful cost recovery results from providing services that families are able and willing to pay for and from developing effective institutional capacities to collect tariffs, loan payments, and other fees.

6.2 Data Needs

Clarifying and understanding the problems peculiar to peri-urban environments is an essential first step in the design and planning of a peri-urban sanitation project. Much of the data needed to better understand these problems may not currently exist and will require a significant effort on the project planner=s part to gather it. Required data includes answers to the following questions:

What are the current environmental sanitation conditions in the targeted peri-urban areas? What percentage of the community currently has access to sanitation as well as to other related basic services such as water supply, drainage, solid waste collection, and so on? What is the nature and quality of the existing services (for example, pit latrines, and septic tanks)? Is the water supply reliable? Is it at the household level, at public standpipes, or through private vendors selling by the bucketful?

What is the baseline health status of the families Xespecially the children Xliving in these communities? Are the highest-risk health problems related to inadequate environmental sanitation?

What are the existing sanitation-related attitudes, knowledge, and behaviors? What anal cleansing materials do families use? Are children encouraged or even allowed to use existing sanitation systems? What is done with infant fecal matter? Do adult women and men use the same sanitation facilities? How is animal fecal matter dealt with? Is sanitation considered a problem by the community?

What is the prevailing topography of the targeted peri-urban settlements? What are the soil and water table characteristics? What is the population density of the community? Is it likely to increase in the future?

What is the legal status of the targeted peri-urban communities? Is land tenure under dispute? Are the plots registered and recognized by the municipality? Is it illegal for urban utilities or other public institutions such as the Ministry of Health to provide services to these informal/illegal communities? Is there a genuine and sincere political commitment by the government to help families in informal/illegal settlements? Is there an active policy to withhold help from these communities or even to encourage abandonment of the settlements?

What are realistic costs for a sanitation intervention? What are area household incomes? What is the nature of the income: irregular, seasonal, steady, informal sector jobs, or formal sector jobs? How much are the households currently spending on various services, such as sanitation and water? How much are families able to pay and how much are they willing to pay for a range of services? What is the social makeup of the households? What percentage of the community is made up of children? What percentage of the households is headed by single working mothers? What is the ratio of renters to homeowners?

What is the economic nature of the peri-urban settlement? Is it primarily a residential area or (more likely) is there significant informal small-scale productive activity in the settlement? What is the nature of these businesses? Do they produce more excreta (as in a restaurant) or waste of a different nature (as in a small-scale tannery or a butcher shop)?

- Which, if any, public institutions have the role and responsibility to provide sanitation services to the peri-urban communities? Are the institutional structure and capabilities of these public institutions appropriate for addressing the problem? Do the senior engineering personnel in these institutions have training and/or experience working in peri-urban areas, and are they open to innovative technical and social approaches to solving the problem? Does a social department exist? Does it employ qualified and experienced social scientists and community organizers? Does the social department have much decision-making power?

- What is the existing social and political structure of the peri-urban communities? Are there existing grass-roots community organizations? Do they represent the community? Who are the leaders of the communities? Do the leaders represent the landowners or do they represent the households living in the settlements? How are community decisions made? Are national political parties organizing potential voters in these communities and promising public services in return for votes?

- What are the existing health, environmental, design, and construction regulations and standards? Are these standards realistic given the country=s conditions? Are they strictly enforced by the government or does the ESA need to follow these regulations? Will strict adherence to these standards automatically eliminate from consideration any technical options that are feasible for a peri-urban area?

- How is the existing financial sector organized? Is home improvement credit generally available to families living in peri-urban areas? Are there existing legal barriers to providing credit to these families? Are the formal financial institutions likely to respond to incentives to provide families with access to credit? Are alternative credit institutions, such as NGOs or credit cooperatives, available?

- Is the lack of adequate sanitation creating an environmental pollution problem for other areas, including the city as a whole and downstream communities?

6.3 Strategies

A comprehensive approach that recognizes the interrelationships between various societal sectors is needed to increase the effectiveness of a peri-urban sanitation project. Projects should be able to depend on cooperation between and among community, municipal, regional, or national organizations and involve both the formal and informal sectors. Complementary projects in water supply, solid waste collection, drainage, and health education may be needed to ensure the effectiveness of sanitation projects. Furthermore, implementation of a sanitation solution may be a multistep process, starting with simple interventions to address the large problems and becoming more complex as finances and institutional capabilities allow.

To promote a comprehensive approach, project design and implementation teams should be interdisciplinary. NGOs can also play an effective role because they can organize illegal/informal peri-urban settlements and serve as an intermediary with formal legal institutions such as banks,

municipalities, and utilities.

6.4 Challenging the Status Quo: A Need for Action

Much was learned during the International Drinking Water Supply and Sanitation Decade (1981-90), especially about developing affordable, durable, and simple technologies, and about the equally important human elements of water and sanitation. Much of what was learned during the decade came from rural experiences, which may not be relevant to peri-urban situations. Similarly, the engineering sector in formal urban areas is strongly biased toward the use of conventional sewage technology that is clearly out of reach of the overwhelming majority of families living in peri-urban areas. This bias is reinforced by existing engineering and health regulations and standards. Consequently, the ?lessons learned≅ from the rural WS&S experience, as well as the conventional wisdom of established engineering professions in urban areas, must be refocused and altered dramatically to have meaning in a peri-urban context.

The greatest need is for action, action comprising the following steps:

- Making existing knowledge on peri-urban sanitation more accessible
- Maintaining statistics that describe the residents of peri-urban areas and their needs
- Sharing the practical implications of applied research within and among countries
- Designing and implementing activities and projects that bring sanitation to the urban poor, and perhaps most importantly
- Documenting and learning from the experiences of those carrying out sanitation activities in peri-urban areas of developing countries

Everyone involved or interested in peri-urban upgrading projects must recognize the uniqueness of the sanitation challenges presented by peri-urban areas. Interested parties must also confront head-on the difficulties in providing appropriate excreta disposal systems in these areas and recognize that many ?impossible situations≅ prevail for which no feasible technical solution exists. WS&S professionals must also challenge the status quoXthe reluctance of municipal and national governments to act and respond to the demands of peri-urban people who lack water and sanitation infrastructure.

By necessity or choice, government institutions, bilateral and multilateral aid organizations, and NGOs in the foreseeable future will be compelled to shift more of their attention and resources to the sanitation needs of peri-urban populations.

Appendix A

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Appendix B

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