

Chapter 10

Sanitation

Conventional wisdom dictates that water should not be supplied without complementary sanitation. This is a development principle. The reality, as many know, is different, because there has not been enough funding for water supply, let alone sanitation.

Given a choice, the needy urban poor will always opt first for water supply, since it will have a direct economic benefit, whereas sanitation will have more indirect benefits related to health. Because sanitation in Asian cities could well be the subject of a book by itself, the function of this chapter is merely to give some indication of the existing status of sanitation in Asia, emphasize its importance, identify some appropriate technologies, and look at what is needed to break out of the status quo.

Improved environmental sanitation also improves economic benefits. Consider the case of investments for sewage collection in Santiago, Chile. The principal justification for the investments was to reduce the extraordinarily high incidence of typhoid fever in the city, but a secondary justification was the need to maintain access to the markets of industrialized countries for Chile's increasingly important exports of fruits and vegetables. (Briscoe, 1993)

A. Gender Issues

World Bank findings from studies indicate that men and women value sanitation very differently. For women, since they are more personally concerned with these issues and more intimately involved in them with respect to their families, sanitation is often the second highest development priority. For men it may be the eighth development priority. To ensure that water sector activities are gender responsive at policy and institutional levels, ADB will promote the integration of gender concerns in policies, plans, programs, and projects. Incorporating explicit gender equity provisions in the objectives and scope of water sector activities will be encouraged.

B. Analysis

Sewerage costs are in the \$300 per capita range, septic tanks cost \$100 per capita, and latrines cost \$25 per capita. The advantages of sewerage are convenience; low health risk; no nuisance from smells, mosquitoes and flies; no problems with gray water (sullage); and no problems discharging industrial wastewater. The disadvantages are high cost, need for access to a reliable supply of piped water, difficulty of construction in high-density areas, unsuitability for self-help, need for pumping on flat ground, difficulty of maintenance, and concentration of pollution. Blockages and the breakdown of pumping equipment pose problems in sewerage systems, especially for low-income communities. There is now, on environmental as well as economic grounds, a growing appreciation of the fact that large sewerage schemes are not necessarily the best solution for some parts of cities, especially those with predominantly low-income communities (see Box 10.1).

In countries where sewerage service costs have risen significantly, industrial users have increasingly questioned whether the public sewer system represents the most cost-effective means of discharging their sewage. There is evidence of a trend toward more use of self-treatment and effluent reuse options. (Organisation for Economic Co-operation and Development, 1999)



Health risk—water pipe in drain

Box 10.1 Rethinking Sewage in Low-Income and Slum Areas

(This material was prepared specifically for this book by ADB's Alex Jorgensen.)

It is quite common for an international consulting firm to use conventional thinking in scoping and sizing various project facilities, including sewage collection and treatment systems. This often leads to the gross oversizing of these systems for a variety of reasons, which are not always the fault of the consultant. Normally it is the city council that insists on “fully modern” sewerage systems, regardless of actual demand. The officials involved have read or believe that such systems are essential for good sanitation, and these men and women are not amenable to a simpler technical solution, such as on-site septic tanks or even pit latrines in low-income or slum areas.

The basic design criteria for water are 24-hour supply and 120–150 l/c/d consumption. This consumption figure ignores NRW (often more than 50%), low pressure, and intermittent supply. Actual water supply is often between one hour every other day and two hours per day, and at low pressure. The real consumption in many areas is more like 30–40 l/c/d. Therefore, the conventional 80% wastewater generation ratio is false. Actual wastewater generation is closer to 50% of the “real” water supply. A related issue concerns individual house or property connections. Due to the cost of these being loaded onto the users, the connection rate is often low. The cost of connections from the street sewer to the property line should automatically be included in the project cost and be financed under the “loan.” While the cost of the connection from the property line to the house would normally be the responsibility of the owner, there may still be a case

for this being financed under the project when a low-income household is involved.

In addition to the capital cost aspect, there are serious operational problems. Sewers tend to be designed to minimum slopes to reduce pumping. When the actual flow in these sewers is half of that anticipated, or much less (as is often the case in low-income and poor areas), the scour velocity is not maintained and the sewers clog. Having an incoming wastewater volume half or less of that expected exacerbates problems, as the wastewater is much stronger in terms of solids and organic content. Therefore the minimum scour velocity needed is much higher. Operational process problems, with resulting odors, poor effluent quality, and high O&M costs, occur when sewage treatment plants have gross excess hydraulic capacity and the sewage strength is stronger than anticipated. To make matters worse, the income from water and sewerage tariffs ends up as a fraction of that projected, which leads to an inability to pay for O&M costs and a greatly reduced ability to repay capital costs.

The answer is for loan agencies to insist on a careful review of actual water use and wastewater generation at the planning stage as a condition of the loan and likewise at the detailed design stage. Once this is done, low-density, low-income, and slum areas should be converted to low-cost sanitation—septic tanks where space and groundwater conditions permit, dual pit latrines with squatter plates in slum areas (where there is usually no space), and good people-sensitive public toilets (like in Pune). Coverage of sewers and reticulation pumping stations and treatment systems should be reduced accordingly.

Nonconventional sewerage—using smaller pipes, laying pipes on a flatter gradient and at a shallower depth, laying pipes inside plots, reducing the number of manholes, and providing interceptor tanks for the settlement of solids—is a potential solution for low-income communities. Recently, in cities like Yogyakarta (Indonesia), small and affordable sewerage schemes have been seen. These serve 200–500 plots with local treatment facilities underground or landscaped. An NGO in this city says government needs to

agree to adopt community-based sanitation. The entry point is giving unauthorized settlers a semilegal status.

Septic tanks are constructed in many areas in Asian cities. Unfortunately, they are often not constructed properly (as in the Maldives, where the effluent outlet feeds almost directly into the water table) or discharge effluent directly into storm-water drains. Furthermore, in areas where there are many septic tanks, desludging and treatment and disposal of sludge are often totally

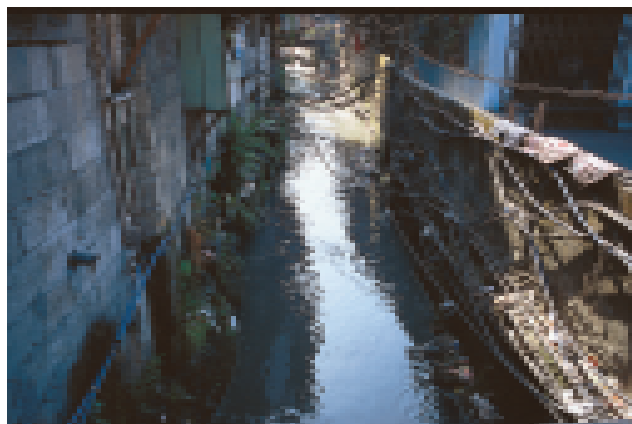
inadequate. As with sewerage systems, if the system is designed to operate a certain way, it should be operated in that way.

There are many different types of on-site latrines used in Asian cities. These include pit, twin pit, pour flush, and ventilated improved pit varieties. “Overhung” latrines (where excretion is direct to a water body) and bucket latrines (where the excreta is dumped outside the community) are also seen. The type of latrine will depend on local conditions, especially the level of groundwater.

C. “Sanitation Connection”

The selected information that follows was sourced from the “Sanitation Connection” Web site. It is offered here as a guide to addressing sanitation issues in developing countries.

The World Health Organization (WHO), United Nations Environment Programme (UNEP), Water and Sanitation Program (WSP), Water Supply and Sanitation Collaborative Council (WSSCC), and International Water Association (IWA) form an international partnership known as the “Sanitation Connection” to offer a comprehensive Internet resource to environmental sanitation practitioners.



Health risks

Policies and Strategies

- *Provide increasing emphasis on demand responsive approaches where the services provided are closely linked to what consumers want and are willing to pay for.*
- *Minimize the quantity of waste: for example, improve water demand management to reduce the*



Sanitation is needed, too

quantity of wastewater generated at source and reduce transfer of wastes to the wider environment through reuse and recycling.

- *Promote solutions that are, as far as is possible, locally based at the household or neighborhood levels, rather than depending upon “downstream” transfer of wastes.*
- *Develop institutional arrangements, mechanisms, and incentives that stress the participation of users and encourage the involvement of both the formal and the informal private sectors.*
- *Develop procedures for economic and financial analyses and planning of investments that include the consequences of suboptimal development: for example, downstream environmental damage or failing to make the best use of local resources.*
- *Develop mechanisms for cost recovery that provide appropriate incentives to achieve stated policy objectives: for example, with regard to subsidy and financial performance.*

Health and Society

The starting point is the household, as people are most likely to be at risk from contamination in the place where they spend most of their time. Health benefits accrue to families who have latrines, even if their neighbours do not; additional benefits then accrue as coverage extends to the whole neighbourhood. Gender equality needs to be promoted through recognizing that women are key providers of health and hygiene services to the family. This household-centered approach rather reverses the way in which planners and engineers view the situation; their starting point tends to be with centralized treatment and primary networks, rather than households. It is important to note



Desludging to the drain

that where wastewater treatment is inadequate, the hazard is moved around rather than eliminated, thereby emphasizing impacts on coastal areas.

Adopting a household-centered approach provides the opportunity to find out what householders think about the sanitation they already have and to explore what they actually want, rather than have other people decide for them. When people are ignored and the local context is not taken into account, sanitation schemes will fail. It is important to build awareness and create the environment to make informed choices. Social marketing is likely to be a key means of stimulating effective demand. This has to be followed up with supporting and facilitating measures to respond to the generated demand: for example, through better access to finance.

Inadequate sanitation impacts on children. Even where facilities are available, there are problems of acceptability and sharing of latrines and of the willingness of children to use them. There is a need for special attention to children's sanitation (including health and hygiene education) both in the home and at school. As well as being essential for a healthy environment at school, there are important opportunities for outreach into households and communities through educating school children.

Environment

- It is important not to lose sight of the fact that the first environmental priority for most families is a clean household that is an attractive place to live. Next comes the local neighbourhood environment around their house and on their street. Only after these are all satisfied is there likely to be much concern with the area beyond, such as the city or rural environment as a whole.

- An important component of sanitation programmes is therefore increasing user awareness of problems of environmental pollution and of local means that can be adopted to minimize adverse impacts of activities.
- Wider problems of regional and national water scarcity and consequent environmental degradation have focused attention on the quantity of water used by different sanitation systems, both sewerred and unsewerred. In addition to moves towards improved reuse and recycling of wastewater, this is leading to calls for sanitation systems that use far less water than is presently the norm. There are a number of on-plot latrine systems that do not require water in order to function, and interest in this area has gained momentum.

D. Community-Oriented Sanitation in Pune¹¹

This now well-known example of urban community sanitation development is presented because it is a success story and as a result is replicated in many parts of South Asia.

The Pune Municipal Corporation (PMC) has been constructing community toilet blocks in slums for more than 30 years. However, the number of blocks built was small and far below the demand for toilets. Moreover, costs were high because of expensive designs and the involvement of contractors. Finally, in the absence of community involvement during project preparation and implementation, existing toilet blocks were abused and became dilapidated, and municipal conservancy staff could not maintain them. As a result, people had to suffer the indignity of having to defecate in the open, and the incidence of diseases like diarrhea was higher in slum areas. The surrounding environment was polluted, leading to the spread of other diseases.

For the first time, in 1999, the Municipal Commissioner wanted to tackle the issues effectively. First, he took up the program at a citywide scale and managed to reach 500,000 people out of a slum population of 600,000. Second, he invited bids only from NGOs so that community participation in construction, design, and maintenance would be ensured. The final partners in the program included the local authority, PMC, Society for the Promotion of Area Resource Center (the

¹¹ Based on ADB's Impact Evaluation Study on Water Supply and Sanitation Projects in Selected Developing Member Countries (2002), presentations made to ADB in Manila, and numerous Internet links to this case study.

lead NGO), and seven other NGOs. Third, he brought down costs significantly by laying down the condition that the eight NGOs chosen could not bid higher than the estimated cost. The total project cost was \$4.2 million, equivalent to about \$25 per family. Fourth, he personally reviewed in weekly meetings the implementation of the program of building about 3,500 toilet seats within 2 years, which helped energize all PMC staff and also remove obstacles.

The role of PMC, which has taken the initiative and provided the basic framework for implementing the scheme, is worth recording. What stands out in the program is the willingness on the part of PMC to involve the beneficiaries through NGOs and let them make their own decisions in matters related to the planning, design, and maintenance of the toilets. In limiting its role to providing finances, PMC may have been the first such corporation in India to adapt itself to a new role, that of the state as a facilitator of development, instead of relying on the straitjacket approach of centralized planning. Having made a tangible impact on the urban poor in Pune, the program has all the characteristics of good practice in terms of partnerships, sustainability, replicability, scalability, and empowerment of beneficiaries.

An independent survey by the Human Settlements Management Institute (India) covered eight case study toilets—each toilet block had 30–40 seats serving about 125 adults and children—operated by caretakers providing 24-hour service. The survey has provided an insight into how a community-based approach to the problem of sanitation along with participatory planning and execution can work wonders in a lifeless system. The survey concludes that the Pune program has demonstrated an innovative solution to tackling the seemingly intractable problem of public health and sanitation. The expeditious implementation of the project and the maintenance of the toilet blocks by the community with the guidance of NGOs are the highlights of this achievement. There were no time and cost overruns in the project, and it provided a citywide solution to the sanitation problem. It has also confirmed that people are willing to pay user charges at the rate of \$0.50 per month per family for sanitation and that these services would not be a burden on the government anymore. The survey records that the program has opened a possibility for a paradigm shift in sanitation infrastructure development.

This experiment in Pune has attracted many visitors from other Indian cities, governments in other countries, and international agencies. The Pune experiment led to the acceptance of this model in Mumbai on a

large scale, as well as in other cities. The Government of India has based its new program for universal sanitation in India on the principles of the Pune program, confirming the replication of this approach.

E. Some Solutions

Worldwide experience shows that sanitation solutions must come from joint efforts of governments and communities. The community must understand the problem and be willing to act. It helps to have a champion of the cause within the community, and members of the community must have a sense of ownership of the project. But no community is an island. Households should pay for on-site facilities, residents of a block for collection, and residents of a neighborhood for treatment and disposal.

It increasingly appears that it does not make sense to mix feces and urine with water to transport and treat these. Eco-sanitation is the process of safely sanitizing and reusing human feces and urine while minimizing water use. Eco-sanitation largely comprises desiccating and composting toilets. These toilets contain and destroy the pathogens, convert the feces into a safe soil improver, and use the nutrients in the urine to grow useful biomass. This approach is being tried in many countries, including Sri Lanka (through an ADB-funded project), with some success. There are cities in the PRC where up to 200,000 households employ eco-sanitation. This process is not a second-rate technology for the rural poor. It is equally, if not more, applicable to periurban and urban habitation at all income levels.

A variation of roof zone technology, the INDION reed bed system, treats and recycles sullage and sewage. Combining physiochemical and biological processes into a single operation, the reed bed forms a complete treatment unit that also reduces energy use and the load on the central sewer system. It can easily be implemented at housing complexes, holiday resorts, schools, hotels, and military camps. It consists of a treatment tank that is filled with proprietary reed bed support and filtering material and planted with wetland plants. Wastewater flows through the medium and around the roots of acclimatized plants and gets treated for organic and suspended impurities by the combined action of plants, microorganisms, and fungi. It can then be disinfected for toilet flushing, gardening and irrigation, or to recharge groundwater. (IEI News, 2000)

Development agencies and governments should funnel development financing away from large urban water supplies (consumers can pay) and into urban

sanitation and rural water supply. The real issue is hygiene education and awareness. Efforts must start with all schools. For pupils to understand this subject and relate to it, they must see good water supplies and sanitation facilities in each and every school throughout a given country. Efforts must ensure that there are good and adequate public sanitation facilities in every town in a given country. The Sulabh (private financed) or Pune (public financed) public pay toilets in India are good examples that can be followed elsewhere. Efforts must address environmental sanitation issues affecting the urban poor residing in unauthorized settlements.

How can this agenda begin to be addressed? The foundation must start with transparent government policies on integrated water resources management. These should include specific policy statements on sanitation. Then independent regulatory bodies (joint water supply and sanitation regulatory bodies) are needed, so that civil society can be assured governments will indeed implement those policies. Development agencies need to partner with one another, and with governments and NGOs, in pursuing the sanitation development agenda. When it comes to “privatization” of services in urban areas, care should be taken to ensure that water supply and sewerage remain bundled. Development agencies can highlight the needs and issues with regional studies and capacity-building efforts. Last, but not by any means least, culture, traditions, and religion must start to be used to inspire people to action on sanitation.

It is important to realize that there is no universal solution. Different ethnic and cultural conditions will affect every approach. Some factors, however, will be involved regardless of other considerations. These factors include understanding that social, cultural, and technical aspects need to be addressed; understanding that small is OK, which means that stakeholders must develop their own approaches; realizing that capacity improvement is needed when considering regional autonomy; realizing that government agreement is needed when adopting community-based sanitation; understanding the need for credit facility, education, and awareness; and knowing that the entry point is giving informal settlers some type of legal status. (Sudjarwo, 2001)

Sanitation (Problems) in a Nutshell

- Funding for sanitation development is a constraint.
- Willingness to pay for sanitation is relatively low.
- Awareness of the need for sanitation is minimal.
- The poor are often in the most vulnerable environments.
- There is a gender issue here—women place a much higher priority on sanitation than men.
- Septic tank design, construction, and maintenance are poor.
- Poor sanitation can lead to cholera or typhoid epidemics.
- The situation is compounded by inadequate solid waste disposal.

Sanitation (Solutions) in a Nutshell

- There is a need for explicit government policies.
- In densely developed areas, conventional centralized sewerage systems are a must.
- In less densely developed areas, it may be possible to construct decentralized small sewerage systems with local, appropriately landscaped, sewage treatment facilities.
- On-site sanitation is OK, if the plot size and ground permeability are adequate and the groundwater table is low.
- Eco-sanitation (not mixing feces with water) has promise.
- Reed bed technology for treatment of wastewater is OK.
- Target the urban poor as a matter of priority.
- Divert development agency and government funding from major urban water supply projects to urban sanitation projects.
- Solutions must be part of integrated water resources management.
- Opt for community sanitation facilities, like those in Pune.
- Get the facilities and education in the schools first.