7

Excreta Disposal in Developing Countries

7.1 THE HAVES AND THE HAVE NOTS

The World Health Organization's figures for 1988 showed that only 67% of the combined urban population of the developing countries had adequate facilities for excreta disposal. Only a minority of these were served by piped sewerage systems. In the rural areas, only 19% had adequate excreta disposal facilities (Figure 7.1). Figure 7.2 shows the levels of service in the rural areas of various countries. These figures are based on very modest definitions of adequacy. Many latrines do not meet minimal public health requirements, are not accessible to children, or are liable to pollute nearby wells.

7.2 MARKETING OF LOW-COST SANITATION

To those for whom water supply and excreta disposal both imply pipes laid beneath the street, there are obvious advantages in combining them in a single programme. However, in the context of low-income communities in developing countries their technology and their manner of implementation is fundamentally different. In such a setting, a water supply means a tap in the street or a pump in the village square, clearly in the public domain. Sanitation, on the other hand, usually means a toilet with an on-site disposal system, a part of the owner's house, built on his land, at his expense and frequently with his (or her) own hands. Its use requires a change in some very intimate habits, in the privacy of the home, by all members of the family. Whereas water supplies are almost universally popular, sanitation facilities are unlikely to be used, still less maintained, unless people want them.

Sanitation therefore has to be marketed, and this requires a very different approach from conventional civil engineering.

(1) In general, health improvement does not motivate many people

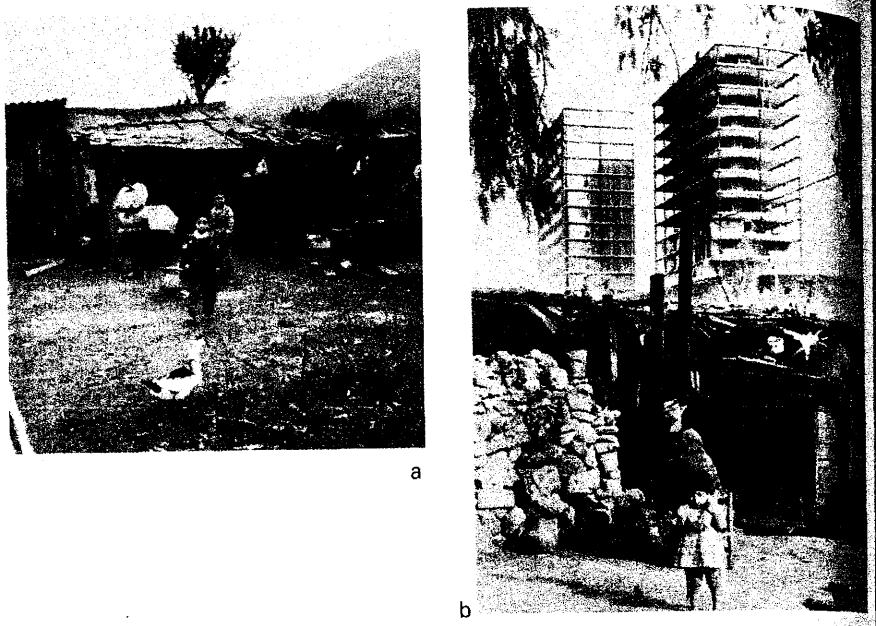

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Figure 7.1 In the developing countries about half the urban population and nearly all the rural population lack adequate disposal facilities. In rural areas (a) people typically defaecate near their houses or in the fields. Children defaecate in the yard. In urban areas (b) wealthy people have flush toilets while the urban poor may have no toilets or latrines at all
(Photos: A Almary, WHO)

to buy latrines, because the connection between latrine usage and health is not clearly perceived. The desire for privacy, convenience or social status is usually more effective in generating demand.

(2) The cost is not a function of the design criteria; rather, the design criteria should depend on the price which purchasers are willing to pay (Figure 7.3); while some programmes have offered latrines at heavily subsidized prices, most of these have reached only a tiny percentage of the target population.

(3) A modification to an existing practice or type of latrine is likely to be much easier to implement than a completely new package of technology. Before marketing a new product, it is essential to study what people already do, and ask them what they think they need.

(4) The acceptability of the product (the sanitation technology) must be checked at every stage in its development by consulting likely purchasers, and by offering prototypes to some of them. It is a good idea to offer a range of models.

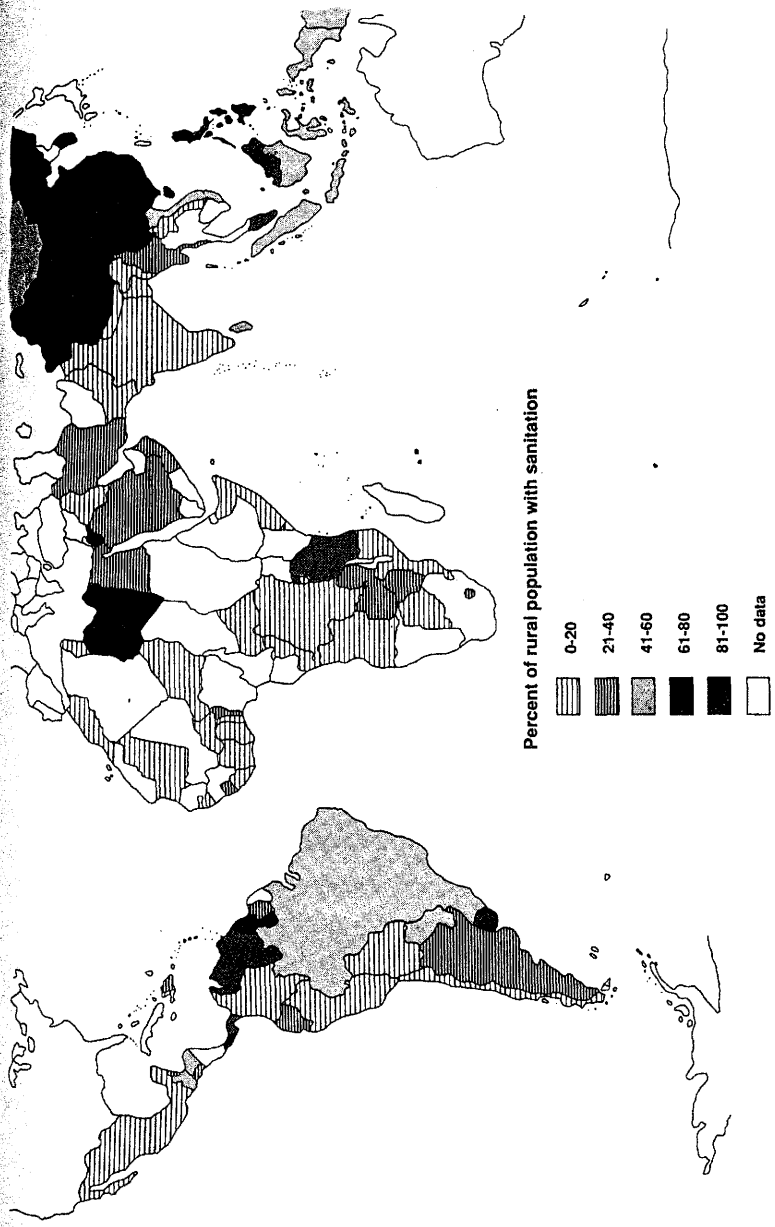

Figure 7.2 Reported percentages of the rural population of various countries having adequate excreta disposal facilities in 1988. These figures are optimistic estimates, and some countries have lower coverage than shown.

(5) The marketing operation requires constant monitoring of the consumer's response. Sanitation promotion, including this monitoring, is best accomplished through a cadre of staff in direct contact with the consumers in the field.
(6) The rate of installation depends on demand, and not on any preconceived project plan. Demand may take several years to build up, as many people will wait until their neighbours have installed a latrine and found it to perform satisfactorily, before they buy one for themselves. The most successful and sustainable sanitation programmes have been led by consumer demand.
(7) There must be someone to provide 'after-sales service' if the technology is not to become discredited. Without good maintenance, any type of latrine soon becomes fouled and offensive, and may then become a health hazard in itself.

7.3 URBAN SANITATION

A major challenge facing those concerned with environmental health in developing countries is that of excreta and refuse disposal systems appropriate to high-density, low-income communities. Such communities are found in increasing numbers around all major towns and cities in developing countries. High-density communities without adequate sanitation range from the totally unplanned squatter settlements and slums (which several governments have tried with little success to prohibit or destroy) to planned high-density housing areas where adequate sanitation has not been provided, largely due to the absence of an acceptable system for which the community could afford to pay.

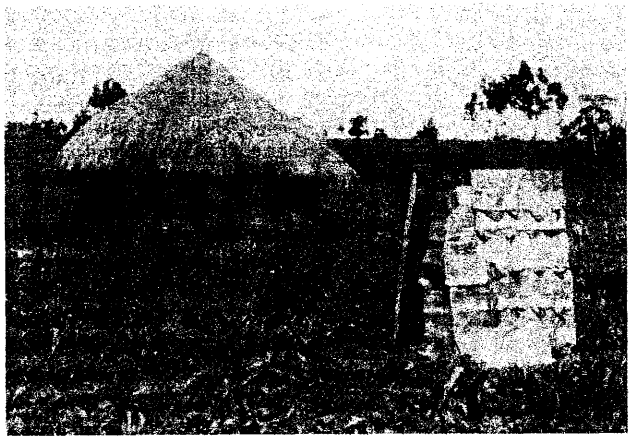

Figure 7.3 Simple pit latrines, such as this one in Kenya, are an acceptable rural excreta disposal system if they are used by all members of the family and kept clean. Rural people may be encouraged to install facilities of this type by government programmes of hygiene education and the distribution of mass-produced latrine slabs at subsidized cost or on credit
(Photo: R Feachem)

The sanitation system which is by far the most convenient to the user is the conventional water-borne sewerage system found in most European communities. However, there are several reasons why a water-borne sanitation system is inappropriate for most high-density communities in developing countries.

Cost The water-borne system is the most expensive of all sanitation systems and has a very high capital construction cost. The cost of laying the sewers alone may be as high as US $1300/person. Assuming that a city authority cannot obtain donor aid to cover the capital costs, then the money must be borrowed and repaid later. Either the community must cover the repayment costs by sewerage charges or additional taxes, or the city must subsidize the sanitation sector at an opportunity cost to other sectors of possible public spending. Experience has shown that most high-density, low-income communities are unable or unwilling to cover the real capital and running costs of water-borne sewerage and that city and town authorities are reluctant to subsidize urban sanitation for the poor.

Water use Water-borne systems use large volumes of drinking water merely to transport wastes along pipes—water which has to be expensively treated before being released back into the hydrological cycle. This extravagant use of water may be justified in a country with ample water resources and a well-established distribution system. It is not justified in many developing countries, where water is scarce and expensive and where distribution systems are very limited and frequently overloaded. Moreover, many developing countries are arid for at least a few months of each year. During these periods even less water is available and there may be no flowing rivers into which to discharge effluent.

Water-borne systems can be installed only in communities with individual-house water connections; the majority of low-income urban dwellers do not have this facility. Many of those with connections have only a single tap in their house and many have only an intermittent supply of water. Sewers can rapidly become blocked during the periods when the water is shut off. It is not just a question of the adequacy of the distribution system, but also the quantity of the water available. Communities with water-borne sewage normally require more than 75 l/person.day, compared with less than 20 l/person.day currently used in many squatter settlements.

Construction Water-borne sewerage is a complex technology requiring careful and skilled construction if it is to operate smoothly. The skills necessary to design and install such a system may be in very short supply in a developing country, thus forcing the employment of expatriate companies, with consequent loss of foreign exchange.

Sewer-laying By and large, sewers must be laid in straight lines. To dig trenches in straight lines through squatter settlements

necessitates the demolition of a substantial number of houses, which is often be politically and socially unacceptable.

Sewers must be laid to a constant falling gradient. On the flat alluvial plains on which many tropical cities are built, this means that numerous pumping stations are required if the pipes are not to be laid excessively (and expensively) deep below ground. These add to the cost and the maintenance problems of the system, especially where the electricity supply is unreliable.

Blockage Conventional water-borne systems are prone to blockage if large objects are fed into them, or if inadequate water is available for flushing. Communities unused to water-borne sewerage will often try to use the system to remove a variety of household wastes, some of which will block the sewers. Materials used traditionally in certain areas for anal cleansing, such as corn cobs and stones, may also obstruct sewers.

By far the biggest obstacle to the adoption of water-borne sewerage for the urban poor is cost. For example, the World Bank has estimated that the construction and operation costs of a sewerage system per household per year amount to roughly ten times the cost of an improved pit latrine or pour-flush toilet.

There is no single most hygienic and appropriate alternative to conventional water-borne sewerage for the urban poor. Various systems are required to suit the diverse environments into which they are to be introduced. Several technologies have been proposed, of which the most promising are discussed in the following chapter. Some of these were invented many years ago; others are much more recent.

7.4 REFERENCES AND FURTHER READING

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8

Types of Excreta Disposal System

8.1 INTRODUCTION

As pointed out in Chapter 7, the use of water-borne sewerage is often impracticable in both urban and rural contexts in developing countries. The design and construction of water-borne sewerage is well described in many standard texts on waste-water engineering (for instance, Okun and Ponghis, 1975) and so is not dealt with here. In this chapter we consider the options for sanitation improvements at low cost.

8.2 PIT LATRINES

The simplest and cheapest improvement to a pit latrine is to provide it with a prefabricated floor, in the form of a squatting slab (Figure 8.1) or with a seat. This has the following advantages:

- the latrine will be structurally safer and (no less important), it will *feel* safer;
- it will be easier to clean;
- using the footrests, it will be easier for users to position themselves over the drop hole, so as not to foul it;
- a hole with the dimensions shown is too small for a child to fall into it, and is therefore safer and less frightening;
- the cement floor will prevent hookworm transmission;
- it also permits a small measure of fly control, through the use of a tight-fitting lid.

The need for steel reinforcement can be reduced or even avoided by making the slab slightly domed or conical in shape (Figure 8.2). Alternatively, a latrine with a strong floor made with local materials such as wood and earth can be improved by placing a small slab, 60 cm square, over the centre. Since this 'finishing slab' is not a