HEALTH POLICY AND PLANNING; 13(1): 78–86

Criteria for successful sanitation programmes in low income countries

BB SAMANTA[1] AND CA VAN WIJK[2]

[1]Sanitation Coordinator, UNICEF, New Delhi, India, and [2]Programme Officer, IRC International Water and Sanitation Centre, The Hague, The Netherlands

In the International Drinking Water Supply and Sanitation Decade (1981–90), the development of a consensus on the concept of sanitation and the planning and implementation of effective and efficient sanitation programmes was not emphasized.

Yet lack of good sanitation is a growing burden and environmental threat. Significant improvement of human health cannot be achieved without good environmental sanitation conditions and practices. A consensus on what makes a sanitation programme successful can help to conserve limited funds and spend those available more wisely. It will also help to reduce the increasing flows of waste poisoning precious sources of drinking water. This article was written to stimulate discussion on what attributes can be taken as characteristic of good environmental sanitation programmes, and on which indicators can be used to assess those attributes in actual sanitation programmes.

Introduction

The development of criteria for assessing the success of sanitation programmes presupposes an understanding of the meaning of sanitation as a concept. The term 'sanitation' has been interpreted and used by different people in different ways. It is therefore no surprise that a consensus is lacking about the methodologies and interventions which lead to success. During the International Drinking Water Supply and Sanitation Decade (1981–90) emphasis was placed on service coverage and construction targets. The World Summit for Children, which set the goals for child survival, development and protection (called the Summit Goals), identified access to sanitary means of excreta disposal as the basis to measure progress under sanitation (UNICEF 1992). The Rio Conference (UNCED 1992) considered sanitation to be part of broader environmental issues. In this sense, the term 'environmental sanitation' includes excreta disposal, sullage disposal, drainage and refuse disposal (Pickford 1993).

Until recently, policies of many countries have focused on access to latrines by households as a generic indicator of sanitation coverage, although of late there has been a shift and an expansion in conceptualizing the term sanitation. For example, the Eighth Five Year Plan of the Government of India (1992) has used the concept of 'total sanitation' to be coterminous with 'cleanliness'. The Working Group on Sanitation Promotion of the Collaborative Council for Drinking Water Supply and Sanitation states that sanitation encompasses all behaviours and practices which act as a barrier to faecally transmitted diseases (WHO 1994). These rather recent efforts to redefine the basic concept derive from a general dissatisfaction with the limited formulations of past decades.

Sanitation and health

The more recent definitions of sanitation have in common that access to a latrine is not the same as adoption of sanitary practices in dealing with human waste. Nor is access to a latrine the same as its hygienic use and the adoption of other hygienic practices. Epidemiological investigations have shown that even in the absence of latrines, diarrhoeal morbidity can be reduced with the adoption of improved hygiene behaviours (WHO 1993).

Regulate Insurance Plans - Establish criteria for EPS creation, organ. & transformation; certify plans; control adverse & risk selection; monitor compliance with regulations; provide tech. assistance.

Regulate Benefits Packages - Define the POS, PAB, PAMI; perform cost-effectiveness studies; regulate complementary plans.

Provider Regulation

Regulation of Provider Institutions - Establish criteria for creation, transformation and strengthening of provider institutions (IPS), provide technical assistance; assist in upgrading infrastructure and equipment, evaluate management in public institutions.

Regulation of Quality - Establish norms for licensing, accreditation, evaluation and control of quality; establish a quality information system; monitor quality of providers.

Responsiveness to Beneficiaries - Define mechanisms for attending beneficiaries; define and promote the community vigilance committees (veedurías comunales); define complaint mechanisms, promote the formation of Leagues of Beneficiaries.

Regulation of Financing

Financing of System - Manage the financing provided by law; establish effective & efficient mechanisms of collection; distribute 'solidarity' resources; manage compensation mechanism for contributory regime; control evasion; monitor sources & uses of funds.

Decentralization

Provide Technical Assistance - Support and credential territorial units at department and municipal level.

Regulate Insurance Plans - The Superintendencia is performing most of the required regulation of the EPS and has established certification and reporting criteria of EPS, but no MSP unit is providing technical assistance.

Regulate Benefits Packages - No MSP unit is currently developing regulation of complementary plans.

Provider Regulation

Regulation of Provider Institutions - The IPS regulation has not yet been approved, there is no clear unit responsible for management strengthening, although the IDB and World Bank-supported programmes are providing support to management strengthening in hospitals.

Regulation of Quality - The current staff does not have the technical capacity to regulate quality; however, the World Bank-supported programmes are providing consultant support and the Superintendencia has a large staff on quality monitoring.

Responsiveness to Beneficiaries - No MSP unit is responsible for providing information to beneficiaries. Superintendencia has a programme.

Regulation of Financing

Financing of System - No MSP unit is responsible for collection of contributions (this function is assigned by law to the EPS) and there is no unit currently monitoring collection. The Superintendencia and FSyG perform many of the other monitoring functions.

Decentralization

Provide Technical Assistance - Although the Directorate General of Decentralization is large and is providing technical assistance, evidence from the field suggests that the need for technical assistance is far greater than the capacity.

Table 1. Impact of the promotion of personal and domestic hygiene on diarrhoeal morbidity

Location	% reduction in diarrhoeal morbidity
Handwashing	
Burma	30
USA	48
Bangladesh (urban)	35*
Combination of practices	
Bangladesh (urban)	26
Bangladesh (rural)	>40**
Guatemala	14
Zaire	11

* Impact on Shigellosis

** Impact seen in both intervention and control areas: reduction due to intervention is approximately 17%

Source: WHO 1993

In several studies from different countries the promotion of personal and domestic hygiene accounted for a reduction in diarrhoeal morbidity, which ranged from 11% in Zaire to 48% in the USA (Table 1). In Bangladesh, studies show that children with more contaminated hands were three times as likely to have diarrhoea than those with less contaminated hands (Henry and Rahim 1990). There seems to be a strong association between the mother not washing her hands before food preparation (Clemens and Stanton 1987) or after cleaning her child after defecation (Saran and Gaur 1981) and an increased risk of diarrhoea. Related to this, it has also been established that the quantity of water used for domestic and personal hygiene plays a very important role in reducing the incidence of diarrhoea (Huttley 1992). Improving only the quality of the water is not enough to guarantee the same.

All these findings point in one direction: sanitation goes beyond building latrines and implementation of hardware. Establishing the infrastructure for excreta disposal cannot be the single indicator to measure the success or failure of a sanitation programme.

Towards defining the criteria

The range of definitions of sanitation suggests that there is, similarly, a range of criteria to assess the degree of success or failure of a sanitation programme. Two suggestions are worth examining in this regard; one by the Working Group on Sanitation Promotion convened by the World Health Organization and the other by the Environmental Health Project (EHP). The formulation of the Working Group on Sanitation Promotion implies that a successful sanitation programme is one which encompasses all measures that reduce human contact with excreta and makes any remaining handling safe (WHO 1994). EHP defines a successful sanitation programme as one that improves health, is sustainable at community and institutional levels, is cost-effective and increases coverage levels (Perez 1994).

Both definitions have certain things in common, but differ in their approach. For example, while linking sanitation with health, the Working Group has relied heavily on measuring inputs and behaviours, whereas EHP has expressed success in terms of health impact. It may be mentioned that the health impact indicators of a sanitation programme are not easy to define and measure, particularly in the short run. Therefore, it seems more feasible to look at sanitation as a package of services and actions which, taken together, can influence the health of a person and the health status in a community. In other words, an input and behaviour oriented approach to defining the criteria will be more practical, since better conditions and practices form the pre-conditions for any later health impact. Input and behaviour oriented approaches further have the virtue of focusing attention on the processes and flexibility of implementation as well as the relevance of adjusting the planning to the needs and culture of the people.

This implies that the success of a sanitation programme is not at all synonymous with the construction of a targeted number of latrines. Issues which need to be answered when assessing the programme would include:

- How complete is the programme in addressing major risks for transmitting sanitation-related diseases?
- Does it concentrate on areas and groups where effectiveness can be highest, that is, on high-risk areas and groups?

- Has the programme adopted a demand driven approach, through increasing people's participation, or a supply driven approach, through heavy subsidy?
- Does it allow adjustment to people's varying needs and payment?
- Does the programme lead to measurably improved practices by the majority of men and women, boys and girls?
- Is it environmentally friendly, or does it increase or create new environmental hazards?

In the next sections these criteria are analyzed in detail.

Completeness and relevance

A package approach to sanitation has become more important now than ever before. This is mainly because the health benefits expected from a sanitation programme very much depend on the adoption of the right combination of all relevant elements of the package, instead of treating each element in isolation. To reduce transmission of faecal-oral diseases, for example, an expert group of epidemiologists and water supply and sanitation specialists concluded that three interventions would be crucial: safer disposal of human excreta, particularly that of babies and people with diarrhoea; handwashing after defecation and handling babies' faeces, and before feeding, eating and preparing food, and maintaining drinking water free from faecal contamination in the home and at the source (WHO 1993). Studies on handwashing, as reported in Boot and Cairncross (1993), show that not only does the act of handwashing make a difference, but so does the ways in which hands are washed.

Effective intervention packages consist of several components, dependent on the local context. In an area in Guinea Bissau, for example, funeral rites have a strong bearing on the spread of cholera and would hence be included as a priority in a sanitation package. When compiling the most effective package, locally prevalent diseases must be considered and related to disease transmission risks in specific locations, such as households and schools, with regard to: (i) safe disposal of human excreta, (ii) adequate personal hygiene, especially handwashing, (iii) the safe handling of drinking water in collection, storage and drawing, (iv) the safe disposal of waste water, (v) the safe disposal of solid waste, including disposal and management of animal waste, and (vi) good home sanitation and food hygiene. A seventh element is risks in disease transmission in the public domain, through the contamination of water sources, inadequate drainage, and inadequate collection and disposal of solid wastes.

While a sufficiently comprehensive approach is required, experience has demonstrated that many projects are overambitious and have an unrealistic set of objectives (see for instance Burgers et al. 1988). Therefore, while the seven themes all address important sanitation areas, priorities must be assigned to those which present the greatest local health risk and are in line with priorities of the population, such as improved sanitation in areas where open air defecation brings problems of privacy, safety, inconvenience and bad odour. Demand is a part of the equation, and gender and class sensitive community participation can be used to bring out demand (Cairncross 1993; Wijk, forthcoming).

Focus on high-risk areas and groups

With large gaps in the use of good sanitation practices and facilities and in funding, it is apparent that in the short run full coverage is not feasible. This implies the need to identify which geographical areas and segments of the population have the highest risks and need to be approached on a priority basis. Areas with high population density, higher cropping/irrigation intensity and little or no open land for defecation away from water sources are at great risk. In this regard the new priority suggested by the regional informal consultation on interventions to improve sanitation behaviour (WHO 1993), i.e. 'hygiene promotion for all and full latrine coverage for high risk populations', is worth considering.

Demand responsive participatory approach

There is growing realization that a demand responsive approach can be more effective and sustainable, and contributes more to sanitation coverage and use, than a purely supply driven approach (Cairncross 1992). Programmes providing latrines with high subsidies have inadequate funds to meet the large requirements for sanitary facilities by vast numbers of beneficiaries and are unable to keep pace with population growth. It is estimated that over 2 billion people in the world need sanitary facilities. If the goal of universal access to and use of sanitation is to be achieved, the investments required for this purpose far exceed the internal resources of the governments

Box 1. Demand responsive sanitation programmes in Lesotho and Bangladesh

Private latrine builders are by now a common sight in Lesotho. By 1989, and as part of a national programme, a special unit in the Lesotho government had trained 900 latrine builders in demand raising, construction and administrative skills. These masons, together with the householders, at that time had achieved the construction of 12 000 VIP latrines. One in four of the builders is a woman. Masons qualify and get a certificate when they have built six latrines according to the specifications. Many of them have also been trained as village health workers. Other key principles of the approach are assessing preferred design, no subsidy, strong promotion, and a proper institutional base. Householders using the masons' services pay for all direct costs - materials and labour. The programme bears the cost of training and programme promotion. Features which distinguish female from male builders are their greater efforts to raise demands, lower preoccupation with profit and preference for work in partnership. Because no range of technology options is offered, it is estimated that the poorest 20% of the population cannot afford a latrine.

Bangladesh has a national latrine programme which offers a range of technologies, low subsidies and a strong promotion strategy. By 1993, it had achieved a latrine coverage of 70% in the districts with an intensive demand creation strategy. Households install either home-made pit latrines or water-seal latrines. They buy latrine parts in Village Sanitation Centres or Marts. Within seven years, 1000 such centres were established and each district now has one. Having seen the demand for sanitation, the private sector is taking over these subsidized centres and has started to sell latrine parts without subsidy. In 1992, a review team visited more than 30 commercial sanitation centres. The private producers sold the latrines at the same price. In a few cases they also provided limited credit. NGOs, notably the Grameen Bank, had stopped their own latrine manufacturing programme and assisted members to buy instead from local producers at an unsubsidized rate. With an annual growth rate of 60% per year, full coverage should be possible at the turn of the century.

and the external agencies. It is therefore essential that alternative delivery systems with little or no direct subsidy are developed to accelerate sanitation coverage.

In demand-responsive programmes, programme support is directed to creating demand, and the capabilities to meet this demand, rather than forming direct contributions to hardware. Private initiatives should be encouraged in programmes, with market mechanisms playing an important role. Wijk (forthcoming) reports as examples the latrine programmes in Lesotho and Bangladesh, which promote sanitation to households and have created provisions in the private sector to meet the demand (Box 1).

Considerable experience further exists that to be effective programmes need to involve householders in the choice of technology and design, implementation (e.g. digging pits and constructing superstructures when paid labour and materials are not affordable), health education and in testing, monitoring and evaluation (Cairncross 1992). Because men and women have different interests, requirements and opportunities, a gender approach in participation is required (Wijk, forthcoming).

Flexibility to meet varying needs and capacities

The Regional Informal Consultation for Hygiene and Sanitation Promotion, organized by the WHO Regional Office for South East Asia in New Delhi in May 1993 (WHO 1993), strongly advocated that sanitation programmes are based on affordable alternatives rather than thrusting a single technological option upon all groups in a programme area. A flexible approach envisages a sanitation upgrading sequence that offers choices ranging from the improvement of local systems and practices to the introduction of permanent double-vault latrines and various types of sewerage systems.

Between indiscriminate open defecation and the relatively expensive pour-flush latrines, there are various options to suit different socioeconomic groups within a given area. As demand and resources for higher level options arise, local systems can gradually be improved. This means that simple improvements should not be disregarded because they fall short of policy-makers' ideals. Flexibility in the choice of technological options can result in accelerating sanitation improvements by the adoption of techniques and technologies that provide a relative health advantage. The 'do-it-yourself' latrines currently promoted in Bangladesh for example, have led to a rapid increase

in the coverage from 10% in 1989 to 35% in 1994 (Luong 1994). Experience from Medinipur in West Bengal, India, reveals that by offering 12 different designs of sanitary latrines with a varying price range and extensive promotion there was a geometric progression in the coverage from 6500 in the first year to 27 000 in the second year and 58 000 in the third year (Samanta 1994, and unpublished progress reports).

Measured, gender-specific behaviour change

Sanitation programmes can only be successful if they produce measurably improved sanitation practices by a sufficiently large number of people. A report by Esrey (1994) gives an adoption by 75% of the population as the point where an impact on public health can be proven. Moreover, consistent practices need to be adopted by a cross-section of the population, that is men and women, boys and girls, in the different socioeconomic and cultural strata. Field studies show less use of latrines by children and men, which can defeat the whole purpose of better health through safe disposal of human excreta. Successful sanitation programmes use a gender approach, marketing improved sanitation facilities and practices to men as well as women to show that cleanliness should not be restricted to women and girls alone.

Environmentally friendly sanitation

One of the tests of a successful sanitation programme is that it does not create environmental health hazards. Environmental hazards include the possibility that groundwater and surface water become contaminated through leaching and disposal of untreated sewage. A lack of well-organized pit emptying systems constitutes a hazard in areas where people lack space or funds to shift single pit latrines. Without a suitable system, pit emptying and sludge disposal methods are health hazards both directly and through contamination of water resources.

A sanitation programme, which aims at improving the environment, should not at the same time bring new environmental risks. Care has to be taken to ensure that the intervention: (i) does not result in soiled facilities which transmit diseases; (ii) does not contribute to surface soil contamination; (iii) does not contaminate surface and groundwater sources; (iv) checks the access of flies and rodents; (v) uses less water; and (vi) safely disposes all waste water, after treatment where necessary.

In summary, we can say that a successful sanitation programme has the following elements:

- a package approach based on local problems which combine a high health risk with a high felt need of the population;
- an upgrading strategy with flexible technology;
- the smallest subsidy for greater programme sustainability;
- hygiene promotion to all and infrastructure for high risks groups;
- gender and class specific community participation in planning and implementing local interventions;
- environmentally friendly consequences;
- sufficient and socioeconomically specific change, that is, improved hygiene practices and facilities are adopted by the majority of men, women, boys and girls in the different socioeconomic and cultural strata.

Indicators for measurement

Ideally all the criteria mentioned above will be used to assess the success of a sanitation programme. Alternatively, a particular criterion or combination most relevant to the context can be used. Whichever criteria are chosen, it is essential that a set of *measurable indicators* is developed, so we can go beyond simple selection of issues to have measurable statements of desired change. These are the yardsticks against which progress can be judged.

A great virtue of formulating and agreeing upon measurable indicators is that standards emerge which are commonly held by all partners in the programme. Through this, the process can provide clear and common goals, an achievement which in itself is important to the success of any programme. To assess the abovementioned criteria, specific indicators are recommended (Table 2).

Reduction in high-risk practices

Measuring the percentage reduction in high-risk practices and conditions makes it possible to see if more people begin to use more sanitary methods and if insanitary conditions are being reduced. How and which particular improved practices and conditions

Table 2. Criteria and indicators for successful environmental sanitation programmes

Criteria	Indicators[1]
Package addressing critical domains of sanitation behaviour (according to local assessment)	% observed reduction in high-risk practices of human excreta disposal: • no or inadequate handwashing at critical occasions • collection, storage and drawing of drinking water • waste water disposal at source and home solid waste disposal
Upgrading strategy with flexible technology	% increase in users of different sex and class who know about and install a facility they can pay for, use and maintain
Small or no subsidy	% of subsidy given to % of population consistently using facilities
Hygiene promotion for all, infrastructure for high-risk populations	% of men, women, children reached by hygiene promotion, leading to observed and sustained reductions in unsafe conditions and practices, and % of high-risk environments where programmes are carried out
Gender and class specific community participation in planning and implementing interventions	men and women in each socioeconomic level and cultural group consulted on needs and demands, and given informed choice on and access to affordable and adequate[2] solutions
Environmentally friendly approach	% of facilities with no new risks to the environment and environmental health through: • soiled facilities • water pollution • soil pollution • mosquito, fly and rodent breeding • excessive water use
Sufficient and socioeconomically specific change	critical mass[3] adoption of hygienic practices by women, men, girls, boys of different socioeconomic and cultural groups

[1] All indicators would be measured in a sample of households and schools in area X in periods Y and Z. Comparison with a control area will allow control for intervening variables.

[2] Adequate in technical, sociocultural and environmental terms (to be defined locally).

[3] Esrey (1994) gives 75% adoption of safe sanitation practices as critical mass for health impact, at least in densely settled areas.

are measured must be defined locally. A simple pit latrine seen to be in use and kept clean, with no signs of human excreta disposal in the environment can be an improvement when it replaces open defecation or a latrine over a water course. Care is needed to define the word 'improved' realistically and clearly for all parties. Many sanitation programmes set such high standards for improvements that even in high-risk areas they cannot be achieved by 75% of the total population.

Increase in knowledge and use of facilities

The percentage increase in knowledge on and adoption of improved facilities relates to the realism and processes of choice when making sanitation improvements. The underlying theme is that decisions on improvements are made by the users, not by the agency, and that both men and women need to be involved, and equally. The agency's task is to ensure that both men and women are informed and enabled to make wise decisions. Because the decisions are the users', and should not depend on the temporary presence of agency support, the technologies involved have to match the users' own frames of reference and access to resources, whether in cash or in kind. Consideration of the gender aspects reveals the degree to which women, as key sanitation managers, are reached with information and take part in decisions, training and functions (Wijk 1994).

Minimal subsidization

If any subsidy is given, it should go to the smallest percentage possible of the target population and be as little as possible, so as not to create continued dependency on external support. It is important to know the total cost on which the subsidy is given, i.e. the cost of the technical and social inputs together. A high percentage subsidy for a high total unit cost for a high percentage of households indicates a low sustainability and replicability of the approach. It is also important to assess what the subsidization is per household consistently using improved sanitation methods and practices. A low per household cost and subsidy are important for the sustainability and replicability of the approach, but are only useful when coupled with consistent and hygienic use and upkeep of the facilities.

Decrease in locally critical conditions

A high percentage decrease in locally high-risk conditions and practices indicates that the programme is successful in promoting better hygiene. This makes it likely that in due course the incidence of the diseases linked to these hazards will become lower and will be evident in health statistics. A stable condition or continued decrease after programme staff have left shows that the programme enhanced self-reliance. Set off against population growth, it shows whether achieved levels of better sanitation are being maintained.

In high-risk areas, limited funds for infrastructure must be spent where they will have the greatest impact. High-risk environments include areas with dense human settlement and risky environmental sanitation practices, a humid environment, a high percentage of low income households, a shortage of water and soap or its traditional substitutes used for handwashing, and a high bacteriological contamination of drinking water sources.

Environmental impact

Although meant to reduce the risks of transmission of water- and sanitation-related diseases, water and sanitation programmes have been known to create new risks. Examples are latrines which are not kept clean and free of flies, pit latrines which are not emptied properly and in time and/or of which the sludge is not safely disposed, raw sewage from sewerage systems which is not treated before disposal, latrines which cause contamination of groundwater, and stagnant water at water points which creates new breeding places for vectors. The percentage to which newly installed facilities are free from such environmental risks indicates the extent to which the programme is environmentally sound.

Impact on all population groups

For an impact on health, improved sanitation practices need to be used by a sufficiently large proportion of all population groups and in particular by those with higher health risks. Assessing who in households and the community have adopted improved sanitation practices tells a programme whether some groups are reached better than others, so that changes in strategies can be made. It also allows programmes to assess whether men are excluded from some aspects of the programme, and whether the responsibility for health and hygiene and for cleaning is imposed only on women and girls, leading to an increase in their workload.

Measurement

It is possible to investigate sanitation behaviour even when the time allowed for fieldwork is a matter of

weeks, not months or years. However, in many cultures the topic does not lend itself to casual conversation or direct questioning. Careful planning and the adoption of unobtrusive and sensitive investigation techniques are called for (Bentley et al. 1994). Anyone wishing to carry out evaluations of sanitation must be familiar with the area and the people, and should have been trained in the use of appropriate methods and tools. Female evaluators are needed for communication with female users. While care must be taken in performing such studies, both Boot and Cairncross (1993) and Almedom and Chatterjee (1994) show that they are less complex and time-consuming than many professionals fear.

To produce valid results, a combination of methods needs to be used (Almedom and Chatterjee 1994; Boot and Cairncross 1993). All methods chosen need to be easy, valid (i.e. measure what is intended) and reliable (i.e. the same measurement by different persons or at different times must give the same result). Hence it is important to formulate indicators that are objective and that measure what is thought to be measured. For example, water seen to be stored in or near a latrine may be for flushing or cleansing and not for washing hands.

Concepts such as 'clean' or 'safe', which are often found in indicators and measuring tools like checklists, are by themselves subjective, because different evaluators make different judgements. Cleanliness needs to be defined in objective terms, e.g. 'no excreta/excreta smears visible in latrine pan'. Research in East Africa showed that suitable behavioural indicators for measurement within sanitation programmes are the disposal of children's faeces in households with and without latrines, and handwashing with soap, ash or another local alternative at critical times (Almedom and Chatterjee 1994).

Measuring can be done by trained project staff, but can also be done by persons and groups from the community, such as men and women from neighbourhood committees, boys and girls in youth groups, or classes of schoolchildren. Measurement by communities can be done for a sanitation agency, but will contribute to community self-reliance when done by communities, schools or neighbourhood groups as part of a self-managed process of change. Community-managed sanitation programmes imply that what is measured, how and how often is decided with the people, and that they know how to analyze and use the data (Kurup et al. 1996).

Specialists in evaluation techniques can help communities and agencies decide what type and amount of data they want, and can handle, to manage their sanitation programme. They can also assist in choosing good local indicators and setting up a realistic system for collection, consolidation and analysis of the data.

In this way, it can be shown quantitatively that sanitation programmes have led not just to an increased number of physical structures, but to improved habits and facilities which are used and maintained to the extent that previously existing health hazards are measurably reduced. Consequently, in due course and depending on the quality of local statistics, the improved conditions and behaviours will be reflected in lower incidence of disease and a higher productivity and reduced health costs to households and government.

References

Almedom A, Chatterjee A. 1994. Indicators for sanitation: yardsticks for cleanliness? *Waterlines* **13**(3): 6–9.

Bentley MA, Boot MT, Gittelsohn J, Stallings RY. 1994. *The use of structured observations in the study of health behaviour*. Occasional paper 27. The Hague: IRC.

Boot MT, Cairncross S. 1993. *Actions speak: the study of hygiene behaviour in water and sanitation projects*. The Hague: IRC and London: London School of Hygiene and Tropical Medicine.

Cairncross S. 1992. *Sanitation and water supply: practical lessons from the decade*. Water and sanitation discussion paper 9. Washington DC: UNDP/World Bank Water and Sanitation Program.

Clemens JD, Stanton BF. 1987. An educational intervention for altering water-sanitation behaviors to reduce childhood diarrhoea in urban Bangladesh. *Am J Epidemiol* **125**: 284–91.

Esrey SA. 1994. Complementary strategies for decreasing diarrhea morbidity and mortality: water and sanitation. Paper presented at the Pan American Health Organization, March 2–3.

Government of India. 1992. *Eighth Five Year Plan (1992–97), vol. II*. New Delhi:Planning Commission.

Henry FJ, Rahim Z. 1990. Transmission of diarrhoea in two crowded areas with different sanitation facilities in Dhaka, Bangladesh. *J Tropical Med and Hyg* **93**: 121–6.

Huttley S. 1992. Hygiene interventions and health impact studies. Paper prepared for WHO Informal Consultation on Improving Water and Sanitation Behaviours, WHO, Geneva, 18–20 May.

Kurup KB, Abdulla KA, Kurien CO et al. 1996. *The community managed sanitation programme in Kerala: learning from experience*. The Hague: IRC

Luong TV. 1994. Towards universal sanitation: Bangladesh. Paper presented at the second meeting of the Collaborative Council Working Group on Promotion of Sanitation, Hilterfingen, 3–5 October.

Perez EA. 1994. What do we know about the potentials and limitations of external support agencies, governments and non-

government sectors. Paper presented at the second meeting of the Collaborative Council Working Group on Promotion of Sanitation, Hilterfingen, 3–5 October.

Pickford J. 1993. Sanitation alternatives and low cost sanitation. Lecture notes. Loughborough: WEDC.

Samanta BB. 1994. UNICEF's experience in promoting rural sanitation in India. Paper presented at the second meeting of the Collaborative Council Working Group on Promotion of Sanitation, Hilterfingen, 3–5 October.

Saran M, Gaur SD. 1981. Epidemiologic correlates of diarrhoea in a slum community in Varanasi. *Indian J Pediatr* **48**: 441–6.

UNCED. 1992. *Report of the UN Conference on environment and development*. New York: United Nations.

UNICEF. 1992. *World summit for children*. New York: UNICEF.

van Wijk CA. 1994. Gender aspects of sanitation, the missing slipper of Cinderella? Gender and water resources management, report from a workshop held in Stockholm 1–3 December 1993, Volume II. Stockholm, SIDA.

van Wijk CA (forthcoming) Gender in water resources management, water supply and sanitation: roles and realities revisited. The Hague: IRC Washington DC : UNDP/World Bank Water and Sanitation Program Geneva: Water Supply and Sanitation Collaborative Council.

WHO. 1993. *Improving water and sanitation hygiene behaviours for the reduction of diarrhoeal disease. The report of an informal consultation*. WHO/CWS/93.10. Geneva: WHO.

WHO. 1994. *Promotion of sanitation*. Report of the Working Group of the Water Supply and Sanitation Collaborative Council. Vol. I. Executive Summary. Geneva: WHO/Water Supply and Sanitation Collaborative Council.

Acknowledgements

The authors wish to thank the members and coordinator of the Collaborative Council Working Group on Sanitation and Hygiene for their encouragement to address the subject. They also thank Ms Kathleen Shordt for her constructive comments.

Biographies

Mr B B Samanta has been with UNICEF, India, for over 11 years and is currently Project Coordinator (Sanitation) in the India Country Office, New Delhi. He has been involved in the Water and Sanitation Sector since 1982 and was a member of the Working Group on Rural Sanitation in India for the current Five Year Plan for 1997–2002. He has also worked in South Africa and Egypt. Mr Samanta holds an advanced degree in Economics, postgraduate diplomas in National Economic Planning and Community Water Supply and Sanitation, and is a life fellow of the Indian Water Works Association and the Institute of Public Health Engineers.

Drs. Christine van Wijk is a sociologist and health extension graduate from the Universities of Utrecht and Wageningen. For 27 years she has worked on the socio-organizational aspects of water supply and sanitation. She has been involved in community-managed programmes in East, Southern and West Africa, Columbia and South Asia. For the last four years she has been the manager of the Asia Section of the IRC, a non-governmental organization involved in knowledge development and exchange on community-managed water supply, sanitation and hygiene programmes in developing countries.

Correspondence: Dr CA van Wijk, Programme Officer, IRC International Water and Sanitation Centre, PO Box 93190, 2509 AD The Hague, The Netherlands.