Health Policy Series

The aim of the Health Policy Series is to stimulate discussion on health policy in the Netherlands.

HEALTH MATTERS

Public health in North-South perspective

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4.1 Environmental hygiene and human health

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1 Introduction

What people do with their lives and those of their children affects their health far more than anything that governments do. But what they *can* do is determined to a great extent by external factors: knowledge, income, the position of women. Governments can create the conditions for better health through their development policies and strategies (figure 4.1-1). The drinking water supply and sanitation sector is one of the sectors which calls for enhancing people's own capacities to improve their conditions and practices, rather than providing free and in the longer term unsustainable services from external resources. Better public health in the South is closely associated with more adequate water supply and better sanitary facilities for the disposal, treatment and where possible recycling and reuse of human and animal excreta, wastewater, stormwater and solid waste. Diseases linked with poor household environments and hygiene behaviour are responsible for nearly 30% of the total burden of disease in developing countries. Within this group, lack of proper water supply, sanitation and hygiene account for 75% of all life years lost (figure 4.1-2). Diseases related to water, sanitation and hygiene are often spread by more than one transmission route (table 4.1-1). Actions therefore have to be multi-pronged and focus on what are locally the greatest risks.

The deterioration of water resources is a second, more indirect threat to public health. Fresh water resources are declining and competition between sectors for water is increasing. In 1989, 6 out of 35 developing countries had a lack of fresh water, 3 an absolute water scarcity and 5 a water barrier. By the year 2000, and assuming a stable population, these figures are expected to have increased to 10, 7 and 11 respectively (Cessti, 1989). By the

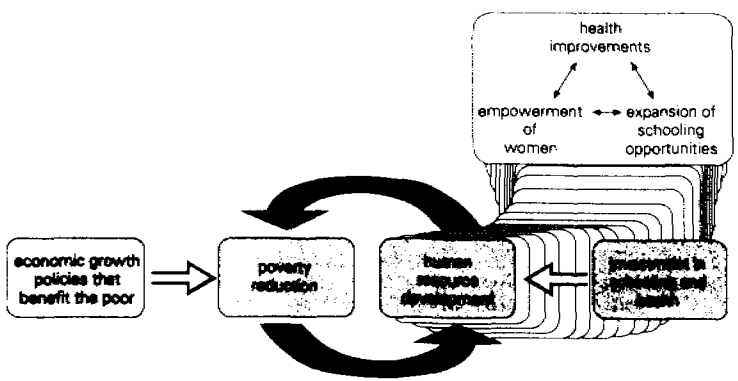

Figure 4.1-1. Factors involved in health improvement (World Bank, 1993).

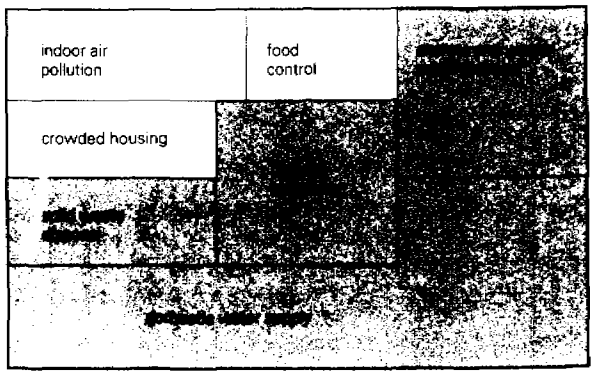

Figure 4.1-2. Estimated burden of disease in poor household environments.

end of the 1990s, many countries will have only about half as much easily accessible water as they had in 1975.

Not only water quantity is a growing issue, but also water quality. The quality of groundwater sources is threatened where excessive withdrawals allow for the intrusion of water of a lower chemical quality, e.g. with a high fluoride content or high salinity. Wastewater discharge into surface waters is set to double between 1980 and 2000, while two million tonnes of human excreta are discharged every day, causing bacterial pollution of water sources. Surface water is also increasingly polluted by chemicals (e.g. fertilizers), pesticides and industrial waste.

2 Environmental health

Human health and well-being are affected by the conditions of the natural and man-made environment. In developing countries more than 4 million children die each year from diarrhoeal diseases, 2 million people die from malaria each year, 2.5 billion people suffer from illnesses linked to contaminated water and lack of sanitation, 2.5 billion people are at serious risk of contacting respiratory disease and cancer from indoor air pollution, 3 billion people are debilitated and malnourished by intestinal parasites, while 200 thousand die each year from acute pesticide and chemical exposures (Tolba et al., 1992). Malnutrition and low economic status greatly exacerbates contraction of these diseases due to lowered immune systems and poor and crowded living conditions. Impaired health reduces economic earnings and ability to maintain sanitary conditions, thereby creating a downward spiral.

Environmental health in developing countries is primarily threatened by infectious diseases. The four types are related to the exposure route:

- water-related infections (water-borne, water-washed, water-based, water-related insect vectors);
- excreta related infections (faecal-oral, soil transmitted, food transmitted, insect vectors);
- refuse-related infections (insects, rodents);
- housing-related (airborne infections, domestic animals).

Table 4.1-1. Transmission patterns and preventive measures for water and sanitation-related diseases (Boot and Cairncross, 1993).

infection	*transmission pattern*	*major preventive measures*					
		safe human excreta disposal	*personal hygiene*	*domestic hygiene (and animal) management)*	*food hygiene*	*water hygiene water consumption*	*wastewater disposal and drainage*
various types of diarrhoeas, dysenteries, typhoid and parathyphoid	from human faeces to mouth (faecal-oral) via multiple routes of faecally contaminated water, fingers and hands, food, soil and surfaces; animal faeces (e.g. from pigs and chickens) may also contain diarrhoeal disease organisms	•	•	•	•	•	
roundworm (ascariasis), whipworm (trichuriasis)	from faeces to mouth: worm eggs in human faeces have to reach soil to develop into an infective stage before being ingested through raw food, dirty hands and playing with things that have been in contact with infected soil; soil on feet and shoes can transport eggs long distances; animals eating human faeces pass on the eggs in their own faeces	•	•	•	•		
hookworm	from faeces to skin (especially feet): worm eggs in the faeces have to reach moist soil, where they hatch into larvae which enter the skin of people's feet	•		•			
beef and pork tapeworms	from faeces to animals to humans; worm eggs in human faeces are ingested by a cow or pig where they develop into infective cysts in the animal's muscles; transmission occurs when an person eats raw of insufficiently cooked meat	•			•		
schistosomiasis (bilharzia)	from faeces or urine to skin: worm eggs in human faeces or urine have to reach water where they hatch and enter snails; in the snails they develop and are passed on a free swimming 'cercariae' which penetrate the skin when people come into contact with infested waters; in the Asian version of the infection, animal faeces also contain eggs	•	•	•			

(Table 4.1-1 continued)

infection	*transmission pattern*	*major preventive measures*					
		safe human excreta disposal	*personal hygiene*	*domestic hygiene (and animal) management)*	*food hygiene*	*water hygiene water consumption*	*wastewater disposal and drainage*
Guinea worm	from skin to mouth: the worm discharges larvae from a wound in a person's leg while in water; these larvae are swallowed by tiny 'water fleas' (cyclops), and people are infected when they drink this contaminated water					•	
scabies, ringworm, yaws	from skin to skin: both through direct skin contact and through sharing of clothes, bedclothes and towels		•	•			
trachoma, conjunctivitis	from eyes to eyes: both direct contact with the discharge from an infected eye and through contact with articles soiled by a discharge, such as towels, bedding, clothing, wash basins, washing water; flies may also act as transmission agents		•	•			
louse-borne typhus, louse-borne relapsing fever	from person to person: through bites of body lice which travel from person to person through direct contact and through sharing clothes and bedclothes, particularly when underwear is not regularly washed		•	•			
malaria, yellow fever, dengue	from person to person through the bite of an infected mosquito; the mosquito breeds in standing water			•			•
Bancroftian filariasis	from person to person through numerous bites by infected mosquitoes; the mosquitoes breed in dirty water	•		•			•

Environmental intervention can greatly reduce the progression from healthy condition to exposure to disease to death. The intervention can focus on sanitation (prevention of pathogen access to environment), hygiene (cleanliness), increased water supply and improved water quality resulting in a lower exposure to pathogens (table 4.1-2). While each type of intervention reduces diarrhoea incidence from 15-36%, the combination of improved water and sanitation reduces diarrhoea mortality by 65% (Esrey, 1994). The combined effects of sanitation, hygiene and improved water result in large reductions of ascariasis (incidence 30% and severity 60% reduction), Guinea worm (incidence 75% reduction), schistosomiasis (incidence 75% reduction) and trachoma (incidence 25% reduction). As the number of non-waterborne outbreaks is about twice as large as the waterborne outbreaks, measures such as sanitation and hygiene are about twice as effective as improved water supplies.

The developing countries have on the average invested USD 13 billion per year in the water and sanitation sector (VROM, 1994). An investment of USD 35.3 billion per year is necessary to provide universal coverage in 2000 at a cost of USD 20-350 per person yet to be covered. More than 45% of the population of developing countries has yet to receive safe water and 58% adequate sanitation. The World Bank calculated in 1993 that the burden of environmental diseases equals 338 million DALYs per year (disability-adjusted life years) with 35% contributed by respiratory infections (indoor air pollution), 29% by diarrhoea (poor sanitation and hygiene/polluted water) and 14% by tuberculosis (crowding). Feasible interventions can reduce this by 79 million DALYs per year. The current per capita health expenditures in developing countries are USD 41 per year and total USD 170 billion per year. More investments in water and sanitation can reduce future health expenditures considerably.

Table 4.1-2. Health effect of sanitation, hygiene and water supply measures (Esrey, 1994).

sanitation (prevention of pathogen access to environment; excreta disposal)
- 36% diarrhoea incidence reduction from improved sanitation
- 30% diarrhoea prevalence reduction in children (3-36 months) with flush toilets
- 15% diarrhoea prevalence reduction in children (3-36 months) with pit latrines
- 40% reduction of stunted growth children with flush toilets
- 26% reduction of stunted growth children with pit latrines
- sanitation caused 7 fold larger reduction in child mortality as compared to water improvement among illiterate mothers

hygiene (environmental cleanliness: washing of hands, food, counters, floors etc.)
- 33% diarrhoea incidence reduction from improved hygiene

water quantity (for human usage and consumption)
- 20% diarrhoea incidence reduction from improved water quantity
- diarrhoea prevalence (24 hours) reduced by 50% when roundtrip time for water collection was reduced from +60 to 0-5 minutes
- 5% reduction of stunted growth children with watersupply at premise

water quality (for human usage and consumption)
- 15% diarrhoea incidence reduction from improved water quality
- Guinea worm reduction

3 The drinking water and sanitation sector today

Implementation of the International Drinking Water Supply and Sanitation Decade (1981-1990) followed after a Ministerial Conference in Mar del Plata in 1977. The goal was to improve health by giving everyone access to sufficient and safe drinking water and better sanitation. The results showed improvement in service coverage, but targets were not met (figure 4.1-3). By 1990, an additional 1350 million people had received improved water services and 750 million improved sanitation. Eighty percent of these improvements were financed by the southern countries themselves. However, in this period the populations concerned increased with an additional 700 million people, an average growth of 2.1% per year. The net gain in this period has thus been only 650 (1350-700) million people which received improved water supply and 50 (750-700) million people which obtained improved sanitation.

Although quantitative achievements cannot be disregarded, the main benefit of the Decade has been qualitative. A better insight was achieved in the determinants of effective water supply and sanitation programmes and an international consensus emerged on overall policies and strategies. These have been documented in a second Ministerial Conference on drinking water supply and sanitation, which took place in Noordwijk in March 1994. The aim of this conference was to operationalize Chapter 18, the chapter on drinking water and sanitation adopted in 1992 by the UNCED Conference on Environment and Development in Rio de Janeiro.

In the policies for drinking water supply and sanitation adopted in Noordwijk, government roles have shifted to providing the regulatory and support framework rather than doing all implementation directly. Communities and the private sector get greater roles and better opportunities. The right to basic water and sanitation provisions is coupled to the obligation to use water efficiently and dispose of wastes soundly, to protect future generations. Programmes will be implemented through a partnership approach which involves all stakeholders. The use of low-cost technologies, which accounted for only 20% of all in-

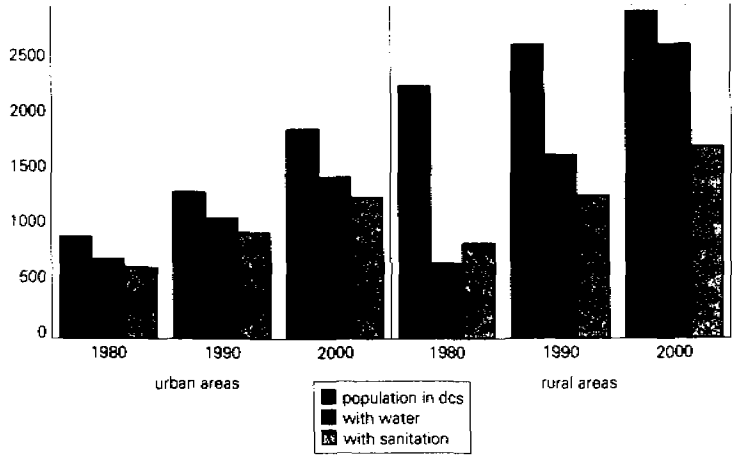

Figure 4.1-3. Size of population in developing countries and number of people served with water and sanitation by year and area (UN, 1990).

vestments between 1981 and 1990, can be increased. Better operation, maintenance and management together with user communities helps to improve performance and share costs. At present, for example, some 40-50% of all drinking water produced gets lost through leakage and wastage. Pricing water and sanitation services realistically ensures that less precious water gets wasted and that dependency on permanent government subsidies, which are much too low to ensure a good service for all, are phased out.

For better environmental hygiene, affordable water and sanitation systems need not only be established, but also continue to perform at an acceptable standard. Yet ultimately it is the change in the *use* of these services, which determines whether water supply and sanitation programmes have an impact on public health. A review of 144 health impact studies show that with properly functioning and used water supply and sanitation systems, substantial reductions in morbidity and mortality can be achieved (table 4.1-3). Few water supply and sanitation programmes, however, have introduced hygienic water use and the measurable improvement of other risky hygiene practices as the ultimate aims of their programmes.

Addressing problems in the area of water resources is in the early stages. To protect the water resources' water quality, part of the solution rests with the water sector itself, as the use of proper excreta disposal and waste water treatment methods would stop bacteriological contamination of these resources. In comparison with drinking water supply, sanitation, however, has so far always come a low second in the sector, as illustrated in figure 4.1-3. The neglect of sanitation has many reasons (Kolsky, 1994). There is also much less consensus as compared to water projects about the factors which make sanitation projects effective. Reducing the gap between water and sanitation has last year been given a development priority last year, when sector agencies met in Rabat under the aegis of the Collaborative Council, which is the UN's coordinating unit for the drinkwater and sanitation sector.

Regarding chemical pollution and decline of water availability, the drinkwater sector is a victim of developments in other sectors, such as irrigated agriculture, mining, forestry and industries. However, footing the bill of the decline in water resources falls mainly on the drinking water sector itself and not on those causing the water source problems. Just because water supply for drinking and basic hygiene has such a high political priority, funds are quite easily made available to drill deeper or go to a farther and better water

Tabel 4.1-3. Achievable reduction in mortality from improved water supply and sanitation (Esrey et al., 1990)

	all studies			*better studies*		
	no.	*median (%)*	*range (%)*	*no.*	*median (%)*	*range (%)*
diarrhoeal diseases						
– morbidity	49	22	0-100	19	26	0-68
– mortality	3	65	43-79	–	–	–
ascariasis	11	28	0-83	4	29	15-83
Guinea worm	7	76	37-98	2	78	75-81
hookworm	9	4	0-100	–	–	–
schistosomiasis	4	73	59-87	3	77	59-87
trachoma	13	50	0-91	7	27	0-79
overall impact on child mortality	9	60	0-82	6	55	20-82

source, when nearby resources are no longer adequate, especially for urban populations. Politicians seem to be less concerned that as a result fewer funds are left for capital investments to serve unserved others and that recurrent costs are magnified.

4 Shifts in intervention strategies

To serve all those unserved with water supply and sanitation in 15 years, a global annual investment of USD 31 billion is needed, 2.3 times the average rate of spending during the Water Decade. It is very unlikely that such funds will become available, as most of sector financing is done by the developing countries themselves. Official development assistance to the health sector, which includes water supply and sanitation, declined from 7% between 1981 and 1985 to 6% in 1986-1990, or about one dollar per person in developing countries

The water sector thus has to become more efficient and effective in using the available resources. The above cost estimates are based on a ratio of 50:25:25% use of high, intermediate, and low-cost technology. Important efficiency measures are:

- less direct implementation by Government agencies;
- a greater involvement of the private sector;
- more autonomy for drinking water and sanitation utilities;
- more community self-management of small water supply systems and sanitation programmes;
- using low-cost technologies and community management in urban neighbourhoods outside the city centres (VROM, 1994).

Aiming for use and shifting to management by municipalities and user organizations have great implications for the planning and implementation of water supply and sanitation programmes. New services widen the users range of options and will only be used when in the eyes of the users (and not: of the programme staff) the benefits of new over old are greater than the socio-economic costs. Often the reasons for non-acceptance are so logical from the users point of view, that promotion of the use of the new facilities has no impact. Many rural women, for example, will rather use nearby unprotected water sources and spend the remaining time on planting, weeding and harvesting, than use extra time to walk and wait at new waterpoints. Less time in the fields will certainly mean less food, while the use of an unprotected water source will only in some cases mean illness.

Water and sanitation management by local councils is not a new phenomenon everywhere. In general, however, most earlier attempts have failed for three reasons. First, the councils have many other tasks besides water, sanitation and hygiene. Second, neither they, nor the users, have been involved in local planning and decision-making. Rather, the new systems were imposed on them, without taking into account variations in local technical, managerial and financial capacities and the availability of tools and spares. Third, capacity building programmes for maintenance, management and financing have not been included.

The newly emerging approach of participatory health engineering changes this drastically. Participatory programmes do not rely on education and communication to change users, but adapt technologies and management systems to local needs, demands and capabilities. The programme aims are measurably accepted, resulting in improved water supply and sanitation systems and hygiene practices. Informed decision making, user organization and training are key elements thereby. Co-operation with other (social, health) agencies plays an important role to get the required mix of expertise. The new projects also require a shift from planning and execution as parallel technical, social and health activities, to working in one integrated and multi-disciplinary field team.

Operationalization of the organizational implications of this integrated approach is not yet widespread. Task descriptions, field procedures and skills development are rarely adjusted for a team approach. Programme staff is still judged by their physical output of predefined and standardized components, and not by the degree to which they have succeeded in capacitating local community groups to maintain, manage and finance locally affordable and acceptable solutions to locally felt problems.

5 Further developments

Looking at current developments in the sector, a number of general directions emerge. For better sustainability and use of the facilities, a shift is emerging towards the use of a greater mix of technologies and service levels in one geographic area. This approach recognizes that one area often has communities with differences in development level, water and sanitation demand and payment and management capabilities. Hence, for each type a different technology and/or service level may be the most sustainable and adequate and each type requires a different degree of attention to hygiene behaviour change.

This variation is represented graphically in figure 4.1-4. Located in the upper right extreme are communities with a relatively high development level, a high water demand and good financial and managerial capabilities. Here a relatively high technology and service level may be both required and sustainable. Promotion of hygiene changes will focus mainly on sanitation (safe disposal of waste water, excreta and solid waste), as water at or in the house throughout most of the days usually means higher water use for hygiene and less need to store water, which then can be recontaminated. At the bottom left extreme are communities with a limited demand and capabilities. Low-cost systems, including upgraded traditional water sources, construction of protected wells and piped gravity systems with community standposts may be the more sustainable and adequate options. Having to carry and store water limits the health benefits. In that case less water is collected for hygiene and recontamination of water in the home is common. Facilitation of more water use, e.g. through neighbourhood built and managed laundry facilities and bathing enclosures or promotion of water transport facilities, and of safe water collection and storage and drawing in the home become necessary.

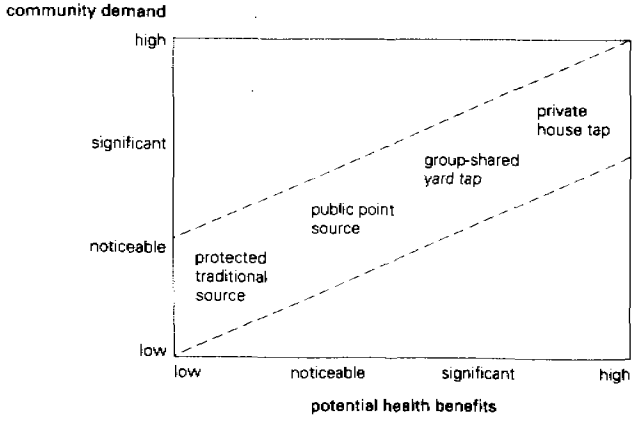

Figure 4.1-4. Selection of service level in relation to community demand and health need.

Table 4.1-4. Participation areas for women in water and sanitation (Van Wijk, 1993).

1 Information
Make sure, by using suitable communication channels and methods, that project information reaches men and women (each group may need different channels). In data collection and analysis distinguish between information from men and women.

2 Gender division
Assess with men and women what work and responsibilities they have in land and water use, care of traditional water sources, construction, care and upkeep of household/school latrines, family health and hygiene, communication with other men, women, and household finance.

3 Meetings
Facilitate women's participation in meetings: time and place suitable for women, women informed and encouraged to attend, seating and language is so all can hear and react, speaking out by women is facilitated (sit together, breaks for internal discussion, choose spokeswoman, etc.). Insist that women can react in a mixed or separate meeting as a condition for project continuation.

4 Planning
Give men and women a say in and achieve acceptable solutions on: design and location of the facilitities, choice of local maintenance and management system, choice of committee members, mechanics, caretakers, health promoters, local financing system.

5 Committees
Determine (by law) that a minimal proportion of members is female. Enable men and women to choose their own representatives on trust and suitability for tasks. Encourage that women are chosen as treasurers (have proved to be most trustworthy). Committees should account for their proper management to male and female users. Higher level committees should include men as well as women.

6 Hygiene education
Involve women as planners and change agents, not as passive audiences. Involve also men.

7 Training
Make sure that men and women are trained for technical as well as managerial tasks. Adapt training provisions to the requirements of women (place, methods, literacy level). Train and reward women for new functions: waterpoint repair (they visit daily), latrine masons (they can work in homes), treasurers (trustworthy and home visits), monitoring (idem).

8 Means
Ensure that credit, materials and skills are available to men and women to make their own improvements in water supply, sanitation and hygiene. Where feasible and relevant, undertake or link up with income generation projects.

9 Gender-sensitiveness
Make project staff and management aware why gender is important and how a gender-sensitive approach is applied.

10 Staffing
Employ female staff and equip them, as well as male staff, for dealing with gender issues. Work in case of shortage of female staff with gender-sensitive male staff and female intermediaries from the communities.

At the field level, the initially purely technical character and the limitation of contacts to formal community leaders meant that initial programmes involved only men. This

changed when programmes recognized that those selecting and using water sources and managing water and waste are women and that to ensure use, women have to be consulted. It was also found that women are most motivated for sanitation improvement and maintenance of water systems, because of the great inconvenience to them when proper facilities fail or break down. Women therefore increasingly carry out local maintenance and management, and programmes have found ways to overcome cultural constraints to women's involvement (table 4.1-4).

The greater focus on women's roles in water and sanitation has not only been beneficial. It has also led to several undesired effects, such as tensions over influence and functions, increased workload, a greater call on women's financial contributions while their access to resources is smaller, and in some cases a withdrawal from responsibilities by men. As a result, women's involvement is being replaced by the use of gender strategies in programme planning and implementation. The underlying premises are that improved water supply, sanitation and hygiene concern women *and* men and that both will only support the programmes if they benefit from them. Hence an equitable division of decisions, work and benefits has to be the basis for the programmes.

Implementation of participatory and gender-sensitive programmes would benefit greatly from inclusions in professional education programmes. At present, insights and experiences gained in the drinking water and sanitation sector are not much fed back into the educational system. Most training for engineers in the rural and low-income urban sector is still along conventional lines. It is rare for educational institutes in engineering to have social and hygiene behaviour expertise in, or linked to their faculty. Courses based on new insights exist mostly abroad, in UK, France, the Netherlands and until recently Finland. The training programme in low-cost technology and participatory processes started by the World Bank, International Training Network, operates in a limited number of developing countries. Programmes for social and health staff working in rural and urban development do not include water supply and sanitation in co-operation with engineers. Few governments of developing countries have incorporated current sector developments in their educational curricula. Donors support mainly implementation projects, not educational reform.

Another area for further development is a more effective focus on the remaining hygiene risks. Many technology programmes still include no or very limited funds to address the risky hygiene practices that allow water and sanitation-related diseases to be transmitted. Moreover, much of these funds are only used to produce educational materials. Personal intervention strategies are not always effective either. Often they focus on one-way education to teach local people in an academic manner (germs theory!) on how particular diseases are transmitted, or use general messages to promote recommended, but locally unrealistic actions to undifferentiated target groups. Programmes need to set more measurable objectives for changing key risky practices and conditions, define objectively verifiable indicators and find out what results are achieved with what strategies and inputs. Professionalism of hygiene promotion needs to be recognized and strengthened.

With regard to gender strategies, developments in hygiene programmes have been the opposite of those in technology programmes. In hygiene programmes the focus has traditionally been on women rather than on men. However, health impacts require a change in behaviour from women and men. In many cultures women are unable to change the practices of men and need the support from men to make certain changes themselves, e.g. in environmental household improvements which require financial investments. A gender approach is thus as necessary in hygiene promotion as in technical programmes.

Integrated water resources management is a new area in the water and sanitation sector and will require much work in the coming years. Within the sector, much can be done by developing effective strategies and sustainable programmes for on-site human excreta disposal, establishing low-cost systems to treat and recycle waste water and strengthening economic and managerial mechanisms to reduce wastage of drinking water. Realistic pricing of water for domestic and agricultural uses and for energy reduces water spillage and overpumping.

Little documented experience exists on gender-specific community management of the local catchment areas of small community water supply systems. With the growing number of such systems, the protection of the resources and the inclusion of other local water sources into holistic water resources development and management systems will get greater importance. Increasingly, the sector will also have to go outside its direct areas of work and take up broader issues of water resources use and management, to prevent that higher productivity in agriculture, industries and energy in the short turn has a high price in terms of insufficient basic services and poor hygiene and health conditions in the long turn.

6 North and South: comparison and conclusions

In establishing infrastructure for water and sanitation, the choices in the South have almost automatically been for conventional and centrally managed piped water supply and sewerage systems of the North. Only in the last decade and a half has an autonomous development of innovative and decentralized technologies and management systems emerged. Nevertheless, 80% of the Decade infrastructure projects in the South used high-level technologies, costing USD 200 per person for water supply and USD 350 for sanitation (VROM, 1994).

Conventional technologies are generally the only subjects taught in schools and universities, and research and development in other technologies and management systems are also still dominated by North-based agencies. Programmes in which national staff develops low cost, non-conventional solutions, such as the Orangi and Baldia sanitation programmes in Karachi, Pakistan and the peri-urban water supply programme in Tegucigalpa, Honduras are still unusual. External support agencies support a mix of conventional and low-cost technologies through implementation programmes, rather than innovative education and research in national institutes.

When opting for conventional solutions of high income urban technologies and central management in the South, it is not taken into account that in the less density populated rural areas of Europe and northern America small community managed water supplies and on-site sanitation are existing even today. Finland still has over 2000 small community-managed small water systems and in the Netherlands, 82% of the population classified as rural, which is 12% of the total population, has on-site sanitation (WHO, 1969). If the ratios for conventional and intermediate and low-cost technologies in the South were shifted from 80:20 to 50:25:25, 80% of the unserved population could be reached for just 30% of the estimated investment needs (VROM, 1994).

Southern preferences for central-urban type technologies have not been accompanied by a parallel system of autonomous, accountable and operable cost-covering management. Only recently has the consensus grown that many more people can be served and services function more adequately when water and sanitation bodies can operate as independent organizations and technology choices and service levels can be matched to what users want and can afford to pay, while those who want more than the minimum social service level pay the real price.

A more economic use of water by consumers and industries through the introduction of progressive tariffs is a development in the South which is still lacking in parts of the northern hemisphere. Progressive tariffs are an effective way of curbing wastage and luxury use and form a development in which several southern countries have set the example.

In the North the trend is towards a greater concentration of utilities, made possible by good communication structures, highly skilled management and cost-effective service systems. In the South the development is towards decentralized technologies and system management, especially in the rural areas, as central management of a large number of systems serving many and often widely scattered settlements generally was not working. Interesting experiments with on-site technologies and decentralized management in, for example, Malawi and Honduras for water supply and India for sanitation indicate that such options are also suitable for certain types of urban neighbourhoods. However, few programmes for decentralized technologies and management systems have as yet done away with the blanket approach and offer users an informed choice from a range of options through a gender-sensitive communication and decision strategy. Information would include all pro's and con's, e.g. regarding labour, costs, management, accountability, use and health. A community choice would ideally also include the option of upgrading existing sources and transport means for drinking water (including wells and donkeys); this makes the system more sustainable and increases usage.

The phenomenon that an impact on public health requires not only general use of functioning water and sanitation systems, but also better education and hygiene and a better position of women, has a clear parallel with developments in the North. In the Netherlands, diseases such as cholera and typhoid disappeared not only through a better infrastructure, but also through better hygienic conditions and practices related to a greater access to education and communication and an improved position of women (Van Wijk, 1994). A similar parallel can be seen for the gap between water supply and sanitation. While in the Netherlands water companies emerged from the middle of the last century, it took the authorities another 50-80 years to take action with regard to adequate disposal and treatment of excreta. That this problem was tackled was the result of the combined pressure of the general public, for reasons of nuisance, and public health inspectors, for reasons of health. That the relevance of good sanitation in the South has now been recognized and that convenience, safety and status have been recognized as more essential promotional factors than impacts on health, increases the chances that the gap will be narrowed.

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