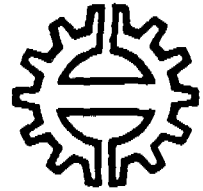


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WATER SERVICES**

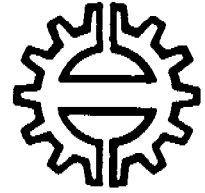
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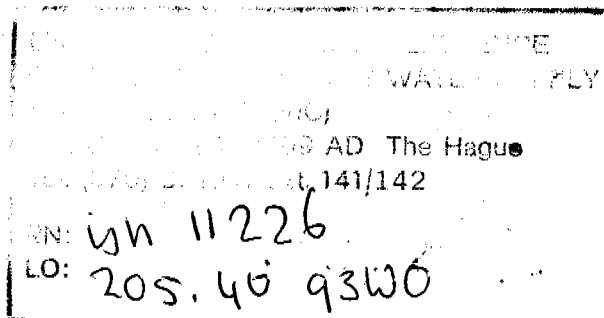
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FOREWORD OF THE EDITORS

The urban population in developing countries is increasing at dramatic rate. The present urban infrastructure can hardly cope with the natural population growth, leave alone the constant migration - rural to urban. Due to this, most of the services such as water supply, sanitation and solid waste management are strained to their limits. Furthermore, these conditions force the city dwellers to squat - illegal occupation of plots - and to live in non-sanitary conditions as services are even more inadequate in squatters.

It is, however, encouraging to note that some governments have recognised the plight of the periurban citizens and are doing something to improve their conditions. Unfortunately these authorities demand strict and unnecessary standards or criteria for roads, pathways, water supply and sanitation. These standards cannot be maintained in the city proper, but are demanded to the periurban upgrading. no wonder most of the upgrading has not been successful.

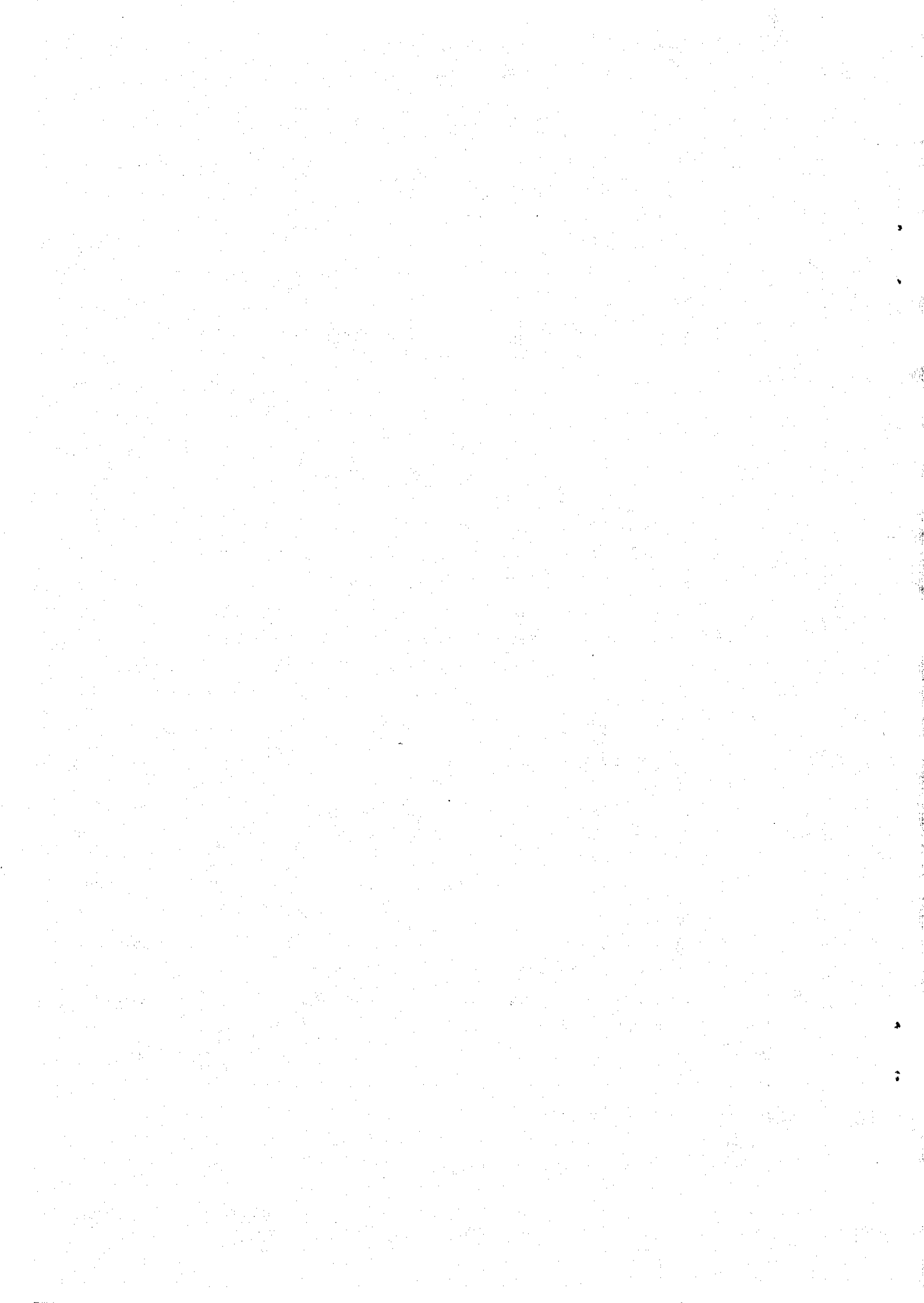
In many cases upgrading of periurban areas depends on foreign support for capital, designs, standards, etc..- Alien technology might be one reason of failure. Examples of such failures are Bangkok in Thailand, the Philippines and Tanzania.

One of the purposes of the workshop was to address urban environmental problems and propose some solutions. It is only recently that attention has been paid to cost-recovery issues and community participation. In some cases decision-making might be too institutionalised in making use of the existing weak structures.

A lot remains to be done if the living standards of the periurban dwellers are to be improved . The expertise, both local and foreign, should be compatible with norms and customs of the potential users, customers of the proposed services. Perhaps optimum results could be obtained by involving the target population for example in managing their water supply and sanitation as well as solid waste.

This one day seminar, organised by the Institute of Water and Environment Engineering of Tampere University of Technology, Finland, proposed several papers covering largely the scope of this sector. It permitted to confront the opinions of African professionals with those of Europeans experts during the active discussions which followed each presentation. Summarised versions of these rich discussions are reproduced here to enhance readers' critical evaluation. The problems approached here are very complex, so that no easy solution can solve them, and real discussion is still needed.

The editors, Dr A. Mashauri and H. Morange.



JARMO J. HUKKA

**APPROPRIATE WATER AND WASTE
MANAGEMENT INFRASTRUCTURE
FOR THE
URBAN SLUMS AND
SQUATTER SETTLEMENTS**

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APPROPRIATE WATER AND WASTE MANAGEMENT INFRASTRUCTURE FOR THE URBAN SLUMS AND SQUATTER SETTLEMENTS

"In all human societies the quality of life depends first on the physical infrastructure that provides for basic necessities such as shelter, water, waste disposal, and transportation. The planning, management, and engineering of the infrastructure necessary to provide these necessities is one of the most important historical responsibilities of engineers and managers... When infrastructure is not present or does not work properly, it is impossible to provide basic services such as food distribution, shelter, medical care, and safe drinking water... The basis for public provision of infrastructure facilities goes back in history, at least to the time of Socrates" (Grigg 1988).

Urban Challenge

According to the report "Our Common Future" of the World Commission on Environment and Development (1987) one of the six greatest global challenges is the urban challenge on the way to the sustainable development. The developing world must, over the next few years, increase by 65 % its capacity to produce and manage its urban infrastructure, services, and shelter merely to maintain today's often extremely inadequate conditions. The urban poorer groups are facing two obvious environmental problems: the presence of pathogens in their environment because of no infrastructure or services to remove and safely dispose of them; and overcrowded housing conditions.

The current annual growth rate for urban population e.g. in Eastern Africa has been projected to be above 6.5 per cent for the period 1985-2000. This would give a doubling time of little more than ten years for the urban population. The low-income communities have been doubling in size even every five years. The task to provide urban poor with basic services, safe water, clean environment and shelter is an enormous and complex challenge that requires both the combined efforts from the governments, international community and the squatter citizens involvement. Mankind has also to develop new attitudes and priorities. Improvement of the environment of the urban low-income settlements will give a crucial impact on the survival of urban poor. This will concern also growing small and intermediate urban centres, not only capital cities as commonly thought.

Deficiencies in the environment due to inadequate water supply, hygiene and sanitation are the cause of 80 per cent of the sickness in the world and between 10 and 25 millions deaths every year. In urban settlements it is the poor who suffer most when municipal governments are not able to provide basic infrastructure under great pressure of urban population growth.

Ehrlich and Ehrlich (1990) describe :

"Half of the population of Delhi are now slum dwellers, and according to the Delhi Planning Authority that fraction will be more like 85 percent at the end of the century. In the summer of 1988, millions in Delhi went without water during the drought; when the rains finally arrived, wells were polluted by the human feces that are everywhere (because of the inadequate sewage system), and a cholera epidemic broke out among the poor. In Bombay, shantytowns make up half the housing, and social workers estimate that 200000 to 500000 people sleep in the streets. Mexico City has so many people without sanitary facilities that a "fecal snow" often falls on the city as winds pick up dried excrement. Its air pollution is rated the worst on the planet.

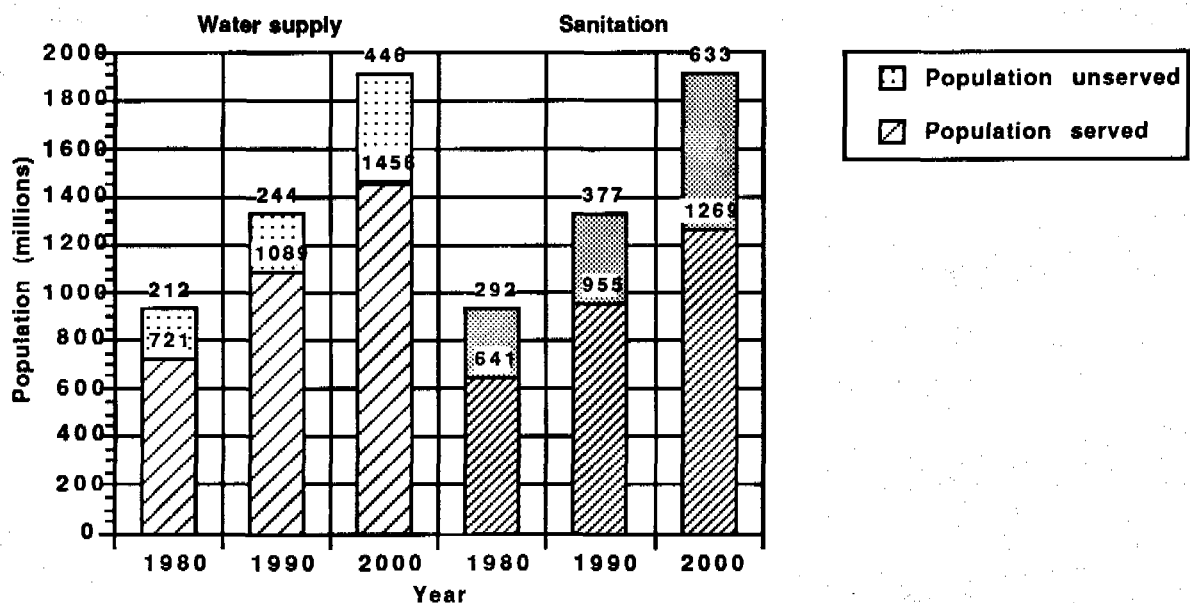


Figure 1. Urban water supply and sanitation coverage in developing countries in 1980,1990 and 2000 (United Nations 1990).

Urban Demography

The United Nations (UN) population projections (United Nations 1989) regarding urban population are 2300 million in 1990 and 2900 million in 2000 (Figure 2). Almost ninety per cent of this growth will take place in less developed regions (Figure 3).

Urban population size is defined as the number of persons residing in urban localities (UN 1989). Different countries use diverse criteria to define an urban locality reflecting a variety of social and geographical conditions. The most common criterion is a minimum number of persons residing in the locality, e.g. at least 200 persons in Denmark, Greenland, Iceland, Norway and Sweden, 20000 persons or more in Mauritius and Nigeria, and of 30000 or more persons in Japan. Most countries choose a minimum between 2000 and 5000 persons. Some countries use quite different criteria to define an urban area, such as the number of dwelling units in a locality, population density, types of economic activity and living facilities.

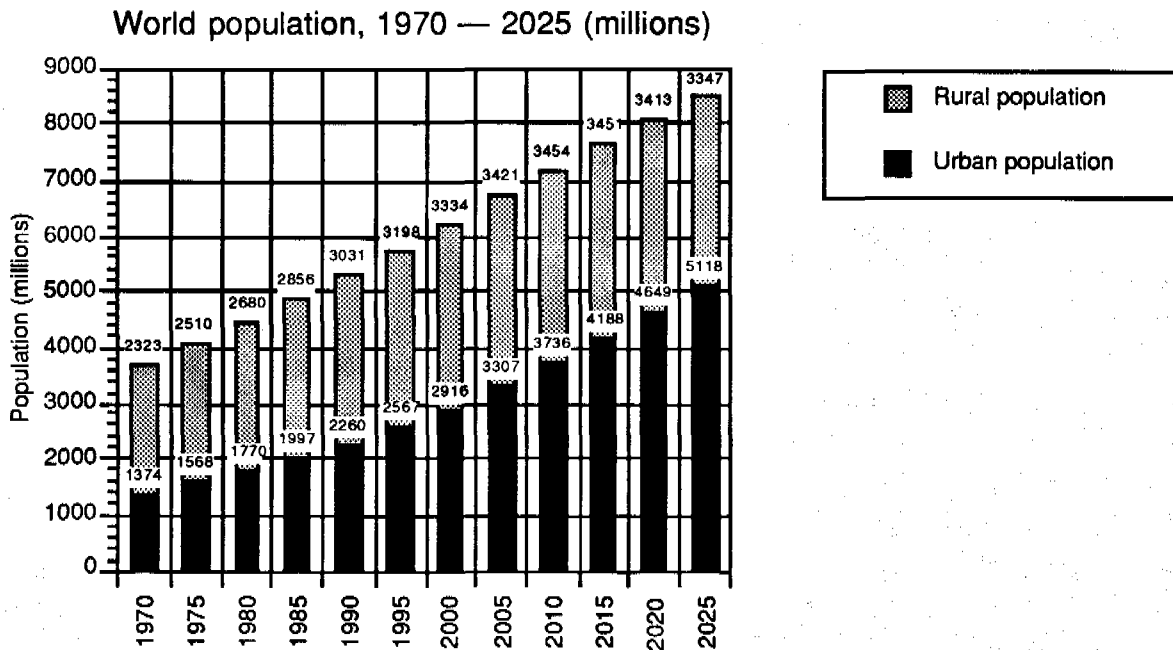


Figure 2. Urban and rural population of the world, 1970 — 2025 (United Nations 1989).

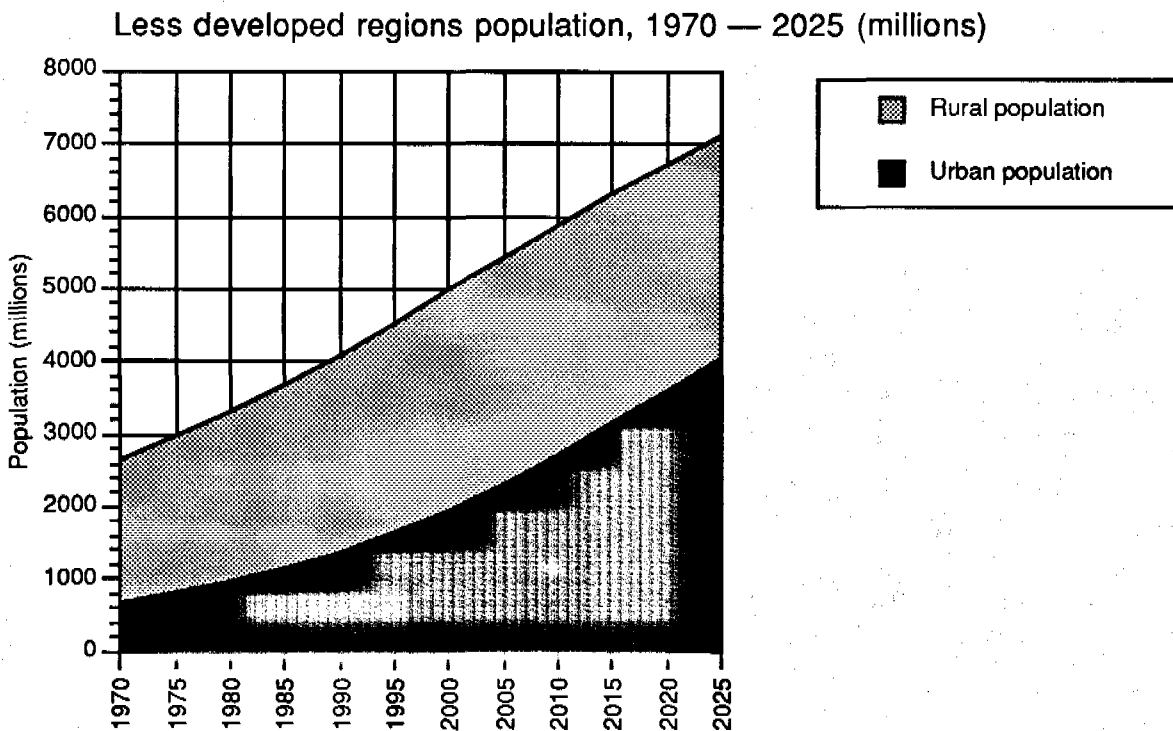


Figure 3. Rural and urban population in the less developed regions, 1970 — 2025 (United Nations 1989).

The figures are based on the UN publication (1989) in which instead of imposing uniform definitions on all countries, national definitions of urban localities are accepted.

- An urban agglomeration is defined as an area with a population

concentration that usually includes a central city and surrounding urbanized localities.

- A large agglomeration may comprise several cities and/or towns and their suburban fringes. Although this concept is common in national statistics, some countries use the concepts of metropolitan area or city instead.
- A metropolitan area is similar to an urban agglomeration, but may be a specially designated administrative unit and may sometimes cover certain rural areas in terms of population characteristics.
- A city is not usually regarded as the same as an urban agglomeration. When a city is used to represent an agglomeration, the size of the agglomeration is generally underestimated, unless the areas of population concentration happen to be solely within the boundaries of the city.

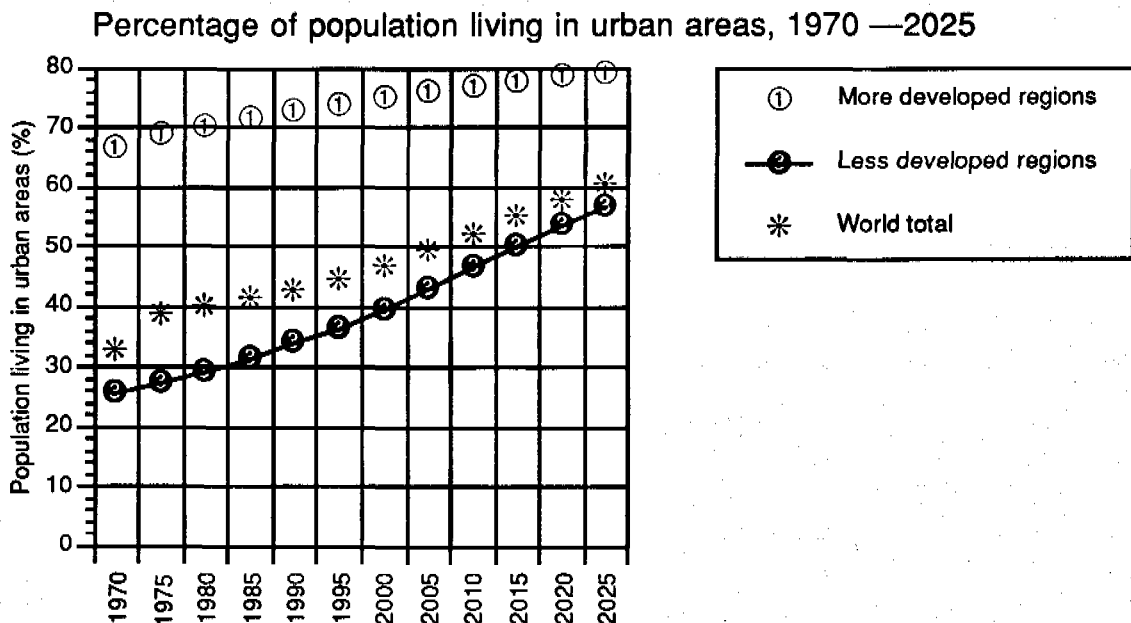


Figure 4. Percentage of population living in urban areas in the more and the less developed regions, 1970 — 2025 (UN 1989).

Poverty

The World Bank report (1990) defines the poverty line:

“A consumption-based poverty line can be thought of as comprising two elements: the expenditure necessary to buy a minimum standard of nutrition and other basic necessities and a further amount that varies from country to country, reflecting the cost of participating in the everyday life of society. The first part is relatively straightforward. The cost of minimum adequate caloric intakes and other necessities can be calculated by looking at the prices of the foods that make up the diets of the poor. The second part is far more subjective; in some countries indoor plumbing is a luxury, but in others it is a “necessity.” The perception of poverty has evolved historically and varies tremendously from culture to culture. Criteria for distinguishing poor from non-poor tend to reflect specific national priorities and normative concepts of welfare and rights. In general, as countries become wealthier, their perception of the acceptable minimum level of consumption — the poverty line — changes.”

The report employs two universal poverty lines needed to permit cross-country comparison and aggregation: USD 275 and USD 370 per person a year (the amounts are in constant 1985 purchasing power parity—PPP—dollars prices). This range was chosen to span the poverty lines estimated in recent studies for a number of countries with low average incomes — Bangladesh, the Arab Republic of Egypt, India, Indonesia, Kenya, Morocco, and Tanzania. The lower limit of the range coincides with a poverty line commonly used for India.

The headcount index is used to measure poverty. It expresses the number of poor as a proportion of the population. The income shortfall, or poverty gap, measures the extent to which the poor fall below the poverty line. It shows the transfer that would bring the income of every poor person exactly up to the poverty line, thereby eliminating poverty. According to the World Bank report (1990) the use of the upper poverty line — USD 370— gives an estimate of 1115 million people in the developing countries — roughly one-third of the total population — in poverty in 1985. The number of extremely poor, i.e. having annual consumption less than USD 275 (below the lower poverty line) was 630 million — 18 percent of the total population of the developing world. The report points out:

“Despite these massive numbers, the aggregate poverty gap — the transfer needed to lift everybody above the poverty line — was only 3 percent of developing countries' total consumption. The transfer needed to lift everybody out of extreme poverty was, of course, even smaller—just 1 percent of developing countries' consumption.”

Table 1 shows a detailed regional breakdown of these estimates.

Table 1. How much poverty is there in the developing countries? The situation in 1985 (World Bank 1990).

Region	Extremely poor			Poor (including extremely poor)			Social Indicators		
	Number (millions)	Headcount index (percent)	Poverty gap	Number (millions)	Headcount index (percent)	Poverty gap	Under 5 mortality (per thousand)	Life Expectancy (years)	Net primary enrollment rate (percent)
Sub-Saharan Africa	120	30	4	180	47	11	196	50	56
East Asia	120	9	0.4	280	20	1	96	67	96
China	80	8	1	210	20	3	58	69	93
South Asia	300	29	3	520	51	10	172	56	74
India	250	33	4	420	55	12	199	57	81
Eastern Europe	3	4	0.2	6	8	0.5	23	71	90
Middle East and North Africa	40	21	1	80	31	2	148	61	75
Latin America and the Caribbean	50	12	1	70	19	1	75	66	92
All developing countries	633	18	1	1116	33	3	121	62	83

Note: The poverty line in 1985 PPP dollars is USD 275 per capita a year for the extremely poor and USD 370 per capita a year for the poor.

The headcount index is defined as the percentage of the population below the poverty line. The 95 percent confidence intervals around the point estimates for the headcount indices are Sub-Saharan Africa, 19, 76; East Asia, 21, 22; South Asia, 50, 53; Eastern Europe, 7, 10; Middle East and North Africa, 13, 51; Latin America and the Caribbean, 14, 30; and all developing countries, 28, 39.

The poverty gap is defined as the aggregate income shortfall of the poor as a percentage of aggregate consumption. Under 5 mortality rates are for 1980-85, except for China and South Asia, where the period is 1975-80.

Figure 5 shows the problems caused by the poverty in urban settlements (Harpman et al 1988).

THE DREAM: HEALTH IN THE CITY		
POVERTY		
<u>Direct problems of poverty</u>	<u>Environmental problems</u>	<u>Psycho-social problems</u>
Unemployment	Inadequate water and sanitation	Stress
Low income	Overcrowding	Alienation
Limited education	Poor housing	Instability
↓	Lack of land to grow food	Insecurity
Inadequate diet	Lack of rubbish disposal	↓
Lack of breast-feeding	Traffic	Depression
Prostitution	Hazardous industries	Smoking
	↓	Alcoholism
	Infectious diseases	Abandoned children
	Pollution	
	Accidents	
	Consumption of junk foods	

Figure 5. For many, poverty forms a barrier to the dream of a healthy life in the city (Harpman et al 1988).

Urban Slums and Squatter Settlements

The urban poor population is seldom homogeneous and the type of urban community affects the strategies and methods to be used in a community services development programme. In relation to the use of these different terms Rossi-Espagnet (1984, cited by Harpman et al 1988) suggests the following definitions:

- Shanty towns: once a commonly used term, but now considered pejorative, referring to the external view that the low-income settlements are only makeshift huts.
- Slum: usually referring to the old, deteriorating tenements in the city centre (originating from the word slump meaning 'wet mire' where working-class housing was built during the British industrial revolution in order to be near the canal-based factories).
- Squatter settlements: originally referring to the fact that the inhabitants squat on, or do not have legal tenure to, the land but now often referring to the new slums where the inhabitants sometimes do have legal title. Squatments is contrived from squatter settlements to include a broader range of the new slums and not simply to imply that all the inhabitants in such settlements are squatting. Besides this familiar term, many adjectives have been officially applied to modify settlements, among them marginal, transitional, uncontrolled, spontaneous, sub-integrated, non-planned, provisional, unconventional, and autonomous.

Definitions of slums and squatter areas may vary from region to region and from city to

city. Slums usually are defined run-down housing in older, established, legally built parts of the city. Squatter settlements are mainly uncontrolled low-income residential areas with an ambiguous legal status regarding land occupation. The process of settlement formation comprise (UNCHS 1982):

- (i) Invasion;
- (ii) Accretion;
- (iii) Entrepreneurial development.

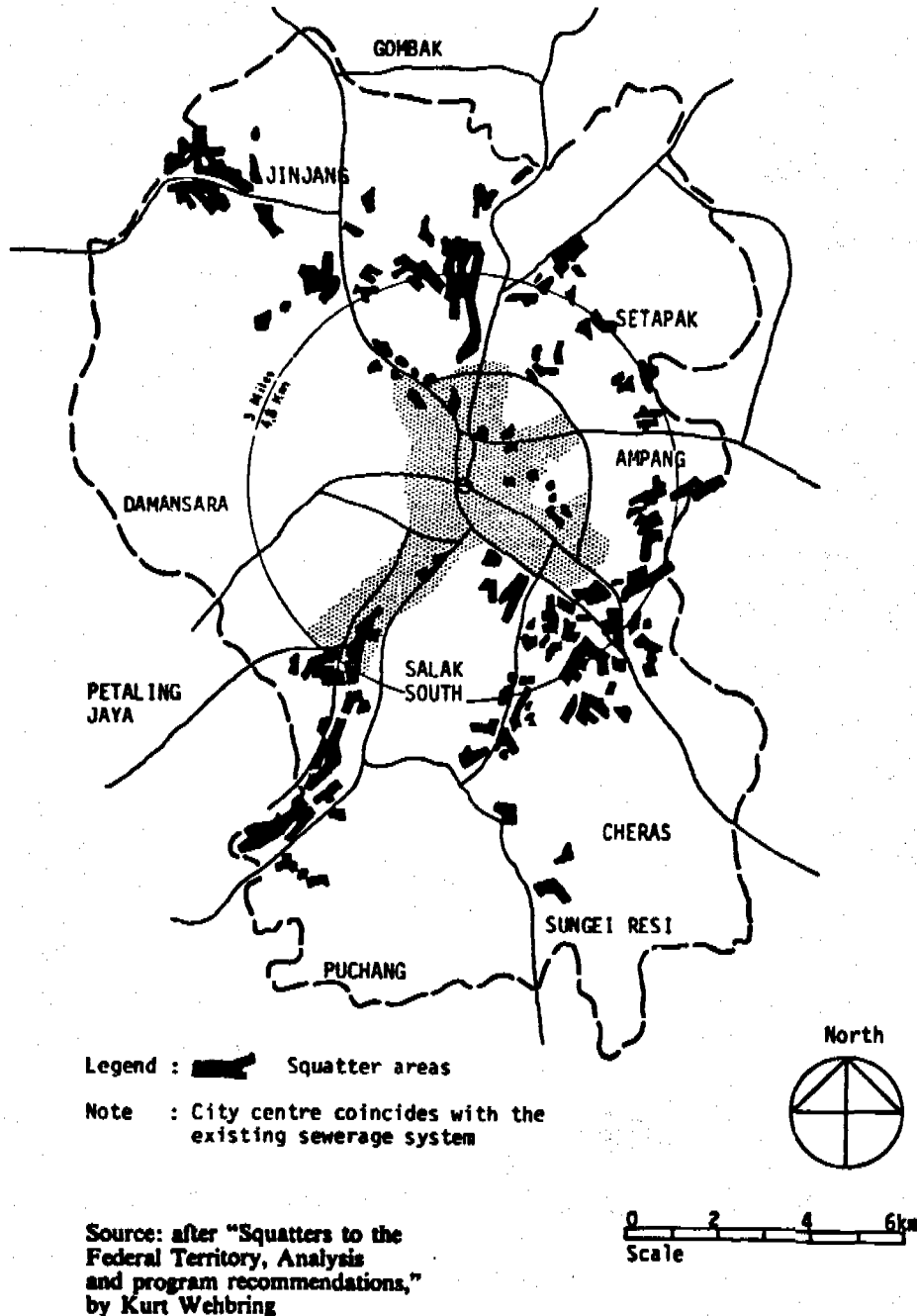
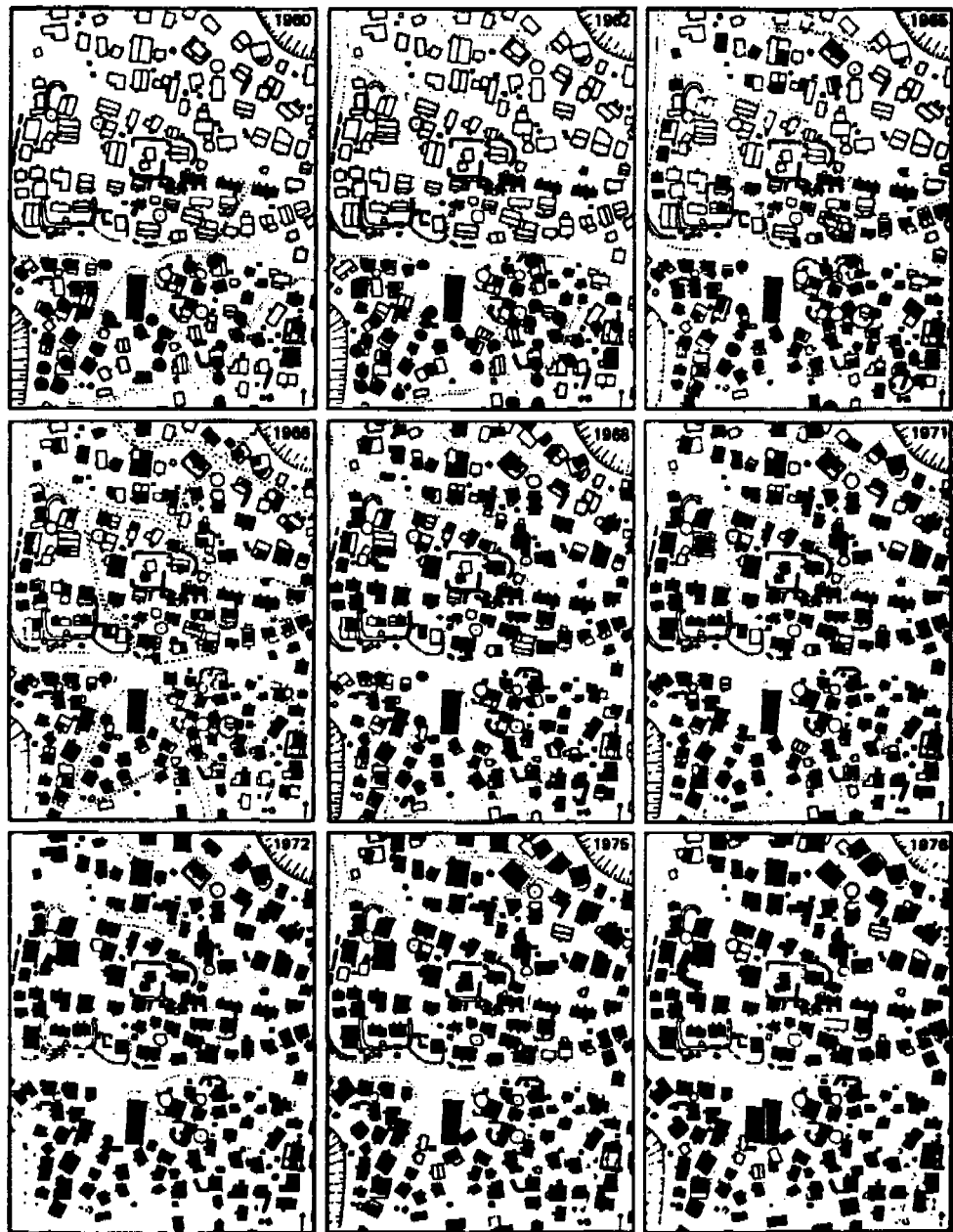


Figure 6. Kuala Lumpur — location of squatter areas (UNCHS 1982).



Source: from Ann and Thomas Schlyter, "George, the development of a squatter settlement in Lusaka, Zambia." Lund, 1979 (background map, 1972)

Scale 0 40 80m

Figure 7. George Compound, Lusaka — growth trough expansion and densification (UNCHS 1982).

The growth and change of settlements comprise:

- (i) Expansion;
- (ii) Densification
- (iii) Redevelopment
- (iv) Population succession.

The factors affecting formation, growth and change are:

- demand for shelter

- proximity to employment
- historical events
- inadequacy of the existing housing stock
- amount of land available
- quality of land available
- land ownership
- limits to growth of other low-income settlements
- community organisation and official response.

Table 2. Comparison of population in selected slum and squatter settlements and their surrounding urban areas (UNCHS 1982).

City	Settlement	Settlement Population	Year	City Population	Year	Growth per annum %	Population in slum and squatter settlements %	Settle- ment population % of city population
Colombo	Punchi Harak Watte	1 400	1977	655 000	1975	1.2	25	0.2
Dacca	Suritola	16 000	1977	1 561 000	1975	10.0	50	0.7
Hong Kong	Yau Ma Tei	132 000	1976	4 010 000	1975	1.8	17	3.3
Lahore	Walled City	500 000	1975	2 460 000	1975	5.4	-	20.3
Osaka-Kobe	Shonai South	17 000	1977	8 684 000	1975	2.0	-	0.2
Ahmadabad	Sabarmati	15 000	1973	2 063 000	1975	2.7	27	0.8
Amman	Jebel-El-Jofeh	5 000	1977	600 000	1974	9.5	17	0.5
Delhi	3 settlements	6 000	1975	4 489 000	1975	5.7	36	0.1
Istanbul	Rumelihisarüstü	11 000	1975	3 255 000	1975	6.5	40	0.4
Kuala Lumpur	Kampong Pandan	5 770	1977	738 000	1975	6.0	20	1.1
	Kampong Maxwell	1 600	1977					
Manila	Tondo Foreshore	170 000	1974	4 444 000	1975	4.2	35	3.8
Seoul	Oksoo No.3	9 000	1973	7 286 000	1975	6.7	29	0.1
Alexandria	Kom-el-Decka	6 121	1976	2 447 000	1975	3.9	24	0.3
Kumasi	Ayigya Village	5 900	1974	337 000	1970	-	-	1.3
Lusaka	George Compound	56 000	1976	463 000	1976	7.5	50	12.1
Nairobi	Kawangware	15 698	1976	741 000	1975	5.6	33	2.0
Port Sudan	Deim Onma	18 000	1970	131 000	1973	5.6	55	16.0
Bogota	Las Colinas	12 500	1977	4 293 000	1977	6.2	60	0.3
Guayaquil	Cerros del Carmen & Santa Ana	9 000	1971	1 006 000	1975	4.0	49	1.2
Kingston	Drewsland	5 000	1970	605 000	1975	4.0	33	1.0
Lima	Villa El Salvador	115 000	1973	3 901 000	1975	5.6	40	3.4
San Salvador	El Manguito	4 800	1977	461 000	1975	4.8	51	0.6
Santiago(Chile)	Manuel Rodriguez	8 500	1977	3 063 000	1975	3.0	20	0.3

The population density varies in low-income settlements very much (Table 3). In some peripheral squatter settlements the density can be under 25000 persons per square kilometre, and in central areas of big Asian cities the densities can be as high as 250000 person per square kilometre (Thomson 1984). Tomlinson (1990) describes that there are at least three potential sources of sites - new developments, whether formal or informal, urban infill and increasing urban density. Residential density has two components — built density and the density at which the buildings are occupied.

Tables 4 and 5 list some of the common ways through which poorer individuals and households find accommodation. The housing needs and possibilities to find housing vary greatly. The important consideration is easy reach of jobs or places where income can be earned. Each individual or household have their own preferences in terms of size of accommodation, location, occupation, quality of accommodation and access to basic infrastructure and services based on their socio-economic conditions. These conditions of individuals and households also change over time and this creates a diversity of the needs.

The possibilities to find accommodation are influenced by the urban population growth rate, and by the poorer households' ability to acquire land on which to build a house shack.

Table 3. Population densities (persons per hectare) in selected slum and squatter settlements (UNCHS 1982).

Region	City	Settlement	Year	Population	Area in hectares	Persons per hectare	Local density standard pers/ha	
Asia	Colombo	Punchi Harak Watte	1977	1 400	1.2	1 170	500	
		Suritola	1977	16 000	8.0	2 000	-	
	Hong Kong	Yau Ma Tei	1976	132 000	71.0	1 860	-	
	Lahore	Walled City	1975	500 000	2 500.0	2 500 ^a	750	
	Osaka	Shonai South	1977	17 000	65.0	262	-	
	Ahmadabad	Sabarmati Riverbank	1973	15 000	9-14	1 000~1 600	-	
	Delhi	Rouse Avenue	1975	2 440	0.8	3 050	-	
	Istanbul	Rumelihisarüstü	1975	11 000	34.0	323	-	
	Kuala Lumpur	Kampong Pandan	1974	5 770	27.0	214	-	
		Kampong Maxwell	1973	1 600	4.8	333	-	
	Manila	Tondo Foreshore	1974	170 000	137.0	1 240	-	
	Seoul	Oksoo No.3	1973	9 000	-	1 240	-	
	Africa	Alexandria	Kom-el-Decka	1976	6 121 ^b	27.0	1 000	250
			Ayigya Village	1974	5 900	31.0	190	200
Lusaka		George Compound	1976	56 000	250.0	224	-	
Nairobi		Kawangware	1976	15 698	17.0	923	-	
		Mathare Valley	1976	68 902	1 570	1 349 ^c	-	
Ouagadougou		Cissin	1973	10 200	112.0	91	-	
Port Sudan		Deim Omna	1970	18 000	30.0	600	-	
Latin America	Bogota	Las Colinas	1977	12 500	12.0	1 042	850	
	Gawkily	Cerros Del Carmen & Santa Ana	1976	13 570	45.0	302	-	
		Villa El Salvador	1973	115 000	3 141.0	150-300 ^d	-	
	Rio de Janeiro	Catacumba	1973	8 600	10.0	860	-	
	San Salvador	El Manguito	1977	4 800	6.0	800	-	
	Santiago de Chile	Manuel Rodriguez	1977	8 500	57.0	149	-	

a This is the reported net density for parts of the total area of 2.500 hectares, for which the gross density is 200 persons per hectare.

b This figure appears to apply to a different census area from that surveyed for the case study: it is inconsistent with the figures on density and building occupation.

c This figure represents the net residential density, the gross density being 439 persons per hectare.

d This range represents the net residential density, the gross density being 37 persons per hectare.

Baross (1983 cited by Hardoy and Satterthwaite 1989) listed seven different kinds of land for the illegal settlements in different cities: customary land; government land reserves; abandoned land; marginal land; sub-division of existing, developed sites in illegal settlements; land rental; and illegal sub-divisions. The common feature for all illegal settlements is that they have little or no provision for infrastructure by formal authorities. If the land is not illegally occupied (squatted), i.e. there is no conflict between the landowners and the dwellers, the authorities generally tolerate better this kind of settlements, and they have better chances to be developed. The attitudes and actions of the governments and the new developments of commercial, industrial and residential areas will also have influence on the possibilities to find cheap accommodation over time. This should be considered, when the poorer groups basic infrastructure services are planned.

Table 4. Types of rental housing used by lower income groups in many Third World cities (Hardoy and Satterthwaite 1986).

Types of rental accommodation	Common characteristics	Problems
Rented room in sub-divided inner city housing (tenements)	Often the most common form of low-income housing in early stages of a city's growth. Buildings usually legally built as residences for middle or upper income groups but subdivided and turned into tenements when these move to suburbs or elsewhere. Advantage of being centrally located so usually close to jobs or income earning opportunities. Sometimes, rent levels controlled by legislation. Infrastructure (e.g. paved streets, sidewalks, piped water, sewers) available. Access to schools and hospitals. Certain Third World cities never had sufficient quantity of middle/upper housing suited to conversion to tenements to make this type of accommodation common.	Usually very overcrowded and in poor state of repair. Whole families often in one room, sometimes with no window. Facilities for water supply, cooking, storage, laundry and excreta/garbage disposal very poor and have rarely been increased or improved to cope with much higher density of occupation brought by sub-division. If subject to rent control, land lord often demanding extra payment "unofficially". Certain inner city areas with tenements may be subject to strong commercial pressures to redevelop them (or their site) for more profitable use.
Rented room in custom built tenements	Government built or government approved buildings specially built as tenements for low income groups; sometimes publicly owned. Common in many Latin American cities and some Asian cities and usually built some decades ago. Some quite recently constructed public housing estates fall into this category although now rare for governments to sanction private sector tenement construction.	Similar problems to above in that original building never had adequate provision for water supply, cooking, ventilation, food storage, laundry, excreta and garbage disposal. Inadequate maintenance common.
Rented room or bed in boarding, rooming house, cheap hotel or pension	Often most in evidence near railway station or bus station though may also be common in other areas, including illegal settlements. Perhaps common for newly arrived migrant family or single person working in city to use these. Single persons may hire bed for a set number of hours each day so more than one person shares the cost of each bed. Usually relatively cheap and centrally located.	Similar problems to above in terms of overcrowding, poor maintenance and lack of facilities. A rapidly changing population in most such establishments prevents united action on part of users to get improvements.
Renting room or bed in illegal settlement	In many cities, rented rooms in illegal settlements represent a larger stock of rental accommodation than in tenements which are legally built (see above). May take form of room or bed within room rented in house or shack with de facto owner-occupier; may be rented from small or large scale landlord even though it is within an illegal settlement.	Problems in terms of quality of building and lack of infrastructure (paved roads, sidewalks, storm drainage) plus site often ill-suited to housing as in squatter settlements and in illegal subdivisions (see Table 3.2). Also insecurity of tenure which is even greater than for de facto house/shack owners.
Renting a plot on which shack is built	The renting of plots in illegal subdivision or renting space to build a shack in some other person's lot, courtyard or garden is known to be common in certain cities; in some cities, space is even rented to people to build a shack on the flat roofs of houses or apartments. Its extent in these and other Third World cities is not known.	Similar problems to those listed above in terms of insecure tenure and lack of basic services and infrastructure. Additional burden on household to build, despite no tenure and no incentive to improve shack.
Renting room in houses in lower-middle income or formal sector worker districts	Declines in purchasing power for many lower-middle income or formal sector worker households has encouraged them to rent out rooms to supplement their incomes and to help pay off loans or mortgages on their homes.	Probably relatively good quality compared to above options. Tenant landlord relationship not subject to contract. Such rooms frequently in areas at a considerable distance from concentrations of employment.
Employer-housing for cheap labour	Some large enterprises provide rented accommodation for their workforce. This is common in plantations but also evident in some cities.	The quality of this housing is usually very poor with several people crowded into each room and very inadequate provision of basic services. Rules often prevent families living there so workers' families have to live elsewhere.
Renting space to sleep outside	Where there are large numbers of people who sleep outside or in public places (e.g., temples, railway stations or graveyards) local officials or protection gangs may demand payment informally, especially in the best locations.	The problems are obvious - not only the insecurity and lack of shelter and basic services but also the need to pay for this space and pay people who have no right to demand such payments.

Table 5. Examples of "owner occupation" housing used by low income groups in many Third World cities (Hardoy and Satterthwaite 1986).

Types of owner occupation	Common characteristics	Problems
Building house or shack in squatter settlement	As city grows and number of people unable to afford a legal house or house site grows, illegal occupation of land sites on which occupants organize construction of their house or shack usually becomes common. Advantage of what is usually a cheap (or free) site on which to build - although as the settlement develops, a monetized market for sites often appears and land sites can be expensive in better quality, better located settlements. The extent to which households actually build most or all their house varies considerably; many lack the time to contribute much and hire workers or small firms to undertake much or all the construction.	Lack of secure tenure; settlement often subject to constant threat of destruction by government. Lack of legal tenure inhibits or prevents use of site as collateral in getting loan to help in construction. No public provision of water, sanitation, roads, storm drainage, electricity, schools, health care services, public transport - or even where government does so, this is long after settlement has been built and is usually inadequate. Poor quality sites are often chosen (e.g. subject to flooding or landslides) since these have lowest commercial value and thus give the best chance of avoiding forceful eviction.
Building house or shack in illegal sub-division	Together with housing built in squatter settlements, this represents the main source of new housing in most large Third World cities. Site is bought or rented from landowner or "middleman" who acts as developer for landowner. Or where customary law is still common, access to a site through the permission of the appropriate chief who acts for the "community". Governments often prepared to tolerate these while strongly suppressing squatter occupation. Often relatively well-off households also organise their house construction on such illegal developments. As in squatter settlements, the extent to which people build their own houses varies considerably.	Comparable problems to those above except land tenure is more secure and landowner or developer sometimes provides some basic services and infrastructure. The site is also usually planned (although so too are some squatter settlements). The better located and better quality illegal subdivisions are also likely to be expensive. If the city's physical growth is largely defined by where squatter settlements or illegal subdivisions spring up, it produces a haphazard and chaotic pattern and density of development to which it will be very expensive to provide infrastructure and services.
Building house or shack in government sites-and-services or core housing scheme	An increasing number of governments have moved from a concentration on public housing schemes (which were rarely on a scale to make any impact) to serviced sites or core housing schemes. Very rarely are these on a scale to have much impact on reducing the housing problems faced by lower income groups.	Public agency responsible for scheme often finds it impossible to acquire cheap, well located sites. Sites far from low income groups' sources of employment chosen, since they are cheaper and easier to acquire. Extra cost in time and bus fares for primary and secondary income earners can make household worse off than in squatter settlement. Eligibility criteria often bar women headed households. Regulations on repayment, building schedule and use of house for work or renting rooms often make many ineligible and bring considerable hardship to those who do take part.
Invading empty houses or apartments	Known to be common in a few cities; its overall importance in Third World is not known.	Obviously insecure tenure since occupation is illegal. May be impossible to get electricity and water even if dwelling was originally connected.
Building or developing house or shack in a "temporary camp"	Many examples known of governments who develop "temporary" camps for victims of disasters or for those evicted by redevelopment - usually on the periphery of the city. Many become permanent settlements.	Land and house tenure is often ambiguous; the a provision of basic infrastructure and services at best inadequate, at worst almost non-existent; the location is often far from the inhabitants' main centres of employment.

Urban Water and Waste Management Infrastructure

Infrastructure can be defined mean those physical facilities that are sometimes called "public works." Public works have been defined by the American Public Works Association (APWA) as follows (Stone 1974, cited by Grigg 1988):

"Public Works are the physical structures and facilities that are developed or acquired by public agencies to house governmental functions and provide water, power, waste disposal, transportation, and similar services to facilitate the achievement of common social and economic objectives.

APWA lists 18 categories of public works and environmental facilities that are included in this definition. Some of the categories are quite general and not directly related to infrastructure facilities, so the following list of 12 categories is taken by Grigg (1988) on a selective basis from APWA's list. It omits some generalized categories of public

administration concerns, but includes all the categories of physical facilities listed.

1. Water supply systems, including dams, reservoirs, transmission, treatment, and distribution facilities.
2. Wastewater management systems, including collection, treatment, disposal, and reuse systems.
3. Solid-waste management facilities.
4. Transportation facilities, including highway, rail, and airports. This includes all of the lighting, signing, and control facilities as well.
5. Public transit systems.
6. Electric systems, including production and distribution.
7. Natural gas facilities.
8. Flood control, drainage, and irrigation facilities.
9. Waterways and navigation facilities.
10. Public buildings such as schools, hospitals, police stations, and fire facilities.
11. Public housing facilities.
12. Parks, playgrounds, and recreational facilities, including stadiums.

Grigg (1988) gives a more workable list consisting of six categories. They are intended to cluster together by industry and professional interest group:

1. Roads group (roads, streets, and bridges)
2. Transportation services group (transit, rail, ports, and airports)
3. Water group (water, wastewater, all water systems, including waterways)
4. Waste management group (solid-waste management systems)
5. Buildings and outdoor sports group
6. Energy production and distribution group (electric and gas).

The water component of infrastructure systems includes facilities for water supplies, wastewater management, flood control and stormwater, and all control facilities that deal with large hydraulic systems, including dams and reservoirs, groundwater systems, waterways, and irrigation facilities. The infrastructure supports a complex socio-economic system, represented in Figure 8, illustrating the simplified reliance of the social system on the economic system, the economic system on the infrastructure, and the infrastructure on the natural environment (Grigg 1988). The economic diagram (Figure 9) illustrates the points in the economic support system, where infrastructure is necessary.

RELATIONSHIP OF INFRASTRUCTURE TO SOCIOECONOMIC SYSTEMS ENVIRONMENT

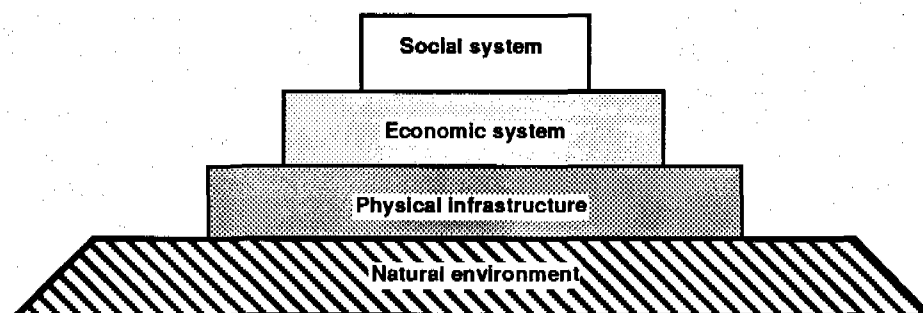


Figure 8. Relationship of infrastructure to socioeconomic system and environment (Grigg 1988).

ECONOMIC SYSTEM SUPPORTED BY INFRASTRUCTURE

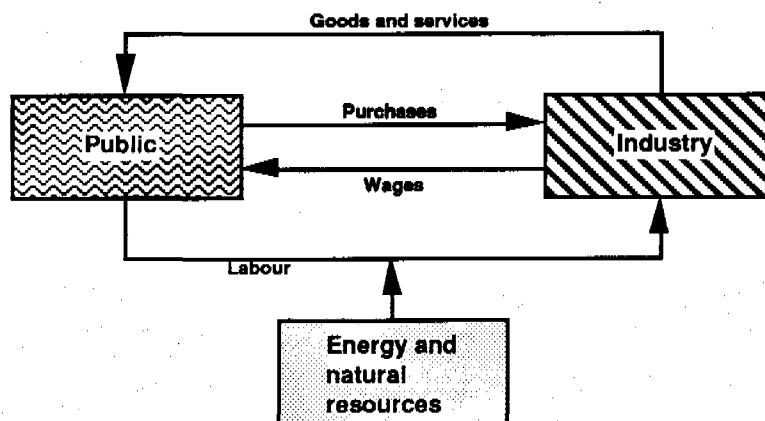


Figure 8. Economic system supported by infrastructure (Grigg 1988).

Municipal services (water supply, sewerage, solid waste management, etc.) can be managed by a public or a private institution (Coyaud 1988). They can be managed at the local, regional, or national level. At the regional level the management can be implemented either under the jurisdiction of a syndicate of municipalities or under one lead municipality acting on behalf of the other municipalities. Table 6 and Table 7 summarizes these municipal services management options (Coyaud 1988).

Table 6. Comparison of management options for government-owned institutions (Coyaud 1988).

Institutional Alternatives	Government-Owned (Régie)		
	Municipal Department (Régie Directe)	Utility Department (Régie Autonome)	Utility Board (Régie Personnalisée)
Managerial Autonomy	No	Yes	Yes
Legal and Financial Autonomy	No	No	Yes
Responsibility for Setting Tariffs	Public Authority	Public Authority	Public Authority
Financing of Fixed Assets	Public Authority	Public Authority	Public Authority
Ownership of Fixed Assets	Public Authority	Public Authority	Public Authority
Operation and Maintenance of System	Public Authority	Public Authority	Public Authority
Financing of Working Capital for O&M	Public Authority	Public Authority	Public Authority
Destination of Revenues from Tariffs	Public Authority	Public Authority	Public Authority
Compensation to Private Company			
Contract Validity Period			

Table 7. Comparison of management options for private institutions (Coyaud 1988).

Institutional Alternatives	Service Contract	Private, or Mixed Government-Private, Company			
		Management Contract (Gerance)	Shared Profit (Régie intéressée)	Leasing Contract (Affermage)	Concession Contract (Concession)
Managerial Autonomy	Yes	Yes	Yes	Yes	Yes
Legal and Financial Autonomy	Yes	Yes	Yes	Yes	Yes
Responsibility for Setting Tariffs	Public Authority	Public Authority	Public Authority	Public Authority	Public Authority
Financing of Fixed Assets	Public Authority	Public Authority	Public Authority	Public Authority	Private Company
Ownership of Fixed Assets	Public Authority	Public Authority	Public Authority	Public Authority	Private until Expiration of Contracts
Operation and Maintenance of System	Public Authority except Specific Services	Private without Commercial Risk	Private with Little Commercial Risk	Private with Full Commercial Risk	Private with Full Commercial Risk
Financing of Working Capital for O&M	Public Authority	Public Authority	Public Authority	Private Company	Private Company
Destination of Revenues from Tariffs	Public Authority	Public Authority	Public Authority	Part to Lessee, Part to Public Authority	Part to Concessionnaire, Part to Public Authority
Compensation to Private Company	Similar to Contractor for Consulting Services	Proportional to Physical Parameters (volumes sold, number of connections etc.)	Proportional to Physical Parameters with Productivity Bonus or Shared Profits	Through Part of Tariffs Reserved to Lessee	Through Part of Tariff Reserved to Concessionnaire
Contract Validity Period	Less than Five Years	About Five Years	About Five Years	Six to Ten Years (possibility renewing contract)	Maximum 15 years

Factors Affecting the Sustainable Development of Urban Settlements and Infrastructure and Key Constraints

Aina (1990) identifies three levels of the operation of political factors affecting the sustainable development of the Third World cities and urban settlements:

1. The global/trans-national level
 - decision making within the world economic system;
 - international relations and world power politics;
 - different vested interests between and within the powerful groups (lobbies) in the first world.
2. The national level
 - the feature of inequality in societies;
 - the features of unsustainable economic and social development paths;
 - the character of the State and politics in the Third World.

3. The local/grass-roots level
 - denial of representation, growth of repression, and denial of access to essential resources and services;
 - local institutions are often powerless to guarantee the delivery of local services.

The origins of the problems related to urban development in the Third World are listed by Herbert (1979) as follows:

1. Structure of employment. The urban economies are unable to absorb their growing population into high-wage employment.
2. Inequitable distribution of capital. The distribution of assets is even more concentrated in wealthy groups than the distribution of current income.
3. Inappropriate education. Primary and secondary education have done little to increase employability in urban areas, since they do offer few practical skills.
4. Scarcity and high costs of basic necessities especially for the urban poor.
5. Physical unpreparedness. The infrastructure has usually been designed for much smaller populations than it has to serve presently.
6. Fiscal unpreparedness. Most national and local governments have weak revenue base, and most major cities also have underutilized revenue bases. User charges often are unnecessarily low.
7. Political unpreparedness. Local administration often is dominated by the national political system.
8. Administrative and technical unpreparedness. The local urban administrators have shortage of funds, capital equipment, and skilled personnel.

Government policies on slum and squatter settlements are three broad types (UNCHS 1982):

1. Laissez-faire: ignoring the slum and squatter areas and allocating public resources to other development sectors.
2. Restrictive or preventive: eliminating or reducing the size of low-income areas, excluding them from urban services.
3. Supportive: integrating the residents socially and economically into the surrounding area, improving conditions in existing slum and squatter settlements.

In many urban centres public agencies are weak or inefficient in providing services. Therefore both businesses and households have to either make their own investments or buy the services from the private enterprises to guarantee the needed supply. The costs of investments (water supply, storm water drainage, electricity etc.) are very high to each businesses or households, and any large scale supplier (public or private) can meet their demands far cheaper (Lee 1988). Inadequate pricing of resources and urban services may lead to:

1. inability to conserve resources
2. inefficient allocation of resources
 - misallocation between capital and recurrent expenditures
 - inability to recover costs and finance services
3. inequitable distribution of services
 - subsidized services for the rich and the middle-income groups
 - inadequate services for the poor

United Nations Centre for Human Settlements report (1986) summarized the problems in infrastructure delivery:

1. **Technological:** lack of awareness of appropriate low-cost relevant technologies; inadequate operation and maintenance of systems.
2. **Institutional:** lack of specific sector policies which form part of a national human settlements policy defined to include the needs of low-income communities; existence of several governmental agencies with overlapping and competing responsibilities; lack of trained manpower.
3. **Financial:** Inadequate resource mobilization and utilization; inadequate cost recovery.

The development of urban infrastructure and services usually follows the pattern of land uses and ownership, and hence the urban poor communities can often find themselves without adequate infrastructure or they have to rely on illegal services (tapping water mains etc.) or they have to pay high price for the services (water vendors, water resellers etc.).

The effects of investment in infrastructure can be listed as follows (UNCHS 1989):

- (a) Investment in infrastructure generally creates or increases (potential) external economies as well as external diseconomies and thereby favours or slows down the growth of existing or creation of certain activities.
- (b) Infrastructure alone is normally not sufficient to initiate productive activities. Other potentials and favourable conditions must also exist or made available to promote development, particularly in regions where no or few such activities exist. Infrastructure is a necessary but not sufficient condition for development.

Table 8. Toilet facilities for inhabitants of selected slum and squatter settlements (Percentage of total structures) (UNCHS 1982).

City	Squatter settlement	Private toilets		Shared private toilet in a building	Public toilet	No toilet	Total
		Pit or bucket latrine	Flush toilet, sewer or septic tank				
Istanbul	Rumelihisarüstü	20	80	—	—	—	100
Kuala Lumpur	Kampong Pandan	75	10	—	—	15	100
	Kampong Maxwell	26	2	48	6	18	100
Manila	Tondo Foreshore	4	49 ^a	—	7	40	100
Ahmadabad	Sabarmati Riverbank	-	-	-	-	100	100
Kumasi	Ayigya Village	-	-	30	70 ^b	-	100
Lusaka	George Compound	31	1	67	—	1	100
Nairobi	Kawangware	98 ^c	1	—	—	1	100
Port Sudan	Deim Omna	1	—	2	—	97	100
Guayaquil	Cerro de Carmen & Santa Ana	4	14	—	—	82	100
Santiago de Chile	Manuel Rodriguez	—	100	—	—	—	100
Lima	Villa El Salvador	36	—	—	—	64	100
Lahore	Walled City	37	26	—	—	37	100
Dacca	Suritola	40	60	—	—	—	100
Osaka	Shonai South	17	83	—	—	—	100

a — Water sealed, with manual flushing to the sea.

b — Communal facilities with a total of 80 holes serving 5 900 people.

c — One latrine shared by an average of 24.5 persons occupying a given plot.

Table 9. Water supply in selected squatter settlements compared with urban water supply in the country as a whole (UNCHS 1982).

Country	Percentage of urban population in country supplied with tap water ^a			Water supply situation in squatter settlements					
	House conn.	Public standp.	Total	City	Settlement	Settlement population	Percentage buildings with piped water	Main source of supply in settlements	Estimated population per standpost
India	39	17	56	Ahmadabad	Sabarmati Riverbank	15 000	—	River; public standposts outside settlement	—
Turkey	46	11	56	Delhi	Jai Rani Bagh	1 000	—	Public standpost(1)	1 000
				Istanbul	Rumelihisarüstü	11 000	50	Individual connections; public standposts	885
Malaysia	72	19	91	Kuala Lumpur	Kampung Pandan	5 770	—	Public standposts(8)	721
Philippines	55	10	65	Manila	Kampung Maxwell	1 600	—	Public standposts (7)	228
					Tondo Foreshore	170 000	17	Street pedlars; public standposts	8 000
Ghana	22	51	73	Kumasi	Ayigya Village	5 000	—	Public standposts(7)	715
Zambia	71	25	96	Lusaka	George Compound	56 000	—	Public standposts(41)	1 366
Kenya	90	7	97	Nairobi	Kawangware	15 700	36 ^b	Plots with public standposts	—
Sudan	71	1	72	Port Sudan	Deim Omna	18 000	—	Public standposts(36)	500
Ecuador	61	13	74	Guayaquil	Cerros Del Carmen & Santa Ana	13 570	31	Public standposts(19)	492
Jamaica	62	3	65	Kingston	Drewsland	5 000	Some illegal connections	Fire hydrant near school	5 000
Peru	51	9	60	Lima	Villa El Salvador	115 000	—	Public standposts	—
El Salvador	37	31	68	San Salvador	El Manguito	4 800	—	Public standposts(5)	960

a — Figures on national urban water supply do not include settlements.
 b — Taps located on plots occupied by many households.

Figure 10 shows the relationships between the key infrastructure and the common urban environmental problems at the spatial scale.

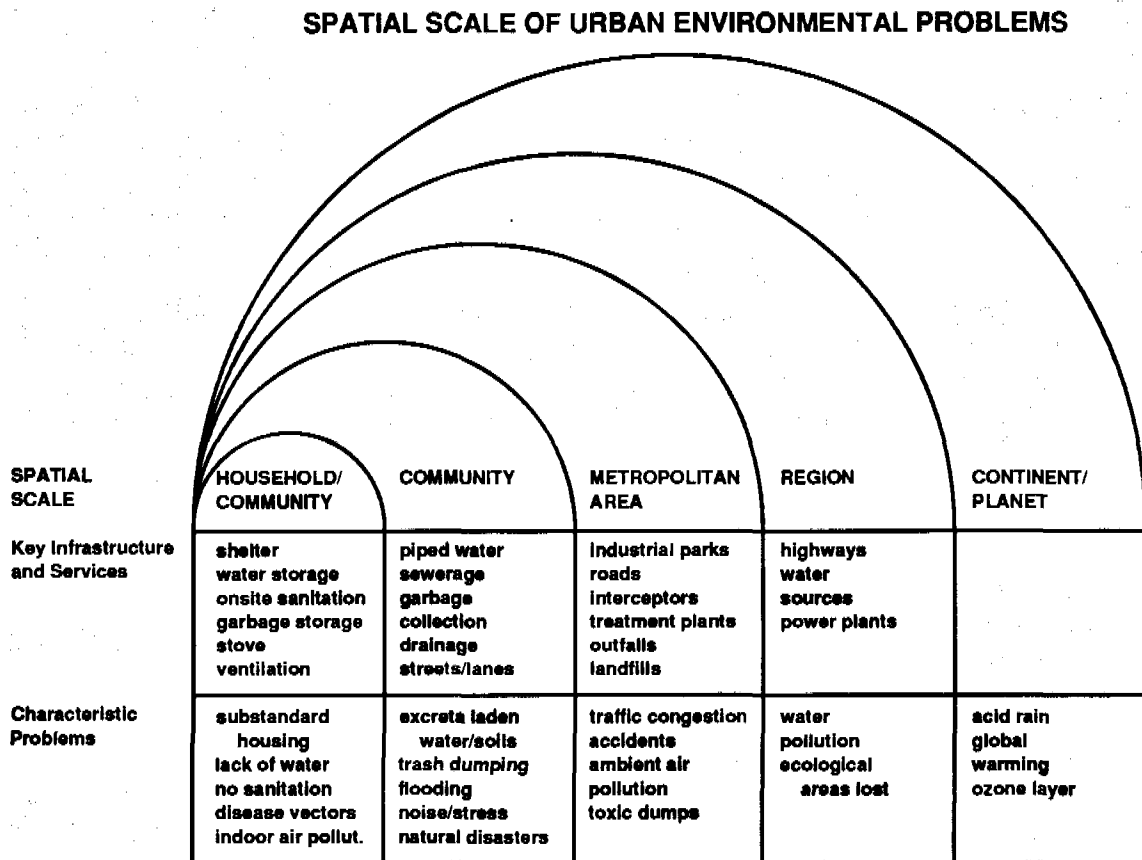


Figure 10. Spatial scale of urban environmental problems (World Bank 1990b).

Participation in Slum and Squatter Upgrading Processes

Six groups of participants in the slum and squatter upgrading process are identified by Angel (1983):

1. Housers, who are mainly interested in self-help housing improvement and see slum infrastructure programmes as means for increasing land tenure security, thus directing more people's savings toward building their own houses;
2. Municipal Engineers, who are primarily interested in public health, and see such programmes as means of removing serious health hazards through the provision of clean water, through the collection of refuse and sewage, and through increased public safety;
3. Community Builders, who are mainly concerned with community organisation and development, and see infrastructure improvements as issues of common interest around which slum dwellers can organize effectively;
4. Politicians, who are mainly concerned with extending and consolidating their ability to rule and perceive slum improvement programmes as an effective way to assist the poor visibly without incurring vast public expenditures, and without unnecessarily alienating the support of the middle class or the land-owning groups;
5. International Funders, who are primarily concerned with disbursing capital for development projects, and see such programmes as a means of providing international assistance which can reach the poor. For them such programmes are appealing because of their low levels of per capita expenditures, because they do not distract attention from rural development efforts, and because they can be justified economically as generating increased property values in improved areas, over and beyond the initial capital investment in infrastructure, which should, in their view, be recovered from the slum dwellers themselves;
6. Slum Dwellers, who are primarily interested in not getting hurt by heavy-handed government intervention and see infrastructure programmes as an effective means of getting "something" from the government, which is clearly better than "nothing", but falls short of what they can see as possible to have.

Angel has noticed that among these key participants in the slum upgrading programmes the level of consensus is rather low, and therefore the pragmatic objectives will have to be obtained through negotiations.

Strategy and action for the provision of appropriate water and waste management infrastructure for the urban slums and squatter settlements

According to Robertson (1990) it is useful to imagine a number of alternative futures for cities. He outlines four alternative futures: Decline and Disaster; Business As Usual; Hyper-Expansion; and Sane, Humane, Ecological:

1. Decline and Disaster: This scenario in the global context includes nuclear war and snowballing ecological destruction, famine and drought, especially in the Third World. Rising levels of unemployment worldwide could lead to economic and social disaster. All these events contribute to decline and disaster for cities. In Third World countries complete urban breakdown might follow from the uncontrolled expansion of cities as millions of impoverished people continue to be driven off the land by the economic and social forces of conventional westernized development.

2. **Business As Usual**: The Business-As-Usual scenario assumes that most things will remain broadly as they are. The world economy will be based on the economic growth of the rich countries that will provide expanding markets for the Third World product. Urban industrialized patterns of life-style and employment will be expected to remain the norm. The top-down, trickle-down approach to social and economic progress will be pursued. Third World cities' uncontrolled growth makes it hard to define a Business-As-Usual scenario for their future, and Business As Usual seems to lead directly to Disaster and Decline.
3. **Hyper-Expansion (HE)**: The Hyper-Expansion scenario foresees that further economic progress in the industrialized countries will only be achieved by concentrating on high technology production and by marketing highly professionalized services. Economic activity will become more global in character, and multinational business will play an even more dominating part than today. Most of the work will be done by skilled elite professional and experts, backed by automation, other capital-intensive technology, and specialist know-how. The majority of people will not need to work, and they will have more leisure time to spend.

This scenario ignores Third World countries and cities, their situation and prospects. It simply assumes that they will follow the industrialized world along a superindustrial path of technical and economic progress.

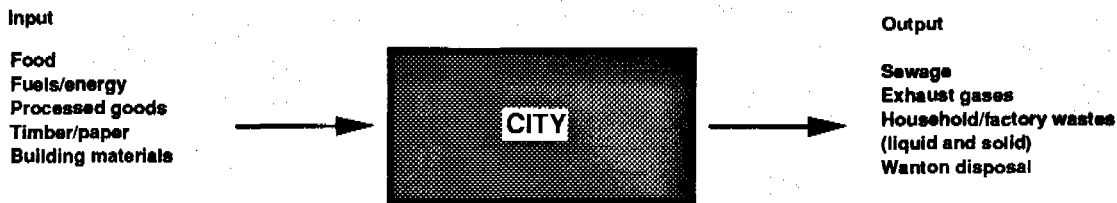
4. **Sane, Humane, Ecological**: The Sane, Humane, Ecological scenario represents a change of direction. This scenario envisages a change of direction not only from greater dependency to greater self-reliance, but also to more conserving, as opposed to more wasteful and ecologically damaging, patterns of production and consumption. Conservation involves more efficient use of resources including human resources. Where work is concerned, the keyword will no longer be 'employment' (as under Business As Usual) or 'leisure' (as under Hyper-Expansion, but 'ownwork'. People will become less dependent on the large institutions of government, business, finance, trade unions, and the professions to give them work and provide them with goods and services. Most aspects of the economy and society will become more decentralised. A key aim of policy at every level will be to enable people to organize themselves for co-operative self-reliance and to develop the capacities, habits, and skills needed for that. More self-reliant cities and more self-reliant Third World national economies will be part of the overall picture.

This scenario has two immediate implications for the future of cities. First, it places emphasis on enabling the people who live in cities to take control of their own future development - on encouraging bottom-up urban revival based on local community initiatives. Second, it places emphasis on the resourceful, self-reliant city, minimizing waste of resources by energy conservation and recycling, and minimizing dependence on imports from outside its boundaries. The scenario also raises questions about the future relationship between city and country. Because the discrimination against the rural village-based economy, and the subsequent displacement of population, has helped to contribute the urban crisis in the Third World, Robertson suggests that the traditional imbalance between city and countryside may be about to be redressed "A New Economics by the Year 2000".

Figure 11 presents the present and future urban metabolism according to Girardet (1990).

PRESENT (LINEAR) AND FUTURE (CIRCULAR) URBAN METABOLISM

(a) Present linear urban metabolism



(b) Future circular urban metabolism

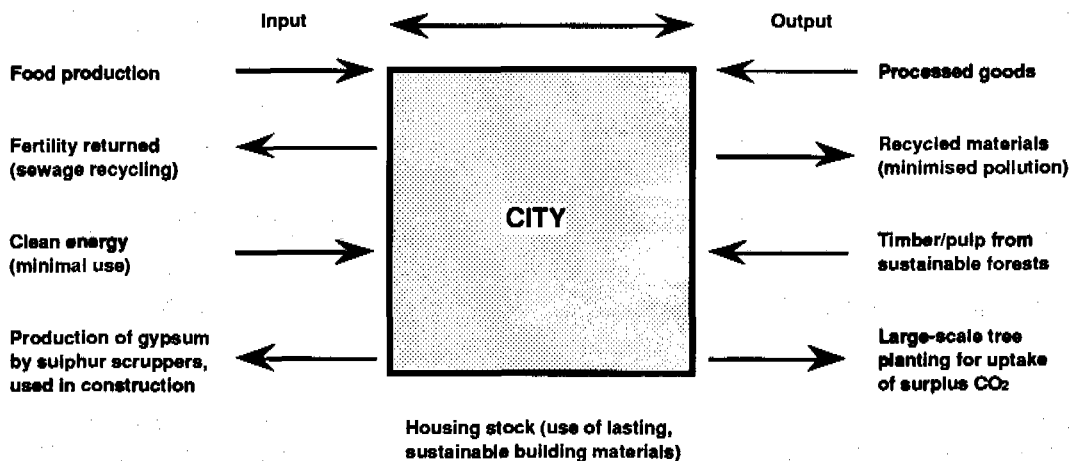


Figure 11. Present and future urban metabolism (Girardet 1990).

Table 10 lists policy measures for national urbanisation strategies and effects of the strategies applied. Table 11/stage 5 nutshells lessons learnt from the innovative projects or programmes. The aim is to convert these isolated examples to continuous programmes. The key issue according to Hardoy and Satterthwaite (1989) is how to provide the legislative and institutional framework for this. The governments policies should concentrate on enabling the poorer groups to meet their recognized needs. Table 11/stage 5 action on basic services shows that the strengthening of local/city governments to allow them to manage basic infrastructure services is essential reform to improve them. This is also a precondition to ensure that the services reach the low income groups. Decentralization of many duties to neighbourhood level authorities gives the community organisations and households better opportunities to participate in the decision making. Most municipal governments are incompetent to implement this, because they do not have financial means and autonomy to provide the necessary investments or they lack qualified personnel.

The government action should be based on the recognition that solutions to problems regarding infrastructure and services can only be solved on the basis of local conditions. The governments themselves have created most often these conditions within the existing legal and institutional frameworks. Financial and other resources of the central and local/municipal government as well as those of low income inhabitants has to be understood.

Table 10. Policy measures for national urbanisation strategies (Renaud 1981).

Scale of operation	Nature of policy measures	Effects
Relations with the international economy	Growth strategy and export orientation, foreign exchange policies, tariffs and trade protection, regulation of foreign investments, international transport policies, and immigration and emigration policies.	Most of these policies have implicit effects on the urban system and can accentuate concentration of the largest cities.
National economy	Population policy; public sector investment allocation; intergovernmental fiscal relations, fiscal transfers, and taxation; transport policies (pricing and regulation of various modes and tariffication by product); communication policies (structure of information networks); national growth policy and sectoral priorities; treatment of the rural sector (terms of trade); labour policy (minimum wage legislation and regulation of professions); banking and finance policies (regulation of new branches and conditions of operation); education (regional specialization of higher education); and regulation of public utilities.	Of all the national policies, those for population sectoral priorities, and the rural sector appear to have strongest implicit effects. The implicit effects of other policies vary significantly from country to country.
Regional, provincial, or state level, including the urban subsystem and rural service centres	Economic development policies (priorities for the region); public investment policies and diversification of activities; formulation of policies by broad areas; public transport policies (priorities for external links and intraregional network); industrial estate policies and other employment location decisions; allocation of health and social services; regional land policies; education (localization of facilities for general and technical education); regulation of urban and nonurban land use; and regulation of utilities.	In most countries the regional level of government is responsible for implementing central government policies and has close control over local activity within cities and rural centres. Strategies must be developed for the long-term growth of the region consistent with national trends. Because of economies of scale, concentration of investments for selected urban centres must be phased according to long-term objectives.
Urban level, including the daily commuting zone	Local land use policies for decentralization; regulation of industrial location and service sector; extensive use of land control as part of urban transport policy; environmental regulations (solid waste, water, and sewerage management); choice of site for satellite cities and policies toward low-income neighbourhoods; management of local taxation system and locally owned public utilities; enforcement of codes for building design and construction; location of major traffic generators (markets; public libraries; stadiums); location of hospitals and health clinics.	The internal efficiency of cities is an important factor affecting further growth. The application of zoning controls can enforce decentralization. Broad options for further expansion need to be identified and a local strategy established. It must be consistent with the sources of the growth of the city.
Rural centres	Most of the policies for the distribution of services in rural centres are determined at the regional government. They are directly affected by national policies toward the rural sector and agriculture.	The growth of rural centres is dependent on farm policies, but strengthening rural services is the direct responsibility of government at the provincial level.

Table 11. Different attitudes by governments to housing problems in cities and the different policy responses (Hardoy and Satterthwaite 1989).

	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Government attitude to housing	Investment in housing provision a waste of scarce resources. Problems will be solved as the economy grows.	Government worried at rapid growth of city populations and of more rapid growth of tenements and illegal settlements. Seen as "social problem"; squatter settlements often referred to as a "cancer".	Recognition that the approach in stage 2 is having very limited impact. still seen as "social problem" but with political or social dangers if not address. Recognition that squatter settlements or other forms of illegal development are "here to stay".	Recognition that approach tried in stage 3 is having very limited impact. Recognition that people in slums and settlements contribute much to cities' economies — providing cheap labour and cheap goods and services with the so called "informal sector" being key part of city economy and employment base.	Recognition that major institutional changes are needed to make approach first tried in stage 4 effective. Recognition that improving housing conditions demands multisectoral approach including health care and perhaps food programmes. Recognition that low income groups are real builders and designers of cities and government action should be oriented to supporting their efforts.
Government action on housing	No action.	Special institutions set up to build (or fund) special public housing programmes supposedly for lower-income groups. Slum and squatter eradication programmes are initiated; often destroying more units than public agencies build.	Public housing programmes with increasingly ambitious targets. First sign of site-and services (or core housing) projects. Reduced emphasis on slum and squatter eradication programmes.	Reduced emphasis on public housing programmes. Far more emphasis on slum and squatter upgrading and serviced site schemes. Ending of squatter eradication programmes.	Government action to ensure that all the resources needed for house construction or improvement (cheap, well-located sites, building materials, technical assistance, credit...) are available as cheaply as possible.
Government action on basic services	Very little action; not seen as a priority. Richer neighbourhoods in cities only ones supplied with basic services.	Initial projects to extend water supply to more city areas.	Water supply (and sometimes sewers or other sanitation types) included in site and service schemes and upgrading projects.	Major commitment to provision of water supply and sanitation.	Strengthening of local/city governments to ensure widespread provision of water supply, sanitation, storm drainage, garbage removal, roads and public transport to existing and new housing developments. Health care also provided; link between poor housing conditions and poor health understood. Perhaps supplemented by cheap food shops or school meal project to improve nutrition.
Government action on finance	Discourage housing investment; considered waste of resources.	Set up first publicly-supported or guaranteed mortgage/housing finance agency	Attempt to set up system to stimulate saving and provide long-term loans to low income groups.	Improve efficiency of formal housing finance institutions to allow cheaper loans; flexible attitude collateral and to small loans for land purchase and house upgrading. Encourage and support informal and community finance institutions to serve those not reached by formal institutions.	
Building and planning codes	No action.	No action. Unrealistic standards in public housing one reason why unit costs are so high.	Recognition that these are unrealistic in that low-income households cannot meet them. Not used in site-and-service and upgrading schemes.	Most public programmes to provide services, land etc. not following existing laws/codes on standards and norms because they are unrealistic.	Building/planning standards reformulated— advice and technical assistance as to how health and safety standards can be met.

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Table 11. Different attitudes by governments to housing problems in cities and the different policy responses, continued.

	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Government action on land	No action.	No action.	Cheap land sites made available in a few sites and services projects.	Provision of tenure to illegal settlements. Recognition that unregulated land market a major block to improve housing and conditions.	Release of unutilized or under-utilized public land and action to ensure sufficient supply of cheap well-located sites plus provision for public facilities and open space.
Government action on building materials	No action.	No action.	Acceptance of use of cheap materials in low income housing which are illegal according to existing building codes.		Government support for widespread production of cheap building materials and common components, fixtures and fittings — perhaps supporting co-operatives within each neighbourhood for production of some of these.
Government attitude to community groups	Ignore them.	Ignore or repress them.	Some "public participation" programmed into certain projects.	More acceptance of low income people's rights to define what public programmes should provide and to take major role in their implementation.	Recognition that government support to community groups formed by lower income residents is a most effective and cost effective way of supporting new construction and upgrading.
Impact on problems	None.	None or negative.	Usually minimal impact than in previous projects may be successful.	Substantially larger impact than in previous stages but still not on scale to match growing needs.	Impact becoming commensurate with need.

Table 12 indicates the required shift in agency management for implementing a participatory approach, Table 13 gives an analytical framework for urban environmental problems, Table 14 explains the links between health and government action at different levels to improve housing conditions in urban areas, and Table 15 shows the government responsibilities to promote environmental quality in urban settlements at different geographic scales.

Table 12. Shift for a participatory approach (Korten and Alfonso 1985).

Management Dimension	Characteristics Commonly Found in National Development Agencies	Characteristics Needed to Foster a Participatory Approach
Locus of Decision-Making	Decisions about program design and content use of funds equipment and personnel made at national or regional levels and fixed over 1 year period or longer.	Basic content and resources of program plus guidelines for implementation set at national and regional levels; but specific decisions about implementation made at local levels in conjunction with local communities as conditions dictate.
Attitudes Values and Skills of Personnel	Personnel see knowledge as residing with professionals in the agency not with the beneficiaries; view beneficiaries of program as recipients whose appropriate role is passive; trained to communicate with other similar professionals in technical language.	Personnel see knowledge as residing in both professionals and beneficiaries with a combination likely to result in the more successful programs; view beneficiaries as active partners in joint process of program development and implementation; trained to communicate with beneficiaries in non-technical language.
Evaluation Systems	Evaluation of personnel is based on activities completed; community capacity building is not part of task assignments; personnel are accountable solely to superiors within the agency.	Evaluation is based on achievement of results; task of building local capacity for participation is considered legitimate part of personnel's work; evaluation stresses accountability both to the people served and to agency superiors.
Stability of Personnel Placement	Personnel viewed as interchangeable from one location to another; transfers are frequent.	Personnel viewed as developing unique relationship with local community and responsible for long-term results; transfers made in frequently being primarily or promotion to more responsible work.

Table 13. Analytical framework for urban environmental problems (World Bank 1990b).

Manifestations	Impacts	Causes	Cures
Deteriorated living environment and services	<p>Health impacts</p> <ul style="list-style-type: none"> - infectious and parasitic diseases - malnutrition - accidents - stress, drugs, violence - acute and chronic toxicity - genetic effects - cancer <p>Lost urban productivity</p> <p>Degradation of the natural environment</p> <ul style="list-style-type: none"> - resource loss - amenity loss 	<p>Substandard housing</p> <p>Lack of water and sanitation</p> <p>Disease-carrying insects and rodents</p> <p>Indoor air pollution</p> <p>Excreta laden water/soils</p> <p>Trash dumping</p> <p>Noise/stress</p> <p>Traffic congestion</p> <p>Natural disasters</p>	<p>Appropriate housing and land development regulations</p> <p>Housing finance</p> <p>Provision of affordable infrastructure and plots</p> <p>Provision of affordable water, sanitation, solid waste services at cost</p> <p>Targeted subsidies</p> <p>Improved efficiency and effectiveness of infrastructure and service provision</p> <p>Pollution control</p> <p>Community participation</p>
Ambient air pollution	<p>Localized primarily in large cities</p> <ul style="list-style-type: none"> - health problems - lost aesthetic, cultural, recreational values - property damage (including historical monuments) <p>At present more of metropolitan area problem than regional/global problem</p>	<p>Urbanisation/Industrialization</p> <p>Fuel/energy pricing and urban energy demand</p> <p>Vehicle ownership</p> <p>Space heating</p> <p>Use of highly polluting fuels:</p> <ul style="list-style-type: none"> - leaded gas - high-sulphur lignite 	<p>Pricing of industrial and energy inputs</p> <p>Regulations and standards</p> <p>Emission charges</p> <p>Monitoring and enforcement</p> <p>Energy conservation</p> <p>Technological interventions</p> <ul style="list-style-type: none"> - scrubbers, baghouse filters - vehicle emissions controls - fuel substitution
Indoor air pollution	<p>Chronic obstructive lung disease</p> <p>Acute respiratory infections</p> <p>Low birth weight and associated problems</p> <p>Cancer</p>	<p>Biofuel use for domestic cooking and heating</p> <p>Passive smoking</p> <p>Cottage industry exposure</p>	<p>Pricing of commercial fuel and energy</p> <p>Targeted fuel subsidies</p> <p>Improved housing and ventilation</p> <p>Public awareness</p>
Solid waste pollution	<p>Health hazards</p> <p>Amenity impacts</p> <p>Blocked drainage and flooding</p> <p>Water pollution (leachates)</p>	<p>Inefficient management (collection and disposal)</p> <p>Impacts not recognized or external to community</p>	<p>Improved collection</p> <ul style="list-style-type: none"> - expanded coverage (e.g. to low-income via community based approaches) - efficient operations (e.g. create contest to markets to encourage private sector entry) - financial strengthening (budgeting, accounting, cost recovery) <p>Disposal technology and management</p> <p>Resource recovery/recycle</p>
Fecal contamination	<p>Diarrheal diseases</p> <p>Parasitosis</p> <p>Malnutrition</p> <p>High infant mortality</p>	<p>Lack of basic sanitation services</p> <p>Excreta laden water/soils</p> <p>Proliferation of garbage/insects</p>	<p>Provision of affordable sanitation options</p> <p>Community-based approaches</p> <p>Hygiene education</p>
Hazardous waste pollution	<p>Acutely affects groundwater, but often multimedia impacts</p> <p>Damage at low concentrations</p> <ul style="list-style-type: none"> - Health damages (e.g. acute and chronic toxicity) - Foodchain accumulation <p>"Timebombs" (hidden dumps that build up over time)</p>	<p>Insufficient regulations/management</p> <p>Pricing of inputs into industries producing waste</p> <p>Impacts removed in space and time</p>	<p>Regulations, standards and charges</p> <p>Monitoring and enforcement capacity</p> <p>Licensing</p> <p>Waste minimization</p> <ul style="list-style-type: none"> - process modification - resource recovery/recycling <p>Treatment and disposal technology and management</p>

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Table 13. Analytical framework for urban environmental problems, continued.

Manifestations	Impacts	Causes	Cures
Freshwater resource depletion (surface and ground water)	Sources running out Increasing marginal costs Land subsidence	Pricing policies Cultural (perception of free good) Over pumping of groundwater Irrigation policies and practices	Improved pricing Integrated watershed management Improved technologies (e.g. wastewater reuse) Regulation of groundwater extraction
Freshwater resource quality degradation (surface and ground water)	Poor quality surface and ground water Health impacts Increasing marginal cost - of potable supply - of industrial supply - of individual treatment Waterlogging and salinisation Saline intrusion	Municipal & Industrial waste disposal practices - Sewerage (water pricing, poor O&M) - Industrial wastes (input pricing, poor regulations enforcement) Urban runoff Irrigation policies and practices Overpumping of groundwater Impacts not recognized or external to the community	Pricing policies Regulations, standards, charges Monitoring and enforcement Solid and hazardous waste management Treatment technology and operations Integrated watershed management Regulation of groundwater extraction Public Education
Lake, coastal and marine water pollution (including fisheries depletion)	Mainly occurs locally: - closed beaches and lost tourism revenues - lost aesthetics - health consequences - eutrophication - fish and shellfish contamination	Municipal and industrial waste disposal (see above) Agricultural runoff (+ related policies) Detergents Shipping/oil Litter/plastics	Water pollution regulations (municipal and industrial) Solid waste management Improved technologies (e.g. outfall design) Shipping facilities and regulations Special areas designation (e.g. marine sanctuary) Coastal zone management
Degradation of land and ecosystems	Loss of wetlands/wildlands (rich genetic diversity, migratory birds, hydrological aspects) Coastal zone degradation Loss of recreational areas (e.g. beach fronts) Deforestation (urban firewood/charcoal demand) Increased erosion	Shadow value of land much higher than prices Absence of land taxation and enforcement Uncontrolled urban growth - absence of planning control - lack of legal alternative to squatter developments Water pollution Solid waste disposal practices Occupation of steep zones	Appropriate incentives (prices and taxes) Affordable planning regulations; enforcement Pollution control regulations Special areas designation (e.g. nature preserves, parks, seashores) NGO-type activity in support of environmental initiatives
Occupation of high-risk land (generally squatter and low-income groups) - low-lying land - floodplains - steep zones	Flooding Landslides, mudslides Erosion Health risks, accidents Property damage and building collapse	Land tenure systems Failed land markets Lack of developed lands Land regulations/enforcement	Appropriate incentives (prices, taxes, tenure, access to housing finance) Less regulation of land markets Provision of affordable infrastructure and plots Targeted subsidies Community participation programmes
Degradation of cultural property: - historical monuments - living monuments	Loss of cultural heritage Loss of tourism revenue	Local value less than international value Air pollution Solid waste management practices Lack of enforcement	Dead monuments: - pollution control - preservation/enforcement Living monuments: - historical districts - tax incentives - public education

Table 14. Links between health and government action at different levels to improve housing conditions in urban areas (Hardoy and Satterthwaite 1987).

Health risks	Action at individual and household level	Public action at neighbourhood or community level	Action at city or district level	Action at national level
Contaminated water - typhoid, hepatitis, dysenteries, diarrhoea, cholera etc.	Protected water supply to house; promote knowledge of hygienic water storage	Provision of water supply infrastructure. Knowledge and motivation in community	Plans to undertake this and resources to do so	Ensure that local and city governments have the power, funding base and trained personnel to implement actions at household, neighbourhood, city and district level.
Inadequate disposal of human wastes - pathogens from excreta contaminating food, water or fingers leading to faecal oral diseases or intestinal worms (eg. hookworm, tapeworm, roundworm, schistosomiasis)	Support for construction of easily maintained latrine/WC matching physical conditions social preferences and economic resources; washing facilities; promote hand washing	Mix of technical advice, equipment installation and its servicing and maintenance (mix dependent on technology used)	Plans to undertake this plus resources. Trained personnel and finances to service and maintain	Review and where appropriate change legislative framework and norms and codes to allow and encourage actions at lower levels and ensure infrastructure standards are appropriate to needs and the resources available. Support for training courses and seminars for architects, planners, engineers etc. on the health aspects of their work
Waste water and garbage — water-logged soil ideal to transmit diseases like hookworm; pools of standing water becoming contaminated, conveying enteric diseases and providing breeding ground for mosquitoes spreading filariasis, malaria and other diseases. Garbage attracting disease vectors	Provision of storm/surface water drains and spaces for storing garbage that are rat, cat, dog and child proof	Design and provision of storm and surface water drains. Advice to households on materials and construction techniques to make houses less damp	Regular removal or provision for safe disposal of household wastes and plan framework and resources for drains	Support for training courses and seminars for architects, planners, engineers etc. on the health aspects of their work
Insufficient water, washing facilities and personal hygiene - ear and eye infections (including trachoma), skin diseases, scabies, lice, fleas	Adequate water supply for washing and bathing. Provision for laundry at household or community level	Health and personal hygiene education for children and adults. Facilities for laundry at this level, if not within individual houses	Support for health education and public facilities for laundry	Technical and financial support for educational campaigns. Coordination of housing, health and education ministries
Disease vectors or parasites in house structure with access to occupants/food/ water eg. rats, cockroaches and other insects (including vector for Chagas disease)	Support for improved house structure — eg. tiled floors, protected food storage areas, roofs/walls/floors protected from disease vectors	Technical advice and information; part of adult/child education programme	Loans for upgrading house. Guarantee supply of cheap and easily available materials, fixtures and fittings	Ensure building codes and official procedures to approve house construction/improvement are not inhibiting individual, household and local government actions. Support for nationwide availability of building loans, cheap materials (where possible based on local resources) and building advice centres. Produce technical and educational material to support this
Inadequate size house/ventilation helps spread diseases such as TB, influenza and meningitis (aerosol drop transmission) and increases frequency of diseases transmitted through interhuman contact (eg. mumps and measles). Risks of household accidents increased with overcrowding; it becomes impossible to safeguard children from poisons and open fires or stoves	Technical advice and financial support for house improvement or extension and provision of cheap sites with basic services in different parts of the city to offer low income groups alternatives to their current shelter	Technical advice on improving ventilation; education on overcrowding related diseases and accidents	Loans (including small ones with flexible repayment); support for building advice centres in each neighbourhood	Produce technical and educational material to support this

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Table 14. Links between health and government action at different levels to improve housing conditions in urban areas (Hardoy and Satterthwaite 1987).
(continued)

Health risks	Action at individual and household level	Public action at neighbourhood or community level	Action at city or district level	Action at national level
Children playing in and around house site constantly exposed to dangers from traffic unsafe sites or sites contaminated with faeces or pollutants	Organization of child care services to allow care for children in households where all adults work	Provision within each neighbourhood of well drained site separated from traffic, kept clean and free from garbage and easily supervised. Ensure first aid services are to hand	Support given to neighbourhood level play, sport and recreation facilities.	
Indoor air pollution through open fires or poorly designed stoves exacerbate respiratory illness especially in women and children	Posters/booklets on improved stove design and improving ventilation etc.	Ensure availability of designs and materials to build improved designs and investigate possibilities of promoting use of alternative fuels	Ensure availability of designs and materials to build improved designs and investigate possibilities of promoting use of alternative fuels	National legislation and financial and technical support for interventions by local and city governments in land markets to support lower level action. Training institutions to provide needed personnel at each level.
House sites subject to landslides or floods as result of no other land being affordable to lower income groups	Regularize each household's tenure if dangers can be lessened; relocation through offer of alternative sites as last resort	Action to reduce dangers and encourage upgrading or offer alternative sites	Ensure availability of safe housing sites that lower income groups can afford	
Illegal occupation of house site or illegal subdivision with disincentive to upgrade lack of services and mental stress from fear of eviction	Regularize each household's tenure and provision for piped water sanitation and storm and surface water drainage	Local government working with community to provide basic infrastructure and services and incorporation into 'official city'	Support for incorporating illegal subdivisions and for providing tenure to squatter households	
Nutritional deficiencies and low income	Action to reduce worm burden and worm transmission. Support for income generating work within the house	Food supplements/ school meals support for enterprises in low income settlements or set up by their inhabitants. If land is available, promote its use for growing vegetables. If malnutrition is serious, consider most appropriate programme to reach most seriously affected groups	Food supplements/ school meals support for enterprises in low income settlements or set up by their inhabitants. If land is available, promote its use for growing vegetables. If malnutrition is serious, consider most appropriate programme to reach most seriously affected groups	Structural reforms, funds for food supplement or other emergency nutrition programmes and other measures to improve poorer groups real income
No or inadequate access to curative/ preventive health care and advice	Widespread availability of simple primer on first aid and health in the home with home visits by health workers to promote its use	Primary health care centre; emphasis on child and maternal health preventive health and support for community action and for community volunteers	Small hospital (first referral level) and resources and training to support lower level services and volunteers	Technical and financial support for nationwide system of hospitals and health care centres. Preventive health campaigns (eg immunization) and nationwide availability of drugs and equipment. Set up training system for paramedics/community health workers. Provide guidelines for setting up emergency services and planning and risk minimization in risk prone areas to minimize injuries and damage if disaster occurs.
No provision for emergency life saving services in event of injury or serious illness	Widespread availability of simple primer on first aid and health in the home with educational programmes on minimizing risks	Basic equipment (eg stretchers, first aid) available and accessible 24 hours a day. Community volunteers with basic training on call and arrangements for rapid transfer of sick person to hospital. Equipment to rescue and treat people saved from burning houses	Support for neighbourhood level equipment plus organization of training programmes for community volunteers. Fire fighting equipment, contingency plans for emergencies	
	Discussions with individuals and community organizations about some minimum changes in site layout to improve emergency vehicle access and create fire breaks	Discussions with individuals and community organizations about some minimum changes in site layout to improve emergency vehicle access and create fire breaks	Discussions with individuals and community organizations about some minimum changes in site layout to improve emergency vehicle access and create fire breaks	

Table 15. Government responsibilities to promote environmental quality in urban centres at different geographic scales (World Bank/UNCHS 1989).

Geographic Scale	Government Provision or Supervision of Private Provision	Government Control
Home	Water, sewers (or regular service to empty latrines); electricity; household waste collection; electricity	Building and perhaps environmental health regulations.
Workplace	Water, sewers, waste collection, electricity and perhaps other services	Regulations on health and safety for employees; social security; emissions; solid/liquid waste generation
Neighbourhood	Roads, paths, pavements, drains, street lighting, emergency services, public space; public telephones*	Land use planning/sub-division regulations; neighbourhood level plans; infrastructure standards
City	Major city infrastructure to supply/support those at lower levels (trunk roads, water pipes, drains, sewers...) public transport; markets; parks; perhaps special provision for toxic waste disposal	Regulations on air and water pollution and disposal of liquid and solid wastes; development controls; physical plans; infrastructure standards; special regulatory system for toxic/hazardous wastes
City-Region	Infrastructure to supply city with water; draw away liquid wastes and sites to dispose of solid wastes beyond city boundaries	Physical plans - often metropolitan or regional plans as frameworks for collaboration between different municipal governments and national agencies; sub-division regulation and development control; controls on dumping of solid and liquid wastes
Global	(This is an area now being discussed internationally - mostly in terms of international agreements to lower discharge of gases which are ozone-depleting and/or contributing to global warming)	

* Although not usually considered part of 'environmental protection', a public telephone is of critical importance in requesting ambulances, doctors or fire engines

NB. This is not a complete list; it is meant only to illustrate the range of government responsibilities for provision and control which have relevance to improving environmental quality within cities

The water and waste management technology to be introduced to serve urban slums and squatter settlements should be appropriate for those conditions. Morawetz (1974, cited by Kaplinsky 1990) describes the appropriate technology as follows:

"Appropriate technology may be defined as the set of techniques which make optimum use of available resources in a given environment. For each process or projects, it is the technology which maximizes social welfare if factor prices are shadow priced".

Kaplinsky (1990) suggests that therefore the project with the highest net social benefit, or sometimes that which has the highest net-social-benefit-to-cost-ratio, is deemed to be the appropriate technology. Grigg (1986) recommends the following categories for success in life cycle management of urban water systems:

1. Make sure of the need and commitment for the system before undertaking to

- plan and build it.
2. Plan it well.
3. Build it with quality construction, equipment, and operating arrangements.
4. Operate it with the best available strategies.
5. Get the most from the system through life cycle management, especially with effective maintenance strategies.

The first one, obtaining a commitment, can be defined as a combination of political consensus building and management planning (Figure 12). The latter two points are vital since they include the important points from financing the system to generate enough revenues for effective life cycle management. They also emphasize the need of both preventive and corrective maintenance, and effective capital planning and budgeting.

**PROCESS OF DEVELOPING COMMITMENT TO BUILD OR MAKE
MAJOR CHANGES IN A SYSTEM**



Figure 12. Process of developing commitment to build or to make major changes in a system (Grigg 1986).

Grigg (1986) comments:

"The first phase shown in Figure 13, the development of the need, has always been a critical one in public works, especially for water facilities, since it is always easy to postpone needed facilities for visible public projects that enhance the image of the political leadership. A new stadium, for example, or a civic center, might get funded before a needed wastewater treatment plant."

Developing an effective interdisciplinary management approach is the only long-term way to safeguard the sustainability of infrastructure. Stone (1974, cited by Grigg 1988) states:

"Engineering capability alone is insufficient for these multidimensional purposes. Engineering and other specialized skills must be complemented by public affairs and managerial competence. These include capacity to deal with the gamut of social, economic, environmental and political factors inherent in planning, policy resolution and program implementation. Practitioners are needed who can integrate public works systems and subsystems into urban and national development programs."

LIFE CYCLE OF AN URBAN WATER SYSTEM

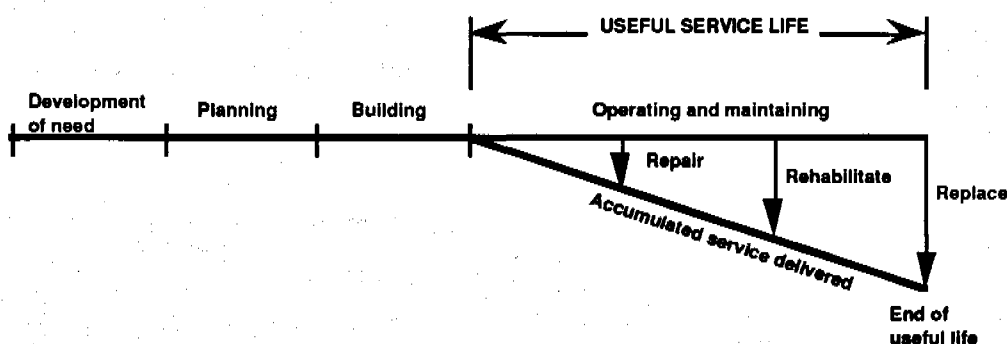


Figure 13. Life cycle of an urban water system (Grigg 1986).

Cost of serving the unserved with water supply and sanitation

A costing model by Christmas and de Rooy (1991) provides an estimated cost of completely serving the unserved among developing countries with water supply and sanitation by the year 2000. The model considers only capital investments, and recurrent costs are not included in the model. Costs are based on 1990 values. The total population among developing countries in 1990 is estimated at 4000 million, with urban and rural areas having 1330 and 2670 million people, respectively. The total population among developing countries, by the year 2000, is estimated at 4810 million, with urban and rural areas having 1900 and 2910 billion respectively.

For the costing model, Christmas and de Rooy divide the unserved population into three broad geographic groups: urban, peri-urban, and rural. Specific "technology categories" are chosen for the geographic groupings. The model assumes that low-cost technologies will be applied to the entire rural areas; that 50 percent of the urban areas will have high cost technologies; the remaining half of the urban areas will be equally divided into low-cost and intermediate-cost. In absolute terms, 810 million people in urban areas and 130 million people in rural areas will require water supply, and 950 million urban and 1680 million rural people will need sanitation services, if full coverage is envisaged by the year 2000. A total cost of approximately USD 357000 million is needed to attain a water and sanitation service coverage of 100 per cent by the year 2000 based on the following distribution of technology categories:

- USD 247000 million for high-cost in urban areas.
- USD 26000 million for intermediate technologies in mainly peri-urban areas.
- USD 11000 million for low-cost in (the remaining) peri-urban areas
- USD 73000 million for low-cost in rural areas.

Figure 14 and Box 1 provide further details regarding the costs and population served in different technology categories for water supply and sanitation. From the above the conclusion can be drawn that to serve the urban poor (50 percent of the urban population, essentially peri-urban) the investment requirement is USD 37000 million, i.e. just about 10 percent of the total investment of USD 357000.

Required investments and population served by 2000

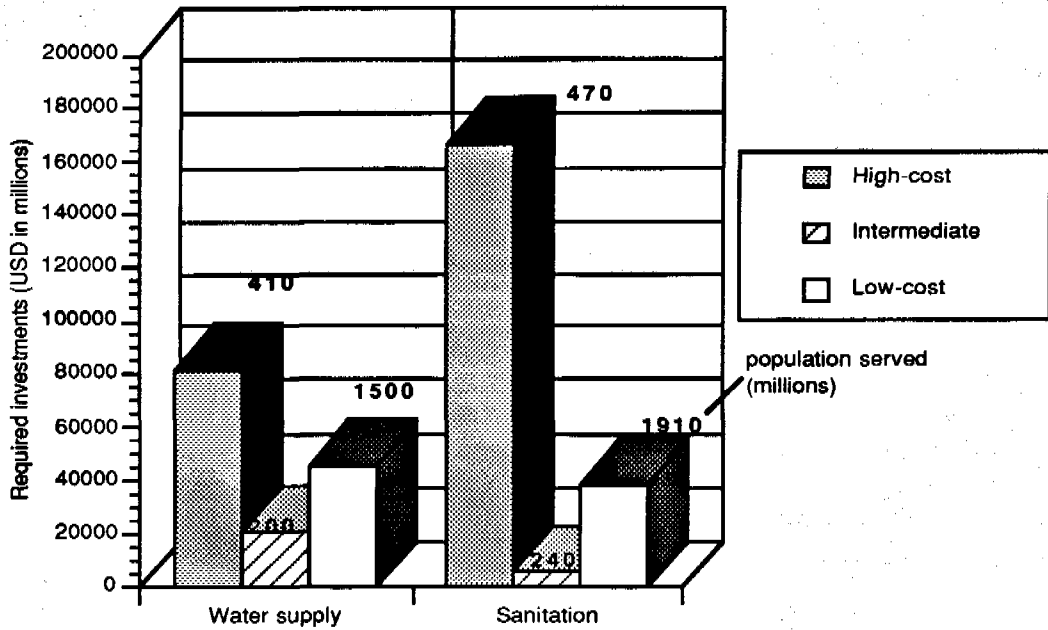


Figure 14. Required investments and population served by the year 2000 in different technology categories (Christmas and de Rooy 1991).

Box 1. The geographic groups with their corresponding technology categories	
Technology category	Cost per capita USD
High-cost technology	
Urban water supply.....	200
Urban sanitation.....	350
Intermediate technology	
Peri-urban water supply.....	100
Peri-urban sanitation.....	25
Low-cost technology	
Rural water supply.....	30
Rural sanitation.....	20
<p>High-cost technology applies to the urban-type system with elaborate pumping stations, water and sewage treatment plants, complete distribution systems and individual household connections for both water supply and sewerage.</p> <p>Intermediate technology, applicable to peri-urban areas essentially, comprises pipe-borne water supply (no allowance for elaborate treatment) leading to public standposts, and on-site sanitation including technologies such as pour-flush and ventilated improved pit latrines.</p> <p>Low-cost technology, targeted to rural areas essentially, includes hand-pump-equipped boreholes or hand-dug wells, rainwater harvesting systems, and pipe-borne gravity-fed systems with public standposts for water supply. Sanitation technologies are the same as those allocated to the intermediate technology category with a slight cost reduction allowing for the use of locally available construction materials for the building of latrine superstructure.</p>	

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DISCUSSION

Following this paper introducing the huge problems going to be discussed during this day, the first question addressed by the chairman, Mr. Wihuri, concerned the criteria for the choice of the four scenarios presented. Mr. Hukka answered that among all the documents consulted, one book contained particularly interesting scenarios for the future of cities. These scenarios present, in his opinion, realistic possibilities depending on what approach is chosen for the future of the city, and are especially relevant for Third World countries.

Then two statements given in this paper were commented by Mr. Semb. The first one, given as a model for development, was in substance: "decentralised rather than centralised development". He mentioned recent studies showing, on the contrary, that urban areas and particularly big cities are the economic "locomotives" producing wealth. The second comment concerned the conclusion given after the link between GNP and investments in infrastructure was presented, which stated that "in order to reduce poverty one should invest in infrastructure". For Mr Semb this is a very difficult problem: is the GNP growing because investments were made in infrastructure, or is it on the contrary, that investments in infrastructure were made because of GNP growth.

The presentator's opinion was that investments in infrastructure will definitely increase the GNP, and that a well functioning structure helps the production as well as it creates jobs to run the infrastructure itself, thus reducing poverty. Concerning decentralisation, Mr. Hukka agreed that cities are essential to the national economy, and precised that his idea of decentralisation does not suppress cities but emphasises the "bottom-up" approach, the decision-making not being concentrated in the hands of only a very few people, but should on the contrary involve more the local as well as the national communities.

In the description of the relationship between infrastructure investments and GNP, the comparison with Japanese and North-American economies appeared difficult to Mr. Rantala, who observed that USA had a rather high GNP when it was started to invest in infrastructure. He then asked whether Finland, which is now living an economical crisis, should invest right now in more infrastructure. His conclusion was that simple comparisons between countries might be dangerous.

Simplified comparisons are always dangerous, agreed the presentator who added though that to reach the World Bank's assessment of reducing poverty, the investments in physical infrastructure should represent a rather essential part of the efforts.

Although agreeing with the conclusions of the presentation based on the World Bank's documentation, Mr. Laugeri apologised that the threshold and time dimensions, to him so essential when considering developing countries, had not been apprehended. He precised that developing countries are under tremendous time-pressure to implement activities directly productive in short term and are very often reluctant to implement activities which would benefit on a longer term, like e.g. water and sanitation activities, even if they may have an impact on their GNP. Mr. Laugeri understood from the examples of Japan and USA, that a certain threshold must be reached and this aspect was missing in the presentation, but the presentator had probably not time enough.

Examples from China and Soviet Union show, in the opinion of Professor Viitasaari, that the strategy of first implementing development and only afterwards environmental protection has brought these countries to disaster. For him at least a part of the infrastructure must be there. Concerning African countries, Pr. Viitasaari believes that Africa being a huge continent, transportation infrastructure as well as some other elements are essential to any start of economical development in this part of the World.

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**WATER VENDING IN URBAN AREAS
IN ETHIOPIA**

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WATER VENDING IN URBAN AREAS IN ETHIOPIA

ABSTRACT

A significant proportion of the urban population is obtaining water from vendors. However, water vending in urban areas has not been well studied. In the future, water supply systems studies and design should take into account vending and should provide adequate preventive and control measures for vending.

Water vending is classified according to its legal status or according to the vending method in use. Water vending occurs as a result of the absence or failure of a public water supply systems. It exists whether vending is legal or illegal. Its presence is not a positive indication of a harmonious water supply system. The operation of public taps and coverage of the system are identified as the most serious factors affecting vending.

Vending is known to serve about 40% to 80% of the population of a town . The consumption of water obtained from vendors lies between that of the consumption from public tap and yard connection.

In general water obtained from vendors is more costly than that of the public system. As there are no alternatives the users are forced to pay very high price. Even though the effect of vending is much felt by the users the water supply system also suffer from it as the vendors eventually affect its operation and destroys its public image.

1. INTRODUCTION

In most developing countries water vending is considered to be illegal. Therefore, it has always been left in the background. However, a significant number of people in the urban areas of developing countries earn their living by vending water and millions of people obtain water from vendors.

For a water supply system to effectively serve its targeted population, the effect of water vending has to be considered in the design and operation of the system.

Based on some information collected in selected towns in Ethiopia for design purposes, this paper tries to analyse how water vending in urban areas functions, what causes it and what are its effects.

In order to know further about the subject and come to specific conclusions the author suggests that detailed site specific studies should be conducted.

2. TYPES OF WATER VENDING

2.1 Definition

To vend is defined by the Oxford Dictionary as "sell, offer for sell (esp. small wares)".

To vend is defined by the Collins Dictionary as "to sell or be sold; to sell (goods) for a

living".

Hence water vending can be defined as " The sell of small quantities of water managed by individuals to support their living."

Water vending can be classified according to the status of the vending activity or according to the method of selling.

2.2 Status of Vending

2.2.1 Legal Vending

In some countries the water authorities sell water in bulk or rent a metered tap to an individual. The individual vends the water to his customers. This sort of vending water takes place in Kenya, Haiti, Indonesia etc. (Whittington et al 1989).

In some places the vendors develop their own water source or transport the water from a natural source spring or a river and vend the water to individuals. The vendors are acting in this case legally.

2.2.2 Illegal Vending

In some countries water vending from a public water supply system is illegal. A typical case is Ethiopia. In Ethiopia the only authority to sell water for domestic use are the Water Supply and Sewerage Authority or the Municipalities. However, vending is taking place almost in all urban areas. A recent (1989-90) study conducted by the Engineering Department of the Water Supply and Sewerage Authority in the towns of Mogo, Hager-Hiwot, and Ghion and a survey conducted by the author(1989-90) with respect to the design of new water supply systems in several towns has shown that illegal vending is taking place at an alarming proportion.

2.3 Method of Vending

2.3.1 Vending From a Permanent Post

In this case the vending takes place at a fixed spot, and can be divided into two groups of vendors.

In the first group the vendors use their yard or house connection from the public water supply system to sell water to his customers. This takes place often where there is a modest town water supply system with small coverage of connections. This type of vendors are found to exist in several towns in Ethiopia, to mention a few: Dessie, Ghion, Mojo, etc. In many cases a great part of the houses were found to depend on vended water: in Hager-Hiwot 153 out of 203 sampled houses (75%), in Mojo 61 out of 145 (42%) and in Ghion 145 out of 183 (79%) .

In the second group the vendors develop their own source, a hand dug well or a spring and vend the water on the spot. These are often found where there is no water supply system or there is acute shortage of water. The Town of Gore is a typical example for this. In Gore vendors serve 24% of the houses with water.

The vendors in both cases are financially in a better position than most of their customers.

Susan (1972 cited by Etherton 1980) provides an example of the range of sources of a shanty area settlement in Bangkok as follows in Table 1:

Table 1. Source of Water Supply

Type of Source	% of Dwelling Units
Vendors	55
Neighbour's House	30
City Main-meter	3
Nearby Tap	10
Rain	1
Other	1
Total	100

2.3.2 Door to Door Vending

In situations where the water source point is far and/or there is a long queuing time, door to door vending takes place. The vendors buy the water from a public tap or individual house connection, transport the water to the customers door and deliver it. A typical example of this would be the towns of Nazret and Gondar in Ethiopia.

3. WATER CONSUMPTION

The consumption of water is affected by the price and the general scarcity of water in the particular area. However, in normal conditions where vending is taking place, the consumption level of the people who use vended water was found to be between the consumption level of public tap users and yard tap users. The following table shows a result of a survey conducted in the towns of Hager-Hiwot and Ghion.

Table 2. Water Consumption by Mode of Service

Mode of Service	Water Consumption (in l/c/d)	
	Hager-Hiwot	Ghion
Public Tap	10.8	12.0
Vendors	20.0	15.0
Yard Tap	22.0	25.3

4. VENDING PRICE

The price of water bought from vendors is in general higher than the price of water got from a public system. The price is influenced by several factors. The main factors identified are:

- Shortage of Water.

During the dry season, when the need of water is high, the price of vended water is more than double than during the rainy season. In Gore the consumers have reported that the price of a 20 l container varies from 0.10 Birr¹ to 0.75 Birr according to the season. This is equivalent to 5.0 and 37.5 Birr per cubic meter respectively.

- Volume of water delivered at one time.

If the volume of water delivered at a time is high enough to be transported by a barrel (200 l steel container) which can be rolled on the street it is much cheaper than the price of 10 containers of 20 l capacity. The main reason given by the vendors is that they have to spend more time for queuing at public taps to collect so many small containers.

- Distance to the source of Water.

The price of the vended water varies according to the distance of the water source involved. In Gore it was observed that the price of a spring water located within the town area is much cheaper than the turbid river water transported from some far place.

In general the water vending prices vary from town to town according to the local situation prevailing there. However, in all cases they are much higher than those of the local official water supply. The following table shows this.

Table 3. Water vending prices

Town	Official Rate Birr/m ³	Vendors Price	
		Average rate Birr/m ³	Maximum Rate Birr/m ³
Gore	---	5.0	37.5
Nazret	0.5	5.0	7.5
Gondar	0.8	5.0	12.5
Baher Dar	0.5	2.5	---
Dessie	0.5	2.5	7.5

5. CAUSES FOR WATER VENDING

5.1 Absence of Water Supply

Where there is no piped water supply system, not any well point neither a spring, vendors fetch water from distant spring, river or any other source and transport the water to the individual homes to sell . This occurs invariably all over the world.

5.2 Shortage of Water Supply

Where there is shortage of water, the people who get constant supply or have storage facility vend water. This has been observed in all the towns the study was conducted.

5.3 Uneven Distribution of Water

¹ 1 Birr =~ 2,1 Finnish Marks.

In some towns the water source is adequate, however, the distribution pipes either do not cover the whole area or there is lack of pressure in the system to cover the high altitude areas. In this case uneven distribution of water takes place. This forces the people living in the uncovered area to buy water from the other part of the town. As a result vendors are created.

5.4 Inadequacy of Public Tap Operation

In most towns about 30% to 50% of the population is expected to collect its water from public taps. However, due to the lack of proper understanding of public tap operation, they are often not provided with a sufficient number of public taps. When made available, they are not provided with an adequate number of attendants, thus public taps are often closed.

For example in Dessie there are 16 public taps. The taps are expected to serve 25,000 people, (i.e 25% of the population). This means that each tap has to serve 1560 persons per day. However, since there are only 7 attendants, in average a public tap is only operational for about 3 hours per day. This is not at all adequate to provide service for 25000 persons.

In one extreme case, in the town of Bahar Dar, it was found that all the public taps were closed. When asked for the reason, nobody knew why.

Coperstock (1978 cited by Etherton 1980) gives the population served per public tap in low income areas in Moroccan towns as follows in table 4.

Hence, those people who are expected to depend on the use of public tap have now to depend on water vendors.

Table 4. Population served by a public tap in Morocco (Coperstock 1978).

Town	Number of Persons per Tap
Casablanca	1000
Rabat	3000
Sale	1100
Kenitra	3300

5.5 Unofficial Promotion of Water Vending

Even though a direct proof has not been obtained, in several towns it has been observed that some of the water service attendants and operators seem to operate closely with water vendors. In some places, except the attendant and the vendors, nobody else knew when the public tap will be opened. In some other places the public taps are intentionally kept closed to force people to buy water.

In some towns where there is an acute shortage, water is served in shifts. Some areas are intentionally provided with water all the time so that they can vend. This has been observed in Gondar for instance. During the month of March 1990, one household was recorded to have consumed 250 m³. In order to confirm whether this had not been a reading mistake or leakage in the pipe, a non-announced visit to this house was made. During the visit several people queuing with their containers were observed. The

household was estimated to have gained over 3000 Birr in a month.

6. EFFECTS OF WATER VENDING

Vending affects most of the low income people in the town. Water vending takes place in the area where the low income people live. The piped water service in the area where the low income people live is poor and the number of public taps is not adequate. Thus, water vending takes place and the poor people are forced to pay 10 to 25 times more than the public service rate.

In order to obtain the minimum amount of water they can survive with, most have to spend more than 8% of their monthly income. For example in Nazret, out of a total of 250 houses randomly selected, 100 earn less than Birr 100 per month. Out of these, 45 % spend more than 8% of their income for water. The situation in Dessie was found to be similar. Out of 143 households earning less than Birr 100 per month, 30% spend more than 10% of their income for water.

In order to save money for other purposes, these families fail to consume adequate water to keep proper hygienic conditions. As a result the main purpose of providing public water supply system is being defeated.

7. CONCLUSION AND RECOMMENDATION

To date water vending has not been taken into account in the design of water supply systems. However, a significant proportion of the urban population is obtaining water from vendors. In the future this should be taken into account and adequate preventive and control measures should be incorporated in the design and operation of the water supply systems.

Water vending occurs as a result of the absence or failure of a public water supply system. It exists whether vending is legal or illegal. Its presence is not a positive indication of a harmonious water supply system.

Water obtained from vendors is much more costly than water obtained directly from a public water supply system. The beneficiaries of this high water cost, in the case of vending from a spot, are the water vendors who are in a better economical condition than the users of the water.

In the absence of other alternatives, people who buy water from vendors pay 10 to 25 times the normal rate, depending on the scarcity of water. About 30% to 40% of the low income population pay more than 8% of their income for water. This is much higher than what is normally considered (2% to 4%) for a financial evaluation of a water supply system.

For further understanding of the causes and effects of water vending, the author suggests that a detailed study should be carried out.

DISCUSSION

This report showed that the financial organisation of the sector is difficult, since official discourses seem to be in contradiction with the reality, Mr. Wihuri stated that these who

are least off pay the most.

The occurrence of vending seems, to Mr. Laugeri, to depend on the threshold of efficiency and the time dimension of the piped water supply (no 24 hours service). For him, the present conditions of operation of networks render water vendors necessary and they should operate legally until the water supply is operative for all.

Concerning the price for water of 0,5 Birr/m³ mentioned in this report for networks' rate, Mr. Laugeri considered it as an average including rather different services like delivery of tremendous amounts of water for big industry and of drops of water for poor thirsty families. The variety renders thus comparison difficult and the use of average values dangerous.

But in Ethiopia, Mr. Metaferia claimed that vendors buy the tap-water at the price of 0,5 Birr/m³ and he wanted to underline the fact that they sell it at a rate ten times higher. Moreover, the official price covers only a third or a fifth of real distribution costs.

The definition of water vending as the selling of small water quantities might be misleading. Mr. Katko remarked that vended water is not necessarily minor, and he mentioned that it can amount up to the half of the total water transported and consequently the flow of money is enormous.

Instead of forbidding water vending, Mr. Katko supported the idea of studying more carefully the phenomenon and suggested to lately use the results for eventual institutionalisation of vending, at least as a temporary measure.

Mr. Metaferia agreed that vending of water will always take place, in some extent but he disagreed that it should be considered as a positive phenomenon. In the cities studied, up to 30 to 40 % of the population was served by vendors, even in towns with good water resources and a network system. For Mr. Metaferia, in these cases the extent of vending more than necessary is not acceptable. Vending as a mean of water supply is risky, because it can go out of proportion and the proper threshold of vending has to be established.

Mr. Semb saw the problem as of fair distribution at a fair cost. He thought that both vendors and network water suppliers are interested at maintaining the system as such: vendors for the high price and networks' staff for the licences given to vendors. This leads to institutional problems which he suggested to solve by privatisation of the pipe systems to enhance price competition.

The experiment of semi-permanent systems was also supported by Mr. Tiainen who proposed to set prices as it has been done in Ethiopia for vending. He wanted to know whether it has been attempted to legalise water vending in Ethiopia. The answer by the presenter was that it has not been done.

Mr. Morange claimed that in some countries water companies have obtained from the authorities a sudden total ban of water vending. Immediately follows an important increase of the number of private connections to the network, but their number decreases almost as rapidly. This leave of new customers could be explained by the inadequacy of water companies' tariffs, especially the monthly or bemonthly payments.

Banning of vendors has not occurred in Ethiopia, to the knowledge of Mr. Metaferia, although it is an illegal activity. In Ethiopia private connection owners pay their water bills monthly according to the meter-reading, but the reporter did not see any reason

why this should discourage customers.

Tore Roy **Semb**

**SANITATION AND SOLID WASTE
MANAGEMENT
IN PERI-URBAN AREAS**

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SANITATION AND SOLID WASTE MANAGEMENT IN PERI-URBAN AREAS

1 INTRODUCTION

I am honoured to be invited to this workshop. My presentation will deal specifically with sanitation and solid waste management in peri-urban areas. I will share with you my experience from working in several less developed countries in Africa and Asia, and in particular from my work for the World Bank the last four years.

I choose to define peri-urban areas as all areas within a city that are not provided with formal infrastructure, but yet populated and developed in a more informal, haphazard and uncontrolled manner. Although these areas often are located on the periphery of the city, they may develop where there is vacant land, such as along railroads, major roads, canals, in low-lying water logged areas, or steep hill sides unsuitable for conventional developments. As a general rule the residents are migrants from rural areas. Most of the residents live in rented accommodations, or temporary shelters without secure tenure. However, the experience throughout the world is that many find it difficult to move up the social ladder, and that these areas slowly develop into permanent residential areas. The social structure, community organisation is usually weak. Some governments have chosen to ignore, others to bulldoze down such slum developments, but some have started to tackle the problem of transforming or up-grading these to formal developments. This may be as much a political as a technical or economical problem.

2. APPROPRIATE SANITATION TECHNOLOGIES

The so called low-cost technologies, or appropriate and affordable technologies have been dealt with extensively by the World Bank, UNDP, Habitat and others, and is presumably well known to everybody here. I will limit myself to a discussion of the application of these technologies in urban areas.

The septic tank/soakaway, pour flush and pit latrine systems were developed primarily for on-site application, serving individual households, or small number of households, and therefore appropriate in rural areas with a dispersed population. In very densely populated urban areas, off-site solutions, i.e. sewerage, seems to be the conventional approach. Below is shown, in Table 1, the relative costs per household for the various sanitation systems (Kalbermatten et al 1990):

Table 1. Relative Cost of Different Sanitation Systems
(Kalbermatten et al 1990)

Facility type	Relative cost
Pour flush latrine	1,0
VIP latrine	1,5
Septic tanks	19,7
Sewerage excl. treatment	15,2
Sewerage incl. treatment	21,4

Simple on-site systems cost only a fraction of septic tanks with ground infiltration or conventional sewerage, and seem to be the obvious solution in urban as well as in rural areas. However, the experience with on-site sanitation in high density areas is mixed, and this technology has not yet found widespread application in urban areas. What are the constraints or problems? I will list a number of contributing factors:

- * Water supply and sanitation facilities in urban areas are normally planned and built by the Public Works Departments, and the planners have been unable to respond to the actual demands of the user or the community.
- * The social structure in most urban slum areas is weak, without a proper community organisation, and for this reason community based implementation has required unreasonably high and costly technical assistance, sometimes higher than the cost of the installations themselves.
- * Appropriate financing or credit arrangements are unavailable, partly because the tenants cannot provide collateral or security for loans, partly because finance institutions or organisations suitable for handling such small loans are non-existent, and partly because there are legal or procedural obstacles in channelling government credits directly to community organisations or individual borrowers.
- * Within a larger low-income area there will be "pockets" with high or medium income homes with septic tank systems, and other pockets with very high density squatter areas, where there are no space for construction of latrines, and sometimes these areas are surrounded by sewered areas. In most larger cities this will lead to a "checker board" development, and it will be almost impossible to reach a sufficiently high service coverage to make a serious health and environmental impact. The Human Waste Disposal Guidelines for Indonesia state that areas with densities below 150 persons/ha are most likely to be suitable for on-site disposal, and areas with densities above 500 pers/ha are most likely to require off-site disposal (sewerage), but the guidelines say nothing about the extent of the project area. HABITAT has obviously arrived at the same conclusion, see Figure 1 (Sinnatamby 1983).
- * On-site disposal is not suitable in soils with very low permeability ($< 10 \text{ l/m}^2/\text{day}$), where the groundwater is too high ($< 1.5 \text{ m}$), or where there is a danger of polluting the groundwater.

In some cases shared sanitation facilities, i.e. several families will share either the toilet, or only the latrine and the infiltration system. These systems have proved to be very difficult to implement.

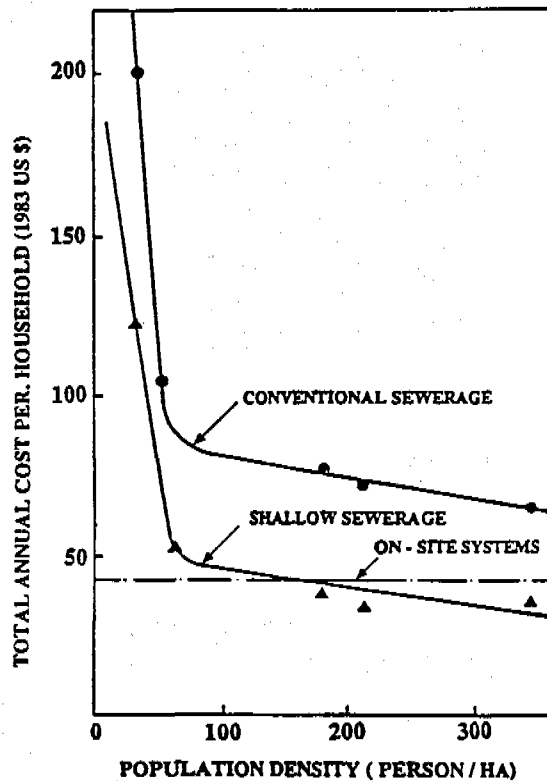


Figure 1: Unit Cost of Sanitation Versus Population Densities (Sinnatamby 1983).

Increased water consumption follows in the wake of improved living conditions, but with deteriorating environmental and public health conditions, as on-site disposal facilities are unable to handle the increased wastewater flows. Until recently no economically feasible sewerage solution for proper collection and disposal was available. However, in recent years research and development of cost effective sewerage systems, such as small-bore (solids free), shallow (flat) or simplified sewers seem to hold some promise. These systems, also called intermediate, falls costwise between the on-site systems and conventional sewerage.

In squatter areas, where individual disposal facilities either are infeasible due to the physical condition, or too expensive, communal sanitation and washing facilities are commonly used. Even though the experience with the use of communal or public toilets/baths is not always the best, this seems to be the only viable option. India has had some success with building of public bath/toilet facilities, sometimes privately owned and operated. Some of the problems associated with communal and public facilities are; a) high costs and low cost recovery, b) if users are charged per time of use, there is a tendency for the residents to use alternative means, such as the streets, drains, canals and rivers, c) lack of proper maintenance as the community does not feel responsible for the facility, d) inconvenient location of the facility, and finally e) most families want a toilet facility not because of the health or environmental aspects, but because of convenience and privacy, and sometimes status, and this cannot easily be provided by a community or public facility.

The depressing conclusion is that there are no easy nor cheap solution to up-grading the sanitary conditions in squatter areas. The key to success is community based systems, non-bureaucratic implementation arrangements, simple funding mechanisms, and a responsive, interactive planning process with a relatively short planning horizon.

Figure 2 shows a successful implementation model used in Indonesia (UNDP 1988). Pilot projects were set up in several towns, where revolving funds were set up to finance private and shared facilities. The funds were provided as materials and cash credits. The materials credit schemes proved less successful, and projects in smaller towns were more successful than in larger cities, and the cost recovery better with relatively short repayment periods (2-3 years) than with longer periods, and the project performance is sensitive to the behaviour of key individuals, such as community leader, mayor, etc.

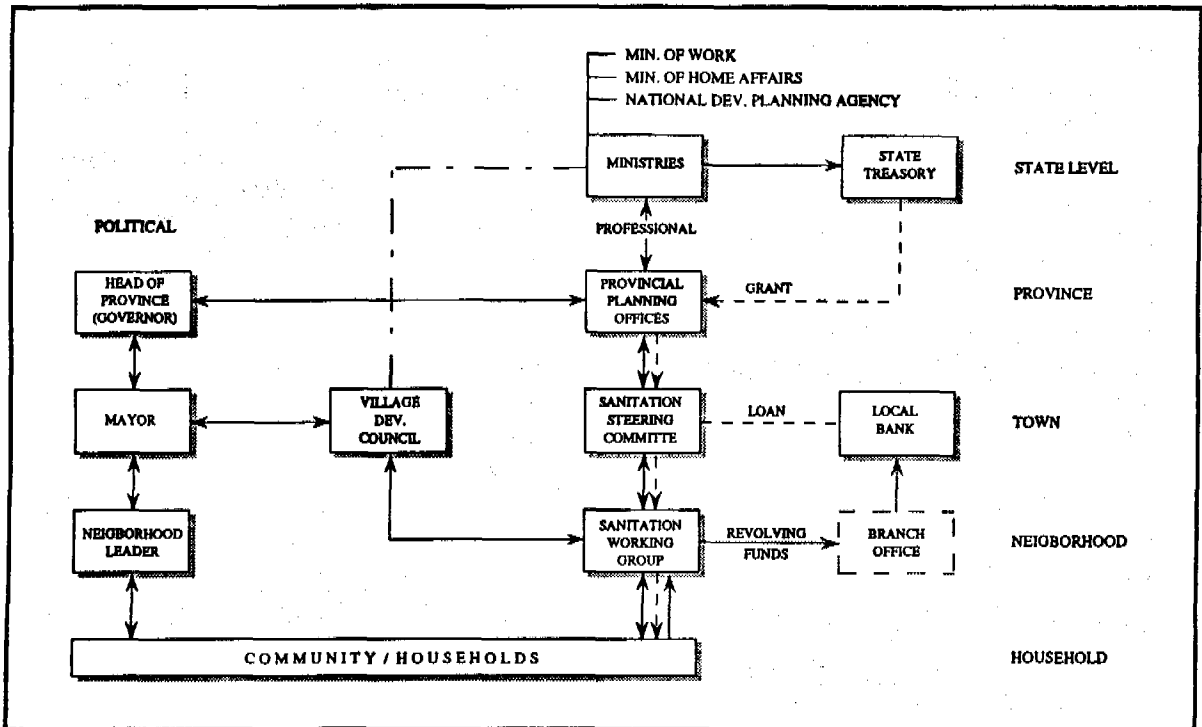


Figure 2: Institutional arrangements for planning and financing community based sanitation systems (UNDP 1988).

3. PROVISION OF REFUSE SERVICES TO THE URBAN POOR

Typically 60-70% of the municipal solid waste is collected, while only about 50% of the population receives regular service. This apparent discrepancy is explained by the fact that the rich produce more garbage per capita than the poor, as shown in the enclosed data sheet. The reasons why services are not extended to the urban poor are:

- * the residents cannot afford to pay for the service,
- * the areas are inaccessible,
- * the community (political) pressure or demand is too weak, and
- * the equipment and institutional arrangements are inappropriate.

Let us consider service cost first. Below is shown in Table 2 service costs (World Bank 1990b), exclusive of cost of investments, depreciation or other capital costs, in some of the countries I have worked with over the last few years:

Table 2. Service Costs of Refuse Services (World Bank 1990b)

City	Unit price, in USD/ton
Uganda, Kampala	1,60
Uganda, Jinja	5,30
Indonesia, Jakarta	6,70
Zimbabwe, Bulawayo	16,00
Zimbabwe, Harare	21,00
Pakistan, Lahore	24,00

The service costs for Kampala and Jinja are atypical, as the service coverage is less than 20%, and waste is only collected from large, communal containers at markets and in the city centres. In the case of Jakarta only secondary collection is included, as the responsibility for refuse collection is splitted between the municipal government who provides secondary collection only in most residential areas, and the neighbourhood or district administration who is responsible for providing primary collection with push carts.

The actual cost of service would be much higher if depreciation costs were included, as a large portion of the collection fleet and landfill equipment normally is inoperable due to lack of spare parts, proper repair and maintenance. In Kampala and Jinja less than 70% of the equipment is grounded on any day, and comparable figures for Harare and Lahore are 50 and 65%. Even though the figures above are incorrect they reflect a cost level difference of 1:10, and this has to do with the different collection system used in these places. Below is given in Table 3 some estimated unit costs with different types of collection equipment.

Table 3. Estimated Costs of Refuse Collection Equipments

Collection Vehicle System	USD per ton*	per family/y **
Compacting truck (8m ³)	19,90	22,20
Side-loading truck (6m ³)	17,38	19,31
Open flat-bed truck (10m ³)	11,92	13,24
Arm-lift truck with skip (7m ³)	10,76	11,96
Secondary collection with roll-on truck/15 m ³ container, primary collection/l m ³ push cart ***	9,35	10,25
Secondary collection with arm-lift truck for 4x2 m ³ containers, and primary collection with arm-lift vehicle/2 m ³ container	5,14	5,71

* Manus Coffey 1989

** assumed 5 members per family and 0,5 kg/per./day

*** own calculations from the "Third Jabotabek Urban Development Project" (World Bank 1990a).

While these costs are idealised, they demonstrate that the choice of collection system is quite important, however, only the five first systems are generally in use, and the last

system type has been researched and developed by Manus Coffey Associates Ltd. with funding and support from the Irish Government, NORAD, the World Bank and HABITAT, but is still on the pilot stage.

The cost per family is also estimated above. It is normally assumed that SWM service costs should be within 1-2% of the family income to be affordable. The assumption may be questionable, but if correct the more conventional collection systems widely used today, would only be affordable to families with annual income of USD 1000 and higher, e.g. the high and medium income groups. The conclusion is therefore that containerised systems based on community/people's participation or self-help actions seem to offer the best hope for an affordable solution.

There are three basically different collection methods.

- a) The conventional, government provided collection and disposal service.
- b) A combination of government provided secondary collection and disposal service, and primary collection organised by the community itself.
- c) A combination of government provided secondary collection, and primary collection based on direct participation by the households.

These three systems will require different levels of participation by the community and/or the households, and different institutional arrangement to manage and run the collection service. Figure 3 illustrates the impact on the unit cost of collection with these different systems, using information from World Bank projects (Harare, Jakarta and Kampala). The cost trend rather than the actual cost level should be emphasised, and it suggests that it is possible to design collection systems that will fit the ability and willingness to pay for most urban income groups.

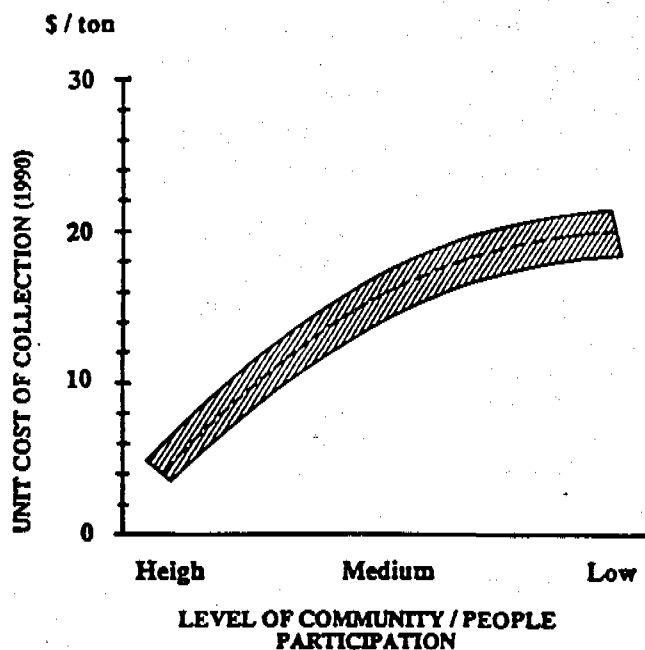


FIGURE 3. Cost Impact With Community/ People Participation
System a) is based on door-to-door or curbside collection using a mixture of compacting and ordinary trucks. This collection system requires a **low community or household participation**. This is the collection system which is presently in use in Harare and

Bulawayo. Actual system costs have been used (Semb 1991).

System b) is presently widely used in urban areas in Indonesia. The municipal or city council is responsible for providing secondary collection from communal collection points serving administrative areas (Kelurahan) of about 20-30,000 people (World Bank 1990a). Large metal containers, concrete bins or depots, or simply hips of garbage on the ground serve as the communal collection point. The neighbourhood administration is responsible for organising and carrying out the primary collection within its area of jurisdiction. This is most commonly contracted out to individuals using push-carts with about 1 m³ containers. This system is considered to require a **medium level of community/household participation.**

System c) is exemplified by the collection system recommended for Kampala (World Bank 1990b). It is based on a collection system which will require a **high level of community /household participation.** The city council is providing secondary collection using 2m³ containers placed at strategic places in residential areas, in consultations with the community organisation (Resistance Council, RC), and within a reasonable walking distance from the households (200m). In most slum areas it will be possible to locate the containers either along the periphery of the service area, or to construct short access roads to suitable sites. In large slum areas special vehicles will be used for collecting the containers one by one, in other areas regular flat bed trucks with hoists will be used to pick up 4 to 6 containers per load. The community, through the RC, will be responsible for cleansing within its administrative area.

The municipal services in Uganda deteriorated during the civil war, and with the extremely scarce resources available after the war, the municipal councils could only afford a rudimentary waste collection service, and placed large communal containers at strategic places at markets, the city centre and in some residential areas. The residents were then free to bring their waste to the public containers, which they actually did to some extent. The National Resistance Movement (NRM) which took over the government in Uganda organised so called Resistance Councils (RC), which allow a progressive popular representation from the grass-root to the central government levels. The RCs, particular at the community level, are now actively involved in self-help projects, such as cleaning up alleys, streets and other public areas. The RCs have representations in the municipal council, can exert political pressure, and are increasingly demanding refuse collection services, and there seem to be a political and social motivation to improve the living conditions also in the peri-urban areas.

4. RECYCLING/REUSE OF MUNICIPAL SOLID WASTE

The scavenger picking his way through mountains of garbage at the landfills, the municipal waste collectors separating out bottles and metal, the scrap dealers and the middle men, all know that there is value in waste, but the governments do not always understand this. The scavengers are more often scorned than appreciated, and little is done from the government to make his work easier. The subject of resource recovery from municipal wastes cannot be dealt with adequately in a few minutes, and I deal only with the reuse/ recycling or scavenging aspects.

Recycling is carried out within the formal and the informal sectors. The formal sector involves mostly recycling of industrial and commercial wastes, and is handled on a industry to industry, or business to industry basis. The informal sector encompass the scavengers, scrap collectors and dealers, and the contractors, as illustrated in Figure 4. There are no clear lines of distinction between the formal and the informal sectors, and in some countries scavenging at the landfills may even be formalised, as we will see later.

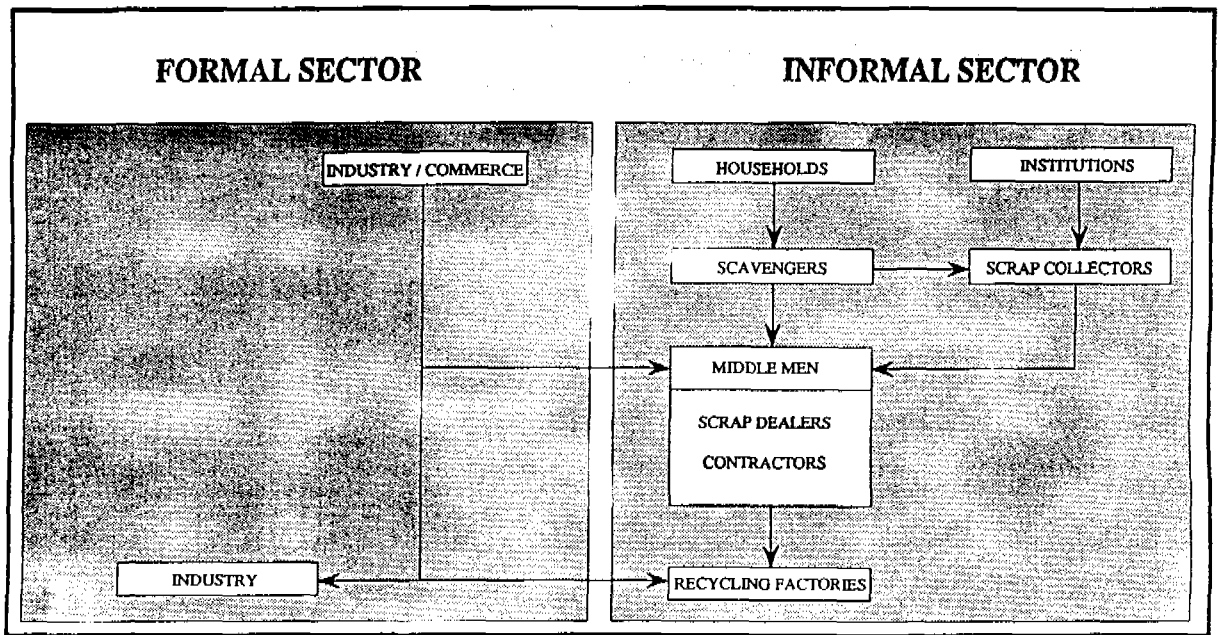


FIGURE 4. Institutional Arrangements for Recycling / Reuse of Solid Waste

Typically 1% of the total labour force in a large city may be involved in informal recycling activities, recovering roughly 2-6% of the total municipal solid waste stream. Formal recycling activities are additional. Covered material is mainly paper, plastics, metal, textiles, leather and rubber, and sometimes food waste from hotels restaurants for animal feed. Scavenging takes place at the source of production, i.e. directly from the households and institutions of commercial establishments or from the collection receptacles and public containers along the streets, or from the disposal sites. The scavenger may earn USD 40-80 per month, while the scrap dealer earns at least twice this. It was recently found in Uganda and Zimbabwe that those involved in manufacturing of products such as stoves, lanterns, bicycle rubber break paddings, etc. earn on the average USD 80-160 per month. These earnings compare very favourably with those of government employees and industrial unskilled labours.

Scavenging and part of the recycling business is often carried out by special religious or ethnic groups, or by people from certain villages or tribes. For example the coptics (Christians) are almost exclusively involved in the scavenging business in Egypt, as well as in Pakistan and other Islamic countries. The landfill scavengers in Cebu, Philippines, came from a small number of villages.

Cairo in Egypt is the only place to my knowledge, where the waste collectors pay the city council for the rights to provide waste collection services in a given area, and thereby to recovering resources from the collected waste. The main income of the waste collectors or zaballens in Cairo is from pig raising, an activity which Moslems would not get involved in. When the governor in Islamia, Egypt, banned pig raising in his district, the waste collection services provided by the zaballens collapsed. The situation in Cairo is unique, and one should not expect that city councils may contract out collection services at a profit, but it could help reduce the service cost.

The value of waste depends on its composition, demand and market value of recovered material, but also on the purity and quantity of recovered material matter. For example clean cardboard and newsprint will fetch prices ten times as high as similar types of paper which have been soiled with grease, oil, etc. Likewise is there an appreciable

difference in the price of clean and dirty plastics. Consequently, it is important to be able to recover discarded material before it becomes mixed with other types of waste. In Egypt the scavengers sell their products to middle-men or dealers in small quantities. The dealers may hoard and clean the recovered material, and will be able to demand prices from the recycling factories, which are several times higher than what he paid to the scavengers.

Table 4 gives the composition of domestic wastes in a number of cities. It should be noticed that 20-30% of the waste stream in many cities in the Less Developed Countries may be recycled, and that paper account for half of this. In practice only a 2-6% of the waste is actually recovered, and why is this so? Mainly because it is only profitable to recover certain types of paper, and because the paper and plastics are mixed and soiled. Significant waste minimisation presupposes source separation, and some kind of government intervention.

Table 4. Domestic Waste Composition (percentage by weight)
(UNDP 1988).

Material Type	Country/City				
	Norway	Kenya Mombasa	Egypt Suez	Ethiopia Addis	Philippine Manila
Paper	34,1	13,5	16,3	2,2	14,9
Plastics	5,7	0,8	1,3	0,9	6,5
Glass	5,5	2,2	1,6	0,9	3,2
Metals	9,0	3,1	1,9	1,0	5,8
Textile	3,3	1,8	2,4	1,6	1,8
Leather/rubber	1,0	0,9	0,2	0,5	1,4
Recycleables	53,1	22,5	23,7	8,4	33,0
Vegetative	37,6	45,0	40,0	11,0	34,0
Misc. inerts	4,7	13,0	12,4	50,3	15,4
Compostable	42,3	58,0	42,4	61,3	49,4

Table 4 shows that 50% or more of the waste may be composted, and this is why this treatment alternative appears so attractive. However, the cost of making high grade, safe and saleable compost, coupled with a low demand for organic material in most developing countries, rarely makes this a viable option. A pilot project aimed at testing and demonstrating decentralised, manual and cost efficient composting was carried out in Jakarta, but failed after a short period due to lack of organised marketing and customers.

The success as well as public acceptance of scavenging activities depend a great deal on how the recovery business is organised. I will describe briefly what I conceive as good and illustrative examples.

a) In Jinja, Uganda about 200 workers have formed a cooperative, the Black Smiths' Society, which produces stoves, lamps, boxes etc. from scrap metal, and the average earning was about USD 160 per month. The cooperative has monopoly on purchase of scrap metal in Jinja, but as they had to sell their products beyond Jinja, they faced competition from producers of similar products in Kampala and elsewhere. The

cooperative provides a purchase and sales organisation, and gives recognition to the business. The municipal council has helped them acquiring a central and suitable location.

b) In Harare, Zimbabwe the City Council had contracted out, through competitive bidding, the right to recover material from the landfills to firms engaged in the recycling business. The contract stipulated and regulated the working conditions for the "pickers" at the landfill, e.g. no children were allowed, picking had to take place at certain hours, the pickers were employees of the recycling contractor, equipped with shoes and gloves, and issued with ID cards. Unregistered scavengers were turned away from the landfill, thus effectively controlling the working conditions, and eliminating one of the more serious complaints to scavenging.

c) In Chitungwiza, Zimbabwe, the city council and the local chamber of commerce had helped some high school students in setting up a recycling cooperative, by providing a suitable site close to the landfill, guidance in business matters, and some credit. At the time when I visited the place in February 1991, the cooperative was a thriving business, giving employment to 21 people, involved in sorting, weighing, washing, and packing reclaimed material. The cooperative labourers, mostly women, wore protective clothing and uniforms. The working hours and working conditions were organised. The site properly fenced in and well kept, and other recycling businesses had developed synergistically.

5. CONCLUDING REMARKS

There are many areas worthwhile further research and development. I have focused on the institutional arrangements, in particular community and people participation aspects. It is my opinion that the approach most likely to succeed in providing affordable and sustainable services to the urban poor is to leave more of the responsibility, the work and the commitments to the people, and to their community organisations, to let them take a more active part in the organisation, planning and running of their own affairs, such as cleansing and sanitation. The government's role should be limited to providing the framework, the regulations and the stimuli for the people at the community level to be able to manage their own services, and there is enough challenges for research in this area, on institutional, financial and to some degree technical aspects.

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ANNEX 1

Waste Generation Rates versus GNP per capita.

Country type	GNP per capita	Daily generation rate
Low-income	> USD 500	0,4-0,5 kg/pers.
Middle-income	USD 500-2000	0,5-0,7 "
High-income	< USD 6000	0,7-1,8 "

ANNEX 2

Waste Generation Rates versus Household Income Levels (Nordconsult):

Country/city	Household Income Group		
	Low	Medium	High
Kenya/Mombasa	0,20	0,44	0,50
Egypt/Suez Region "	0,20	0,25	0,40
Ethiopia/Addis Ababa "	0,16	0,11	0,29
Philippines/Manila "	0,17	0,21	0,48

ANNEX 3

Waste Density Variations (UNDP 1988).

Country/city (kg/m ³)	Household (kg/m ³)	Street Market (kg/m ³)
Norway	180	
Kenya/Mombasa	254	
Egypt/Suez Region	300-400	210-240
Ethiopia/Addis Ababa	280-390	
Philippines/Manila	165-225	457 275

DISCUSSION

The first question concerned the real possibilities of installation of latrines in urban areas because of their need for space. Mr. Semb agreed that in many urban areas there is not a lot of space, but it is technically feasible to dig it under the house itself. However only a few people would choose this solution. Another possibility would be to build common facilities, but then the difficulty is to find people who wish to collaborate and share the facility in difficult conditions (e.g. no legacy for land,...). This is why the sewerage is often the most effective, especially the new, flat, solid-free system, built outside streets.

Mr. Wihuri mentioned "composting latrines" as a good example of appropriate technology, comfortable because they are designed to be odor-free and practical because they are to be emptied from their bottom. Several comments were made on the cost of such equipments (sometimes as expensive as the all house!) but the author agreed with Pr. Viitasaari that the differences between costs of a VIP latrine and that of a septic tank cannot be as big as 20 times, as the figures presented. For Mr. Semb private individual latrines are preferred to any collective system because they provide privacy, convenience and sometimes status.

The small difference in total price induced by the treatment of sewage astonished Mr. Laugeri. Mr. Semb highlighted the variations that occur between cities, big cities needing longer collection pipes and more careful treatment, ponds on the other hand being very cheap, and he discouraged listeners to use the given figures as such.

Concerning refuse management, Mr. Semb noted that in some countries, e.g. Egypt, Pakistan, the Philippines, the refuse collection has been organised into cooperatives by some cultural minorities. These informal/formal organisations are doing a great job to scavenge, recycle, sort and final disposal of the solid wastes. Mr. Semb mentioned that scavengers in Zimbabwe are officially recognised in the solid waste management business.

About refuse management, Mr. Metaferia argued about the idea given on the picture "Cost of solid waste collection" that the cost per capita is reduced by local participation. His opinion is that the figures are reduced only because the community itself pays part of the costs, and this part does not appear anymore in the statistics. If total costs are considered he does not believe that they should be any lower.

True enough if we consider the opportunity costs of carrying refuse to collection points. But for Mr. Semb it would be wrong to include into costs of waste collection the time spent by dwellers to bring their refuse to collection points, as for water transportation by women for example. The refuse can be brought on the way to other occupations, and thus costs are not increased, i.e. costs of the utilities are reduced.

The question of financing sanitation and waste management is very difficult in slum areas. Mr. Metaferia mentioned the mortgage system developed in Manila for home improvements. Mr. Semb remarked that these loans given for housing or more specifically for waste collection or wastewater treatment are accorded only to house owners, and thus cannot help rented apartments' dwellers, and even less families living illegally. Here is the most difficult aspect as the credit facilities are not extended to the poor of the poor - the "illegal" tenants.

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URBAN SLUMS IN BANGKOK

1. GENERAL BACKGROUND

To be able to work in other countries calls for patience and motivation to learn the local ways of thinking and to deal with unfamiliar customs and traditions. This I had to learn on my arrival in Thailand in 1982. Between 1982 and 1990, I spent almost seven years working at The Banana-tree Day-Nursery in Bangkok, a day nursery for about 100 preschool children between two and a half and five years of age. About 80 of these children come from Klong Toey, the largest slum in Bangkok.

The population of Thailand is about 56.7 million people. They are living in an area of 514 000 m² which is about the size of France. In the capital Bangkok there live more than 7 million people in an area of approximately 1567 m². Of these seven million people, about one million are living in slums.

Thailand has a monsoonal tropical climate with an average temperature of 27° C. The Bangkok metropolitan area is divided into two parts by the Chao Phraya river. Although a constitutional monarchy with a much beloved royal family, it seems to be characteristic for Thailand's politics that the country undergoes military coups periodically.

The formation of slums often occurs under contradictory circumstances. While mainly ruling that squatting is illegal, the authorities at the same time provide 70% of the electricity and 50% of the water supply with own meters to the people living in slum areas. A slum may be loosely defined as follows: An area of residence with an extremely high population density where the environment lacks proper sanitation services and has no free space thus being unhealthy and unsafe. The area is over-built with housing units of shabby construction which are usually left in a state of disrepair.

2. HOW AND WHY SLUMS GET STARTED

The principal reason for the slums is very evident: more people move into a big city than the authorities can accommodate in publicly rented or owned housing. This is also facilitated by a climate which is mild or warm most of the year. In the Bangkok metropolitan area there are also some other specific reasons for slums which are as follows:

(1) - There is a certain amount of land belonging to government agencies which is temporarily left vacant due to lack of money or lack of proper plans for its use. The land is consequently left underdeveloped and neglected. Because of inadequate control, people who move into the city from the countryside or who have been evicted from their previous home in the Bangkok area move in and set up their houses there. Usually these houses are built from discarded materials.

(2)- There are also pieces of land possessed by land speculators. When this land is neglected by the owners, the squatters move in.

(3)- Some of the land is owned by Buddhist temples and some is Crown property. In these cases the land is generously let to the poor people for very low rent. Frequently this kind of land becomes overcrowded due to in-migration of relatives and friends.

(4) - Bangkok Metropolitan Authority has not paid sufficient attention to the provision of sewers, drainage and garbage control for the above mentioned lands. There is also no official control on the building of houses and shelters in these areas.

3. A TYPICAL BANGKOK SLUM: KLONG TOEY

Klong Toey slum is the biggest slum in Bangkok. It is situated close to the sea port and is on land owned by the Port Authority of Thailand. The port was constructed between 1939 and 1954 according to the plans of the German engineer Ing Arnold Agatz.

Originally the government forcibly took possession of the land from private owners thereby obtaining an area of about 890 acres (3.6 m²). From the total amount of land, about 667 acres (that is 74.8%) is used according to the plans of the authorities. Of the rest, about 162 acres (13.7%) is occupied by squatters and 64 acres (11.5%) is unoccupied swamp area. Much of the water in the swamp is between 1.5 and 6 meters deep and covered with water hyacinth. Other areas lie higher with shallow water covering a surface of clay and grass.

At first, the Port Authority allowed the building of 12 rows of houses at the edge of the swamp. Each such row, named Lock 1 to 12, contained 20 houses making altogether 240 units. In this area there were opium dens as well as much alcohol abuse. But the Port Authority did not have the money to complete all their original plans. They therefore changed their policy in order to earn money by building rows of shops, creating a market place, etc. This however meant the eviction of families in Locks 1 to 5 who consequently moved in as squatters into Locks 6 to 12. Later on in 1966 the Port Authorities tried to evict a further 4320 families (21 700 people) from the area. In Klong Toey slums there live nowadays more than 57 000 people. In 1982 Lock 12 consisted of 1270 families which is about 6,500 people. Each family had about 60 m² of land which is more than in other parts of the slum where people may have as little as 10 m² for their use.

Inside the slum home the dwellers will typically have one corner serving as a kitchen with a small bucket serving as a fire place, and a few household articles. The actual cooking will happen on a verandah or other open space area. There is generally no running water but clay pots are used to keep some water. In some houses there are refrigerators. Windows are holes without glass, instead they are partly covered with wood. In another corner there are mattresses and bedclothes in one pile during the day and are spread on the floor for the people to sleep on during the night. There is minimum amount of furniture, and clothes are often kept in zip-up soft material wardrobes. People sit and eat on the floor or on straw mats.

Most slums lie under water almost all the year round in Bangkok. In Klong Toey there is a small street serving as entrance to the slum. Besides that there are usually no streets. Instead, there are narrow walkways, constructed from wooden planks raised above the water level, which are often in a state of disrepair. Most houses are built on stilts just high enough to make sure that the water level during the rainy season does not reach the floor. There is no system of drainage or sewers to carry the used water from the houses. Water accumulates underneath the houses and spreads all over the low land becoming

stagnant and polluted. Worse still, as there is no garbage collection, rubbish is littered all over the slum. Rotten food and garbage together with stagnant pools of sewage create a serious health hazard for the slum dwellers. Rats and flies multiply very fast in this environment. The whole slum also becomes a good breeding ground for mosquitoes.

There are no recreational areas. Usually there are some water taps where people can get water. The materials used for building the slum housing consist mostly of low grade wooden boards which have been collected from garbage dumps. The roofs are mainly made out of iron sheets. During the hot season this increases the already hot temperatures inside the houses which have been built without any insulation. During the rainy season the roofs very often leak. The houses have been laid out without order but with the aim to utilise all available space. They are built mostly wall to wall until the whole plot of land is fully occupied. The living quarters are built in a temporary manner even though some people have lived there 15-20 years.

4. LIFE STYLE IN SLUMS

Slums are full of people and bustling with activity. Many household chores are performed outside the houses. Often the small verandah standing on stilts in front of the house serves as a place for cooking, washing dishes, doing the laundry, taking a bath and family gatherings. Very little privacy is possible among slum dwellers and the social interaction between residents is quite intensive. Small rooms in the houses or only one-room houses force people to spend life outside talking with neighbours, spending time in coffee shops, snack food stalls or gathering on verandas of popular residents. The overcrowded conditions are apparent by the number of children and youth playing various games in the walkways or wherever there is an open space available. There are no planned playgrounds for children.

Because of the inferior social and environmental conditions in slum areas, the residents feel themselves a sub-culture of society and develop a general attitude of being an underclass or inferior class of the society. Slum dwellers are mainly poor people and either unemployed or paid low salaries for all sorts of work: e.g. manual workers, craftsmen, vendors, taxi and truck drivers, dock labourers and semi-skilled workers who have no permanent jobs.

Most of the people are of child bearing age and their families are growing fast. People have different social and cultural backgrounds since some of them come from the countryside while others have grown up in the cities. Each slum community has its own informal administrative arrangements. The problems in the slums get worse the more crowded the slums become. A few details of slum life: There are many mobile bankers with 20% interest rate per month. Despite the poverty, colour televisions are not uncommon. There are fewer video recorders which however are mainly used as a means of accessing pornographic and violent films. Polygamy and husband desertion are common. Schools close to slum areas are usually next to major roads and traffic can cause up to 100 decibels of noise in the open class rooms.

5. DIFFERENT KINDS OF SLUMS

The National Housing Authority of Thailand has defined different types of slums in Bangkok as follows:

- 1) Inner-city slum: more than 15 years of settlement with high levels of deterioration

- 2) Land-rented slum: less than 15 years of settlement with no planning and with some signs of deterioration.
- 3) Squatter settlement: areas that have been occupied by people without permission from public or private owners - e.g. the communities along the canals, rivers, railway lines and areas that have been destroyed by fire.
- 4) Slum under eviction: areas that must be abolished to make way for road construction; expropriation for public or private enterprise.
- 5) Slums with cement roof: two or three store concrete hostels providing very high density housing especially for taxi drivers and factory workers.

In the Klong Toey area several five-store flats were built to accommodate the slum dwellers. One flat consists of effectively one and a half rooms with a small kitchenette and toilet. These blocks of flats seem to have become a slum in a new vertical way because of overcrowding and the accumulation of refuse.

A different attempt was made to rehouse the residents evicted from the Lock 12 area. This time, between 1982 and 1985, The National Housing Authority and The Port Authority of Thailand joined to prepare land of 70 rai (28 acres) in the Lock 6 area. The Port Authority leased the land to The National Housing Authority at the price of one baht (4 US cents) per square wah (4 m²). The organisation appears to have been exemplary with consideration given to the dismantling and transport of the dwellers' previous residence, the building of new housing, the provision of cheap building materials and procurement of building loans.

The responsibility for land preparation was given to The National Housing Authority. They spent about 24 million baht (about 1 million US dollars) for different facilities like water pipelines, open drainage canals, roads, electrical poles, etc. Each of the 1480 relocated families now have 60 m² of land on which to live legally rental contracts being for periods of 20 years. Many of the new houses in this area have been built out of concrete. With this type of planning, the standard of living of these residents has improved substantially.

6. SPECIFIC PROBLEMS

6.1 Floods

One of the worst environmental problems in the whole of Bangkok is flooding. First of all the city was built on marsh land although the reason for that at the time was a defensive action against Burmese invaders. Because of the swampy ground, the whole city is sinking at the rate of a centimetre per year. Tall buildings, being extremely heavy, increase the sinking process. But despite the recognition of this problem, pressure from the business sector ensures the continuation of building construction in the city centre. In the slums, the houses are built on stilts. This is done as a means to avoid flooding and is cheaper than the alternative of filling the block of land with earth. On the other hand when the surrounding areas have been developed by richer enterprises, they use the land fill method. The result is that the water level for the slum residents rises and flooding can occur every time it rains. During a flood in Bangkok, water covers all the streets and yards and flood water becomes sewer water. Sometimes it may be dangerous to walk on the flooding streets when one can come across a poisonous snake, even cobras, or one can get electrocuted when the power lines make contact with the water. It is also a big practical problem when the toilets cannot be used at all. In the 1980's during the worst floods in 500 years,

the authorities delivered plastic bags to use for toilet needs. In the worst affected areas the flooding lasted for several months and the water reached thigh level. During the rainy season it has happened that the water sewer manhole covers have been removed by the water pressure allowing small children to fall in and drown.

6.2 Canals: Drainage and Transportation

Bangkok is sometimes called Venice of the East because of its many canals. Today more and more of the canals are turning into effective sewer ditches. Some of the canals have been filled in order to build more roads for the rapidly increasing traffic. Filling up the canals has worsened the flooding. The original sewer pipelines appear to be inadequate for the heavy rainfalls and demands of the increasing population. The swampy ground also makes the building of an underground transport system impractical, thereby eliminating one possible solution to Bangkok's severe traffic jam problem.

In previous times the canals were the main means of transport for citizens and there can still be seen water-busses and taxis operating along the Chao Phraya river. Canals have also served as water supply systems, e.g. to the Royal Silk Factory and to the Chulalongkorn University. Nowadays there are still many people who use the canal or river water for household chores, but people complain that they get skin rashes from the water; and it is no wonder, because all the household and industrial waste waters are released into the river and canals without any prior treatment .

One consequence of Bangkok's heavy automobile traffic is that people may get more lead from using river water or even water from the cleaner canals, than from the water being carried in covered pipelines. Mild doses of lead can cause anaemia, weakness, headache, dizziness and even irritability.

The smell of sewer water in open canals and the uncollected garbage piles is very noticeable in many parts of the city.

6.3 Water Supply

Very often the pressure of the clean water is so low that people living on the second floor cannot get any water from the tap if they don't use their own pumps. The quality of the clean water is not high. People can get different types of parasites and worms from the normal tap water.

6.4 Social welfare problems

Social problems may accumulate, as for example when the poor health of a mother with many children leads to the neglect and malnutrition of her children. Adults may get easily involved in gambling when there is not enough money for the rent or other bills. Children who grow up in an atmosphere of neglect may be strongly influenced by the many negative aspects of social life in the slums. Teenage girls may be enticed into prostitution and boys may be lead to petty crime or to experimentation with cheap drug substitutes like sniffing of solvents. The overall attitude may turn to a lack of hope and apathy. Despite this, one can always find some youths who display strength and courage in trying to improve their lives.

Nobody wants a slum next to his house. The old attitude defines the slum to be an area of deep decay both morally and economically. The slum people are considered to be all from the countryside, hopeless failures who possess no identification cards and no education,

they are thieves and heroine sellers. To be sure, there are cases when this is true, but more often slum people are normal families from both city and country who just find themselves in desperate circumstances. Most of these people are honest and work hard to make ends meet under very difficult conditions.

There have been attempts to clear up the slums by building high storey walk-up for people living in slum areas who have lost their homes through fire or eviction. Seventy percent of the present occupants are of medium or high income classes who bought their rights to rent these flats from the original low-income families. Although the rental contracts explicitly forbid such transfer of rights, the administration of public housing is too inefficient to enforce these conditions. The original occupants have moved back to live in the slums again.

Fire spreads very easily in slum areas because the huts are so densely built and made out of wood. Fire victims who find themselves suddenly homeless need often to seek shelter under bridges in order to protect themselves from rain or the hot sun.

7. DEVELOPMENT ASPECTS (SUGGESTIONS FOR IMPROVEMENT)

Waste water

Only this year, 1991, has the Bangkok Metropolitan Administration decided to build the first plant to treat waste water. It is indeed surprising that it has taken so long to recognise that the cornerstone for a healthy society is well functioning clean water and waste water systems as well as garbage collection. It is especially surprising since the Thai people themselves have great respect for cleanliness. During the hot season people like to take showers 3-6 times per day and to change their clothes daily. It is however still a problem in Bangkok where one has to pay for clean water and garbage collection but not for waste water because it is not treated.

Air Contamination

Urgent action is needed to stop environmental pollution in Bangkok. Not only is the water contaminated but so is the air. To solve the problem of congested traffic and help reduce air pollution, the Metropolitan Administration is considering an elevated train system. Clearly such a project is unavoidable despite the great financial expense it is undoubtedly going to cause.

Housing

There is a paper called The Greater Bangkok Plan 1990 which was proposed by Litchfield. It states that the government should supply 17,000 units of housing annually to alleviate the problems of slums. The aim of short term improvements of some elementary living conditions in slums are water supply, drainage systems, garbage collection, repair and construction of walkways and improved fire protection.

Land sharing

The legalisation of part of the land for dwellers would be good. The Port Authority could claim the slum area for extension of the port at any time, but eviction would create serious political problems too. Land sharing is one development plan for Klong Toey. According to it the dwellers would leave part of the land they occupy in return for another part of the area. It contains a rebuilding programme for dwellings and an upgrading programme for the remaining parts of the slum as well.

Coordination

There should be closer cooperation between different government and private organisations. Although it has been proposed to establish slum area committees which would consist of both slum residents and city officials, relatively few such committees have so far been recognised. Such committees would definitely help the legal status of the slum residence. Moreover, if slum residents together with government representatives could work together, it would create the best chance for community participation in the decision making process as well as in its execution.

Benefits of living in a slum

The vast majority of people in the Klong Toey slum want to stay in the same area. Many of them are working in the port. People want to live in the city because then there is little or no travelling costs to go to work or to the market to buy the daily groceries. There are also more schools for children to go to. Rents are also lower in the slum areas. Some costs, as for example for house building materials, are very low in the slums. Wives can also earn some money as peddlers and vendors selling for example sweet Thai desserts, fruit or various traditional Thai dishes. The children can help the finances of the family by selling newspapers or flower garlands on street corners, although this is often at the cost of their school studies.

For some dwellers there may also be some more personal advantages. People may migrate to the slum from the same village in the countryside through stories of an easy life in the big city. Then relationships between people can be very close through kinship and common traditions. Occasionally this may also cause burdens when a better-off family is obliged to help a poorer one. On the other hand the slum dwellers are usually ready to help the neighbours to look after the house, small children and old people temporarily when somebody has to go somewhere. Slum people may be more traditional in observing their own cultural customs. This may be seen for example during the Thai new year festival in hot season; residents really enjoy the habit of throwing water on passersby.

Method: Model projects

One way for development in Thailand seems to be to create model areas where one or more of the problems have been taken into consideration and solved in a new way. Then other people can come by and observe what has been done and how. The aim is to motivate people by offering them new ideas in action. The King of Thailand, Rama IX, has used this method frequently in helping farmers in the rural areas.

Concluding remarks

One should not forget to leave room for the local people's own creativeness too when working in another country. It is important to be able to see the problems and to divide them into smaller and smaller components until one part can be dealt with effectively. The small deeds may be like a drop in a bucket but they can be very meaningful and essential for those individuals who are in immediate need. There is need not only for heroic enterprises but also for simple actions.

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DISCUSSION

Mr. Chairman underlined the method proposed by Ms. Kuronen to tackle the huge problems of this big city: cut the problems into smaller and smaller units to tackle them at the end.

Sewerage appears to Mr. Semb to be impossible in conditions such as presented here. But he notices also that if water supply is improved solely, it will increase the amount of wastewater that will dilute the uncollected garbage.

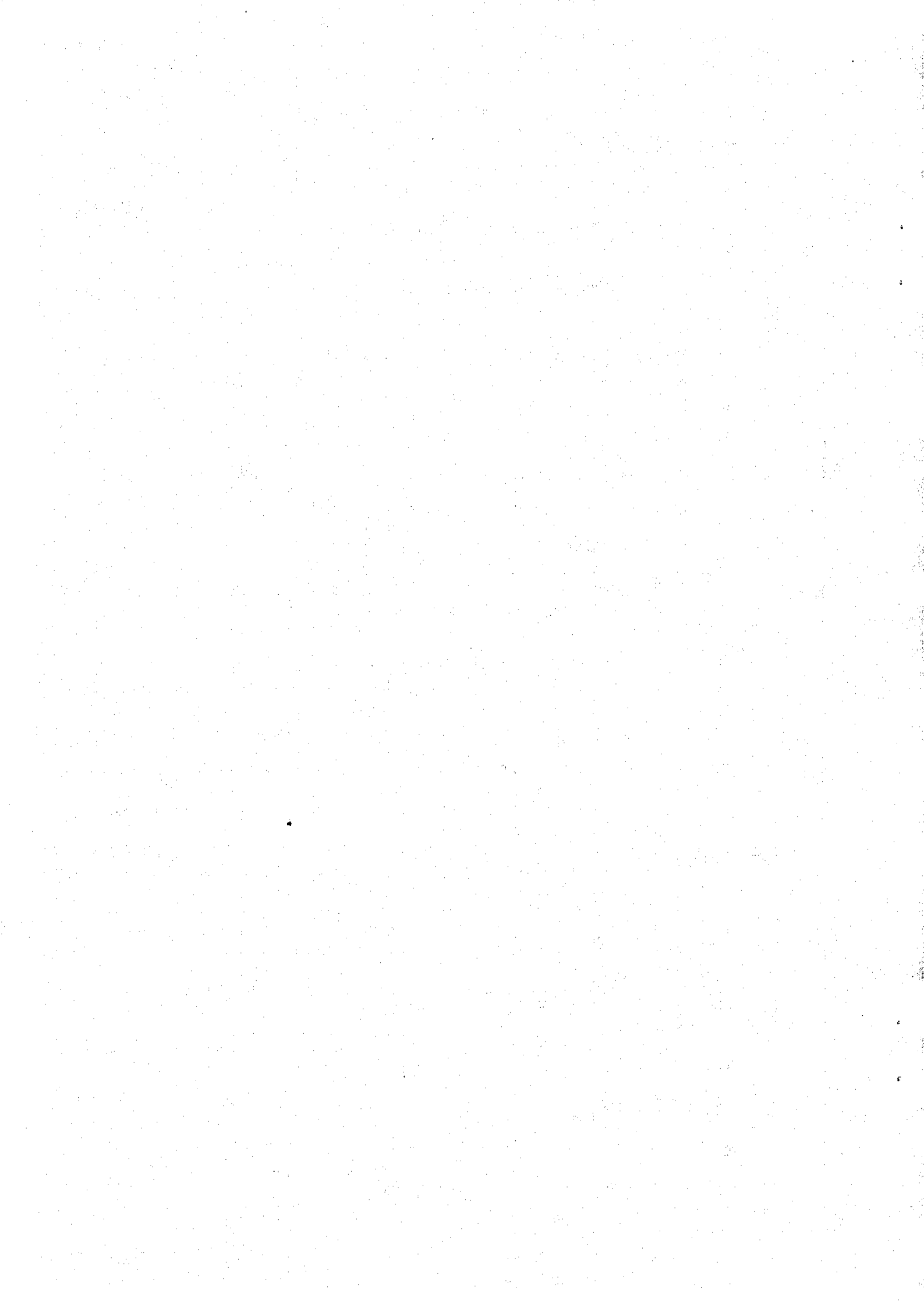
Work is done though, corrected Ms. Kuronen: channels are deepened, houses along channels are demolished and new areas are equipped before-hand for rehousing. Anyway the piped water is not potable without boiling which increases dwellers expenses as it requires energy.

Answering to Mr. Morange who asked whether slums' inhabitants wish to improve sanitation, Ms. Kuronen insured that there are people who wish it, especially educated individuals.

The Bangkok Land Sharing Programme mentioned by Mr. Hukka has brought good results, such as constructions on dry land, according to the reporter. Mr. Morange noticed that in this city the problem of wastewater collection is included in the vast question of drainage.

To answer a question on who do possess the land on which slums of Bangkok are built, it was said that several national institutions and many land speculators possess the land and collect rents which are not low. Several administrations operate in the slum areas to serve the inhabitants, for instance the social ministry, the national housing authority, the health ministry, etc.. Several private organisations (NGOs) work also in the slums.

This amount of external actors would need coordination, commented Mr. Metaferia who has a similar experience from Ethiopia of what he considers as too many uncoordinated actors operating in the same city.



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PRICING OF WATER SERVICES

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PRICING OF WATER SERVICES

1. Inadequate Cost Recovery as the Key Constraint of Water Services

The American Water Works Association (AWWA 1984, cited by Grigg 1986) made a survey of the most severe constraints on the water supply industry. Out of the 24 detected constraints, inadequate rates were considered the most severe one, and several other cost recovery-related constraints were identified.

In 1986-1987 a comparative study was made on the four Nordic-supported rural water supply projects in Tanzania. The study showed that the donors' share of the implementation costs of each project was over 90 percent, in some cases close to 100 per cent. The study pointed out that putting a price on water was becoming absolutely necessary to be able to raise funds for operation and maintenance (Katko 1987).

Many of the developing countries, especially those in Eastern Africa, have since achieving independence had the policy of supplying water totally, or almost, free of charge to rural and urban fringe consumers. One of the most striking examples is Tanzania, which became independent in 1961. The Government started financing all water supply investments in 1965, and in 1970 it even started to cover operation and maintenance costs. It took more than two decades to realise that this policy is not feasible. By 1990 methods of making consumers contribute at least part of the costs were being seriously considered. Yet, the "free water policy" has not so far been abandoned.

The "free water policy" has falsely been considered a solution for the equity objective. Yet, there are many other objectives to water pricing, such as efficiency, financial, public health and environmental requirements (OECD 1987). Carballo (1979) stated that "if what is essential has to be free or cheap, why should not the same criterion be employed to food which just as vital as water?" In Finland a cabinet minister, speaking about health services, stated as recently as 1989 that "the equity principles of the Finnish society require that the most important services related to human life are free of charge". To sum up, whether countries are rich or poor, in the name of the equity services should be free!

2. Consumer's Ability and Willingness to Pay

Traditionally it has been considered that a household can spend a maximum of five percent of its income for water. This criterion is a broad guideline and is not necessarily applicable everywhere, since it does not take into consideration local conditions. Consumers' willingness to pay can be predicted by: (i) asking consumers in advance about their own estimate of their future willingness or by (ii) looking at and monitoring consumers' previous or present behaviour.

The contingent valuation method (CV method) uses questionnaires and bidding games in finding out consumers' own hypothetical estimates of their willingness to pay. Since 1987 this method has been tested in several developing countries. It seems obvious that the CV method can be used successfully either in combination with other methods on actual behaviour, or to create a contingent market when no actual water selling happens.

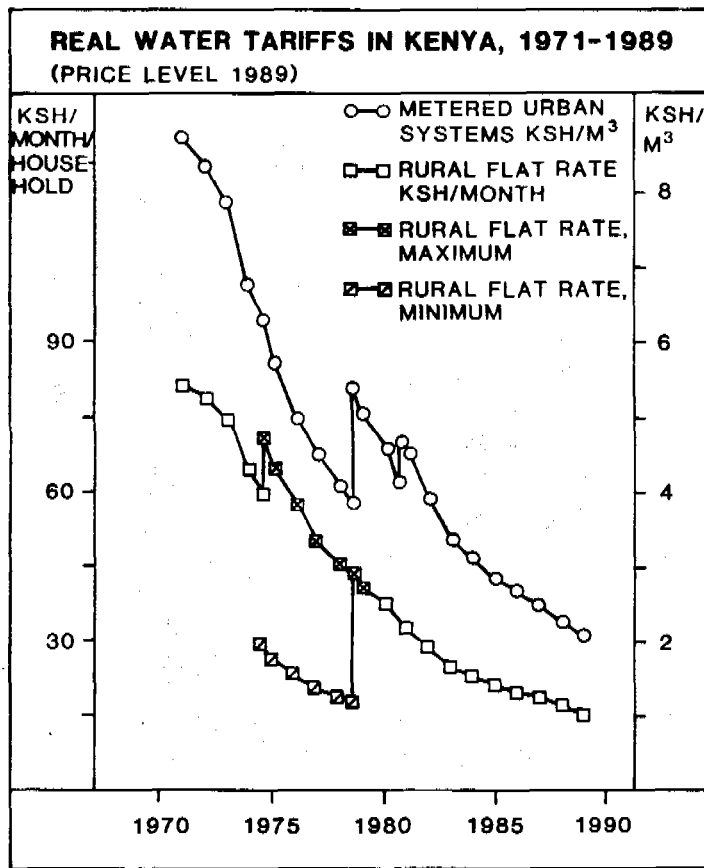
The widespread practises of water reselling and vending demonstrate consumers' actual behaviour and their willingness to pay for operative service. Yet, especially the practises of reselling are hardly documented. These practises have for long been ignored by water utilities, who should try to learn from these activities and improve their own services. Besides, the results of vending and reselling surveys are beneficial in negotiating and renewing water tariffs (Katko 1991). In many developing countries water reselling is officially forbidden and often meter readers or other water utility staff members are to fine the resellers. The author's view is that water utilities should not try to punish consumers for their entrepreneurship, but rather put it to good use. Many of the vending and reselling surveys show that the poor consumers in developing countries already pay substantial amounts of money for operative service, i.e., reselling and vending.

3. Water Tariff Development

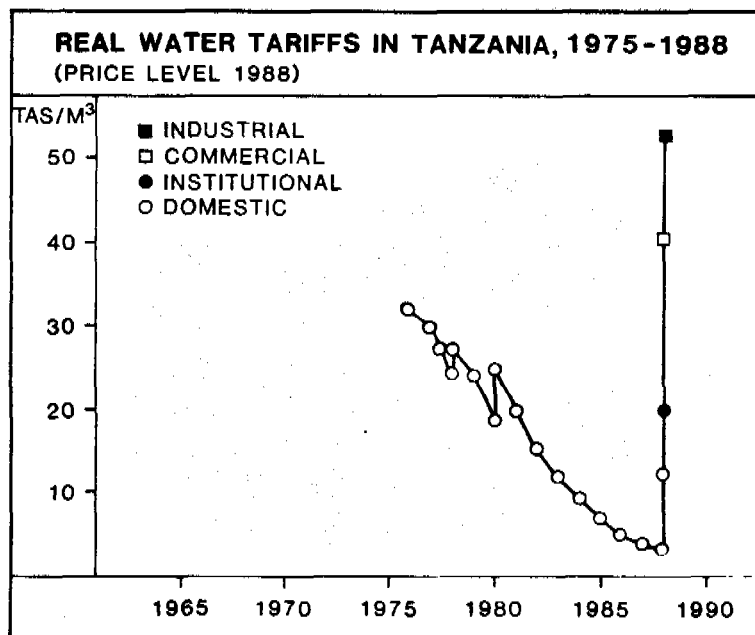
Figure 1 shows the dramatic decline of real water tariffs in Kenya and Tanzania. Ever since their independence in the 1960s they have experienced a sharp decline in water tariffs in real terms. Both countries are recipients of Finnish Development Cooperation in the water sector. The water tariffs are geographically uniform and have to be decided at the Cabinet level. With this arrangement, tariffs can only seldom be adjusted, and then without adequate consideration of inflation and cost increases.

Both the equity and efficiency criteria can be met through progressive tariffs: cross-subsidized minimum block consumption and increasing block rates for higher consumption. In addition to volume based tariffs fixed charges can be used. These should be lower for small water users. Yet, water should not be free for any consumer group except in emergency cases.

By 1991 FINNIDA has supported or planned to support bilateral water projects in Ethiopia, Kenya, Mozambique, Nepal, Sri Lanka, Tanzania, Vietnam and Zanzibar (United Republic of Tanzania). In all these countries the acute need for developing water pricing policies is evident.



a)



b)

Figure 1. Water tariffs in real terms in a) Kenya and b) Tanzania.

4. Fee Collection and Financial Management

Water metering in developing countries should be started with the biggest consumers, the most potential payers. It can then gradually be expanded to individual house connections. Because of the often intermittent supply and possible poor water quality, less sophisticated meters of lower accuracy but higher reliability should be developed and used. Modern meters are often unsuitable. Meter installation, meter reading, billing practises, and revenue collection are other important factors. Many of these functions are often difficult to manage. Especially in urban water supply systems adjustment of rates is not sufficient as such. Equally important are cost consciousness and more efficient billing and revenue collection.

If metering is not feasible, alternative tariffication systems can be used. They can be based on estimated specific water consumption for various purposes, types of housing, types of water fixtures etc. On the whole, imagination should be used in design of water tariffs and collection methods. Charges could vary from on the spot payments to seasonal ones. As Laugeri (1987) stated "Everyone should contribute to the cost, but not necessarily in the same proportion, in the same way or at the same time".

5. Water Pricing as a Policy and Institutional Problem

At the end of the IDWSSD the "Global Consultation on Safe Water and Sanitation for the 1990s" was held in New Delhi, in September 1990. The so-called "New Delhi Statement" pointed out many cost recovery related issues. The background paper stated, e.g., that (Global Consultation...1990):

- * Water is still wrongly considered a resource that has no value
- * The policy of free water has often failed
- * If users don't pay, no one else is likely to

In addition, the New Delhi statement points out the need for strong institutions. Yet, the alternative institutions: autonomous utilities or associations, are not clearly spelled out in the statement. In Eastern Europe, also, pricing in water resources management and environmental protection became highly topical issues in the late 1980s.

6. Future Development Needs

In the long it will become absolutely necessary to introduce wastewater charges. This is very crucial since it means that water bills would more than double, if priced properly. Maybe a dozen of the world's nations do presently collect a major part of the actual costs of sewerage and effluent treatment. Failure to introduce a similar policy will be fatal for the developing countries, many of which already face water scarcity problems.

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DISCUSSION

The subject of this presentation contains one the reasons of the failure of the sector who has more expenses than income, introduced Mr. chairman.

The scientific approach of Mr. Katko to this subject -cost recovery- generally considered as pure business, and his approach considering both developed and developing countries has been very appreciated by Mr. Laugeri. The background of civil engineer of Mr. Katko gives a new point of view in this discussion, and should be taken as an example for students in civil engineering how they should open their curriculum. At the same time it proves that engineers are still usefull.

The research of Mr. Katko does not contain financial aspects, and he thinks that there is no general solution, that each project must analysed separately.

The question of the way to charge customers for very poor or even non-existing service was raised by Mr. Hukka. The malfunctioning of services might be the main reason why people use other services and therefore it is impossible to solve this problem without proper technology, answered Mr. Katko. His magic triangle is Appropriate technology, Cost recovery and Appropriate institutions.

The politicians are considered as a rather difficult component in the sector by Mr. Wihuri. His experience, in several countries, with electoral promises of free water for the immense majority of poor in the name of a democracy, has brought the sector into

bankruptcy. He explains that in reality if the price of water is subsidised for e.g. 50%, the families who use most of water receive most of the subsidies, and these families are not those who use the public taps, but these who have a house connection. The families who can afford a house connection are the better off households, who thus receive most of the subsidies! This illusion sold to the electors has brought the sector into the present situation.

The tariff structure can partly compensate this phenomenon, according to Mr. Katko. He considers the political problem as part of the institutional structure. In Tanzania for example, the policy of free water has favoured centralisation and at the same time has hindered the creation of consumer managed small organisations, like Finnish cooperatives and associations.

The idea that tariff structure could correct the phenomenon of inverse subsidisation presented by Mr. Wihuri was rejected by Mr. Semb. On the contrary, he does not understand why the private sector has not developed to respond to the strong demand on water supply.

In Finland exist a lot of water supply institutions with the private status, noted Mr. Katko, and they are managed in a rather different way than the municipal works. In this country, large bulk water organisations are being created, on a private status too, often with local governments as the main shareholder. According to him in developing countries too exist a lot of small scale private water supply associations or co-operatives, especially in french-speaking countries where private management and operation is rather common.

Mr. Nandiga wondered, what is the reaction of authorities to such ideas in countries where private organisations are not favoured. On the contrary Mr. Katko has never had any difficulty for dialogue, especially with the professionals of these countries who were almost of the same opinion. Some problems might come from persons not belonging to the water sector, concluded the presentator.

The Water Decade has tried to enhance safe water supply, and even to couple it with sanitation, notices Mr. Gigamba. Now one speak about fee collection for a service that people have difficulties to discern: many do not see even the advantage of safe water and sanitation, so that they cannot accept to pay for water that they have had always free, for them things have come too abruptly. He adds that the donors want to go in areas where there is no demand for improvement of the water supply, where there is a sufficient source and thus create the problem of cost recovery. He is quite sure that on the contrary in dry areas, people are ready to pay, almost any price.

Mr. Katko suggests not to generalise and consider case by case. He thinks therefore that more autonomy should be given to each facility, for example to create its own tariff to respond to their real needs instead of the artificial national tariffs. But in Tanzania, as well as in Sweden, exist hundreds of small scale, fully consumer managed water co-operatives of which the officials do not know even their existence.

The concept of free water was then criticised by Mr. Metaferia because he considers that even in the case of subsidisation, people pay for the water supply, not directly, but through the taxation. He thus asks whether water is really free in this case.

In Finland too a part of water supply is financed via the budget and taxation. For him the

main danger is that the money is needed somewhere else and will not be available, so that for him direct charging of the consumer seems to be more appropriate than taxation. This principle should be also valid for the sewerage side, which is the most difficult to finance directly both in developing and in developed countries.

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**INTEGRATED URBAN
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INTEGRATED URBAN DEVELOPMENT AND MANAGEMENT

1. THE URBAN CHALLENGE

Urbanisation is unstoppable.

Urban population growth is fast outracing rural population growth. By the turn of the century, 39 per cent of the population of the developing countries is projected to be living in urban areas¹.

Urban poor as a challenge for Nordic Development Assistance.

The urban social misery is formidable, especially in the fringe areas of the rapidly growing metropolitan cities in the south. If Nordic development assistance is geared only to the countryside, we will miss a significant part of other target groups, the homeless, squatters, woman-headed households (Lund 1988).

From project implementation to urban management.

In the years to come we will be confronted with huge engineering problems in finding solutions to the water supply, sanitation and solid waste needs in urban areas in Developing Countries. These sectorial problems cannot be solved without a broad inter-disciplinary approach. The strengthening of managerial skill and experience, especially at the local level administration, is crucial (Simensen 1987).

Priorities for urban assistance are changing

Based on an analysis of the responses to a survey concerning the OECD donor-organisations' recent and current policies and programmes for assistance to the urban sector in LDCs (4) and other information (HABITAT, DAC/OECD) there is evidence that many multi- and bilateral agencies are giving increased emphasis to the key policy issues in managing urbanisation.

Institutional strengthening is a key issue.

One of the points of consensus is the importance of institutional strengthening: "Multi- and bilateral agencies have an important role in urban management

¹ Global Report on Human Settlements

reform and institutional strengthening through carefully structured training assistance which should help achieve the sustainability and durability of the training activity that is indigenous to the country. Through a process of encouraging and facilitating the transfer of responsibilities from central to local governments, these training programmes also encourage more efficient service delivery, revenue generation and urban management in secondary urban centres." (UNCHS 1988).

New Urban Management Options

The French policies for assistance to the urban sector are summarised in the above-mentioned survey (UNCHS 1988) as follows

1) Reinforcement of local authorities in charge of urban management through transfer of responsibilities from the Central Government to these authorities, with adequate financial resources.

2) Setting up programmes and projects for the benefit of the municipalities, technical and administrative training, management of urban services and urban infrastructure.

3) Supporting decentralised co-operation between French local authorities (city councils) and their counterparts in developing countries (twinning) with the involvement of NGOs and social associations.

The three main changes during the last 10 years have been: - from town planning to urban management

- from provision of new infrastructure to maintenance of the existing networks and services
- from technical to financial knowledge and abilities.

2. URBAN ASSISTANCE - A MOMENTUM FOR NORDIC DONORS

As a conclusion of the above-mentioned trends -the urban challenge (which is also the name of one chapter in the Bruntland Report) - we could state that urban assistance in a manner which supports the social aims of Nordic Development Policies should be reappraised and experimented with. The objective situation calls for bold and innovative action. As far as municipal management is concerned, the Nordic countries, the public administration and the NGOs represent a magnitude of urban management experience which could be transferred in an appropriate way to the urban scene in LDCs.

Why Mozambique and Why Nacala?

FINNIDA has decided, in the context of the country negotiations held in October 1988, that the city of Nacala in Northern Mozambique is the place where a special urban integrated development project will be undertaken with the financial support of FINNIDA. As this is the first project of its kind financed by FINNIDA it can of course be asked:

- why this approach should be taken in a rural country like Mozambique?

Figure 1: Urban services development approaches
(Simensen 1987, modified by M. Mansikka 1989)

ERRATUM

PAGE 92: Figure 1 is to be found on page 94 (upper part)

PAGE 94: Table 1 is the lower part, under the figure

There are, however, good reasons for this:

1) The emergency situation in cities.

South African-backed terror and destruction, drought and the initial poor choice of a rural development strategy have caused a dramatic increase in rural migration (Pinsky 1985). While continuing to favour agriculture and large industry, the apparently less productive structures of the cities should not be abandoned. They are the basis for organised life and economic production for a significant portion of the population, they provide important sources of goods for the countryside and markets for agricultural products, and they can help improve the conditions of the rural population (Dowas 1988).

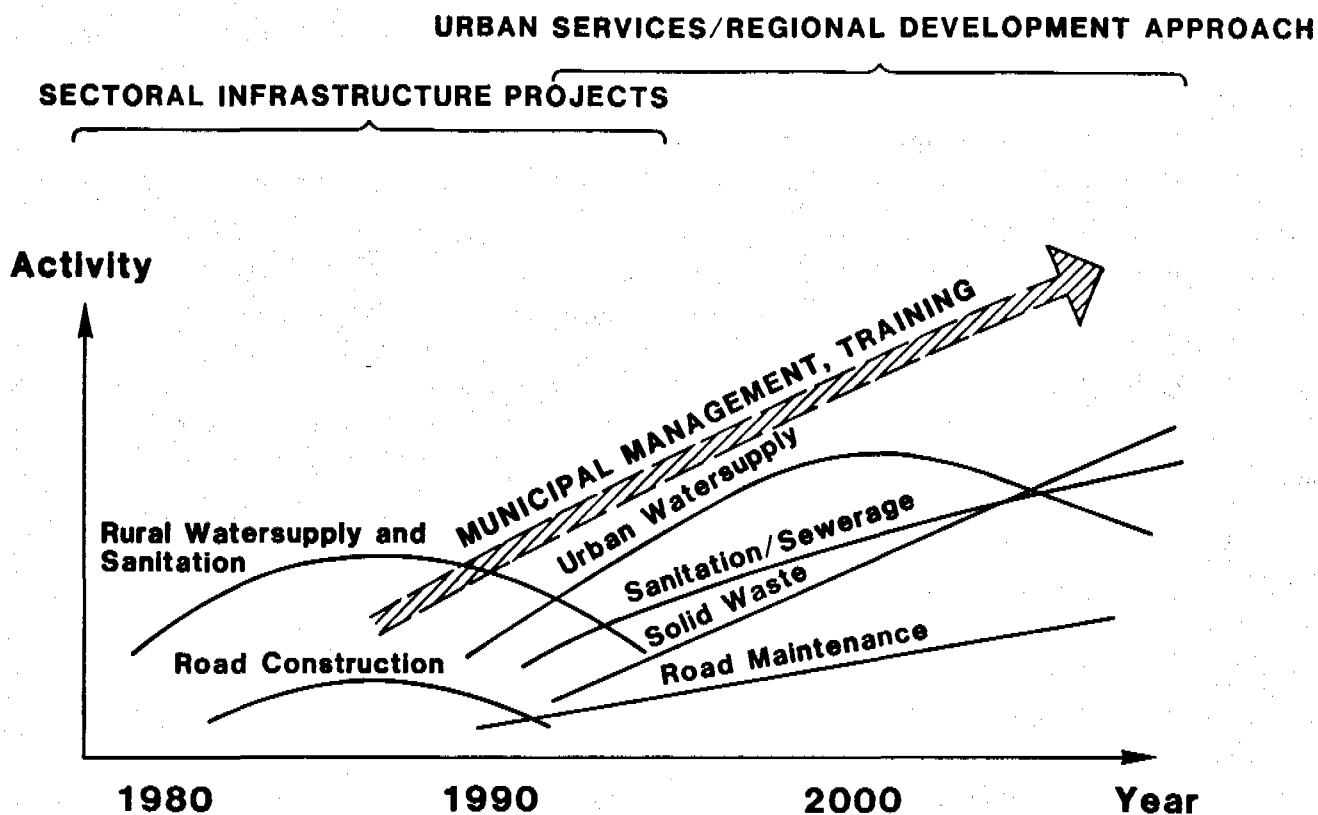
2) Decentralisation Process in Mozambique.

At a Seminar on Local Government Management arranged by the World Bank, and co-financed by FINNIDA in Maputo last September the findings were that Mozambique has started a political and administrative step-by step process towards strengthening the financial autonomy and technical capacity of local government in the country. At the seminar, training was repeatedly pointed to as a new factor in the development of the municipal sector (World Bank 1988).

3) More emphasis on software is needed.

The Nordic countries have, together with other donors, given priority to major infrastructural projects such as telecommunications, power generation, port construction etc. Sufficient attention has not been paid to the "software" required to run these investments (SIDA 1988). In addition to the Limpopo and Beira "corridors", Nacala is also part of a corridor from Mozambique to Malawi. The necessary "hardware" development in the port of Nacala should be supported by the socioeconomic development of the city. This is, in fact, the central argument in locating the urban development project in Nacala where FINNIDA is already supporting the third phase of the container terminal construction.

Table 1: Outline for Municipal Management strategy chart for Nacala



Defining the management problem	Categories of solution	Example of possible solutions (studies, actions)	Operational synthesis
*Which are the regional factors causing population growth? *Which are the effects on employment, trade and social life of the opening of the Nacala-Cuamba-railway? *What do carrying capacity calculations suggest for the urban growth control? *What are the aspirations of people concerning urban structure and services? *Which are the causes behind soil erosion? *Are there problems in the social mobilization of people? *What measurements of the problem do we need to set in place?	People	*Develop a participatory approach with delegation of authority at the local level *Support self-help shelter construction	1. Understanding the politics and getting commitment 2. Developing participation 3. Household and farming systems studies 4. Master plan for training 5. Using resources efficiently for replicability 6. Management for sustainable economic and environmental development 7. Umbrella approach: developing long-term commitment 8. Break-through action: emergency project in erosion control 9. Re-evaluation of planning principles and construction standards 10. NGO-liaison/involvement 11. Donor coordination
	Environment	*Carrying capacity studies *Experimental nurseries *Train people in small-scale environmental improvement	
	Economics, policy	*Review of taxation and tariff policies *Mobilization of the resource base *Relaxation of central and regional financial control	
	Institutional	*Develop integrated planning and monitoring practices *Train technical and community development staff *Awareness raising workshops	

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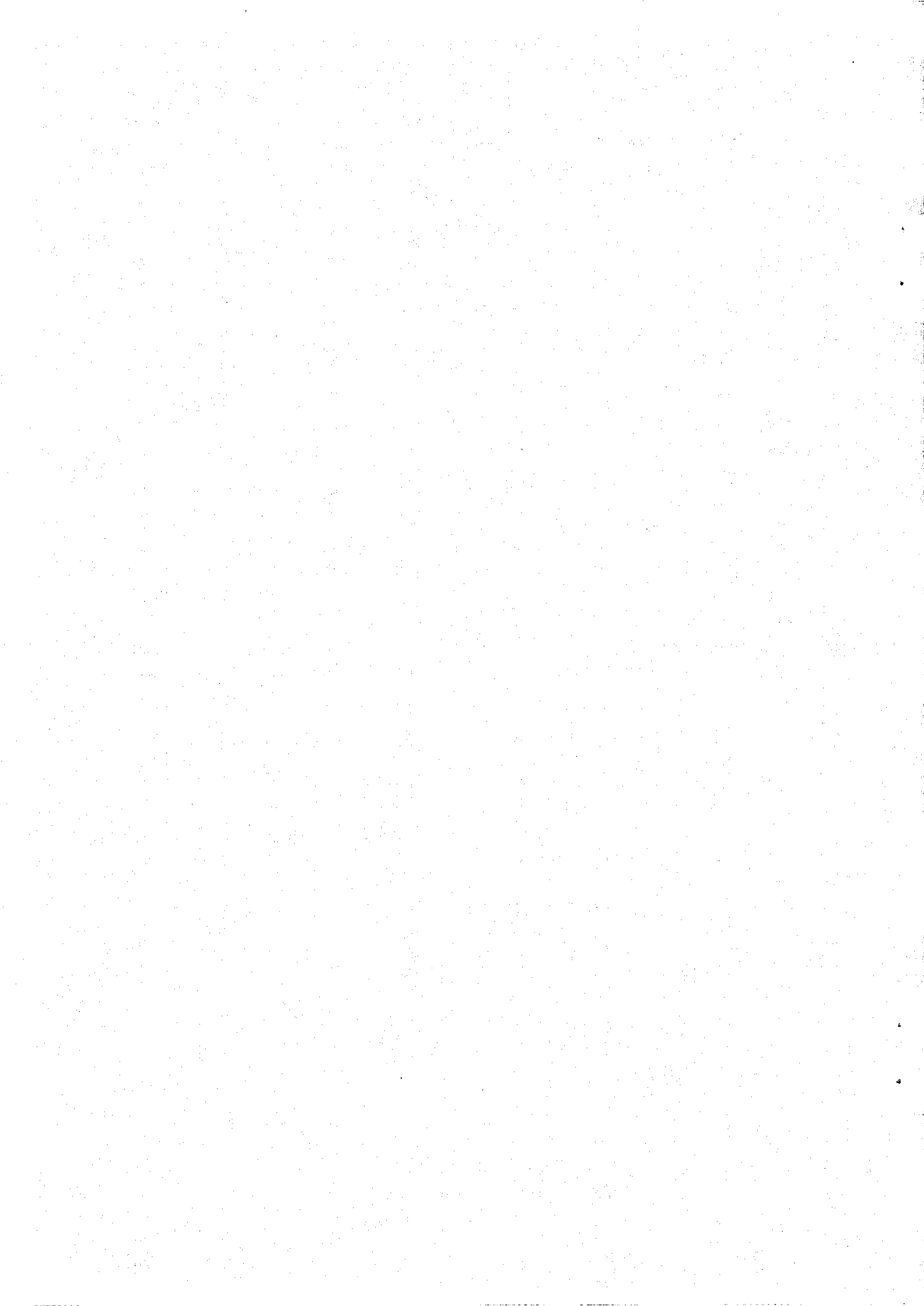
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1 BACKGROUND

1.1. Water Resources

Global water resources are estimated at approximately 1400 million km³. Only 14 000 km³ or 1% of this is available as a recyclable natural resource suitable for meeting various water demands. The remaining 99% consists of ocean water, glaciers and inaccessible ground water. Most of the water needed for domestic use, agriculture, livestock and industry is presently taken from lakes. Developments in ground water technology have made large-scale utilisation of shallow and medium deep aquifers possible as well.

At present, the total global consumption of water is approximately 2600-3500 km³ annually. The available fresh water resources are in principle sufficient for meeting both present and future demands. However, global water resources are very unevenly distributed. Shortages of water supplies place restrictions on social development in many locations. The majority of these are found in developing countries, particularly in Africa.

1.2. Utilisation of Water Resources

Water is a necessary prerequisite for nearly all of society's operations. It is essential to domestic life, agriculture, livestock, industry, energy production and water transport. Water systems can also serve as valuable nutritional stores through fishing and the utilisation of aquatic vegetation. As these various needs for water compete with one another, a one-sided utilisation of water resources creates conflicting situations and diminishes the potential for other uses. This could lead to environmental deterioration, sometimes of an irreversible nature. The compounded economic losses to society caused by unbalanced water management may prove irreversible even in the case of short-term projects. The long-term economic impact of environmental damage can often be even more disastrous. Short-sighted misuse of a water source may compound the social and economic pressures already existent in many developing countries.

The use of land and of water are interrelated. In drawing up a water supply plan it is essential to take into equal account all the various needs for water, often in conjunction with land use management. Thus also water supply and sanitation programmes must be seen as a part of the multi-purpose use of waters. Only in this way will it be possible to prevent the damage and destruction due to one-sided utilisation of water courses.

The social effects of an adequate and safe water supply can be significant. Improvements in health conditions ease the pressure on health services, releasing more resources for development and alleviating human suffering. The amount of time and energy which women in particular spend on carrying water in developing countries could be freed for income-generating activities as well as social development and interaction. At the same time an organised water supply can serve the interests of social equality.

2 OBJECTIVES AND GENERAL STRATEGY

The Significance of Water Supply and Sanitation in Achieving Development Cooperation Goals

Water supply and sanitation development is one of the most important sectors in Finland's social development cooperation work. The aim is to improve the national level of public health in accordance with the aims of the developing country concerned, and to promote social development through improvements in water supply and sanitation.

Water supply and sanitation projects tend for the most part to be local projects focusing on serving a sub-standard section of the recipient country or otherwise essential area from the point of view of its development. In this way Finland seeks to support development cooperation and the attainment of the latter's goals.

3 FINNIDA'S DEVELOPMENT COOPERATION IN WATER SUPPLY AND SANITATION

3.1 Bilateral Projects

Finland's water supply sector is distinguished by three distinctive features:

- The urban water supply is of high quality by international standards and takes advantage of modern technology;
- the water supply systems of rural communities are normally independent companies run by the users themselves;
- and in sparsely populated regions many people rely on their own wells.

This experience with the water supply sector, in addition to recent international experiences, serves as a good foundation for the country's participation in water supply projects for development cooperation.

3.2. Resources

The implementation of water supply and sanitation projects funded by FINNIDA usually presupposes the involvement of various Finnish professionals. Educational backgrounds of the professionals include engineering, hydro-geology, economics, social science, education and health care.

Finnish expertise continues to be in demand in water supply and sanitation development cooperation. A shift in project orientation is taking place, with an increased emphasis being placed on the assistance for the recipients' own water sector programmes. This requires change also in the qualifications of the Finnish professionals as they will increasingly act as supporting rather than implementing staff.

4 OBJECTIVES AND OPERATIONAL MODELS OF THE WATER SUPPLY AND SANITATION SECTOR

4.1. Target Groups

Water supply and sanitation projects are mainly directed at population groups in rural areas with water supply systems at a nationally substandard level and at urban areas lacking adequate water supply. The aim is the promotion of social equality through assisting in fulfilling basic needs for water and sanitation services, in accordance with user capacities.

Other main beneficiaries are the target country's own organisations responsible for water supply and sanitation. The goal is to upgrade their capacities and abilities to carry on improvements without external assistance.

4.2. Objectives

Long-Term Objectives

The overall objective in water supply and sanitation projects is the improvement of health conditions of the target population and provision of opportunities for equal social development and economic growth. Another goal is improvement in the use and protection of water resources. The environmental settings must be a fundamental consideration for all projects. Lasting results can only be obtained through environmentally sustainable projects.

In order to provide users with the capacity to operate, maintain and expand water and sanitation facilities in the future themselves, the aim is to develop operational and economic structures for maintenance and upgrading in conjunction with the beneficiaries and recipient organisations.

Operational Models

The operational models of development cooperation in the water supply- and sanitation sector are:

- the support of projects comprehensively promoting social development in cooperation with other social development sectors
- protection of water sources and improving the operation, maintenance and management of water supply systems
- upgrading the sector organisations and thereby enabling autonomous responsibility for water supply and sanitation development
- the support of projects based on an awareness created through health education and community involvement
- continuous upgrading of planning and implementation of water and sanitation projects
- development of international cooperation and donor coordination

The approach chosen for each target and the reasons behind it are as follows:

Support of Water Supply and Sanitation Projects Promoting Comprehensive Social Development

The most important aim of water supply and sanitation projects is the improvement of public health. Through this economic gains may also be obtained from the project. By expanding water supply and sanitation coverage social equality is promoted as well.

1. In order to promote the improvement of health conditions and the advancement of economic growth people must be guaranteed an adequate amount of safe water to meet their basic needs year round. For improvements in water supply to be effective, the standard of hygiene must be raised through health education and sanitation improvements.
2. Water supply and sanitation projects are to be planned in such way that the basic needs of the lower-income segments of the population in both rural and urban areas are met.
3. The needs of the various population groups and the local culture must be taken into consideration in the planning and implementation of the project.
4. Water supply and sanitation services should support economically productive operations which are environmentally sound.

Development of the use, maintenance and protection of water sources and facilities.

Water is a renewable natural resource which is vital to all living creatures and economic operations. This valuable natural resource must be used sustainably without causing any damage to the environment or water resources.

5. Water supply and sanitation projects must be environmentally sustainable.
6. Water supply and sanitation projects must be planned and implemented to include a solid foundation for the operation, maintenance and upgrading of the systems--technically, financially and from the point of view of skills.

Strengthening of Sector Institutions

One of the most important forms of development cooperation is the long-term improvement of the administrative and technical capabilities of sector institutions. One aim of the water supply and sanitation sector is the development and strengthening of the responsible recipient organisations in order to enable them to eventually take over operation of the sector without external assistance.

7. The development of personnel resources within the water supply and sanitation organisations is supported at all levels for the upgrading of institutional capacities.
8. The operational infrastructure and financial viability of water supply and sanitation organisations should aim at self-operation and the development of economic and efficient services.
9. Prospects for the private sector to support the public sector must be considered in water supply and sanitation projects.

Support of Projects Which Create Public Awareness Through Community Involvement and Health Education

The success of rural water supply and sanitation projects in particular is directly based on the recipients' needs and resources in both planning and implementation. The users must be actively involved in the decision-making process for all stages of the project. The possibilities and requirements for user participation in urban water supply and sanitation projects must always be clarified as well.

The development of water supply and sanitation will only benefit public health if the habits and behavioural patterns related to water and hygiene are improved. This in turn requires awareness of those factors which affect personal health and how they can be adjusted, as well as encouraging the initiative for making such changes. A well planned and implemented health education programme can bring about these results.

10. Participatory models must be adhered to in projects as a guiding principle. All stages of the project must be based on the personal needs and capabilities of the beneficiaries, who are to be actively included in the various stages.

11. The need and motivation to improve the existing situation and to change behavioural patterns should be encouraged through comprehensive health education. For this reason the health education organisations of the recipient country itself should be supported, in such a way that a continuous process of health education independent of the project would be created.

Improvements in Water Supply and Sanitation Planning and Implementation as a Continuous Process

In recent years production-oriented approach has been replaced that supports the developing countries own development efforts. Consequently, training, planning and development of implementation methods, in addition to the improvement of operational procedures and management as well as the financial management of organisations are the most important fields of operation. One aim is the improvement of the partner country's ability to take over the responsibility for sector development. This demands continued improvements in the planning and implementation, in order that projects would at all times respond to the changing conditions and needs of the recipient country.

12. Project planning must be developed in such a way that project objectives are clearly and realistically defined, based on existing conditions and implementation possibilities. Project planning must comprehensively cover all aspects necessary for the attainment of targets such as health education, improvements in operational systems and procedures, training, development of financial viability and the use of appropriate technology.

13. Projects must be comprehensively planned to ensure that they contain the operations required for the attainment of all objectives.

14. Support given to the development of labour resources and organisations must be based on long-term considerations.

15. Project planning must be a continuous process, based on a dynamic assessment of needs and resources, and on knowledge gained from project evaluation.

Development of National and International Cooperation

Most of the target countries within the sphere of Finnish development cooperation have not had a clearly defined strategy for water supply and sanitation which would effectively guide the donors. For this reason individual donors have operated according to their own guidelines and traditions. This has resulted in a diversity of operational methods and the technology selected. This has complicated matters for the recipient organisations of the target countries and even led to reverses in development.

16. Development cooperation within a given sector must comply with the guidelines adopted by each country. In order to bring consistency to these goals, coordination in the target country must be actively encouraged and participated in.

17. International coordination should reduce opposing operational models and supporting principles and policies which promote sustainable development.

Quantitative Targets

Approximately 10% of Finland's bilateral development cooperation funds are to be used for the support of water supply and sanitation development. Rural development projects will likewise continue to receive support. In addition financing for urban water supply and waste water projects addressing environmental concerns will be increased. The leading principle in all support to the water supply and sanitation sector is that the necessary preconditions should be established in order to achieve sustainable development. In this way quantitative aims will not overtake qualitative ones.

DISCUSSION

The first question, of Mr. Gigamba, concerned the cooperation between donors, which seem not to exist in Tanzania. The 22 regions of this country are shared between the donor agencies and thus do not know what happens in the neighbouring regions.

FINNIDA is aware of this problem, but on one hand the recipient countries are sovereign states, so that for Mr. Wihuri, the duty for collaboration lies within the hands of these governments. They realise the need for consultation and have annual sectoral meetings with the other Nordic agencies, being aware that it is almost as talking in the back of recipient countries. Thus the responsibility must remain that of the recipient governments.

The comment of Mr. Semb concerns the ratio between rural and urban investments. The majority of people live in rural areas, but the citizens need more investments. The paper presented suggests to reverse the ratio 60/40% in favour of urban. For Mr. Semb, the change is in the right direction but might be insufficient. The issue is also controversial in Norway. Mr. Wihuri considers this as a purely political issue and could not precise to Mr. Katko the similar ratios for the other Nordic countries' policies.

The idea to support, instead the poorest most in need, those who are able to later subsidise the poorest, received the support of Mr. Laugeri, who then asked what class of population has been chosen as the target group. The approach defended by Mr. Wihuri is geographical, the assistance being designed to a whole area to reach self-supporting. The design targets those who have just enough money to support the project, preferring local tariffs, and as short money routes as possible and the target group is defined in each case separately and in consultation with the recipient country's authorities in order to follow the policy of this country.

Mr. Hukka asked how Finnida's urban projects take into account service client development, the accountability of customers, and also what will be the future proportion between loans and grants. The answer was that some efforts have been done, the attitude of civil servants is changing, but Mr. Wihuri thinks that progress is still needed. The decision between loans and grants is political, but generally the poorest countries receive more grants, as well as rural areas still for a long time.

Louis Laugeri

**URBAN
WATER SUPPLY AND SANITATION
BEYOND THE DECADE**

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URBAN WATER SUPPLY AND SANITATION BEYOND THE DECADE¹

1 END-DECADE (1981-1990) PROGRESS REVIEW

1.1 Service Levels

The most encouraging achievement of the International Drinking Water Supply and Sanitation Decade has been the large increase in the number of rural dwellers with access to safe water supply. Less encouraging are the reports on sanitation, which has continued to receive less attention. However, the 1990 service levels indicate that the momentum created by the establishment of the Decade has eventually resulted in breaking a never-ending cycle: previously, water supply and sanitation development had in many countries been restricted to rehabilitation and extension of urban facilities, with the objective of maintaining a tolerable service level, compatible with sound commercial practice, for those who were the most likely to contribute to the welfare of the water industry. In some cases, the development of rural water supply and sanitation had seemed to be postponed indefinitely.

The results of the Decade therefore show a marked deviation from the traditional pattern of sector development. In urban areas, the proportion of population served has remained stable, as a result of the dramatic urban population and water consumption growth rates registered in most countries. Efforts have been made to improve the quality of the supplies; thus the proportions of town dwellers supplied with water through house connections, and benefiting from adequate sanitation facilities, have increased significantly.

By the end of the Decade, about one-fourth of the urban population is still deprived of adequate water supplies, while one-third is without adequate sanitation.

1.2 Prospects

In the absence of any evidence that urbanisation might slow down, it appears increasingly difficult to bridge the gap between supply and demand in urban water supply and sanitation. The cities of the developing world are faced with prospects of depletion and pollution of their water resources, dramatic increases of the population groups at high health risks, and growing difficulties in the provision of services as a result of the proliferation of slums. Although some progress has resulted from the implementation of Decade approaches (see §1.3 and §3.1) in urban poor areas, in some cases even these approaches should be revised, or at least the resources available should be considerably increased to ensure their success. However, some difficult decisions to be taken in order

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to improve cost recovery and cost containment, may be even more important than the resources to be allocated.

In most urban areas of developing countries, the few rich people become fewer and less rich in relation to the growing mass of newly arrived poor who must have water at low cost. While average household incomes decrease, the cost of drinking water supply and wastewater disposal increases as a direct function of demand, as no economy of scale can compensate the growing cost of mobilising and treating new water resources. One drop of water out of three is lost in distribution, the two which remain are sold to the rich at half of their cost price, while only the poor pay to the water vendors a true market price. It is only by improving cost containment and cost water vendors a true market price. It is only by improving cost containment and cost recovery that the total coverage objective adopted by most governments can be regarded as feasible.

1.3 Merits and Shortcomings of Decade Approaches

According to the recommendations of the Mar Del Plata Action Plan, Decade approaches have given priority to the unserved populations, particularly in urban poor and rural areas, to the formulation and implementation of autonomous and self-sufficient action programmes, to the use of socially relevant systems, to community involvement at all stages of development, and to coordination of water supply and sanitation programmes with the other elements of primary health care and with other concerned sectors.

As these various approaches differed considerably from the conventional models, the concept of water supply and sanitation development has changed in the framework of the Decade. Its previous definition corresponded for most countries to a continuous extension of service areas, which would be achieved through gradual decentralisation of structures and resources, so that coverage would be extended from capital cities to medium-size towns, then to the larger rural agglomerations, and then to the small villages. Although logical, this model has proved difficult to apply, essentially because it does not adequately account for the dramatic growth of urban poor areas, and the constant rehabilitation and improvement needs of existing systems, which result in giving better water to those already served, rather than extending the service to new population groups.

As urban and rural programmes were to be developed simultaneously, and were given equal importance, transfers of resources had to take place from urban to rural areas. The limits of the decentralisation potential of the water supply and sanitation agencies appeared more clearly, and emphasis was placed on the role of communities. However, these should have access to support structures, and the absence or insufficiency of such structures in water supply and sanitation create difficult problems, requiring an intersectoral approach, in order to involve more decentralised sectors such as Public Health or Rural Development.

Large differences have been noted in numerous cases between the theoretical approaches and the concrete reality of development during the Decade; urban water supply often continued to have the preference of investors, and sanitation was in most cases neglected; projects sometimes continued to be imposed on the communities rather than undertaken by them; sector agencies, particularly in water supply, continued to act in isolation. Water supply and sanitation have remained costly in relation to other elements of primary health care programmes, in which therefore they are not easily integrated; finally, the approach which consists in undertaking "pilot" projects in the hope that they can be "replicable" has proved even more questionable in water supply and sanitation than in all other elements of primary health care.

While it would have been vain to hope that the development pattern of a very traditional sector could be changed within ten years, the need for such a change has not been

questioned, and it has been clearly expressed in national plans. Increased efforts have been made in rural and urban poor areas, not only to improve coverage, but also to promote health education and community involvement; however, it could not be expected that such efforts give visible results as early as 1990.

Because the absorptive capacity of the countries and of the water supply and sanitation agencies is one of the most important criteria for project appraisal, loans have tended to flow towards the relatively more affluent developing countries, and water supply projects, particularly in the urban subsector, have continued to absorb the largest share of international aid. There are signs, however, that policies are changing to correct the imbalances between water supply and sanitation and between rural and urban projects, a number of bilateral agencies now report a concentration of activities in rural areas. Funds are also made available for support programmes, particularly in training and health education, operation and maintenance, community participation and institutional development. Still urban water supply has great advantages over other subsectors, particularly because of the existence of a reliable institutional framework, the availability of prepared projects, the short time required for appraisal and implementation, the easy political, socioeconomic and public health justification, and the possibility to recover costs.

1.4 Serious Oversights

Even in urban areas, water supply and sanitation services could become less and less affordable to the poorer population groups as the result of both conceptual errors and deliberate ignorance of true facts. In developing countries, most urban agglomerations have fast-growing low-income districts, while residential and industrial consumptions are at best stagnant. Long-term master plans showing constant increases in demand and decreases in cost are often not much valid beyond their first phase.

As it is difficult for a private company to start water supply and sanitation operations in a developing country, because access to both the water market and the financial market is restricted, there is little or no competition which would result in lowering costs.

Non-revenue water remains constantly high, so that new investment is constantly required, even though demand has not increased to the extent which was anticipated, and cash income has been much less than needed for expansion. Official institutions sometimes do not pay their bills. Industry often abstracts and rejects large quantities of water with its own private installations, thereby keeping outside of a public system to which it should contribute. There is also a need to account for sewerage costs, because they do or will exist. If large consumers continue to pay a decreasing share of the water bill, if half of all water produced remains lost or otherwise unpaid-for, if industries are allowed to pollute the environment on the grounds that sewerage is too costly for the community, and if hygiene education remains inadequate, then the poorer people will in fact be penalised to the point where they will return to unsafe sources, rather than pay a high water bill.

Where resources are scarce, the objectives of extension and sustainability of the service are often conflicting. Disputes may arise as governments promote the extension to the entire population of water supply and sanitation services, while agencies have as their objectives the continuity and improvement of the supply for those who are already connected or otherwise served by the public system, and the maintenance of their sanitation facilities. It is certainly easier to improve progressively the quality and quantity of water sold to the richer and larger consumers than to take the chance of extending the service to the poorer districts of large cities, or of allowing communities to manage their own supplies in urban poor areas. Another reason for the preference of some agencies for rehabilitation projects is that they provide the most economical solution to the problem of leakage in water supply systems.

2 PLANNING BEYOND THE DECADE

2.1 Needs Assessment

Before the beginning of the Decade, it was recognised that most countries were in need of assessing their current situation, and the ability of their on-going plans and projects to be expanded to meet the goal of universal coverage by 1990. During the Decade, most governments have constantly refined their planning and reporting systems for community water supply and sanitation, with the result that today, they are capable of up-dating their sector development plans as a matter of routine, especially in urban water supply and sewerage.

It is of course advisable that every government undertake a detailed assessment of the population which still remains to be covered by water supply and sanitation services. But this assessment should now include more precise data than was generally the case in 1980. Coverage should be defined by population groups and service levels, and needs should be ranked in order of priority. In urban water supply, the total population to be served by private house connections should be assessed, and the service gap should be identified as the difference between this total population and the population currently served with house connections. To provide a sound basis for future planning, the gap should be not only identified and measured, but also localised in urban groups defined by population brackets, e.g. agglomerations of 3 000 to 10 000 inhabitants. AS was experienced in rural water supply during the last decade, the number and size of agglomerations and the number of water points (or projects) is generally more important than the volumes of water, except in towns where the capacity of the existing system is about to be insufficient to cover future needs; the towns in which such shortages are to be expected should be identified.

The last phase of the urban water supply coverage assessment should concern that part of the urban poor subsector which cannot be supplied economically through house connections, and which for some time will have to rely on public standposts or other forms of communal supply. Here also, the gap should be defined essentially in terms of missing water points and number of projects to be undertaken.

In order to provide a realistic basis for future planning (especially with regard to absorptive capacity), the assessment should be concluded with a comparison between recent progress in coverage and water demand growth rates; the cases of industry or tourism or municipal demand should be treated separately.

As in water supply, urban sanitation needs should be analysed to show separately the number of unserved people who live in areas where sewerage is the most appropriate technology. The presentation of data should be in the same form as in water supply, with emphasis on number and size of population groups requiring sewerage or other forms of sanitation. The essential of these presentations should concern used water and excreta disposal; other forms of sanitation, such as solid waste disposal or stormwater drainage, should also be mentioned, not in terms of volumes, but rather in terms of number of areas without adequate installations or services, classified as previously by population brackets.

2.2 Large Rural Agglomerations and Regional Systems

The staff in charge of assessing water supply and sanitation needs in preparation for plans beyond the Decade should focus their attention on those population groups and coverage programmes which in recent years have constituted bottlenecks. Of major interest is the segment of the rural population which is acquiring urban characteristics from the point

of view of water supply and sometimes sanitation, as a result of growing population density and high water needs within the agglomeration itself, migration of a temporary or permanent nature, or existence of a number of rural agglomerations in a regional setting with urban water supply characteristics. Each of these situations is typical and well documented: small dwellings at the gates of large cities (in Morocco), rural agglomerations of 10 000 to 50 000 inhabitants (in Zaire), regional systems including several villages (in Cameroon) or several hundreds of villages (in Turkey).

In all of these cases, different organisations are in charge of urban and rural water supply and sanitation; the distinctions are for instance as follows:

- in Cameroon and Morocco, all agglomerations which are not administratively defined as urban are rural; there is no provision governing the Case of villages which are subject to rapid immigration, and have more than 5 000 or 10 000 inhabitants before they are officially declared urban;

- in Turkey, one agency provides water to agglomerations of less than 3 000 inhabitants; other agencies provide water to agglomerations of 3 000 inhabitants or more; there is no provision for dealing with rural agglomerations which become urban within a short time;

- in Zaire, the urban water supply agency is in charge of financially feasible water supply projects; large rural agglomerations may thus benefit of urban-type systems if they have urban-type densities and economic conditions.

In all of these cases, and in many other countries, there are insufficient provisions for dealing with the population which is rapidly moving from rural to urban areas, and which, temporarily or for a long time, is at high health risk as a result of inadequate infrastructure and dwelling conditions. These settlements should be clearly identified in urban water supply and sanitation sector plans.

2.3 The Water Cycle

As urban population and water demand grow, the new water resources which must be mobilised to satisfy the priority needs of drinking water supply are more and more distant and polluted. In large cities, contrary to what happened in past decades, it can hardly be envisaged that water supply projects could be undertaken without prior study of their immediate and long-term effects on the water resources, including an analysis of technological options to ensure the provision of adequate installations for the collection, treatment and disposal of waste waters, and in some cases for wastewater reuse, whenever this is warranted by climatic and economic conditions.

In Malaysia and other countries, it has been shown that in a situation where water resources are abundant and reuse cannot be envisaged economically, the cost of sewerage should be included (although shown distinctly) in the selling price of water: consumers will generally pay for sewerage if it is associated with water supply on the same bill. This is even true for those consumers who enjoy the benefits of urban sewerage only indirectly, as demonstrated in the case of Ivory Coast, where many people living in Abidjan pay a sewerage charge in addition to their water bill, as a contribution to general environmental protection efforts, although their houses are not connected to the sewerage system.

Where they are economically and technically feasible, wastewater reuse projects have three major benefits they protect the water resources from pollution; they provide a substitute for fresh water, in all cases where the rate of withdrawal is higher than that of

replenishment of the resource; and they provide an incentive to construct urban sewerage works: the longer the water cycle, including multiple reuses, the lower the cost/benefit ratio, and the easier the overall economic justification of a sewerage project, at least in those regions like the Maghreb or the Sal where water resources are scarce. In order to accelerate national programmes of sanitary disposal of human excreta and liquid waste, more research should be devoted to the public health, environmental and overall economic benefits of wastewater reuse projects, and more specifically to their resources conservation and protection aspects.

The above suggests that water supply projects should not be planned without due consideration of their sanitation correlates, that sewerage projects should not be appraised without identifying the benefits which they provide in terms of protection and conservation of the resource to be used for water supply and other purposes, and that wastewater reuse projects should not be envisaged without accounting for their benefits with regard to both water supply and sewerage. In urban projects, the end-product is "clean" water; the water cycle should be envisaged as a whole, every time a water supply, sewerage or reuse project is planned or appraised; similarly, water tariffs should include provisions to pay for the hygienic disposal of used water, whether as water-borne sewage, or after reuse, or in any other state.

2.4 The Case for more Efficient Services

In developing countries, many water supply systems are intermittent, many sewers are clogged, many treatment plants do not work and are bypassed. This situation may be due to inappropriate design, lack of manpower and other resources such as funds, materials, energy or equipment, and sometimes neglect or lack of discipline. Similarly, because Ministries of Health have insufficient staff on their water supply and sanitation services, the qualitative surveillance of water supplies is sometimes insufficient, even in the case of reuse.

The consequences of excessive tolerance with regard to the quality and reliability of the service, even though based on evidence that resources are lacking, have been far too important to be overlooked. The manager of a large water-consuming industry will be reluctant to pay his water bill to an agency which is half bankrupt as a result of its inability to collect arrears from government. Similarly, if this industry has its own private water supplies, for instance through a borehole, it will be difficult or impossible for a public utility to convince it to connect to the public system, or to enforce any regulation to that effect, if all that is offered is an unreliable intermittent service. In order to reduce the health hazards of wastewater reuse, the types of crops to be irrigated may be subject to regulations; these however will not even be considered if the agency is unable to guarantee the quality of the effluent which it provides for reuse.

Many large consumers do not pay for water. They have an excuse for keeping off the public system, on the grounds that this is unreliable and in some cases dangerous. Most urban communities tend to postpone investment in sewerage in order to avoid paying for the service. The largest consumers and the main pollution agents derive benefits from this situation.

The case of the poor is even worse, as they are sometimes provided with improvements which are hardly noticeable, at prices which are high for them. Communal installations, for instance, are often not acceptable, and it is useless to plan and construct them if they are not going to be used; this has been true for instance of communal latrines in many parts of the world; it is even true of public standposts in some cases.

Even in situations where resources are scarce, there is therefore a case for planning expensive works. The threshold of wastage of resources is the limit beyond which

planners should not go, and this limit may be very high. Half of all water produced is unaccounted-for, or remains unpaid-for for other reasons. The water sector is a unique case of such large losses, and therefore provides a unique opportunity for highly cost-effective measures such as systems rehabilitation, preventive maintenance, and strict enforcement of regulations and penalties aimed at reducing wastage and fraud and controlling private supplies. This is another opportunity to spend relatively large amounts of money on relatively minor repairs without being prodigal.

3 ACTION LINES FOR THE 1990S

3.1 Action Lines '84

After the first three years of the Decade, a consultation was held in WHO in 1984 to review the Action Plan which had been developed at the UN Water Conference in Mar Del Plata, Argentina, in 1977, and to formulate new lines of action to facilitate the implementation of Decade approaches and the attainment of their objectives. Six action lines were thus defined as follows:

1. Emphasise rehabilitation and operation and maintenance.
2. Mobilise local money.
3. Linkage with primary health care.
4. Decade promotion campaigns.
5. Better use of human resources.
6. Reemphasise Decade concepts:

(a) complementarity of water supply, sanitation and health education, (b) water quality and health, (c) community participation and choice of technology, (d) water resources management, (e) external finance.

3.2 Action Lines '90

After seven more years of implementation, the principles and approaches of the Decade appear to remain valid and useful for the definition of future programmes. Thus the issues raised in the context of action line 6, from 6(a) to 6(e), provide the framework for planning and evaluating urban water supply and sanitation projects, which emphasise health education, water quality, community participation, appropriate technology, protection and conservation of water resources, and mobilisation and optimum utilisation of external finance.

Similarly, the five other action lines continue to apply well to urban water supply and sanitation projects. Emphasis should be placed on rehabilitation and operation and maintenance (action line 1) if the issue of high levels of unaccounted-for water is to be addressed. It should be kept in mind, however, that rehabilitation of existing works does not by itself provide solutions to the problems of those urban poor areas which are totally deprived of service. Rehabilitation is generally less expensive than the construction of new works, and like preventive maintenance, it provides low-cost solutions to the problems of existing installations; however it is not a substitute for the large extensions required in most urban networks.

The mobilisation of local money (action line 2) was understood as finding substitutes for government and external funds, generally in the private sector. Privatisation of urban water supply has been quite common, especially in the more developed countries, because urban water demand is steady, and urban institutions and markets are usually efficient. In some rare cases like Malaysia, it has also been attempted to privatise urban sewerage, despite the low level of recognition of this service by its users, and the resulting low financial performance of sewerage agencies; however, sewerage is privatised in some developed countries. In Malaysia, even rural water supply has recently been largely privatised.

Matters of public interest cannot easily be vested in private hands in the absence of strict regulatory mechanisms, especially in sectors like water supply which have direct public health implications. Government interventions are therefore required to ensure that services will be extended to the less-privileged, that best use will be made of national resources, and that a private water company can remain viable without charging exorbitant prices to other sectors of the economy.

A more efficient way to implement action line 2, with the same understanding that local money should be mobilised, is to emphasise the concept of cost recovery from users of the service, which is usually well accepted in urban water supply and sanitation. The past decade has revealed development problems associated with lack of liquidity in urban water supply and/or sewerage agencies or companies. For these agencies, liquidity maintenance has become the primary objective of cost containment and cost recovery. The general failure to recover the full cost of water supply and sewerage services from large and rich consumers has also been recognised, and action in this direction is certainly warranted in the next decade. It will also facilitate privatisation.

Linkage with primary health care (action line 3) remains an essential condition of progress in urban water supply and sanitation. In 1984, it was essentially conceived as a way to mobilise some of the resources of the health sector, particularly primary health care workers in rural areas. In urban areas, the issue can be addressed differently. The resources of the health sector should of course be mobilised for promotion and education, essentially in urban poor areas. However, in view of the advanced level of the technology required to supply large cities with drinking water or to provide them with hygienic collection and disposal of wastewater, there is generally no efficient substitute to the conventional public utility model.

Other types of linkage with primary health care seem to be more important to meet the specific needs of urban areas. As the achievement of sustainable community water supply requires liquidity maintenance and therefore cost recovery, urban water and sanitation tariffs should be high enough to ensure that this objective is continuously attained: government should give priority to the provision of urban water supply and sanitation services in their investment programmes; people should be willing to pay for these services.

Urban water supply and sanitation agencies and community organisations often find it difficult to convince their governing bodies and user groups that projects in their sectors have high benefits. Many of these organisations suffer from liquidity problems which make them unattractive to investors. The recovery of financial costs becomes increasingly difficult as service is extended to the less-privileged, and project appraisal based on financial criteria alone results in unfair discrimination between potential beneficiaries, so that development is often limited to improvements for the sole benefit of those already served.

There is a clear need to document and promote the awareness of the health benefits to be expected from well managed water supply and sanitation facilities. This has been the

subject of numerous country requests, and of a specific recommendation of the recent WHO/UNDP Water Supply and Sanitation Consultative Meeting of Pacific Island countries (Suva, Fiji, 26 June - 1 July 1989).

Decade promotion campaigns (action line 4) to encourage the generation of reports on successful and innovative projects, are intended to increase public awareness of water supply and sanitation benefits, and are therefore linked to action line 3.

Improvements in the development of human resources (HRD - action line 5) have resulted from numerous programmes involving both the individuals to be trained and the institutions to be developed, in the context of a "dual-focus" approach. Efforts will continue in this direction in the 1990s, but more emphasis should be placed on the priority issues identified in a recent assessment of HRD policies and programmes:

- absence of a coherent HRD policy integrated with development policies in other sectors of the national economy;

- lack of well trained senior HRD professionals;

irrelevance of curricula to the real needs of providing basic water and sanitation (services) to under-served populations and improving employee performance;

- inefficient deployment and utilisation of available human resources.

The enhancement of the role of women and women's organisations, the development of attractive career paths to reward competent staff, and the establishment of functional relationships between community participants and government-paid workers, are other important development actions which should be continued in the nineties.

3.3 Conclusion

The new action lines proposed can therefore be defined as follows (figures in parentheses refer to sections in the text):

- Action Line A. investment plans to meet the demand of population groups on the basis of priorities and technology choices (2.1, 2.2).

- Action Line B. Effects on water cycle to be included in assessment of costs and benefits of water supply, sanitation (including sewerage) and wastewater reuse projects (2.3).

- Action Line C. Improve performance with regard to the quality and reliability of the service (2.4).

- Action Line D. Promote cost recovery from all beneficiaries (2.4).

- Action Line E. Study the consumers' market in order to avoid providing population groups with types of services for which they are not willing to pay (2.4).

- Action Line F. Plan urban/urban poor investment mix (including rehabilitation and extension) designed both to reduce water losses and to extend coverage (2.4, 3.2-1).

- Action Line G. Promote privatisation subject to strict government control (3.2-2).

- Action Line H. Document public health benefits of water supply and sanitation to enhance willingness to pay and encourage investment (3.2).

DISCUSSION

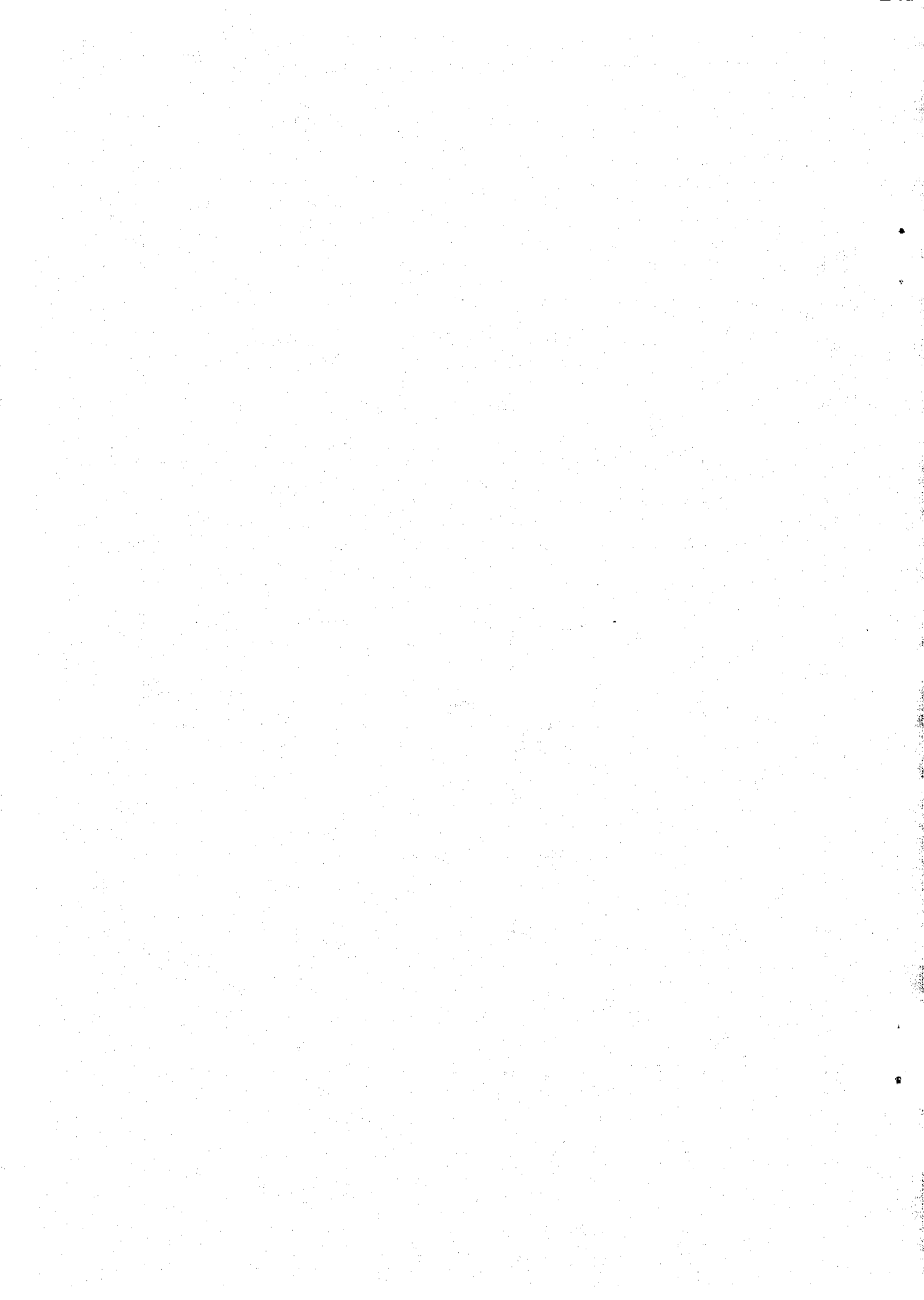
The population of developing countries have a different structure than that of richer countries noticed Mr Semb and precised that particularly, the proportion of richer people is very small. Thus he concludes that subsidies given by the richer part of the population to support the whole of service are sufficient in Europe, but they cannot be sufficient in poor countries where only a very small fringe of the population will have the minimum revenue to subsidise the service. The market forces and adequate tariff appear to be solutions to avoid inefficient systems where people are queuing for hours.

Mr Laugeri said that simple privitisation does not exist, and that privitisation cannot bring automatically good framework, and both private and public system have advantages and inconvenients. Privitisation is often used as a fashionable argument in his opinion. Parts of water agencies can be privatised, temporary contracts can be signed, nothing more.

Mr Laugeri mentionned that the expectations of the IWSSD were too ambitious to expect the developing countries to do so much in 10 years of time. The same things took more than 2 to 3 generations in the developed world.

Prof. Viitasaari is worried by the developments of the policy defended in this paper. Water supply alone has been said to have no effect on health, then it was connected with sanitation, this again is not sufficient, now health education is suggested to be connected to all projects. But Prof. Viitasaari wonders what health education can be: the effects on public health can be measured only on the scale fo several generations. A study conducted by Mr Laike in Ethiopia proved that women are not taking care of spreading the information on hygiene. Health education must thus be defined.

The ambition of Mr Laugeri is not to define action lines for the whole world. In the past, WHO has controlled construction, given master plans, etc, but will now concentrate on new roles that are to be defined, but will be less instrumental and more for reflection.



LIST OF PARTICIPANTS

NAME

INSTITUTION

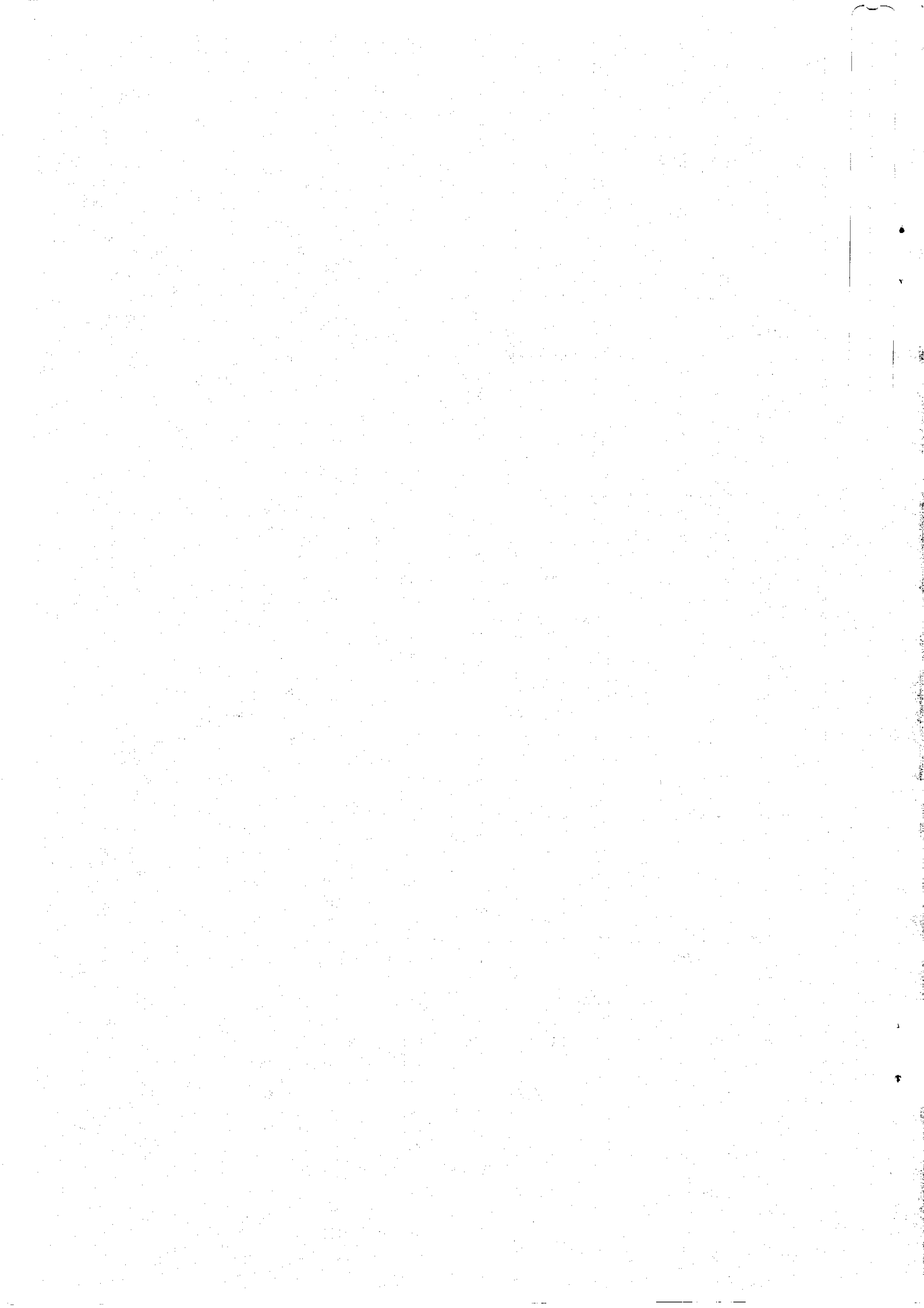
Invited speakers:

Mr Jarmo Hukka, researcher	Tampere University of Technology (TUT)
Mr Tapio Katko, researcher	Tampere University of Technology
Ms Seija Kuronen	Finnish Evangelical-Lutherian Mission
Mr Louis Laugeri, technical officer	World Health Organisation (WHO)
Mr Mikko Mansikka, Councillor of Construction, Ministry of the Environment of Finland	
Mr Amha Yesus Metaferia	Metaferia Consult International, Ethiopia
Mr Tore Semb	Norconsult International A.S., Norway
Mr Heikki Wihuri, Water Supply Advisor, FINNIDA, (Chairman of the seminar)	

Other participants:

Ms Hanna Amdebirhan, student	TUT, Pg-course, Ethiopia
Mr Haile Mariam Dessalegn, student	TUT, Pg-course, Ethiopia
Ms Haregwa Gebreselassie, student	TUT, Pg-course, Ethiopia
Mr Julius Jigabha, student	TUT, Pg-course, Tanzania
Mr Boniface Karanja, student	TUT, Pg-course, Kenya
Mr Enock Kitandu, student	TUT, Pg-course, Tanzania
Mr Olli Lento, project engineer	Soil and Water Ltd., Finland
Ms Lucy Macharia, student	TUT, Pg-course, Kenya
Mr Edmund Mahugi, student	TUT, Pg-course, Tanzania
Dr Damas Alfred Mashauri, resear.	TUT, Water and Environmental Engineering
Mr Hugues Morange, researcher	TUT, Water and Environmental Engineering
Mr Bigambo Nandiga, student	TUT, Pg-course, Tanzania
Mr Argaw Neway, student	TUT, Pg-course, Ethiopia
Mr Pekka Pietilä, Course Director	TUT, Namibia-course, Finland
Ms Kirsi Porvali, Program officer	FINNIDA, Finland
Mr Mussa Ramadhani, student	TUT, Pg-course, Tanzania
Mr Pentti Rantala, Director	AIR-IX Consulting Eng. Ltd., Finland
Ms Anu Rosendahl, Director	Finnconsult Ltd, Finland
Mr Meshack Saboke, student	TUT, Pg-course, Kenya
Ms Sirpa Sandelin, Senior lecturer	TUT, Pg-course, Finland
Mr Osmo Seppälä, Course director	TUT, Pg-course, Finland
Mr Erik Sjöberg, Project coord.	Ministry of Environment, Finland
Mr Erkki Tiainen,	Plancenter Ltd., Finland
Mr Alemeshet Tsegaye, student	TUT, Pg-course, Ethiopia
Mr Joseph Thuo, student	TUT, Pg-course, Kenya
Ms Marjut Valtonen, engineer	Vesi-Hydro Consulting Eng., Finland
Dr Matti Viitasaari, Professor	TUT, Water and Environmental Engineering
Ms Yemarshet Yemane, student	TUT, Pg-course, Ethiopia

TUT: Tampere University of Technology



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