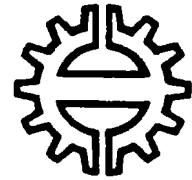


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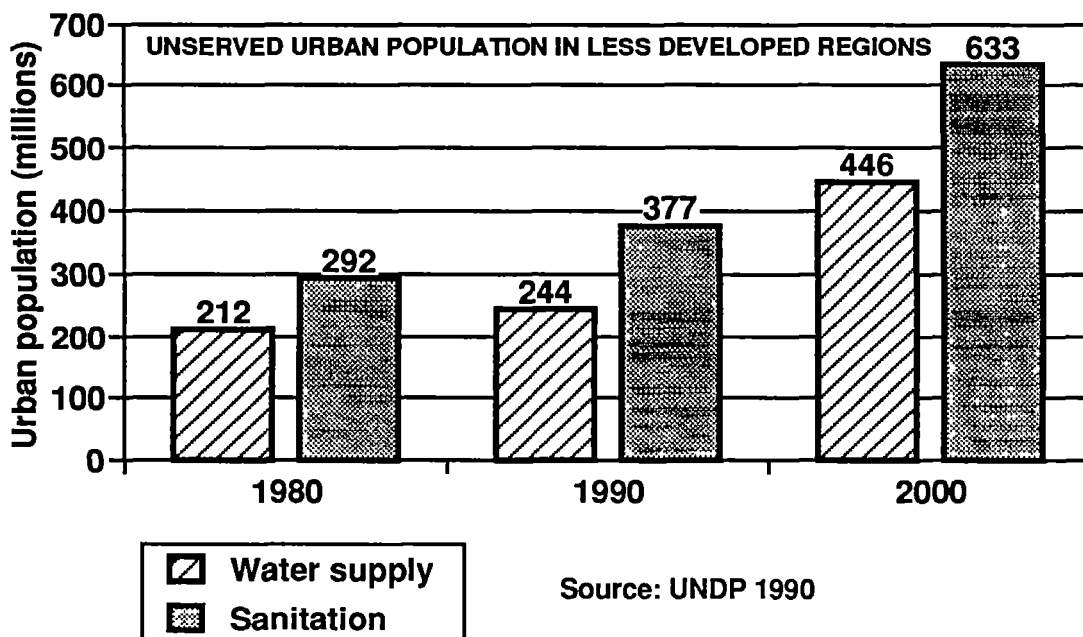


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SUSTAINABLE PERI-URBAN WATER AND WASTE MANAGEMENT INFRASTRUCTURE

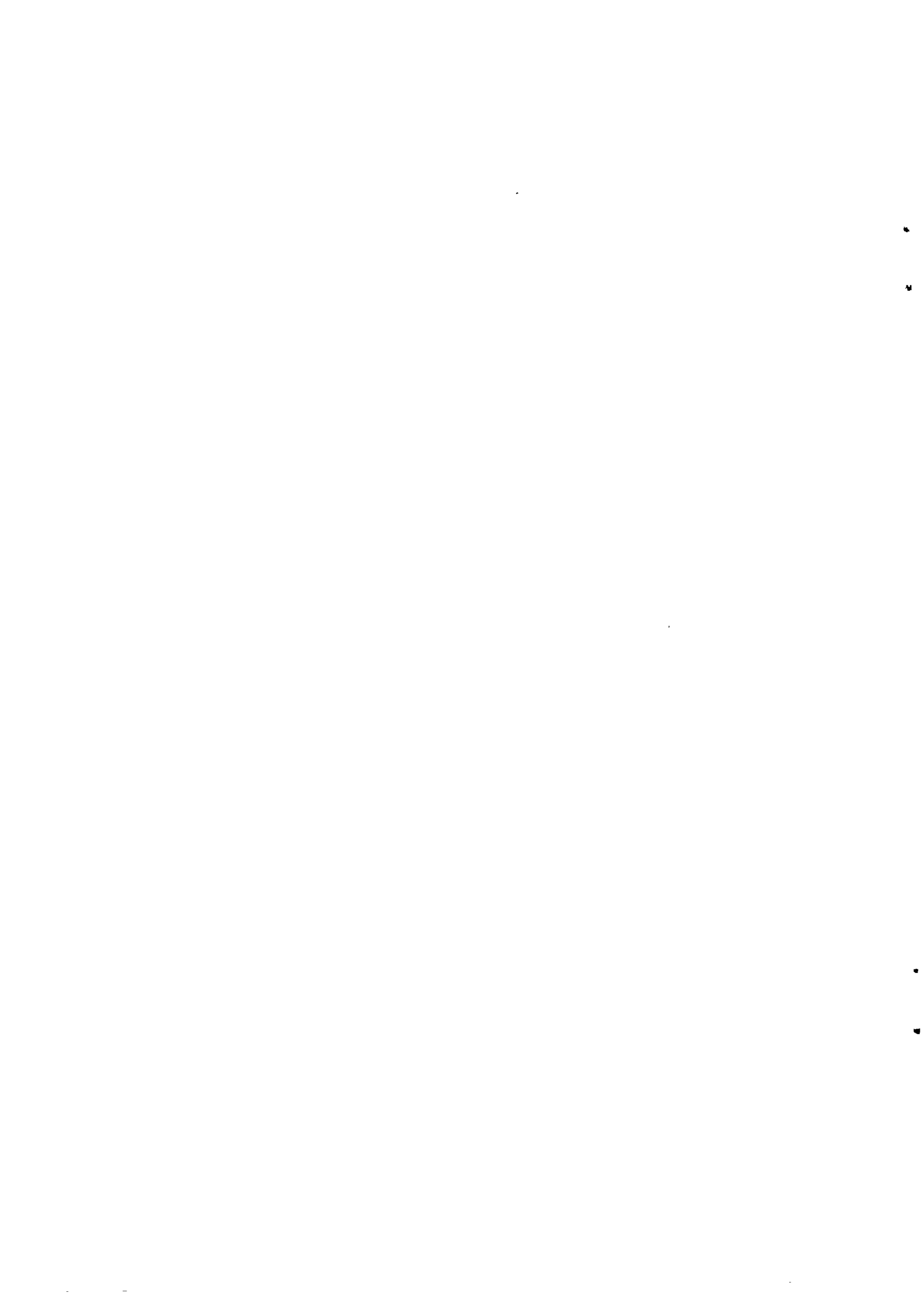
A model for the future



Tampere, Finland 1994

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PREFACE AND ACKNOWLEDGEMENTS

"You can check out any time you like, but you can never leave."

Eagles, Hotel California, 1976

This is a research paper prepared at Tampere University of Technology, Institute of Water and Environmental Engineering (TUT/IWEE), Finland. This paper is based almost exclusively on the literature and documentation review from 1990 to 1994. This paper will be available only in English.

I have written this paper particularly keeping my mind on the development of the cooperation between Finland and the developing economies. My interest in development cooperation was first brought into daylight with the little help from my friends in the 2nd Postgraduate Course in Water Supply and Sanitation organized by IWEE from 1979 to 1981. It has hopefully mellowed along the experiences in the Cayman Islands, in Sri Lanka and in several other countries, but especially at IWEE headed by professor M. Viitasaari. I highly appreciate his leadership and views. My friends at IWEE involved in the development cooperation activities, Sirpa, Tapsa, Reijo, Osku, Harri, Pekka, Hugues, Alfred, Laike and many others together with participants in various courses, seminars and symposia IWEE has organized have created an inspiring and encouraging working environment. The discussions with the members of the Water Supply and Sanitation Collaborative Council's Working Group on Urbanization in Siena, Italy and with Mr Amha Yesus Metaferia in Ethiopia and in Finland, with Dr P.M.A. Odira and Mr E.N. Nyangeri in Kenya, and with Dr D.A. Mashauri and Dr Abebe Laike Selassie in Finland have greatly improved this paper. I have got the valuable background documentation from various sources, notably from the experts in The World Bank, UNCHS, FINNIDA and WASH. I wish to express my gratitude to these swell colleagues.

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The views and interpretations are those of the author, and should not be attributed to Tampere University of Technology or to any of its departments or institutes, or to any individual acting on their behalf.

Finally, I thank my wife Tarja for her patience and understanding during the project. She constantly reminded me gently: "Isn't it ready yet?"

Tampere, May 1994

Jarmo J. Hukka
MScTech., Senior Research Associate

ABSTRACT

The objective of this study was to define a hypothetical future model for the institutions responsible for the management tasks regarding peri-urban water and waste management infrastructure in developing economies. The model is based on a core vision, i.e. on "an evolutionary hypotheses". The comparison of the future mode with the "real-world" is hoped to make a contribution to economically, socially and environmentally sustainable development.

It is estimated that in developing countries 810 million people in urban areas will require safe water services and 950 million will need adequate waste management services, if full coverage is to be conceived by the year 2000. The health problems resulting from the lack of water supply and sanitation facilities are great among the urban poor living in overcrowded peri-urban settlements. Deficiencies in the environment are the cause of 80 percent of the sickness in the world and between 10 and 25 millions deaths every year. The peri-urban families suffer most when municipal governments cannot provide the basic infrastructure. The diminishing, polluted and poorly managed water resources, environmental pollution and constrained economic growth are the other consequences of this agony the whole nation has to face in many developing economies in the future. The other elements exacerbating the consequences are: underdevelopment; government's budgetary and administrative crisis; shortage of foreign exchange; government's weak revenue bases; the bias of discrimination against low-income families; and absence of political will to change from urbanization paradigm to peri-urbanization paradigm.

Many experiences show that institutional arrangements, weaknesses and malfunctions are the major causes of ineffective and unsustainable peri-urban water and waste management infrastructure. A soft systems methodology developed by Checkland and modified by Mannermaa to tackle ill-structured problems in societal systems was used as a research methodology in this study. Mannermaa has modified the original methodology into a direction more suitable for the futures research. The formulated future model for the water and waste management organization indicates that, even if the organization itself would be properly designed, sound and even customer-oriented, the environmental constraints, i.e. government's policy and legal framework with respect to peri-urban development and infrastructure do not provide the required accountability and service provision from the peri-urban customers' point of view. One of the key environmental constraints is the lack of financial self-sufficiency of the organizations. Therefore they have a restricted power to provide the accountability and successful services to different stakeholders, since that power will depend on the environment of the organizations. Their responsibilities cannot exceed the given power and freedom to act.

The diagnosis of the future model with the real-world situation implies that—also in donor assisted urban infrastructure development activities—the project-level interventions alone do not have much impact on the sustained peri-urban infrastructure. Therefore much greater attention has to be paid to poorly conceived policy and legal frameworks. This requires capacity building to create an enabling environment, where the water and waste management institutions can operate successfully and be responsive to the customers. The capacity building must be done regarding the following two interrelated concepts: strengthening of institutions and development of human resources. Although education and training at all levels are essential, instituting the leadership for a successful quality organization requires first of all well educated managers. The leadership and people are basic elements of the management culture which creates an environment that responds quickly to stakeholders' needs and expectations. Incorporating total quality's values and philosophy in the organization is a must—in addition to the use of common sense—in order to serve also the peri-urban communities on sustainable basis.

Key words: peri-urban, water and waste management infrastructure, sustainable development, evolutionary futures research, soft systems methodology, institution, capacity building, accountability, total quality management

TIIVISTELMÄ

Tämän tutkimuksen tarkoituksena on muodostaa tulevaisuusmalli instituutioille, jotka vastaavat kehitysmaiden kaupunkien köyhimpien asuma-alueiden vesi- ja jätehuollosta. Evolutionaariseen hypoteesiin "ydinvisioon" perustuvan tulevaisuusmallin ja nykytodellisuuden vertaamisen tavoitteena on tunnistaa muutosmahdollisuuksia, jotka luovat pohjaa kestäväälle kehitykselle.

Kehitysmaiden kaupungeissa on arvioitu olevan tarvetta lisätä vesihuoltopalvelujen kattavuutta 810 miljoonalle ja sanitaatiopalvelujen kattavuutta 950 miljoonalle ihmiselle vuoteen 2000 mennessä. Terveyshaitat johtuen puutteellisista vesi- ja jätehuoltopalveluista ovat vakava ongelma erityisesti tiheään asutuissa slummeissa ja hökkelilyllissä. Veden määrään tai laatuun sekä puutteelliseen ympäristöhygieniaan liittyvät haitat ovat syy 80 prosenttiin kaikista sairastumistapauksista maapallolla ja johtavat vuosittain 10. . . 25 miljoonaan kuolemaan.

Kaupunkien köyhimpien asuma-alueiden perheet kärsivät eniten, kun kaupungit eivät pysty järjestämään teknistä perusrakennetta. Ehtyvät, saastuneet ja huonosti hoidetut vesivarat, ympäristön pilaantuminen ja heikko talouskasvu ovat seurauksia, joista koko kansakunta joutuu kärsimään. Alikehittyneisyys, hallitusten budjetti- ja hallintojärjestelmän kriisit, valtion heikko tulopohja, köyhempien väestönsien laajamittainen diskriminointi ja puuttuva poliittinen tahto muuttaa kaupunkisuunnittelun lähtökohtia—teoriat ja mallit eivät huomioi slummien ja hökkelilylien tarpeita ja kasvua—lisäävät seurausten vaikutuksia.

On havaittu, että institutionaaliset rakenteet, niissä ilmenevät heikkoudet ja virheelliset toimintatavat ovat pääsyy tehottomaan ja nopeasti rapautuvaan vesi- ja jätehuoltoon. Tutkimusmenetelmänä käytettiin Checklandin kehittämää pehmeää systeemimetodologiaa, joka on tarkoitettu joustavaksi ja yleiseksi kehikoksi ongelmanratkaisulle inhimillisissä systeemeissä. Mannermaa on kehittänyt alkuperäistä metodologiaa tulevaisuudentutkimukselle paremmin soveltuvaksi.

Vesi- ja jätehuolto-organisaatiolle kehitetyn mallin avulla voidaan todeta, että vaikka organisaatio siinänsä olisi hyvin suunniteltu, tehokas ja vieläpä asiakaslähtöinen, organisaation ympäristössä olevat rajoitteet, esimerkiksi hallituksen periaatteet ja lainsäädäntö liittyen köyhien asuinalueiden ja niiden peruspalvelujen kehittämiseen, eivät anna mahdollisuuksia tuottaa palveluja ja ottaa asiakkaat huomioon parhaalla mahdollisella tavalla. Suurin ympäristörajoite on omarahoitusvelvollisuuden ja siihen liittyvän vastuun puute, ts. organisaatiot eivät voi kattaa palvelujen tuottamisesta aiheutuvia kustannuksia niiden myynnistä saaduilla tuloilla. Organisaatioilla ei ole korkeintaan kuin osavastuu toimintansa rahoituksesta. Niitä voidaankin vaatia tuloksellisuutta vain niiden toimivallan ja toimintamahdollisuuksien puitteissa.

Tulevaisuusmallin ja nykytodellisuuden diagnostisointi osoittaa, että infrastruktuurirakentamisen hanketasolla tehtävillä toimenpiteillä ei ole paljonkaan vaikutusta siihen, että toteutetut tekniset järjestelmät toimisivat kestäväen kehityksen periaatteiden mukaisesti. Tämä koskee myös kehitysyhteistyöjärjestöjen rahoittamia infrastruktuurihankkeita. Entistä suurempaa huomiota tulee kiinnittää tuloksellista toimintaa ehkäiseviin epäkohtiin periaatetasolla sekä lainsäädännössä. Tuloksellista toimintaa suosivan ympäristön kehittäminen edellyttää institutionaalisten rakenteiden ja valmiuksien muutoksia.

Organisaatioiden toiminnan kehittämisessä täytyy huomioida kaksi toisiinsa sidoksissa olevaa pääkohtaa: instituutioiden vahvistaminen ja henkisten voimavarojen kehittäminen. Vaikka koulutus on tärkeää kaikilla organisaatiotasoilla, asiakastyytyväisyyteen tähtäävä laatujohtaminen vaatii hyvin koulutettua ylintä johtoa. Asiakaslähtöinen johtajuus ja ihmiset ovat keskeisessä asemassa yrityskulttuurissa, jonka päämääränä on vastata nopeasti eri sidosryhmien tarpeisiin, vaatimuksiin ja odotuksiin. Asiakaslähtöisyyteen perustuvan johtamisjärjestelmän arvojen ja filosofian omaksuminen organisaatioissa on talonpoikaisjärjen käytön lisäksi tärkeää palveltaessa myös kehitysmaiden kaupunkien köyhien asuinalueita.

Avainsanat: kehitysmaiden kaupunkien köyhien asuinalueet, vesi- ja jätehuolto, kestävä kehitys, evolutionaarinen tulevaisuuden tutkimus, pehmeä systeemimetodologia, instituutiot, institutionaalinen kehittäminen, palvelukyky, kokonaisvaltainen laadunohjaus

SUSTAINABLE PERI-URBAN WATER AND WASTE MANAGEMENT INFRASTRUCTURE

A model for the future

Table of Contents

	Page
PREFACE AND ACKNOWLEDGEMENTS	1
ABSTRACT	2
TIIVISTELMÄ	3
TABLE OF CONTENTS	4
LIST OF TABLES	6
LIST OF FIGURES	7
LIST OF BOXES	8
ABBREVIATIONS AND ACRONYMS	9
SUMMARY	11
1 INTRODUCTION	16
1.1 Urban challenge	16
1.1.1 Snowballing constraints	16
1.1.2 Agenda 21 advocating new strategies and action	17
1.2 Objectives of the study	18
1.3 Structure of the study	18
2 BASIC CONCEPTS AND DEFINITIONS	20
2.1 Sustainable development	20
2.2 Urban locality	21
2.3 Urbanization and urban growth	21
2.4 Peri-urban area	22
2.5 Systems and system classes	23
2.6 Water and waste management infrastructure	26
2.7 Poverty and fourth world	27
2.8 Developing country	27
3 RESEARCH METHODOLOGY	28
3.1 Checkland's soft systems methodology	28
3.2 Soft systems methodology in futures research	28
4 PERI-URBAN WATER AND WASTE MANAGEMENT INFRASTRUCTURE— EXPRESSION OF PROBLEM SITUATION	30
4.1 Description of peri-urban situation	30
4.1.1 Underdevelopment	31
4.1.2 Urban settlements	33
4.1.3 Peri-urban settlements	37
4.2 Description of peri-urban water and waste management infrastructure situation	42
4.2.1 Causes of deficiencies in peri-urban water and waste management infrastructure	42
4.2.2 Service coverage and level of peri-urban water and waste	42

	<i>Hukka, J. Sustainable peri-urban water and waste management infrastructure</i>	5
	management infrastructure	60
	4.2.3 Effects of deficiencies in peri-urban water and waste management infrastructure	65
4.3	Peri-urban water and waste management infrastructure—problem situation expressed	71
5	SUSTAINABLE PERI-URBAN WATER AND WASTE MANAGEMENT INFRASTRUCTURE	72
5.1	Future assessment	72
	5.1.1 Importance of infrastructure in economic development	72
	5.1.2 Urban and peri-urban settlements	77
	5.1.3 Urban environmental management	104
	5.1.4 Water and waste management infrastructure	109
5.2	Core vision of relevant peri-urban water and waste management infrastructure systems	167
5.3	Making and testing future model for sustainable peri-urban water and waste management infrastructure systems	169
	5.3.1 Building future models	169
	5.3.2 Formal system concept	174
	5.3.3 Other systems thinking	176
6	DISCUSSION	178
	6.1 Comparing future model with reality	178
	6.2 Planning and implementing development programme	180
	6.3 Implications for development cooperation	181
	6.4 Review of research	182
	6.5 Need for further research	183
7	CONCLUSIONS AND RECOMMENDATIONS	184
8	REFERENCES	187

LIST OF TABLES

Table 2.1	Characteristics of systems	24
Table 4.1	How much poverty is there in the developing countries? The situation in 1985	32
Table 4.2	Median household income levels in selected slum and squatter settlements and estimated poverty levels in urban areas	32
Table 4.3	Importance of rural-urban migration as a source of urban population growth: selected developing countries in the 1970s	35
Table 4.4	Proportion of squatters and slum-dwellers in selected cities	37
Table 4.5	Comparison of population in selected slum and squatter settlements and their surrounding urban areas	39
Table 4.6	Population densities in selected slum and squatter settlements	40
Table 4.7	Population growth in Nairobi and in Kibera	40
Table 4.8	Types of rental housing used by lower income groups in many Third World cities	41
Table 4.9	Examples of "owner occupation" housing used by low income groups in many Third World cities	42
Table 4.10	Distribution of local authority population in Kenya in 1987	48
Table 4.11	Ministry of Water Development, actual expenditure 1979/80-1988/89	58
Table 4.12	Monthly revenue collection performance by Kenyan local authorities in 1986	59
Table 4.13	Unit cost of produced water and revenue per unit in Kenyan local authorities in 1986	59
Table 4.14	Levels of water supply and sanitation service in India in 1988	61
Table 4.15	Position of water supply, wastewater generation, collection and treatment in Class II towns in India in 1988	62
Table 4.16	Water and sanitation service coverage in Kenya	62
Table 4.17	Population served with water among municipalities in Kenya in 1987	63
Table 4.18	Toilet facilities for inhabitants of selected slum and squatter settlements	64
Table 4.19	Water supply in selected squatter settlements compared with urban water supply in the country as a whole	65
Table 5.1	Real GDP and real GDP per capita growth rates for low- and middle income economies, 1965-2000	73
Table 5.2	Policy measures for national urbanization strategies	83
Table 5.3	Different attitudes by governments to housing problems in cities and the different policy responses	85
Table 5.4	Societal conflicts, and alternative strategies for pursuing participation	89
Table 5.5	The division of responsibilities between different agencies for housing and related infrastructure and services	92
Table 5.6	Matrix of housing supply agents and activities	92
Table 5.7	Community level obstacles and possible mechanisms for overcoming them	99
Table 5.8	Categorisations of objectives of community participation	99
Table 5.9	Objectives and actual community participation in projects reviewed	99
Table 5.10	Reasons for the inclusion of women in community participation	102
Table 5.11	Water available and water required for Egypt	107
Table 5.12	Analytical framework for urban environmental problems	107
Table 5.13	Links between health and government action at different levels to improve housing conditions in urban areas	110
Table 5.14	Investment requirements in water sector in Kenya by the year 2000	121
Table 5.15	Comparison of management options for government-owned institutions	131
Table 5.16	Comparison of management options for private institutions	132
Table 5.17	Management system elements	150
Table 5.18	First priorities for improvement of low-income residential communities in six Asian cities	158
Table 5.19	Proposals in order of priority as selected by all six committees of Kebele 29, Addis Ababa, Ethiopia in 1986	158
Table 5.20	Infrastructure components in selected slum improvement programmes and projects	159

LIST OF FIGURES

Figure 1.1	The structure of the study	19
Figure 2.1	Kuala Lumpur—location of squatter areas	23
Figure 2.2	Five classes of systems which make up a systems map of the universe	25
Figure 3.1	Soft systems methodology in futures research	29
Figure 4.1	The methodology—stages 1 and 2: Expression of problem situation	30
Figure 4.2	Underdevelopment—multidimensional schematic framework	31
Figure 4.3	Population in less developed regions 1970-2025	34
Figure 4.4	A schematic framework for the analysis for the migration decision	35
Figure 4.5	George Compound, Lusaka—growth through expansion and densification	38
Figure 4.6	Water tariffs at 1989 price level in Kenya, 1975-1986	58
Figure 4.7	Urban service coverage in 1980, 1990 and 2000, all developing countries	61
Figure 4.8	Spatial scale of environmental problems	66
Figure 4.9	Household expenditure on water as percentage of income	68
Figure 4.10	For many, poverty forms a barrier to the dream of healthy life in the city	69
Figure 5.1	The methodology—stage 3a: Future assessment	72
Figure 5.2	Gross-catalytic interactive threefold harmony of society capable to evolve	74
Figure 5.3	Relationship of infrastructure to socioeconomic systems and environment	74
Figure 5.4	Economic system supported by infrastructure	75
Figure 5.5	Present and future urban metabolism	79
Figure 5.6	Process for the application of the basic minimum needs strategy in the development of congested communities in the Bangkok metropolis	87
Figure 5.7	Map showing implementing organizations and geographical locations of urban projects reviewed	100
Figure 5.8	Organizational and other support for self-help	103
Figure 5.9	Safe water: three scenarios, 1990-2030	106
Figure 5.10	Adequate sanitation: three scenarios, 1990-2030	106
Figure 5.11	Key dimensions of sustainable water supply: operative technology, appropriate institutions and adequate cost recovery and their relationship with government water policy and external support	112
Figure 5.12	Hierarchy of consideration on matters	113
Figure 5.13	Conceptual framework linking monitoring, planning and advocacy	115
Figure 5.14	Required investments and population served by the year 2000	120
Figure 5.15	Illustrative section of an impact network	147
Figure 5.16	Life cycle of an urban water system	148
Figure 5.17	Process of developing commitment to built or make major changes a system	149
Figure 5.18	Infrastructure management system, with sub-systems	150
Figure 5.19	Key role of decision support system in management activities	152
Figure 5.20	Holistic approach in community health in Kebele 41, Addis Ababa, Ethiopia	159
Figure 5.21	Schematic lay-out of conventional and shallow sewer-systems	165
Figure 5.22	The methodology—stage 3: Core vision(s) of relevant systems	167
Figure 5.23	The methodology—stage 4: Building future model	169
Figure 5.24	The future model of the Utility—the general structure	171
Figure 5.25	The Decision support system in the future model of the Utility	172
Figure 5.26	The Management system in the future model of the Utility	173
Figure 5.27	The Performance audit and control system in the future model of the Utility	174
Figure 5.28	The methodology—stage 4a: Formal system concept	175
Figure 5.29	The methodology—stage 4b: Other systems thinking	177
Figure 5.30	The methodology—stage 5: Comparison of future model with reality	178
Figure 5.31	Stages 6 and 7: Planning and implementing development programme	181

LIST OF BOXES

Box 5.1	Factors which can encourage a more decentralized pattern of urban development	81
Box 5.2	Community involvement in cities in the developing world	98
Box 5.3	Government responsibilities to promote environmental quality in urban centres at different geographic scales	105
Box 5.4	The geographic groups with their corresponding technology categories	121
Box 5.5	Water supply system in Abidjan, Ivory Coast	141
Box 5.6	Saguapac water cooperative in Santa Cruz, Bolivia	142

ABBREVIATIONS AND ACRONYMS

AIC	—	Average Incremental Cost
APWA	—	American Public Works Association
AWWA	—	American Water Works Association
BHC	—	Botswana Housing Corporation
BOT	—	Build, operate, transfer
CAERN	—	Companhia Estadual de Aguas e Esgotos do Rio Grande do Norte
CATWOE	—	Customer/Agent/Transformation/World/Owner/Environment
CHF	—	Cooperative Housing Foundation
CPCB	—	Central Pollution Control Board
DDA	—	Delhi Development Authority
EDI	—	Economic Development Institute
ESA	—	External Support Agency
FIM	—	Foreign Investor-Manager
FINNIDA	—	Finnish International Development Agency
FUPROVI	—	Fundacion Promtora de Vivienda
FY	—	Fiscal Year
GDP	—	Gross Domestic Product
GNP	—	Gross National Product
GOB	—	Government of Botswana
GOK	—	Government of Kenya
GTZ	—	Gesellschaft für Technische Zusammenarbeit (German Agency for Technical Cooperation)
hd	—	head (person)
HUDCO	—	Housing and Urban Development Corporation
IAWQ	—	International Association on Water Quality
IDA	—	International Development Association
IDWSSD	—	International Drinking Water Supply and Sanitation Decade (1981-1990)
IMF	—	International Monetary Fund
IUIDP	—	Integrated Urban Infrastructure Development Programme
IWEE	—	Institute of Water and Environmental Engineering
IWSA	—	International Water Supply Association
KDA	—	Karachi Development Authority
KES	—	Kenyan Shilling (USD 1 = KES 23.02, Aug 2 1990)
KIP	—	Kampung improvement programme
km	—	kilometre
km ²	—	square kilometre
KMC	—	Karachi Metropolitan Corporation
K£	—	Kenyan Pound (K£ 1 = KES 20; USD 1 = K£ 1.15, August 2 1990)
lcd	—	litres per capita per day
LDC	—	Less developed country
lpd	—	litres per day
LWUA	—	Local Water Utilities Administration
m ³	—	cubic metre
Mld	—	million litres per day
MOE	—	Ministry of the Environment
MOWD	—	Ministry of Water Development
NCC	—	Nairobi City Council
NGO	—	Non-Governmental Organization
NHDA	—	National Housing Development Authority
NORAD	—	Norwegian Agency for International Development
ONAS	—	Office Nationale de l'Assainissement
OPEC	—	Organization of Oil-Exporting Countries
OPP	—	Orangi Pilot Project
O&M	—	Operation and Maintenance
PDUD	—	Project de Développement Urbain de Djibouti
PPP	—	Purchasing Power Parity
PQLI	—	Physical Quality of Life Index
RDF	—	Rural Development Fund

SANAA	—	Honduran National Water and Sewerage Authority
SEEG	—	Société d'Exploitation des Eaux de Guinée
SHHA	—	Self-Help Housing Agency
SIFA	—	state infrastructure financing agencies
SODECI	—	Société de Distribution d'Eau de la Cote d'Ivoire
SONEG	—	Société Nationale des Eaux de Guinée
SWMB	—	Solid Waste Management Board
SWMP	—	Solid Waste Management Project
TQM	—	Total Quality Management
TUT	—	Tampere University of Technology
UEBM	—	Unit for Barrios Marginales
UK	—	United Kingdom
UN	—	United Nations
UNCDF	—	United Nations Capital Development Fund
UNCED	—	United Nations Conference on Environment and Development
UNCHS	—	United Nations Centre for Human Settlements (Habitat)
UNDP	—	United Nations Development Programme
UNEP	—	United Nations Environment Programme
UNESCO	—	United Nations Educational, Scientific and Cultural Organization
UNFPA	—	United Nations Fund for Population Activities
UNICEF	—	United Nations Children's Fund
US	—	United States
USAID	—	United States Agency for International Development
USD	—	United States Dollar
USEPA	—	United States Environmental Protection Agency
VIP	—	Ventilated Improved Pit Latrine
WASH	—	Water and Sanitation for Health Project
WB	—	World Bank
WFP	—	UN/FAO World Food Programme
WG/U	—	Working Group on Urbanization
WHO	—	World Health Organization
WID	—	Women in development
WSS	—	Water supply and sanitation
WSSCC	—	Water Supply and Sanitation Collaborative Council

SUMMARY

Background

It is estimated that in developing countries 810 million people in urban areas will require safe water services and 950 million urban people will need adequate waste management services, if full coverage is envisaged by the year 2000. Overcrowding and the extremely unhealthy housing conditions common to peri-urban settlements are the most immediate environmental problems threatening human welfare. Deficiencies in the environment due to inadequate water supply, hygiene and sanitation are the cause of 80 percent of the sickness in the world and between 10 and 25 million deaths every year. Peri-urban poor dwellers suffer most, when municipal governments cannot provide the basic infrastructure under the great pressure of urban population growth.

Objectives of the study

The long-term goal of the study is to make a contribution to economically, socially and environmentally sustainable development. The immediate objective of the study is to define a hypothetical and conceptual future model for the institutions responsible for the management tasks regarding peri-urban water and waste management infrastructure. The comparison of the hypothetical model with the "real-world" is hoped to lead into a high quality debate with concerned participants facing the peri-urban challenge. This discussion hopefully generates action to make feasible and desirable development programmes and the subsequent commitment to implement them.

Structure of the study

This study is a part of the research programme "Institutional development of water services" carried out by Institute of Water and Environmental Engineering, Tampere University of Technology. Under this programme the other published reports on the peri-urban issues are the following:

- Macharia, L. 1992. Sanitation options for Kibera low-income area in Nairobi. MSc thesis. Tampere University of Technology. Institute of Water and Environmental Engineering. Publication No. B 53. 97 p.
- Morange, H. and Mashauri, D.A. (eds). 1993. Workshop on Management of Urban Services. Tampere 25.4.1991. Tampere University of Technology. Institute of Water and Environmental Engineering. Occasional Paper No. C 48. p
- Sandelin, S. (ed). 1994. Low-income area water supply and sanitation in selected African cities. Tampere University of Technology. Institute of Water and Environmental Engineering. Publication No. B 59. 165 p.

The problem situation is defined and expressed based on the comprehensive literature review. The documentation was collected from 1990 to 1994. Also the future assessment was done on the basis of the literature. A core vision "an evolutionary hypothesis" for the system "the Utility" responsible for peri-urban water and waste management infrastructure was formulated in accordance with the research methodology. The future model for the Utility was made based on that core vision. Then the model was tested and compared with the reality.

Research methodology

The methodology applied in this study is a soft systems methodology developed originally by Peter Checkland for action research. It is a general and flexible theoretical framework in problem-solving in real-world situations to tackle ill-structured problems. Mannermaa has modified original methodology into a direction more suitable for futures research within the framework of the evolutionary paradigm.

Hypotheses

At the global scale, the peri-urban infrastructure cannot be considered sustainable in accordance with the definitions of the sustainable development. It cannot satisfy the fundamental human need of permanence (or subsistence). The public institutions responsible for the peri-urban water and waste management infrastructure that cannot yet be considered sustainable may be defined as follows:

The people and the patterns of regular, repetitive interactions among them that execute—in collaboration with other relevant institutions—planning, from strategic planning to implementation planning, finance, construction, operation and maintenance of infrastructure in order to achieve the objective of “universal access” to safe water supply and adequate sanitation that maintains economically, socially and environmentally sustainable development. This has not yet been achieved globally.

The following **core vision** having the status of the **evolutionary hypotheses**—concerning the formulation of the future—was selected for the formulation of the future model:

The Utility is a professionally-manned system of providing universal access to water and waste management infrastructure, and of securing responsive, successful and efficient water and waste management service delivery to the customers. The system aims to integrate the concepts of accountability, total quality and empowerment, and follows the principles of continuous improvement and continual innovation. By this total quality management the system makes the best possible contribution to the economically, socially and environmentally sustainable development.

This system performs the basic **transformation process** as follows:

The system takes in: financial resources; water and waste management technology; information on government's and/or owner's policies, strategies and action with respect to peri-urban infrastructure; information on the needs, preferences and expectations of different stakeholders; information on organization; information on the facilities and the environment including water resources; and information on innovative technology and management techniques.

The system uses these inputs, its acquired intellectual property and water and waste management infrastructure to generate—in co-operation with other relevant actors in related sectors (housing, public health etc.)—action concerning the provision of safe water and adequate waste management services to peri-urban areas which makes the best possible contribution directly to improve and sustain the environment in peri-urban areas, and indirectly to satisfy the fundamental human need of permanence (or subsistence) in the society at large. The system also generates information for the owner on the future development threats and possibilities of water and waste management infrastructure.

The actors in the system are the professionals employed by the utility. The system's direct **beneficiaries or victims** are the residents and the business (formal and informal) in peri-urban areas, and the utility as a whole. The system's other affected beneficiaries or victims are the residents and the business in the areas affected by the environmental impacts caused by peri-urban areas, the decision-makers including the professionals of the owner and the politicians, and the society at large.

The system's **owner** is the government (local, regional or national) or other public agency. The utility can be managed either by a public or private institution. The main **environmental constraints** which this system has to take as given are: underdevelopment; government's budgetary and administrative crisis; shortage of foreign exchange; weak revenue bases; the bias

of discrimination against low-income families; absence of political will to change urbanization paradigm to peri-urbanization paradigm; the urban poor have limited access to credit; the national (regional or local) government's inappropriate policy on pricing of water and waste management services; the system's lack of financial self-sufficiency; inappropriate policies and legal framework regarding urban development; inadequate policies on peri-urban settlements and infrastructure; the system's limited power to influence government policies such as zoning and land tenure; some peri-urban areas often inaccessible; lack of penalties to prevent environmental pollution; lack of appropriate educational systems; lack of appropriate research&development systems; poorly conceived legal frameworks and accountability for public institutions; diminishing, polluted and poorly managed water resources.

The system acts in the **world**, where the sustainable development and satisfying of the fundamental human needs of the world's poor are listed as priorities. The environmental problems that damage the health and productivity of the largest number of people, especially the poor, require that the priority should be given to the one-third of the world's population that has inadequate sanitation and the 1 000 million without safe water.

Findings and recommendations

The world-image selected is based on the concept of the sustainable development. The study implies that even if "the Utility"—the organization responsible for the provision of peri-urban water and waste management services—would be properly organized, accountability and customer-orientation built in, management systems well functioning, employees well trained, the system itself cannot guarantee good services due to the constraints in the given environment. The formulated future model for the water and waste management organization indicates clearly that these environmental constraints hinders the sustainable development regarding the peri-urban infrastructure. One of the key environmental constraints is the lack of financial self-sufficiency of the organizations. Therefore they have a restricted power to provide the accountability and successful services to different stakeholders, since that power will depend on the environment of the organizations. Their responsibilities cannot exceed the given power and possibilities to act. The obvious consequence is that the residents and business will suffer from the lack of services. This will cause negative impacts economy—even at macro level, health and environment.

Although there are number of important issues in development paths of peri-urban settlements, the provision of basic infrastructure and shelter will have a key role in future efforts to improve living conditions and environment of low-income households and in proximity. The inadequate service coverage and level regarding the peri-urban water and waste management infrastructure are often due to the governments' policies within the existing legal and institutional frameworks. Negative land use controls with unrealistic standards are also causing high budgetary costs that reduce service coverage and level. Therefore the key problem of land use and control in urban settlements and in the vicinity should be solved.

Sufficient quantity and quality of water, and the environment free of toxic substances and pathogens should be considered as satisfiers of the human fundamental need: permanence. Therefore the public authorities responsible for infrastructure must guarantee the universal coverage and adequate level of service. In order to improve the environment and living conditions of the urban poor the following key elements must be considered:

- The planning paradigm for formal urbanization is not valid, and must thus be abandoned for peri-urbanization;
- National and local governments should limit their roles to providing services which the families and communities cannot provide themselves, i.e. the government should concentrate on enabling the urban poor to meet their recognized demands;
- The implementation priority should be given to the infrastructural projects having the highest net social benefit or net-social-benefit-to-cost-ratio;
- The programmes to improve the infrastructure and the environment should be considered as an economic investment with full cost recovery. Therefore people benefiting the improvements should be treated like customers;
- National and local governments should strengthen their revenue base (property and

- land taxes, property rates, levies on business activity, local tax, sales tax, local income taxes) and introduce user charges covering the costs of the services produced;
- Local governments should give water and waste management utilities the right to provide services to illegal settlements, by not subjecting this action to the unreasonable requirements of legal regularization of land tenure or of formal master plans.

When the performance of peri-urban urban water and waste management infrastructure is to be improved, the following two key matters should be considered:

- the institutions responsible for urban water and waste management services shall be required and allowed to be financially self-sufficient; and
- institutions responsible for urban water and waste management services shall be required and permitted to improve public accountability, i.e. by creating service culture to secure efficient service and to meet the needs and expectations of different stakeholders.

The comparison of the model with the real-world situation implies that—also in donor assisted urban infrastructure development activities—the project-level interventions alone do not have much impact on the sustained peri-urban infrastructure. Therefore much greater attention has to be paid to poorly conceived policy and legal frameworks. This requires capacity building to create an enabling environment, where the water and waste management institutions can operate successfully. The capacity building must be done regarding the following two interrelated concepts: strengthening of institutions and development of human resources. Although education and training at all levels are essential, instituting the leadership for a successful quality organization requires first of all well educated and trained managers to cope with the essential change from administrative domain to service domain. The leadership and people are basic elements of the management culture which creates an environment that responds quickly to customers' and other stakeholders' needs and expectations. Incorporating total quality's values and philosophy in the organization is a must in order to serve the peri-urban communities on sustainable basis.

Review of research

The methodology used in this study, Checkland's soft systems methodology developed further for futures research by Mannermaa, appears to be promising even in literature review and analysis based on that. It offers a systemic approach to such a "real-world" problem situation, where the comprehensive literature review on the situation is used. Though it is highly recommended that in this kind of a study a group of experts should formulate the core vision(s) and the future model(s). This would be beneficial, and the comparison stage would also gain from this group approach.

The methodology due to its certain flexibility offers a quite interesting and useful tool in the studies regarding human activity systems. Especially the stage that Mannermaa has added—the future assessment—makes the original structure's applicability even better, since it will show the possible development paths of the system and its environment.

The selection of the system in this study—the organization responsible for the provision of peri-urban water and waste management services—is conscious. The good characteristic of the methodology is that it would anyhow have revealed the key constraints, even if the selection would have been done differently. The approach of the methodology with respect to the defined changes is also appropriate and useful in action research within development co-operation, since the changes have to meet two criteria. They must be arguably systemically **desirable** and simultaneously **culturally feasible** given prevailing attitudes and power structures, and having regard to the history of the situation under examination. Yet, one dimension should be added based on Mannermaa's further development of the methodology: having regard to the future of the system and its environment.

Implications for development co-operation

It seems that in general, the current trend in the developing economies is to overinvest in the infrastructural facilities in the sense that they either deteriorate well before their life time or are not producing the planned services. Therefore the investments in this unsustainable development can be considered overinvestments. Yet, the number of those unserved has increased and will continue to grow in the future, i.e. there is the actual need to make sustainable investments in peri-urban water and waste management infrastructure. When the donors are thinking of making contributions to the development of peri-urban water and waste management infrastructure, they should carry out sufficient benefit cost analysis well **before** making the final commitment to support the project.

These analysis cannot alone guarantee the sustainability. There is a strong implication that the long-term sustainability is endangered due to inadequate cost recovery. There are also other reasons, why potentially sustainable infrastructure may be allowed to deteriorate before its planned life time. The institutional arrangements are found to be a major cause of ineffective and unsustainable water and waste management services.

This means consequently that **capacity building** is the most important element in the development of sustainable peri-urban water and waste management infrastructure. Capacity building is not only required in water sector, but also in other sectors, e.g. responsible for urban development and land management, to create favourable policy and legal environment for successful water and waste management service delivery to peri-urban settlements. A clear implication is that in the current policy and legal environment dominating in developing countries the capacity building including human resources development is the most sustained development activity that the donors can support. Action-oriented research is a foundation for improving urban management and infrastructure. Especially the concept recommended by Briscoe and Steer (1993), the "structured learning" studies based on learning from innovative approaches would be appropriate for international technical assistance and funding.

Need for further research

There are many interrelated matters related to the peri-urban water and waste management infrastructure paradigm, which would require further research and empirical testing. The action research is required in relation to the following:

- (i) institutional alternatives for management of water and waste management infrastructure;
- (ii) institutional incentives in infrastructure development process;
- (iii) requirements to legalize peri-urban settlements;
- (iv) options to provide informal settlements with formalized infrastructure;
- (v) procedures and mechanisms to obtain full cost recovery for services;
- (vi) development of management systems;
- (vii) integrated water resources management and protection;
- (viii) economic instruments in environmental protection;
- (ix) options to make land registration more simplified;
- (x) financing options and mechanisms for peri-urban projects; and
- (xi) the concept of the Total Quality Management (TQM) in water and waste management engineering.

1 INTRODUCTION

1.1 Urban challenge

"In 1968, The Population Bomb warned of impending disaster, if the population explosion was not brought under control. Then the fuse was burning; now the population bomb has detonated. . . Many attempts are being made to resolve urban problems in poor nations, including the encouragement of industry to locate in secondary cities to divert some of the people fleeing from the countryside and reduce pressure on the megacities. Most migrants are peasants displaced by industrialized agriculture. Ironically, that industrialization is one of the strategies that have helped keep food production up with population growth globally. But, as long as population growth continues at anything like current rates, trying to solve those urban problems is like trying to bail out the ocean with a thimble."

Ehrlich and Ehrlich 1990

1.1.1 Snowballing constraints

According to the report "Our Common Future" of the World Commission on Environment and Development 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 World Development Report 1992 (World Bank 1992a) lists sanitation and clean water as environmental priorities. Environmental damage occurs when inadequate water supply and sanitation services are compensated by inappropriate solutions. Global water consumption has doubled in the 40 years from 1940-1980, and it is expected to double again before the turn of the century. The majority of this consumption (some 70-80%) is for agricultural purposes; industrial activities account for some 20%; and domestic use for only about 6% (Jönch-Clausen 1992).

The water management profession will face a chaos of an unprecedented scale and complexity. Its causes are diminishing fresh water resources, less developed regions population growth, contaminated water sources and insufficient financial resources aggravated by sociopolitical and environmental problems. The way in which water resources is being managed has increasingly severe environmental implications, including the accelerating soil and water degradation, the degradation of natural ecosystems and freshwater pollution. Many countries already face a severe water crisis, which is set to worsen as the 21st century approaches (Biswas 1991).

The fact that more than 1 000 million people either lack shelter or live in unacceptable conditions is a serious impediment to development. In developing countries overcrowding and the extremely unhealthy housing conditions common to urban slums and rural settlements are the most immediate environmental problems threatening human welfare (UNCHS, MOE and FINNIDA 1991). The cholera epidemic in Latin America is a part of worldwide pandemic that began in 1961 in Asia and spread to Africa in 1970 and Latin America in 1991 (WASH 1992). Public health officials do not expect cholera to disappear any time soon in Latin America, where the lack of safe water and sanitation in urban settlements creates conditions favourable to the spread of this classic waterborne disease.

Deficiencies in the environment due to inadequate water supply, hygiene and sanitation are the cause of 80 percent of the sickness in the world and between 10 and 25 million deaths every year. The poor suffer most when municipal governments cannot provide the basic infrastructure under great pressure of urban population growth. Kivistö (1992) estimates that 1.5 . . . 2 times more urban environment than there is now in the developed countries should be constructed in the next 30 years in the developing countries. Therefore that will be the history's largest construction process. The improvement of the environment of the urban low-income settlements will give a crucial impact on the survival of the urban poor. This will concern also growing small and intermediate urban

centres, not only capital cities as commonly thought.

The current annual growth rate for urban population, e.g. in Eastern Africa has 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.

According to Pouliquen (1991) the economic growth will be increasingly constrained by the capacity of ecosystems to perform two essential functions: to replenish resource inputs into the economy, and to absorb the wastes generated by production systems. Therefore, the growing and major challenges in the water and sanitation sector are: managing water resources and improving sanitation in the urban environment. Israel (1991, cited by Grigg 1993) states that the World Bank studies of the 1980s gave the overall impression that the infrastructure of many developing countries are failing, or are inadequate to support growth. The impact on economy caused by the lack of infrastructure was indeed diagnosable in Peru, where in just the first ten weeks of the cholera epidemic in 1991, losses from reduced agricultural exports and tourism were estimated at USD 1 000 million—more than three times the amount that country had invested in water supply and sanitation services during the 1980s (World Bank 1992).

1.1.2 Agenda 21 advocating new strategies and action

The United Nations Conference on Human Settlements in Vancouver in 1976 set 1990 as the date for community water supply and sanitation to include all urban and rural areas. The United Nations Water Conference in Mar del Plata in 1977 reiterated the Habitat commitments, and the United Nations General Assembly formally launched the International Drinking Water and Sanitation Decade (IDWSSD), 1981-1990, in November 1980.

In 1990 the United Nations (UN) announced a new campaign "Safe Water 2000" to carry on the momentum of the International Water Supply and Sanitation Decade. This new campaign will call for international efforts to support Third World countries in provision of sustainable development within water sector, and finally, apart from political wrangling over preserving tropical forests and biodiversity, the United Nations Conference on Environment and Development (UNCED) agreed the rapid extension of water supply and sanitation services in Rio de Janeiro in June 1992. The "Earth Summit" also set out a series of objectives in seven water resource areas. Guiding principles behind these programmes were drafted in Chapter 18 of the summit's Agenda 21 policy document. Chapter 18—Protection of the quality and supply of freshwater resources: Application of integrated approaches to the development, management and use of water resources—describes objectives, implementation methods and time frames for each of seven programme areas (IAWQ 1992):

1. Integrated water resources development and management;
2. Water resources assessment;
3. Protection of water resources, water quality and aquatic ecosystems;
4. Drinking water supply and sanitation;
5. Water and sustainable urban development;
6. Water for sustainable food production and rural development; and
7. Impact of climate change on water resources.

The investments in water supply and sanitation in developing countries are currently about USD 10000 million annually. The programmes set by the UNCED would require extra annual investments of USD 35 000 million up to 2000 to be fully implemented. Developing countries should provide about half these new funds. The main problem in the settlements development process will be related directly to the financing of the construction of infrastructure. Drinking water supply and sanitation services would take about 15-20% of all the investments in infrastructure.

1.2 Objectives of the study

The long-term goal of the study is to ease the living of the "Fourth World" low-income dwellers in accordance with the national strategies formulated on the bases of Chapter 18 in Agenda 21. This will be acquired by creating physical facilities and management systems to support and to establish necessary prerequisite for improved home and neighbourhood environment, for better health conditions, and for greater convenience. Better basic infrastructure will also in general provide cheaper services, and allow more time for other activities contributing thus to the process of social and economic change required to wipe out poverty.

The immediate objective of the study is to define a hypothetical and conceptual future model for peri-urban water and waste management infrastructure, in particular for public institutions responsible for the management tasks. The comparison of the hypothetical model with the "real-world" is hoped to lead into a high quality debate with concerned participants facing the peri-urban challenge. This discussion hopefully generates action to make feasible and desirable development programmes and the subsequent commitment to implement them. The external support agencies (ESAs) should also be interested in the implications of the debate.

1.3 Structure of the study

This study is a part of the research programme "Institutional development of water services" carried out by Institute of Water and Environmental Engineering, Tampere University of Technology. Under this programme the other published reports on the peri-urban issues are the following:

- Macharia, L. 1992. Sanitation options for Kibera low-income area in Nairobi. MSc thesis. Tampere University of Technology. Institute of Water and Environmental Engineering. Publication No. B 53. 97 p.
- Morange, H. and Mashauri, D.A. (eds). 1993. Workshop on Management of Urban Services. Tampere 25.4.1991. Tampere University of Technology. Institute of Water and Environmental Engineering. Occasional Paper No. C 48. p
- Sandelin, S. (ed). 1994. Low-income area water supply and sanitation in selected African cities. Tampere University of Technology. Institute of Water and Environmental Engineering. Publication No. B 59. 165 p.

The structure of the study is defined in accordance with the research methodology applied (see: Chapter 3). The structure is shown in details in Figure 1.1. The problem situation was defined and expressed based on the comprehensive literature review. The documentation was collected from 1990 to 1994. Also a future assessment was done on the basis of the literature. A core vision "an evolutionary hypothesis" for the system "the Utility" responsible for peri-urban water and waste management infrastructure was formulated in accordance with the research methodology. The future model for the Utility was made subsequently. Then the model was tested and compared with the reality.

The peri-urban water and waste management infrastructure can be either formal or informal component of the urban water and waste management infrastructure. The formal peri-urban institutional system providing water and waste management services are mainly managed by the public authorities or communities themselves. The informal institutional system are managed, e.g. by water vendors and resellers, and waste scavengers. In this study the focus will be on the formal services the public authorities are assumed to be responsible for.

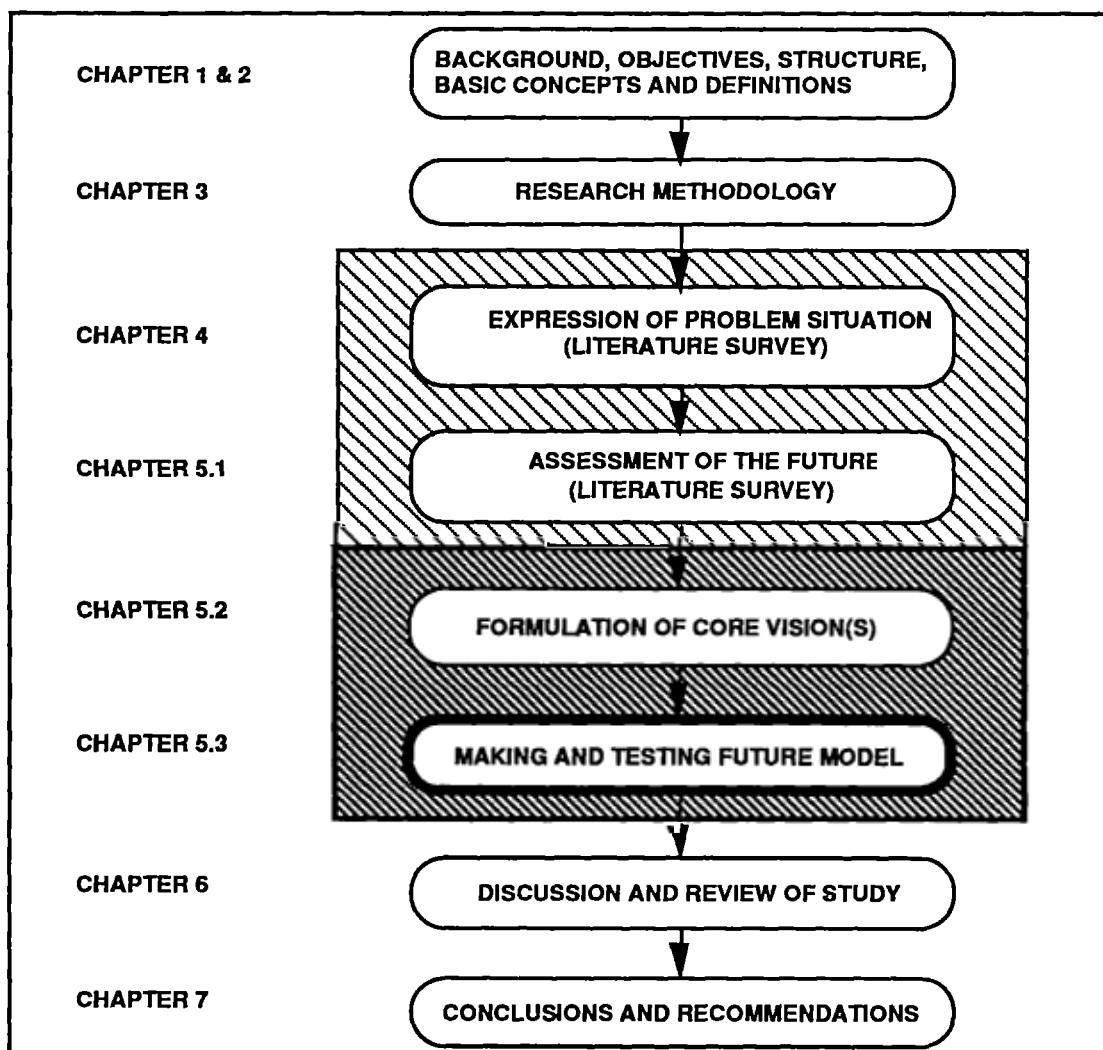


Figure 1.1 The structure of the study.

2 BASIC CONCEPTS AND DEFINITIONS

2.1 Sustainable development

"If I was to tell you yesterday, that yesterday there was an environmental catastrophe in the Third World that killed 50 000 people, most of them children, seriously injured 200 000 people, many of whom will die subsequently, I think you would be shocked. There was an environmental catastrophe yesterday of that scale in the Third World, and today and tomorrow. Fifty thousand people die every day in the Third World from the lack of clean water, lack of sanitation, lack of health care. Two hundred thousand people get ill every day from that. If we don't bring their concerns and their needs to 1992, we will be sustaining a status quo, not promoting sustainable development."

Satterthwaite 1991

The report of the World Commission on Environment and Development (1987) gives two concepts for sustainable development:

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

- the concept of "needs", in particular the essential needs of the world's poor, to which overriding priority should be given; and
- the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.

Development involves a progressive transformation of economy and society. A development path that is sustainable in a physical sense could theoretically be pursued even in a rigid social and political setting. But physical sustainability cannot be secured unless development policies pay attention to such considerations as changes in access to resources and in the distribution of costs and benefits. Even the narrow notion of physical sustainability implies a concern for social equity between generations, a concern that must logically be extended to equity within each generation."

Milbrath (1989) defines a sustainable economic system that it must serve a variety of values; it must:

1. Preserve and enhance a well-functioning ecosystem;
2. Provide humans with goods and services—necessities for a good life;
3. Provide opportunities for fulfilling work—self-realization;
4. Achieve and maintain economic justice; and
5. Utilize resources at a sustainable rate—justice for future generations:

According to Max-Neef (1986), fundamental human needs are finite, few and classifiable, and they are the same in all cultures and all historical periods. It is only the form or the means by which those needs are satisfied that changes over time. Nine fundamental human needs are identified: permanence (or subsistence); protection; affection; understanding; participation; leisure; creation; identity (or meaning); and freedom. Max-Neef declares that:

"From such classification. . . it follows, for example, that housing, food, income are not to be considered as needs, but rather as satisfiers of the fundamental human need of permanence (or subsistence)."

Therefore also safe drinking water and adequate sanitary conditions provided by water and waste management infrastructure systems can be considered as satisfiers of the need of permanence (or subsistence).

The World Bank considers a project sustainable if the economic rate of return it generates is at least equal to, if not greater than, the opportunity cost of capital (Ostrom, Schroeder and Wynne 1993). This conceptualization is compatible with the objective of maximizing net social welfare because it requires a project to yield net benefits that exceed the total costs of the undertaking. Total costs include capital as well as maintenance costs, and all external costs. Also Kaplinsky (1990) suggests that 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.

2.2 Urban locality

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, 20 000 persons or more in Mauritius and Nigeria, and of 30 000 or more persons in Japan. Most countries choose a minimum between 2 000 and 5 000 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.

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.

2.3 Urbanization and urban growth

Hardoy and Satterthwaite (1989) defines *urbanization* as follows:

"The process by which an increasing proportion of population comes to live in urban centres. A nation which is urbanizing has an increasing proportion of its population living in urban centres—but the term *urbanization* usually implies not only this change in the distribution of population but also processes which cause this change which are usually a combination of economic, social and political change."

The *urban growth* is defined by them:

"The growth of population living in urban centres. This is not the same as urbanization, because if the rural population and the urban population are both growing at the same rate, there is urban growth but not necessarily growth in the proportion of people living in urban centres."

The *level of urbanization* means the percentage of the population living in urban centres. Since the figures for the level of urbanization in a nation are based on that nation's own definition as to what is an urban centre, they are not comparable figures for other nations.

2.4 Peri-urban area

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, Lusty and Vaughan 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.

There are also many different local terms for low-income urban settlements (Harpman et al 1988, Bairoch 1988 and Peri-Urban Network . . . 1993):

- Brazil: favelas, alagados, vilas de malocas, corticos, mocambos;
- Peru: barriadas, pueblos juvenes, barrios marginales;
- Venezuela: barrios, ranchos;
- Mexico: colonias proletarias, colonias paracaidistas, jacales, ciudades, perdidas, asentamientos irregulares, colonias populares;
- Panama: barrida de emergencia;
- Chile: poblaciones, callampas, campamentos;
- Ecuador: barrios, urbanizaciones, ranchos;
- Argentina: villas miserias;
- Colombia: barrios clandestinos, tugurios, invasion;
- El Salvador: colonias ilegales, tugurios;
- Morocco: bidonvilles (can or drum towns);
- Tunisia: goubvilles, bidonvilles;
- Ethiopia: chica;
- Zimbabwe: periurban septic fringes;
- Turkey: hisseli tapu, gecekodu, gecekodular (erected in a single night);
- Iran: halabi abad (canned-foods town), alatchir (peasant hut), and gode (hole, quarry);
- Iraq: serifas (hut);
- India and Pakistan: bustees, jompris, chawls, ahatas, cheris, katras, juggies;
- Korea: panjachon;
- The Philippines: barong-barong; and
- Indonesia: kampong (little village);

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. *Peri-urban areas* are commonly referred to as squatter settlements, marginal, transitional and uncontrolled neighbourhoods, the informal sector, low-income areas, shantytowns, urban slums, or illegal settlements (Bairoch 1988, WASH 1992). A **broad definition of peri-urban areas** by the Peri-Urban Network (WASH 1992) also includes inner-city tenement buildings and low-cost boarding houses. Peri-urban areas, the neighbourhoods and parts of cities where most of the urban poor live, usually have extremely limited or no access to central water supplies, sewage or septic systems, garbage collection, and other services. This broad concept is also used in this study.

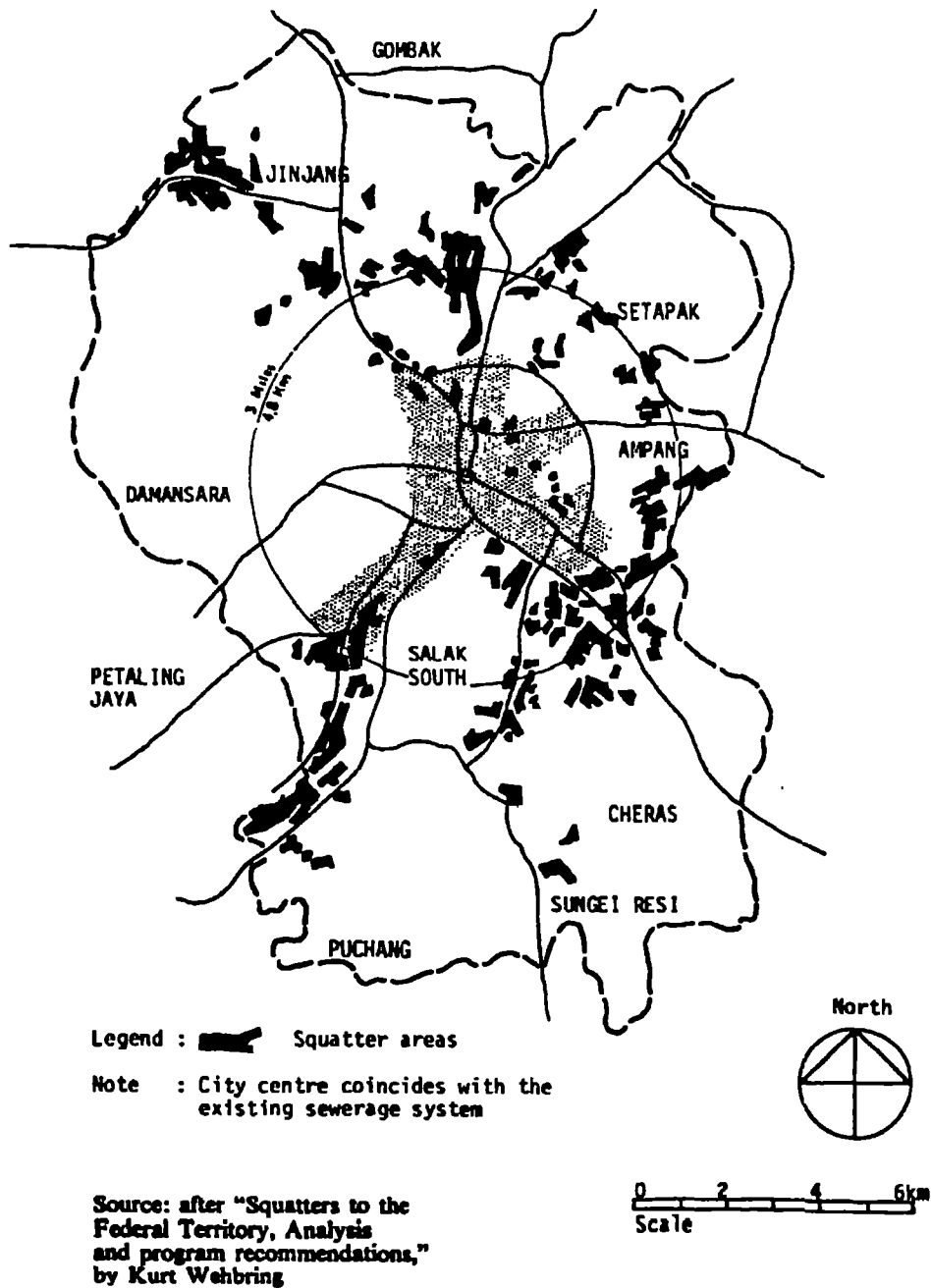


Figure 2.1 Kuala Lumpur—location of squatter areas (UNCHS 1982).

2.5 Systems and system classes

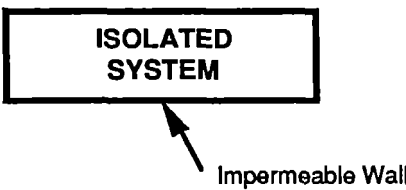
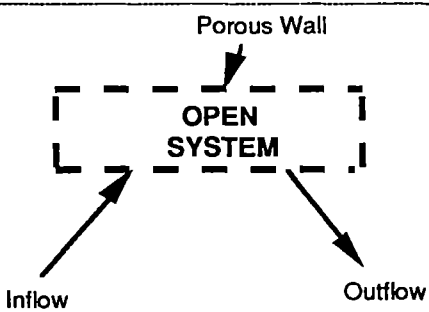
According to Çambel (1993) it is helpful to speak of "systems" without having to elaborate on all of the details. By definition, a *system* is a collection of organic or inorganic matter, or even of institutional entities, surrounded by a wall. This wall may be real or imaginary. Çambel gives different types of walls surrounding complex systems. Depending on the type of wall, he defines three different types of systems: isolated systems, closed systems, and open systems.

Isolated systems are surrounded by walls so rigid and impermeable that nothing can cross them. In real life there are no true isolated systems, because there is always some sort of leakage. The concept of isolated systems is used in scientific work, because by excluding external forces such

as gravity the analysis can be more tractable and provide useful insights, although at best only approximate. In economics, too, externalities are excluded, and this also is unrealistic, because economic systems are influenced by various forces. In reality, systems will be pulled or pushed away from equilibrium and they will behave nonlinearly.

Closed systems are surrounded by walls that do not allow the passage of matter, although they allow energy and information to pass through them. In this context *open systems* are the most appropriate. These have permeable walls so that matter, energy, and information or entropy may cross them in either direction. E.g., institutions are open systems. All kinds of goods are brought in and out of buildings, people come in and go out and thus contribute to both material and information exchanges. Telephone lines help exchange information between the institutional building and affiliates outside. The characteristics of open and isolated systems are compared in Table 2.1 (Çambel 1993).

Table 2.1 Characteristics of systems.

ENVIRONMENT	
	
<ol style="list-style-type: none"> 1. Adiabatic or perfectly insulating wall separates the system from its surroundings. Absolutely nothing can cross the wall in either direction. 2. We only consider the macroscopic aspects of the system. 3. The system is in equilibrium. 4. The system undergoes only reversible processes, i.e., it is conservative, Hamiltonian. 	<ol style="list-style-type: none"> 1. A permeable wall separates the system from its surroundings. Hence there are flows (i.e., in and/or out) across the wall. The flows include material, energy, information, entropy. 2. We only consider both the macroscopic or microscopic aspects of the system. 3. The system may or may not be in equilibrium, and this can occur on either the macroscopic or microscopic levels. It may be near to equilibrium (linear case), or it may be far from equilibrium (nonlinear case). 4. The system can undergo irreversible processes, i.e., it is dissipative.

Checkland (1984) classifies "systems classes" summarized in Figure 2.2 as follows:

1. Natural systems;
2. Designed physical systems;
3. Designed abstract systems;
4. Human activity systems; and
5. Transcendental systems.

The natural systems are those which originate in the universe. They are as they are as a result of the forces and processes which characterize this universe. They are systems which could not be other than they are. There are also many other observed entities which are similar to natural systems, but they can be other than they are. These are the systems which are the result of conscious design. They are the *designed physical systems* which man has made. They are designed to serve some human purpose which is their origin.

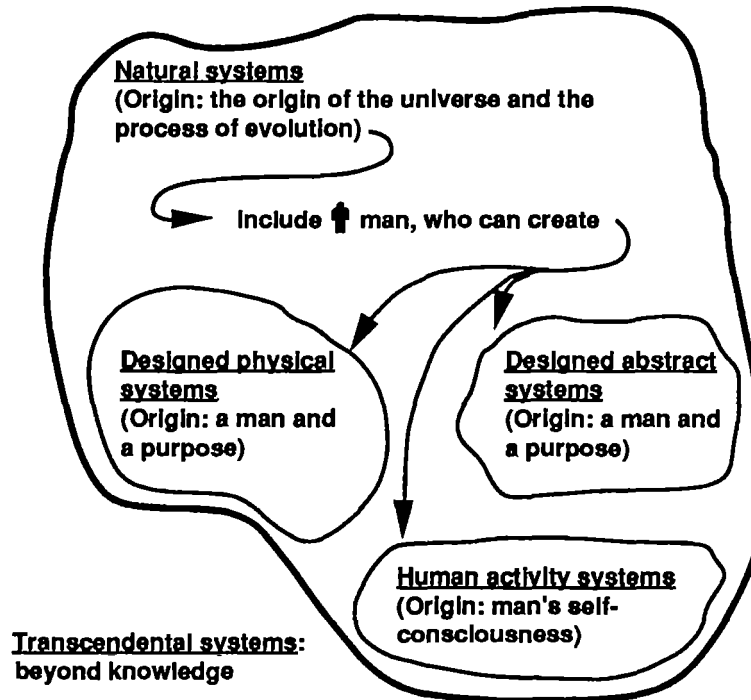


Figure 2.2 Five classes of systems which make up a systems map of the universe. We may—investigate, describe, learn from natural systems—create and use designed systems—seek to “engineer” human activity systems.

But man's design capability is not limited only to physical artifacts. The *designed abstract systems* such as mathematics or philosophies represent the ordered conscious product of the human mind. They are in themselves abstract systems, though they can be captured in designed physical systems such as books and films.

The human act of design is itself an example of a fourth possible system class: the *human activity system*. These are less tangible systems than natural and designed systems. However, there are clearly observable human activities more or less consciously ordered in wholes as a result of some underlying purpose or mission. Checkland gives as an example of an observer who might take as a system a football team seeking to win a championship; the team members will themselves know of their involvement as crucial to the system's purpose, and will have their own definitions of the purpose or mission which links the system's activities and marks its boundary. The components of all such systems can be taken to be human activities.

These human activities will involve various natural and designed systems such as playing ground, rules of the game, etc. Checkland points out that it is better to restrict the definition of the human activity system to the activities themselves, naming and describing other associated systems, if appropriate at the time. Ostrom et al (1993) describe that social infrastructure consists of institutions—the people and the patterns of regular, repetitive interactions among them that transform inputs into outputs. Institutions include such things as families, private firms, government agencies, local communities, churches, and garden clubs. In accordance with this definition the institutions may be considered human activity systems.

Beyond natural, designed physical, designed abstract, and human activity systems there has to be a category to include the systems beyond knowledge. Checkland names these *transcendental systems* in accordance with Boulding (1956).

2.6 Water and waste management Infrastructure

The term “*infrastructure*” can be taken to 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 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. In this study the main focus will be on water supplies, wastewater and waste management. The wastewater and waste management are sometimes called "sanitation" in accordance with the reference.

In managing of physical facilities called "infrastructure" an institution—a human activity system—is a prerequisite. According to Checkland (1984) the management process, not interpreted in a class sense, is concerned with deciding to do or not to do something, with planning, with considering alternatives, with monitoring performance, with collaborating with other people or achieving ends through others; it is the process of taking decisions in social systems in the face of problems which may not be self-generated.

2.7 Poverty and fourth world

The World Bank report (1990a) 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 relative 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 gives 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—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. It is often criticized because it ignores the extent to which the poor fall below the poverty line. 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.

The term "*fourth world*" has been used by UNESCO (1980, cited by Tabibzadeh, Rossi-Espagnet and Maxwell 1989) to describe a sub-proletariat whose housing, sanitation, clothing, and food are inadequate; whose cause is not championed by politicians and unions; who have limited information, education, and voice; and who, because of indifference or intolerance, and the way that they are affected by the law and by administrative practice, are systematically prevented from exercising the rights that other people take for granted.

2.8 Developing country

For operational and analytical purposes the World Bank's main criterion for classifying economies is gross national product (GNP) per capita. Every economy is classified as low-income, middle-income (subdivided into lower-middle and upper-middle), or high-income. Other analytical groups, based on regions, exports, and levels of external debt, are also used. The World Development Report 1992 uses the latest GNP per capita estimates to classify countries (World Bank 1992a). The country composition of each income group may therefore change from one edition to the next. The country groups used in the report are defined as follows:

- Low-income economies are those with a GNP per capita of USD 610 or less in 1990.
- Middle-income economies are those with a GNP per capita of more than USD 610 but less than USD 7 620 in 1990. A further division, at GNP per capita of USD 2 465 in 1990, is made between lower-middle-income and upper-middle-income economies.
- High-income economies are those with a GNP per capita of USD 7 620 or more in 1990.

Low-income and middle-income economies are sometimes referred to as developing economies. The use of the term is convenient; it is not intended to imply that all economies in the group are experiencing similar development or that other economies have reached a preferred or final stage of development. Classification by income does not necessarily reflect development status. The use of the term "countries" to refer to economies implies no judgment by the Bank about the legal or other status of a territory.

3 RESEARCH METHODOLOGY

3.1 Checkland's soft systems methodology

The methodology applied in this study is a *soft systems methodology* developed originally by Peter Checkland for action research (Checkland 1984). It is a general and flexible theoretical framework in problem-solving in real-world situations (Mannermaa 1991). The soft systems methodology approach is meant to be used for tackling **ill-structured problems** in human activity systems.

According to Checkland the concept human activity system is crucially different from the concepts of natural and designed systems. These latter "could not be other than they are", but human activity systems can be manifest only as perceptions by human actors who are free to attribute meaning to what they perceive. The fundamental difference is thus that human activity systems could be very different from how they are, whereas natural systems, without human intervention, could not. The special nature of human activity systems means that systems studies concerned with them are always multi-valued, with many relevant and often conflicting values to be explored. The outcome is never an optimal solution to a problem, it is rather a learning process which leads to a decision to take certain actions in the knowledge that this will in general lead not to "the problem" being now "solved", but to a new situation, in which the whole process can begin again.

By "methodology" Checkland means a set of principles of method which in any particular situation have to be reduced to a method uniquely suitable to that particular situation. He classifies a methodology to be intermediate in status between a philosophy and a technique or method. A philosophy is a broad non-specific guideline for action in accordance with his definitions; a technique is a precise specific programme of action which will produce a standard result. A methodology will lack the precision of a technique but will be a firmer guide to action than a philosophy. Where a philosophy tells "what" and a technique tells "how", a methodology will contain elements of both "what" and "how". Checkland has sought a methodology for using systems concepts which would have four characteristics:

- i) it should be capable of being used in actual problem situations;
- ii) it should be not vague in the sense that it should provide a greater spur to action than a general everyday philosophy;
- iii) it should not be precise, like a technique, but should allow insights which precision might exclude; and
- iv) it should be such that any developments in "systems science" could be included in the methodology and could be used if appropriate in a particular situation.

3.2 Soft systems methodology in futures research

Mannermaa (1991) has developed Checkland's original methodology into a direction more suitable for futures research within the framework of the evolutionary paradigm. Figure 3.1 represents a chronological sequence of the methodology in the form of a diagram. The methodology contains two kinds of activity: stages 1, 2, 5, 6 and 7 are *real-world* activities necessarily involving people in the problem situation; stages 3, 3a, 4, 4a and 4b are *systems thinking* activities which may or may not involve those in the problem situation, depending upon the individual circumstances of the study. In principle, a start can be made anywhere in the logical sequence. Backtracking and iteration are also essential as well as working simultaneously, at different levels of detail and on several stages. The stages in details are described in Chapters 4, 5 and 6 corresponding with the relevant stage of the methodology.

The evident difference between the original and the methodology developed by Mannermaa is that the latter has a clear future orientation in systems thinking and in the following stages. The aim is not to seek for the solutions to the present real-world problems by expressing the problem situation, by formulating the conceptual model and by comparing them, but by expressing the problem situation, by formulating the future model and by comparing them in order to look for possible, desirable and undesirable development paths for the decision-making target group to be studied.

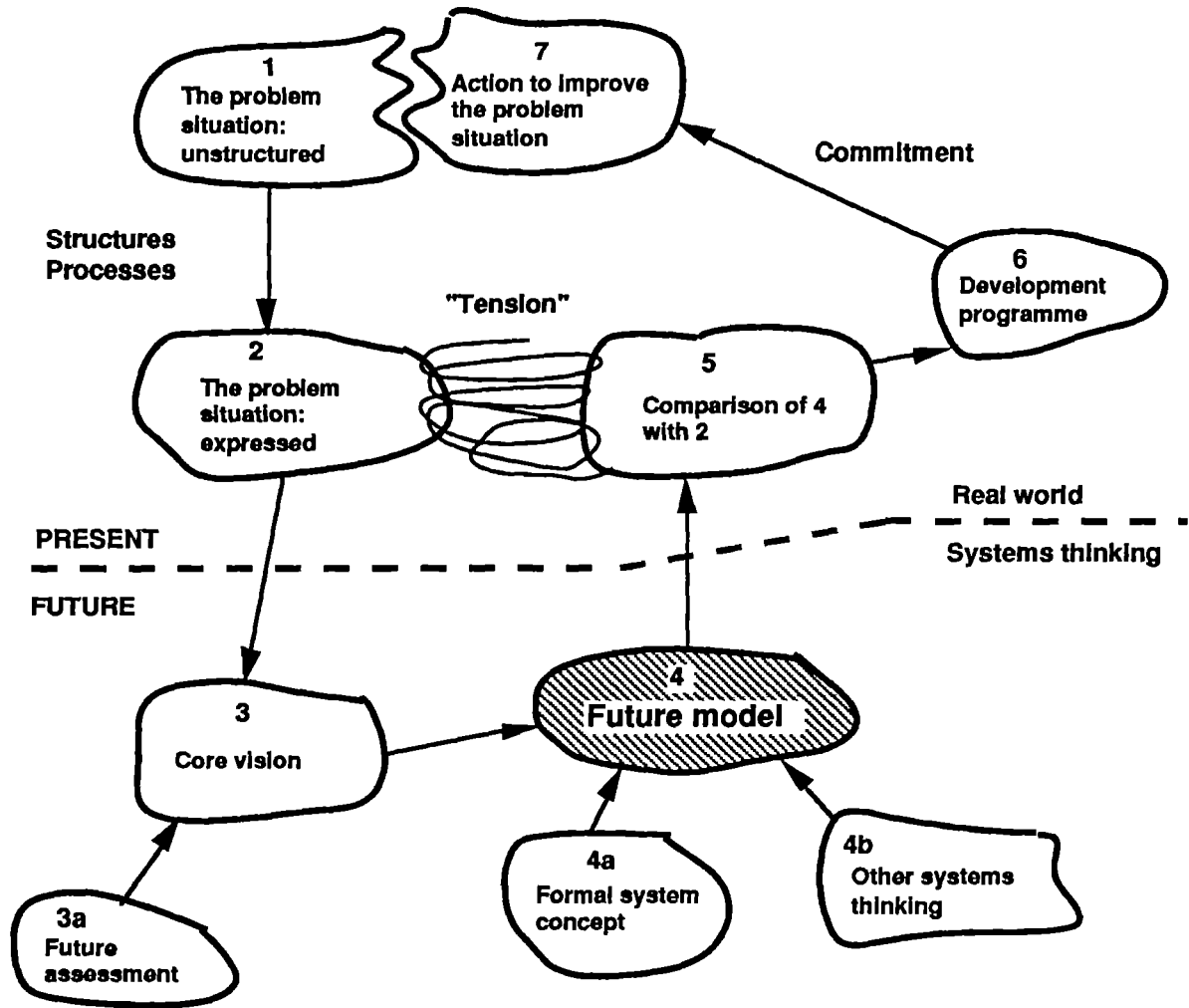


Figure 3.1 Soft systems methodology in futures research (Mannermaa 1991).

In this study the methodology is applied to organize the information related to water and waste management institution and to compare the formulated model with the reality in a systemic way.

4 PERI-URBAN WATER AND WASTE MANAGEMENT INFRASTRUCTURE— EXPRESSION OF PROBLEM SITUATION

4.1 Description of peri-urban problem situation

The objectives of stages 1 and 2 (Figure 4.1) are to determine the richest possible picture, not of “the problem”, but of *the situation* in which there is perceived to be a problem. In human activity systems there will always be many possible options for “the system to be engineered or improved”. Also system boundaries and objectives may well be impossible to define (Checkland 1984). Therefore it is useful to make the initial expression by collecting as many perceptions of the problem as possible from a wide range of people with roles in the problem situation, and by determining the situation not in systems terms at all.

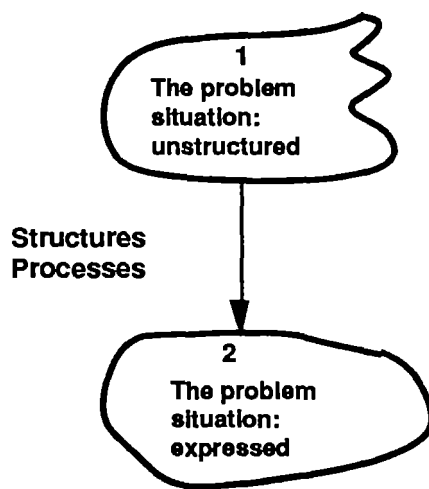


Figure 4.1 The methodology—stages 1 and 2: Expression of problem situation.

The richest possible picture of the problem situation enables the selection to be made of a viewpoint or (viewpoints) from which the further analysis of the present situation can be performed. One or more particular systems which will be part of a hierarchy of systems are being defined as *relevant* from the point of view of the system’s future analysis and of problem-solving. The function of stages 1 and 2 is *to display the situation so that a range of possible and relevant choices can be displayed*.

It has been found that this initial analysis should be done by recording elements of slow-to-change *structure* within the situation and elements of continuously-changing *process*, and forming a view of how structure and process relate to each other within the situation being investigated. “Structure” may be examined in terms of power hierarchy and the pattern of communications both formal and informal. “Process” may be examined in terms of basic activities of deciding to do something, doing it, monitoring both how well it is done and its external effects, and taking appropriate corrective action. According to Checkland the relationship between structure and process, the “climate” of the situation, has frequently been found to be a core characteristic of situations in which problems are perceived.

In the following description the aim is not to achieve a pin-point accuracy in “classification” of causes and effects of the deficiencies related to peri-urban water and waste management infrastructure. They are numerous and mainly interrelated. In order to get the richest possible picture of the problem situation various views and findings have been described.

4.1.1 Underdevelopment

Todaro (1989) gives a multidimensional schematic framework for underdevelopment (Figure 4.2).

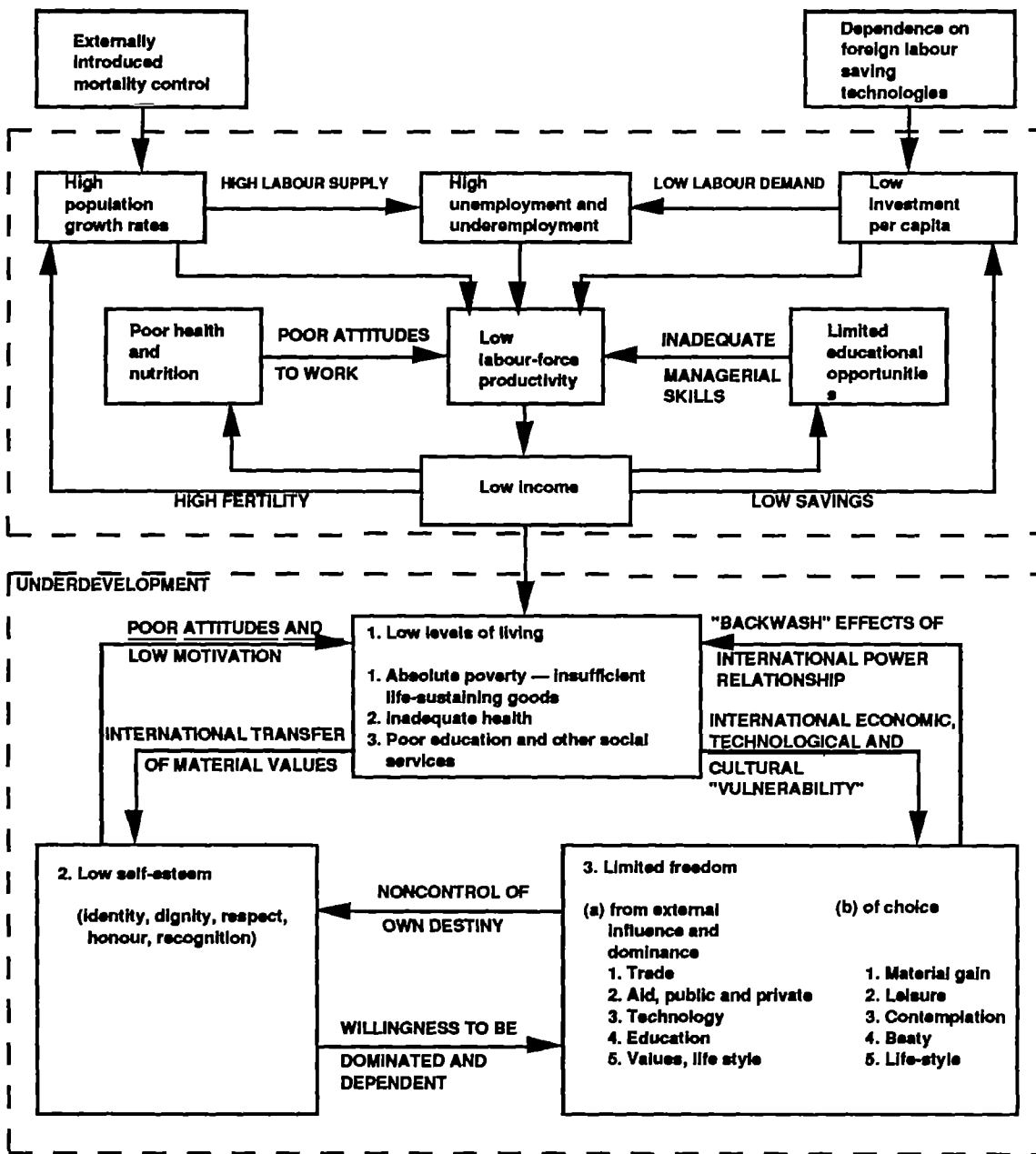


Figure 4.2 Underdevelopment—multidimensional schematic framework.

According to the World Bank report (1990) the use of the upper poverty line USD 370 (see:Chapter 2.6)—gives an estimate of 1 115 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. Table 4.1 shows a detailed regional breakdown of these estimates. 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 4.1 How much poverty is there in the developing countries? The situation in 1985 (World Bank 1990a).

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 (perc.)
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	60	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	1 116	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.

Table 4.2 shows median household income levels in selected slum and squatter settlements and estimated poverty levels in urban areas (UNCHS 1982).

Table 4.2 Median household income levels in selected slum and squatter settlements and estimated poverty levels in urban areas.

City	Settlement	Median household income in settlement (USD per month)	Absolute poverty income level for city (USD per month)	Relative poverty income level for city (USD per month)	Percentage of urban population estimated below absolute poverty
Colombo	Punchi Harak Watte	40	68	-	25
Dacca	Suritola	38	110	-	61
Lahore	Walled City	33	65	-	48
Istanbul	Rumelihisarüstü	115	-	291	18
Kuala Lumpur	Kampong Maxwell	153	215	-	20
Manila	Tondo Foreshore	87	180	-	26
Alexandria	Kom-el-Decka	20	-	122	22
Kumasi	Aylgya Village	75	-	143	16
Lusaka	George Compound	65	175	-	25
Nairobi	Kawangware	74	122	144	25
Port Sudan	Deim Omna	29	-	155	23
Bogota	Las Colinas	142	145	154	24
Guayaquil	Cerros del Carmen & Santa Ana	100	196	161	23
San Salvador	El Manguito	55	-	176	18

In efforts of shifting expenditures to eliminate or reduce poverty has several obstacles (Linn 1983):

1. Political obstacles;
2. Direct transfers of current incomes from higher- to lower-income groups through the budget are not costless;
3. Fiscal dividends in the provision of services to lower service cost to the poor involve a conflict between high- and low-income groups; and
4. Subsidies to lower service costs to the poor involve losses in efficiency and public revenue.

4.1.2 Urban settlements

"The term explosion (or inflation) is entirely justified both by the scale of the phenomenon and above all by its nature. For this rapid increase in the number of city dwellers and in the proportion of the total population concentrated in urban centres has taken place virtually without economic development, without industrialization. More serious still, it has been accompanied by no increase in agricultural productivity. All this completely justifies the expressions coined to describe this form of urbanization: cities before their time, hyperurbanization, overurbanization, urban hypertrophy, and so on. But how do we explain this urban growth? It is essentially one of the elements of underdevelopment."

Bairoch 1988

According to the report by United Nations Centre for Human Settlements (UNCHS 1989a) national governments focus on macroeconomic and fiscal strategies in times of overall slow economic growth, often neglecting human settlements. This has a negative effect on both urban and rural areas, since settlements have a key role in economic development. 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.

Lewin (1981) lists a variety of demographic, economic, social, legal, organizational and administrative factors affecting urban housing conditions and demands:

- (a) Rapid population growth as a result of natural growth, and rural-urban migration (Figure 4.3 and Table 4.3);
- (b) Low income level of the majority (50-85 percent) of urban households, a considerable share of which is engaged in the informal sector of the economy;
- (c) High costs and relatively high standards of both public and authorized private construction, which are beyond the reach of some 80-90 percent of urban households;
- (d) Scarcity and high prices of urban building land—often as a result of speculation;
- (e) Outdated building regulations and related legislation;
- (f) Inadequate provision of urban facilities and services;
- (g) Antiquated system of land survey, mapping, and registration, and shortage of qualified staff;
- (h) Slow process of urban planning, zoning, etc.;
- (i) Lack of saving and housing financing institutions;
- (j) Inadequate housing policies and programmes, and lack of co-ordination among the authorities concerned.

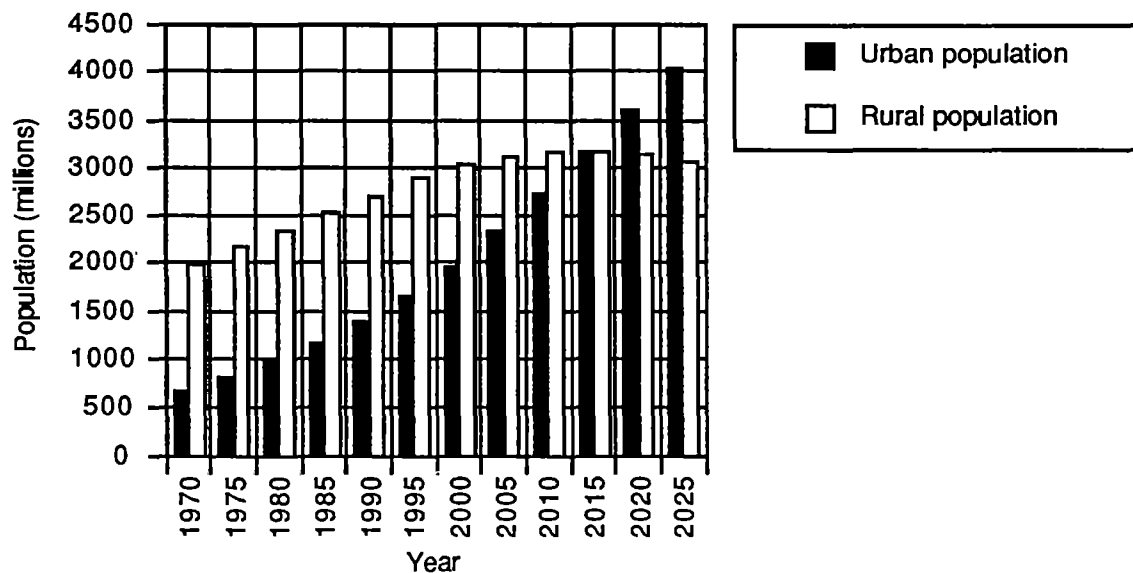


Figure 4.3 Population in less developed regions 1970-2025 (UN 1989).

The factors influencing the decision to migrate are varied and complex (Todaro 1989, Figure 4.4). He lists some social, cultural, and psychological factors emphasized in the early research on migration:

1. Social factors including the desire of migrants to break away from traditional constraints of social organizations;
2. Physical factors including climate and meteorological disasters like floods and droughts;
3. Demographic factors including the reduction in mortality rates and the concomitant high rates of rural population growth;

4. Cultural factors including the security of urban "extended family" relationships and the allurements of the "bright city lights"; and
5. Communication factors including improved transportation, urban-oriented educational systems, and the "modernizing" impact of the introduction of radio, television, and the cinema.

Table 4.3 Importance of rural-urban migration as a source of urban population growth: selected developing countries in the 1970's (Todaro 1989).

Country	Annual urban growth (%)	Share of growth due to migration (%)
Argentina	2.0	35
Brazil	4.5	36
Colombia	4.9	43
India	3.8	45
Indonesia	4.7	49
Nigeria	7.0	64
Philippines	4.8	42
Sri Lanka	4.3	61
Tanzania	7.5	64
Thailand	5.3	45

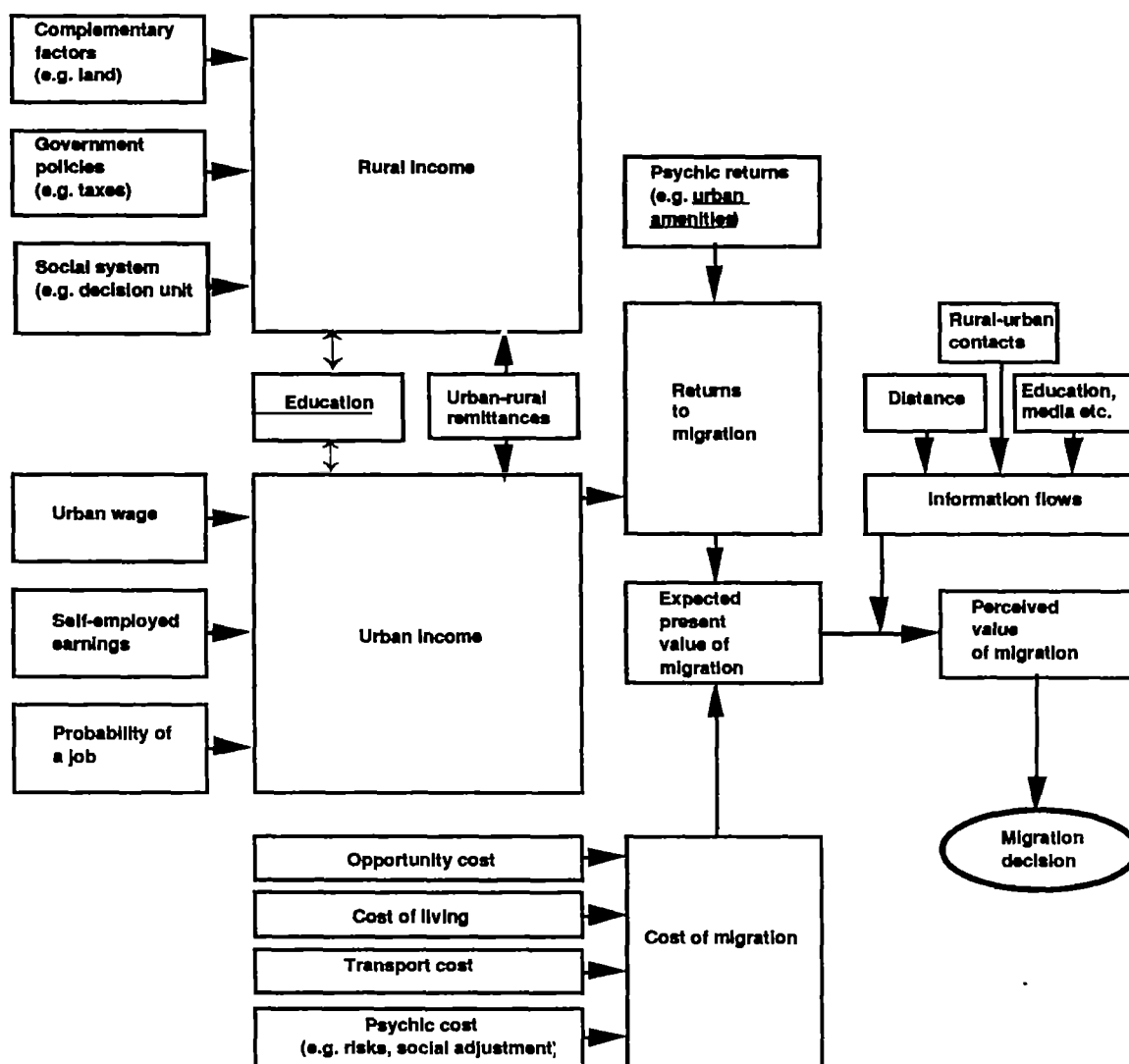


Figure 4.4 A schematic framework for the analysis for the migration decision.

Although Todaro admits that all these noneconomic factors are relevant, he also points out that there now seems to be widespread agreement among economists and noneconomists alike that rural-urban migration can be explained **primarily by the influence of economic factors**. Bairoch (1988) lists the main causes explaining the urban explosion as follows:

1. Extremely high density of agricultural population;
2. Large difference between urban and rural income;
3. Education;
4. Shift from high mortality rates to rapid natural growth.

Bairoch (1988) declares that the reason why the migration has not been even more rapid is the scale of urban unemployment. In an attempt to cope with rural-urban migration governments generally have tried the following four approaches (Tabibzadeh et al 1989):

1. To improve social and economic conditions in rural areas through agrarian reforms, labour and tax policies, policies and projects for rural regeneration (as in the United Republic of Tanzania), and so on. Considered in theory to be the most promising, this approach has in practice been only marginally successful. With a few notable exceptions (Bolivia and Costa Rica), promised land reforms have not been carried out, or only partially so (as in Egypt). The poor have rarely been provided with more land, or benefited from favourable prices for their agricultural produce. In some cases the effect has been the opposite of that intended: rural-urban migration often accelerated, as in Argentina, Colombia, Ecuador, and Peru;
2. To control migration through legislation, including residence at work-points (as in China, India, and Indonesia), a system of identity cards and residence permits, enforced with police support, and physical clearance of illegal settlements (these were the policies until recently in Nairobi and Khartoum); slum removal, and obligatory resettlement (as in Brazil and the Philippines). The success of these measures (some of which violate Article 13 of the Universal Declaration of Human Rights that states "Everyone has the right to freedom of movement and residence within the borders of each State") generally depends on the implementation of additional measures aimed at creating adequate social and economic conditions in the settlement areas;
3. To redistribute the rural population within the rural areas (projects in Brazil, India, Indonesia, Malaysia, Nepal and Sri Lanka). Only a few of these projects have succeeded in relocating the targeted number of persons. Inadequate infrastructure and poor communications have been among the main constraints. In addition, the projects have been costly and have covered relatively small numbers of people;
4. To accommodate migrants in urban areas through housing projects, "sites and services" schemes, and so on, as in Kenya, United Republic of Tanzania, and Venezuela (Caracas) or to redirect them to other urban areas (satellite towns, etc.) as in Malaysia, Mexico, Peru (Lima), Republic of Korea, Senegal (Dakar), and Venezuela (Ciudad Guyana), decentralization of industry to encourage population growth away from the main conurbation (as in Indonesia), and incentives, such as free or subsidized land and loans for construction, to encourage people to settle where the government thinks that they should—as in Juba (Sudan) and, most recently, in Pakistan. The implementation of such projects has encountered a number of problems, and their success has differed widely. One important conclusion seems to be that, whether or not they have achieved their goals, they have stimulated more migration to the urban areas, thus aggravating the problems of urban congestion and unemployment.

The available evidence suggests that **none of these methods works** particularly well. For many cities the measures outlined above came too late, since any of the benefits of regulation were outweighed by the natural population increase. Several countries (e.g. Indonesia and Mozambique) have now accepted this fact and are not resisting ad hoc settlements (Tabibzadeh et al 1989). Prud'homme (1993) states that especially large cities in developing countries contribute to the national budget more what they receive from it. The cities make big budget contributions because of concentration of activities and wealth within them, and this should be used an important policy implication for the further development of the cities.

4.1.3 Peri-urban settlements

"The urban poor, typically housed in slums or squatter settlements, often have to contend with appalling overcrowding, bad sanitation, and contaminated water. The sites are often illegal and dangerous. Forcible eviction, floods and landslides, and chemical pollution are constant threats. Some of these people are migrants from the countryside who are seeking better-paid work. For many, particularly in Latin America, migration is permanent. For others, as in East Africa and parts of Southeast Asia, it may be temporary, reflecting (for example) seasonality in agriculture."

The World Bank 1990a

Hardoy and Satterthwaite (1989) estimated that in most cities 70 to 95 percent of all new housing is built illegally. From 30 to 60 percent of the cities' population lives in illegal settlements (see: Table 4.4). Because most governments regard them as illegal—they do not provide infrastructure and services for them. Ehrlich and Ehrlich (1990) describe the situation in Delhi, India as follows:

"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 faeces 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 200 000 to 500 000 people sleep in the streets."

Table 4.4 Proportion of squatters and slum-dwellers in selected cities (Tabibzadeh et al 1989).

Region and city	Year	City population (thousands)	Slum-dwellers and squatters	
			No. (thousands)	%
Africa				
Addis Ababa	1981	1200	948	79
Casablanca	1971	1506	1054	70
Kinshasa	1969	1288	733	60
Nairobi	1970	535	177	33
Dakar	1969	500	150	30
Latin America				
Bogota	1969	2294	1376	60
Buenos Aires	1970	2972	1486	50
Mexico City	1966	3287	1500	46
Caracas	1974	2369	1000	42
Lima	1970	2877	1148	40
Rio de Janeiro	1970	4855	1456	30
Santiago	1964	2184	546	25
South Asia				
Calcutta	1971	8000	5328	67
Bombay	1971	6000	2475	41
Delhi	1970	3877	1400	36
Dhaka	1973	1700	300	35
Karachi	1971	3428	800	23
East Asia				
Manila	1972	4400	1540	35
Pusan	1969	1675	527	31
Seoul	1969	4600	1320	29
Jakarta	1972	4576	1190	26
Bangkok/Thonburi	1970	3041	600	20
Hong Kong	1969	3617	600	17

Baross (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. Security of land tenure in squatter areas may encourage further squatting (Tokman 1984). If the rents and land values will rise increasing land and property taxes, the affordability for the poor will be reduced (Tym 1984). The middle-income groups who can invest in affordable, and titled, land, may thus invade the squatter areas.

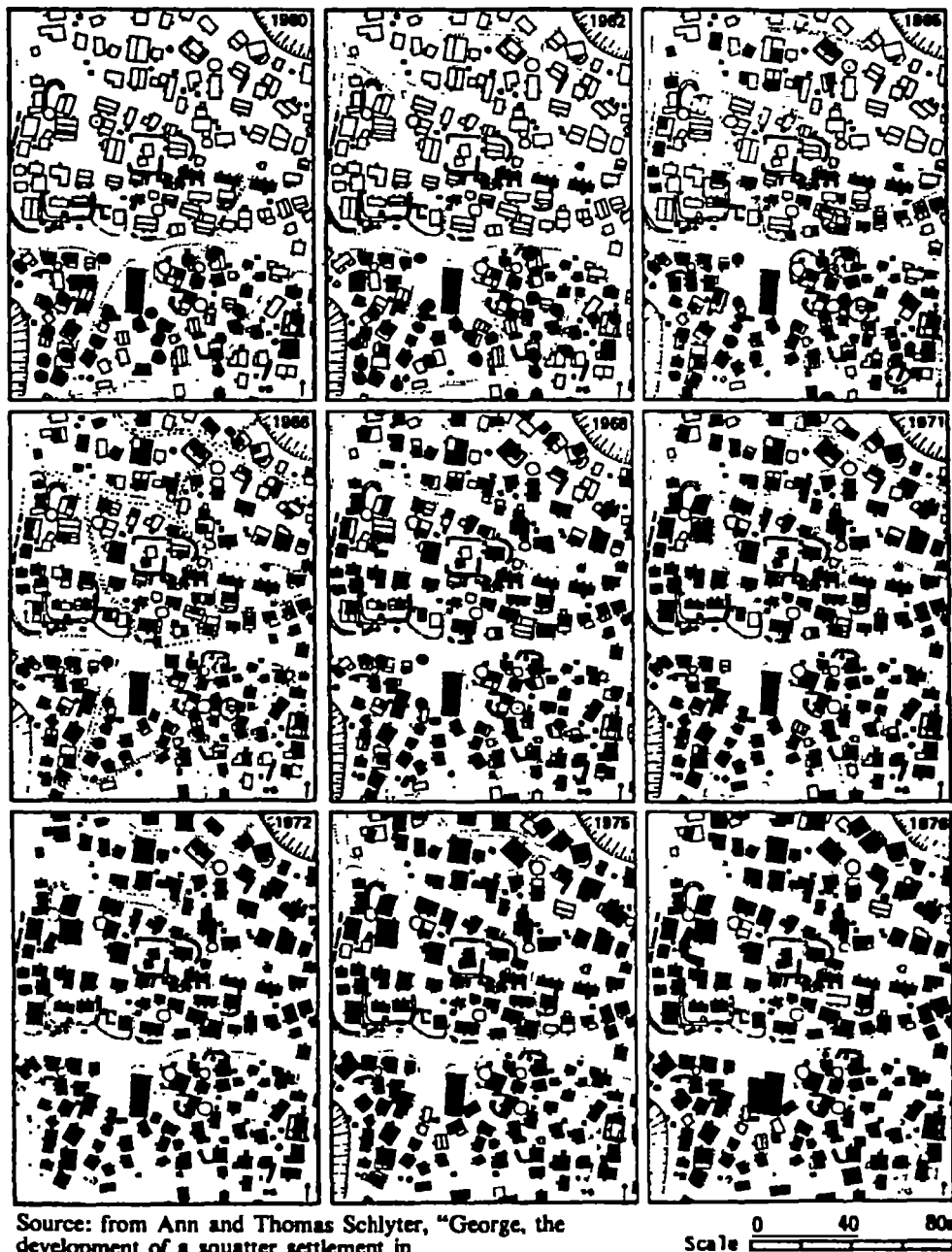


Figure 4.5 George Compound, Lusaka—growth through expansion and densification (UNCHS 1982).

The process of peri-urban settlement formation comprises (UNCHS 1982): invasion; accretion; and entrepreneurial development. The growth and change of settlements comprise: expansion;

densification; redevelopment; and 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; and
- community organization and official response.

The population densities varies in low-income settlements very much. In some peripheral squatter settlements the density can be under 25 000 persons per square kilometre, and in central areas of big Asian cities the densities can be as high as 250 000 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.

Table 4.5 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
Daaca	Surtitola	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	Shonal 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-EI-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	6.6	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	Cerro 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

Table 4.6 Population densities 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	
	Dacca	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	Shonal 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-Deeka	1976	6 121 ^b	27.0	1 000	250
		Kumasi	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	
	Gawklly	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 hd/ha.

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.

For example, the population growth in Nairobi, Kenya and in Kibera squatter settlement which is locating about seven kilometres from downtown Nairobi are shown in Table 4.7. The area of Kibera is about 2.5 km² and the population was about 450 000 in 1992. This gives a population density of 180 000 hd/km² (Macharia 1992).

Table 4.7 Population growth in Nairobi and in Kibera.

Year	Population Nairobi hd	Annual growth rate in Nairobi %	Population Kibera hd	Annual growth rate in Kibera %
1948	119 000			
1960			3 000	
1962	267 000	5.9		
1965			6 000	14.9
1969	509 300	9.7		
1970			11 000	12.9
1975			20 000	12.7
1979	827 800	5.1		
1980			60 000	24.6
1989	1 420 000	5.5		
1992			= 450 000	18.3

Tables 4.8 and 4.9 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, terms for 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 4.8 Types of rental housing used by lower income groups in many Third World cities (Hardy and Satterthwaite 1986a).

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

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 a "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 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

4.2 Description of peri-urban water and waste management infrastructure situation

4.2.1 Causes of deficiencies in peri-urban water and waste management infrastructure

"Land—its use, abuse, control and ownership—is the central problem of the city. Neither capitalist nor socialist societies have solved the problems resulting from competition over land; in both societies some people continue grow wealthy through their control of land, while lack of land helps to keep others poor. . . . Conferring security of tenure on squatters, legalizing their settlement and providing it with services, does not solve all the problems of the inhabitants. Squatting is not only a land issue: it is an economic and social issue which tends to be discussed mainly in terms of land... Funding agencies tend to see security of tenure as a matter of land and its title. But individual squatters see it as an indication of whether they will be able to stay in their dwellings for an appreciable time. This security is as much a factor in employment opportunities, general urban development policies and family circumstances as is title to a plot." McAuslan 1985

Solo, Perez and Joyce (1993) consider the constraints that can make the provision of water and waste management infrastructure to peri-urban settlements extremely difficult under four subheadings:

1. Physical and technical:
 - difficult sites and terrain;
 - complicated site layouts; and
 - overreliance on conventional service-delivery systems.
2. Economic and financial:
 - the high cost of water and sanitation to families of low income;
 - the shortage of capital for investments; and
 - the limits of formal sector housing.
3. Institutional:
 - weak and disorganized operation of public works systems;
 - new emphasis on financial discipline, revenue collection, and pricing policies sometimes thereby undermining broader public needs;
 - inability to service low-income communities; and
 - susceptibility to corruption and politicization.
4. Structural:
 - cities are often defined according to fully serviced areas, which do not always include the poor;
 - planning is by prohibitive zoning;
 - population growth rate is not always taken into account;
 - prohibitive land-use planning distorts the urban land market;
 - city planning and building codes define housing without services as unacceptable;
 - legalization and property rights must first be approved before ownership of land is recognized;
 - the emphasis on private sector growth over social policy;
 - the limitations on the international donor; and
 - the bias of discrimination against low-income families at local, national and international levels.

McGranahan (1991) states that where the government has taken primary responsibility for providing water and sanitation services, budgetary and administrative crises, such as those recently experienced in much of Africa, can lead to deteriorating conditions. Where responsibility for providing water and sanitation services is not matched by commensurate political power, it is difficult to obtain even the appropriate share of government expenditure. The organizations responsible for water and sanitation may not have the power to influence related government policies, such as zoning and land tenure. An important consideration in the provision of public services is also that "scaling-up" (or the implementation of a project on a uniform national basis) is a perennial problem in development. The last three decades have been mainly characterized by limited or pilot projects which, though good, lead others nowhere (Tabibzadeh et al 1989).

The factors that affect the ability of the poor in getting access to water supply and sanitation services are many and interrelated (Kudat and Fon 1990). They also influence many other aspects of household water behaviour, including the quality and quantity of water consumption, the effective demand for water and sanitation, the ability of the poor to voice their demands and to be able to seek alternative solutions. These factors are listed below as follows:

1 Macro/national factors

1. Poverty
 - spatial dimensions of poverty; and
 - political commitment to poverty alleviation.
2. Legislation
 - poverty dimensions of legislation;

- spatial dimensions of legislation;
 - building codes/WSS regulations; and
 - eviction.
3. Institutional capacity
 - promotion of community participation; and
 - incorporation of WID in sector mainstream.
 4. Political participation
 - class dimensions; and
 - gender dimensions.

I Community settlement patterns

1. Socio-economic homogeneity;
2. Patterns of property ownership;
3. Physical infrastructure;
4. Population density;
5. Type of housing stock; and
6. Local power structure.

II Shelter characteristics

1. Ownership;
2. Shelter type (e.g. single/multi story);
3. Shelter organization (e.g. multi/single unit);
4. Availability of yard or space (inside/outside); and
5. Micro drainage.

IV Water supply characteristics

1. Cost;
2. Siting;
3. Design;
4. Quality of water; and
5. Regularity of service.

V Household characteristics

1. Household composition;
2. Income;
3. Work patterns;
4. Education of household members; and
5. Decision making mechanisms.

Macro level, community and shelter specific constraints define the boundaries within which the poor seek opportunities for improving their living conditions. Favourable household characteristics, such as higher incomes, help the poor in altering their shelter constraints or in eliminating some community constraints by moving out of their communities. Kudat and Fon (1990) report:

"In the specific case of Chittagong, both the exit and voice options of the poor, and especially of the poor women are severely constrained. . . . Poor women are particularly constrained in their ability to exit from one safe source and enter another safe source. They cannot employ the self-help option alone and depend largely on the decision of their husband. Among women, those who head households or who have to work as maids have incomes far too low to afford vendors. They are also too poor to move into better communities. Yet, garment workers enjoy greater flexibility; many may move into better communities and/or afford the purchase of services, including from vendors.

The "voice" options for the poor, and especially of poor women, are also restricted. There are very few decisions outside the realm of the household that the poor participate in, in a meaningful manner. Women are further constrained; even in the household context their voice is not heard.

Elected local bodies, including ward commissioners, do not represent the poor; rather they own the largest parcels of the slums and control informal sector jobs. While women's representation in ward boards is required by law, many female ward members we identified were, in fact, wives of the commissioners. Other types of community organizations are also not available and overall political conditions discourage the formation of public meetings, public hearings, panels, etc. When these occasionally take place, women are largely excluded. Local NGOs are basically branches of international voluntary agencies and not indigenous organizations representing the poor. As to legal possibilities, these also provide little protection for the poor."

Causes of deficiencies related to arrangements of water infrastructure for the periurban settlements adjacent to urban centres may be the following (Hardoy and Satterthwaite 1989, Lauria 1990) :

- i) residents frequently do not have land tenure;
- ii) the areas are often inaccessible (steep slopes, ground conditions ill-suited for construction, swamps, subject to flooding);
- iii) conventional service levels are usually inappropriate; and
- iv) residents are poor, presenting a special challenge for financial self-sufficiency.

Land development policies and management

Linn (1982) states that many of the apparent symptoms of urban inefficiency, in particular congestion and pollution, are due to inappropriate policies within the city rather than the result of inefficient city size or inefficiently high rates of urbanization. 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.

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 authorities' land-use definition of urban land may be according to fully services area. Those areas, where low-income families live without access to water and sanitation, by this definition, are not considered urban land (Solo et al 1993). 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 changes to be developed.

Hardoy and Satterthwaite (1989) describe that some governments have released unutilized and under-utilized land to provide land-sites for housing in "serviced site" projects as an alternative for squatter settlements. Households receive a plot with basic infrastructure and services, and they have to organize the construction of houses on the land provided. Very few serviced-site projects have gone to a continuous programme. The following constraints of serviced site and upgrading programmes have been identified (UNCHS 1986a):

- rising land prices and decrease in cheap rental accommodation;
- problems related to maintenance, if no provisions for that;
- if no increase in local government capacity to manage new basic infrastructure (financial, or personnel) deterioration of the once built services will occur;
- if no increase in local government capacity is ensured, it will be difficult to continue the upgrading programmes;

- schemes can be too expensive for poorer groups;
- schemes can be in wrong location (too far from places where the income is obtained);
- plot sizes and site lay-outs not appropriate to the needs and priorities for inhabitants;
- governments' economic problems;
- available resources can not cope with the population growth; and
- difficulties in land acquisition for low income settlements (high cost of land, long acquisition procedures, government unable to expropriate land).

In Cameroon, for example, it is not uncommon for registration process to take between two to seven years, which explains why out of an estimated 1.6 million plots countrywide only 100 000 are registered (Farvaque and McAuslan 1992). In Lima, Peru, the requirements for legalization of purchased land involve 112 steps and can take a minimum of four years. The steps include four presidential signatures of different occasions (Solo et al 1993).

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. Tomaro, Topik and Zalla (1984) assess the degree to which identifiable low-income and spontaneous neighbourhoods would benefit during visits to the sites selected for development under the Thirty Cities and the Greater Tunis Complementary Program. Housing in these areas often had one or more of the following characteristics:

1. placed on land that was not necessarily owned by the resident;
2. built without a permit;
3. constructed by residents themselves;
4. placed on a site without giving attention to an overall development plan;
5. inexpensive and non-permanent materials used or haphazard construction;
6. lack or sparseness of infrastructure services such as water, sewer, roads;
7. located outside the boundaries of municipalities.

Amos (1984) found that the most common weakness in squatter upgrading and sites and services programmes is that they make inappropriate demands upon the existing political and administrative institutions, and are not compatible with current decision-making system. Therefore he recommends:

"The organizer of an upgrading and site and services programmes cannot expect either to work outside the institutional culture of the administration or to reform it overnight. One must, therefore, try to construct a workable system which will help agencies improve their capability and which will produce a reasonable number of the required units at reasonable cost and deliver most of them to the intended target group. To some extent this may be achieved by concentrating attention upon the output of completed units rather than upon the activities of individuals or subsections within the organization."

Taylor (1983) reports that one disadvantage of the Jakarta's kampung improvement programme was that it failed to adequately upgrade sanitation and public water supply. The KIP provided only minor upgrading at kampung level, but improvements in infrastructure systems would have required major city-wide action.

The term "land banking" usually refers to buying by governments in advance of need, but can cover all government land acquisitions. Tomlinson (1990) takes the Delhi Development Authority (DDA) in India as an example demonstrating problems which intercede between land banking and an effective housing policy:

"Delhi's population increased from 2.3 million to 5.7 million between 1961 and 1981, and is expected to grow to 14.3 million by 2001. In 1961 the city's squatter population constituted 8 per cent of the whole. In 1981 it totalled 24.8 percent of Delhi's households. The DDA (Delhi Development Authority) was formed in 1957 and was empowered to acquire land for public use and to act as a land bank, its function being to service, develop and allocate that land and to fund itself by selling leases and using the funds so generated to enable it to acquire and develop additional

land.

The underlying principle was that the DDA would acquire cheap, agricultural land on the urban periphery and be in a position to prevent speculation on land prices. It was anticipated that this would allow increases in value to accrue to the DDA, that it would enable the city to direct future development through its control of "far-flung and locationally poor" areas. Much of this almost free land and services was also subject to ineligible uptake and downward raiding. Most of the developed residential land—52 percent—was sold to the relatively rich, also occasionally at subsidised prices.

In the mean time Delhi's squatter population increased to 24.8 percent of the city's population. Confronted by land frozen against private sector development and the slow pace of public sector development, about a million squatters were forced into "unauthorised settlements". The squatters, however, were not always in a hopeless situation—through gaining the patronage of local politicians they were often able to obtain not only official recognition of their occupation of the land but also services for their settlements."

Tomlinson (1990) points out that unless public acquisition of land is associated with a commitment to providing serviced land for the poor, little purpose is served by public intervention or control of the land market. There are many other problems linked with land banking:

- (i) Cost of land; the demand for land will be close to sites of employment, but this land will be especially expensive. The land acquired further out in anticipation of urban growth might become expensive, if it will not be developed at a later date. United Nations (1983) reports that largescale acquisition of public land increases demand and restricts supply, forcing land prices up, and hurting the urban poor in particular;
- (ii) Squatter invasions; public land tends to be primary target of squatter invasions, and if public authorities do not recapture some or all of the costs of the land, the sustainability of land banking programme is obstructed. Tomlinson (1990) points out that unplanned squatter settlement on public land will considerably increase the cost of any subsequent attempts to service the settlement;
- (iii) Administrative capabilities; local governments administration is weak and cannot cope with the requirements of successful land banking; and
- (iv) Financing; local governments have seldom funds for largescale land acquisition, or access to low interest rate loans.

Most of Kenya's municipal boundaries include large areas which are rural by nature. The study by Wambulwa and Kessen (1989, cited by Odada and Otieno 1990) has shown that in 1987 only 48 percent of category A, 28 percent of category B and 16 percent of category C municipalities were urban. Rural areas were defined as those areas with a population density less than 750 people per square kilometre. Table 4.10 shows the urban and rural extent of the municipalities in 1987.

Table 4.10 indicates that in category A when Nairobi is excluded from this category, only 24 percent of total municipality areas are urban while the rest (76 percent) are rural. Category B municipalities have only 9 percent of their total areas categorized as urban. In category C municipalities, 18 percent of the total area is urban compared to 82 percent rural. For all the local authorities, only 30 percent of the total area is urban while the rest 70 percent is rural. When the two major towns of Nairobi and Kisumu are excluded, only 17 percent of Kenya's other municipalities are categorized as urban. Less than half (49 percent) of Kenya's population in the municipalities can be regarded as urban.

Table 4.10 Distribution of Local Authority Population in Kenya in 1987 (Odada and Otieno 1990).

Local Authority	Urban		Rural		Total Number (thousand)
	Number (thousand)	% of Total	Number (thousand)	% of Total	
CATEGORY A					
Nairobi	1205.6	98.6	17.5	1.4	1223.1
Kisumu	127.5	59.7	86.1	40.3	213.6
Nakuru	125.9	68.6	57.6	31.4	183.5
Eldoret	74.9	66.2	38.3	33.8	113.2
Thika	46.2	72.2	17.8	27.8	64.0
Kericho	19.1	41.8	26.6	58.2	45.7
Nyeri	39.5	71.7	15.6	28.3	55.1
Kitale	29.8	66.8	14.8	33.2	44.6
Nanyuki	25.1	90.2	2.7	9.8	27.8
Nyahururu	15.6	92.2	1.3	7.8	16.9
Sub-Total	1709.2	86.0	278.3	14.0	1987.5
(Excl. Nairobi)	503.6	65.9	260.8	34.1	764.4
CATEGORY B					
Meru	49.8	15.4	273.9	84.6	323.7
Kisii	36.1	75.3	11.9	24.7	48.0
Kiambu	28.7	60.2	19.0	39.8	47.7
Bungoma	22.3	57.9	16.3	42.1	38.6
Embu	17.5	69.6	7.7	30.4	25.2
Sub-Total	154.4	32.0	328.8	68.0	483.2
CATEGORY C					
Mombasa	472.7	90.6	48.8	9.4	521.5
Malindi	42.6	23.5	139.0	76.5	181.6
Machakos	37.0	33.0	75.1	67.0	112.1
Kakamega	44.6	83.2	9.0	16.8	53.6
Murang'a	9.6	48.3	10.1	51.4	19.7
Sub-Total	606.5	68.3	282.0	31.7	888.5
(Excl. Mombasa)	133.7	36.4	233.1	63.6	366.8
Grand Total	2470.1	73.5	889.0	26.5	3359.1
(Excl. Nairobi and Mombasa)	791.8	49.0	822.8	51.0	1614.6

Water and waste management Infrastructure

United Nations Centre for Human Settlements report (1986b) summarizes the main causes for deficiencies 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.

Technological causes

For example, Tomaro et al (1984) states:

"Although ONAS is conscious of the need to provide necessary services as economically as possible in the rehabilitated areas, in general "appropriate technologies" are regarded as temporary and less than ideal solutions, not only by ONAS but by developers and agencies involved in residential construction, as well as municipalities charged with handling solid waste disposal. ONAS is wedded to piped systems and intends in time to install these systems in every urban centre of more than 2 000 inhabitants.

ONAS realizes that it cannot achieve this objective in the next decade. Consequently, it has accepted the use of "provisional" (non-pipe) solutions to the sanitation problems of urban areas. For example, ONAS frequently approves the sanitary systems designed and installed by public and private sector developers, which call for the construction of a common cesspool. These vary in size depending on housing density and are designed and installed according to ONAS standards. They are serviced by the municipality until linked to the ONAS system."

The FUPROVI is assisting the Los Sauces, an existing settlement of 226 families in the outskirts of the capital, San Jose. Wray (1990) describes:

"Water is obtained from a near-by stream for which each family pays a fixed charge. FUPROVI has helped the community to build a small dam, slow sand filter and a 50 mm transmission pipe. Individual connections are provided to the houses. FUPROVI feels that distribution pipe costs are unnecessarily high due to the need to meet the standards set by the water regulating authority regarding minimum diameters, service connections and pipe cover. The same applies to the sewerage system which is based on a conventional system using 200 mm minimum diameter concrete pipes, individual house connections and flush toilets (residents at present use latrines)."

The reasons for the unsuccessful urban planning more commonly are ineffective institutional frameworks and incorrect specification of the problem than the planning models themselves. Echenique (1983, cited by Ridgley 1986) identifies three main factors determining the success of planning models in developing countries:

1. Specification of the problem;
2. Theoretical strength of the model; and
3. Institutional setting.

Ridgley (1986) gives the principal reasons, why the urban planning models are not used:

- i) the "comprehensive incomprehensibility" of the large simulation models in use;
- ii) the high cost of data collection and model development, refinement, and use, in a climate of worsening urban fiscal conditions;
- iii) the models' lack of strong references to policy issues and tools;
- iv) little contact between the eventual users of the models and their developers;
- v) exaggerated expectations about the models' capabilities; and
- vi) ineffective communication of the modelling results to decision makers.

Ridgley gives also the externalities challenging rational planning models, and causing failures in urban planning:

- unforeseen developments in the future;
- inability to implement master plans;
- divergent objectives of different parties involved;
- incorrectly identified objectives;
- actions recommended that threaten existing public agencies;
- conflicts with the interests of powerful parties; and
- actions of local government are determined more by political and social relations than by

the functional analysis of urban needs.

Robinson (1990) describes the attitudinal dimension of the maintenance problem:

"Maintenance has traditionally been considered to be an unglamorous activity. In many organisations, it has become the preserve of the incompetent and those who lack motivation. It has been seen as a dead-end job, often based in the poorest available office accommodation and with allocations of budget that are too low and are arbitrary. There has been little political commitment to the subject, since maintenance provides few opportunities for "cutting tapes" and gaining kudos. There is no prestige or grand opening ceremony associated with obtaining 85 per cent availability of mechanical equipment over a 12 month period, even though this may represent a major engineering achievement which could have a dramatic effect on the performance of the operating organisation as a whole."

For example, the study by the National Institute of Urban Affairs (1986) showed that the installed water distribution capacities were underutilized, and unaccounted for water was 30-40 percent reflecting low level of performance of the urban local bodies in India.

Institutional causes

"The greatest deficiencies in public services can be expected when small, close-knit elites and the working class are widely separated in terms of power and privilege without a large buffer group."

Portes and Walton 1976, cited by Ridgley 1986

Water supply arrangements in peri-urban areas fall within a broad range of system configurations that vary according to whether they involve the public or private sector (or both) and vary also according to how they combine three elements: the water source, the production, and the delivery. Because each of the three elements may be separately owned, a given system may present a complex pattern of ownership that includes public institutions, voluntary organizations, and private enterprises (McGowan, Hodgkin and Kaplan 1992). Peri-urban water supply arrangements may involve a city water utility or department as the main supplier. Wholesalers lease taps from the utility and sell water to retail distributors who move water, e.g. using barrels on donkey carts from the wholesaler to the consumers. Others are entirely private operations, involving households or enterprises that have their own wells and satisfy at least part of their water needs from this source. Other private enterprises buy water from private truckers, who purchase it from public water utilities. Some arrangements involve consumers who, through poverty, inadequate supplies, or supply interruptions, cannot afford to purchase water and thus are forced to use open-access sources.

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

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 organization 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; and

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.

Ostrom et al (1993) describes an institutional approach to explaining development outcomes:

"Identifying the reasons for the failure to maintain many capital investments and proposing remedies to reduce the squandering of resources in impoverished settings are demanding tasks. Where capital is invested in physical facilities, the cause of failure could occur at any or all of the stages of the development process; there is no solitary, easily identifiable cause. One cannot point to poor design, lack of resources, inadequate training, lack of coordination, opportunistic behaviour, or overly centralized institutions as the single source of the problem, even though some of these factors are most likely involved whenever a particular facility is inadequately maintained or completely abandoned.

On the other hand, we argue that there is one underlying analytic cause for the failure to sustain investments in facilities. That cause is the set or sets of perverse incentives facing participants in the design, finance, construction, operation, maintenance, and use of facilities. In other words, when we find major investments in facilities, including rural infrastructure facilities, abandoned or deteriorating rapidly soon after construction, we presume that some of the actors involved in the development process confronted a set of incentives that rewarded them (or did not sanction them) for actions that yielded an unsustainable investment."

According to Ostrom et al (1993) incentives are more than just financial rewards and penalties. They are the positive and negative changes in outcomes that individuals perceive as likely to result from particular actions taken within a set of rules in a particular physical and social context. Other types of inducements include:

- (i) opportunities for distinction, prestige, and personal power;
- (ii) desirable physical conditions in the workplace, including clean, quiet surroundings or a private office;
- (iii) pride in workmanship, service for family or others, patriotism, or religious feeling;
- (iv) personal comfort and satisfaction in social relationships;
- (v) conformity to habitual practices and attitudes; and
- (vi) a feeling of participation in large and important events.

National and subnational level

"Governments fail to provide basic services or to ensure that other organizations or businesses do so. In addition, most governments, legal and regulatory systems for planning and managing urban areas inhibit and repress the efforts of their citizens to meet their own basic needs with their own resources and organizations."

Hardoy and Satterthwaite 1989

A survey conducted in 1982 by the IMF showed that, while in the industrial countries some 57 percent of all government jobs were accounted for by local rather than central government, the figure was only 15 percent for the developing countries (Stren and White 1989). By the 1980s large Anglophone African cities had in the urban council structure a mix of elected and centrally-nominated councillors controlling a local bureaucracy with an extensive base of local taxation and a wide range of local functions—like solid waste management, preventative public health, roads,

sewerage and water supply. These were administered of the councils. The central governments, however, are having the budgetary controls and responsibility of administrative support.

The Francophone African cities the structure is the communal pattern, where the commune is a direct creation of the central government. It consists of elected representatives, an executive mayor, and a number of small administrative departments. Local bodies may be responsible only for limited number of services like garbage removal and street cleaning. The central government agencies, parastatals, or private companies are responsible for many urban services including water supply.

Van Praag (1989) states that deficient organization and management, not lack of technique or know-how, are the central problem. What one sees in most developing countries and especially in government organizations is a lack of maintenance, and the reasons for this are:

- poor management;
- lack of funds;
- Insufficient qualified staff; and
- non-production-oriented staff.

The UNCHS report (1989a) points out that in most developing countries there are no holistic and integrated urbanization policies. Investments are made by sectoral agencies and there have been few evaluations of the costs and benefits of alternative urbanization strategies:

"From the country cases, a number of common deficiencies in institutional arrangements for subnational planning emerge. The case studies illustrate the shortcomings of approaches which rely exclusively on technical solutions, such as the reliance on only infrastructure investments to redress regional imbalances. . . . Moreover, settlement planning continues to be indifferent to the real processes of social and economic change in developing countries, thus producing physical development plans which are both impractical and inapplicable, and furthermore, already outdated and overtaken by events by the time they are approved."

The most prevalent types of intermediate-level and subnational institutions are as follows (UNCHS 1989a):

- (a) Administrative deconcentrated institutions
 - Provincial or district administration created under colonial and pre-industrial regimes to extend the power of a centrally ruled State to the local level;
 - Revenue collection, the magistracy policing and various other control functions are associated with these institutions;
 - Development functions were aimed at enhancing productivity and marketing capacity in order to increase revenue and export receipts.
- (b) Decentralized institutions
 - Different powers and activities are entrusted with institutions at the centre, provincial and district levels;
 - These decentralized subnational institutions often coexist in the same spatial area as administrative bodies which represent the higher authority, eliciting another type of anomaly;
 - Administrative structures generally have a very clear topdown line of control;
 - Provincial and district assemblies existing in many governmental frameworks are in fact administrative divisions of unitary systems. Thus they can make decisions only within limited boundaries, procedures and standards laid down by higher levels of government.
- (c) Technical institutions
 - Institutions performing specific technical functions such as boards responsible for electricity, water, housing and drainage, among others;
 - They operate within their own specific terms of reference and mandates;
 - They are relatively impervious to outside political interference from other

- institutions;
- They offer an opportunity to achieve outcomes consistent with national development strategies;
- They tend to direct their services towards settlements which have the ability to pay for their services;
- Horizontal co-ordination among these institutions is generally poor.

(d) Development authorities.

- Authorities may be public, semi-public or even private corporations operating over a wide geographic region and entrusted with extensive powers;
- Usually set up in specific regions in order to achieve national development objectives;
- Quite often these authorities act in opposition to local interests, particularly when they are established to carry out large-scale capital projects which may alter the socio-economic characteristics of a particular region, or disturb the existing ecological balance. Friedman (1980, cited by Sivaramakrishnan and Green 1986) points out the the common constraints regarding the creation of development authorities:

"Where development authorities have increasingly assumed the responsibility of sectoral agencies or moved into project implementation themselves, they have failed to bridge the gap between the institutions responsible for creating assets and those responsible for maintaining and improving them. Furthermore, they have tended not only to foster centralization of power (both functionally and territorially), but also to undermine still further traditional local governments already weakened by the loss of sectoral responsibilities, finances, and manpower to the special ad hoc authorities. As a result, sensitivity to locally expressed needs at the submetropolitan level has declined; another more common problem, however, is that there is less public access to and public participation in urban management."

(c) Financial institutions.

- Financial institutions at the subnational level, either in the form of banks or of development corporations, can direct resources into appropriate local investments in line with national development goals.

Many of the deficiencies from the country cases in the organizational rationale, processes and human resources were results of poorly conceived legal frameworks from which these institutions were created. Deficiencies in institutional rationale, procedures and human resources are interrelated, so that an integrated strategy of combining new institutional arrangements and human resources development is required. The main deficiencies in organizational arrangements (UNCHS 1989a) were as follows:

- The implementation of sectoral programmes takes place in isolation and often in conflict with others. Also the experiences in South and East Asia (Sivaramakrishnan and Green 1986) indicates that the sectoral approach to urbanization has had a too limited time perspective and also too narrow a vision. Therefore the development has been more fragmented both sectorally and territorially .
- The national socio-economic planning is implemented through budgets and financial transfers to sectoral schemes through hierarchies of vertically-linked agencies.
- Top-down institutional links weaken the national socio-economic policy, because they promote programmes which the local level is neither interested in implementing nor maintaining.
- The urban settlement planning methods, principles and values are linked more closely to theory and irrelevant standards than to the resolution of priorities between spatial levels, economic groups and social interests.
- The deconcentration of central staff to regional and local branch offices, as an extension of central authority. This is in contradiction with the policy of decentralization, i.e. handing over of political power and decision-making to subnational institutions at the regional and local level.
- The administrative institutions are dominant, because they receive and pass on

instructions to achieve specific objectives from above.

- The specialized planning institutions have authority from sectoral ministry or a national-government secretariat and they are not accountable to the local people.
- The supportive institutions which supply services and inputs to the entire institutional system are independent of regional and local-level decision-making. Their horizontal co-ordination with hierarchical administrative institutions is weak, incompatibility and conflict.
- A highly centralized system procedures cause delays and confusion.
- The incompatibility and lack of clarity between different institutions may lead to the situations that a number of small and insignificant projects are initiated and implemented.
- The financial arrangements are centralized, and/or adequate technical capability rests in central ministries and their sectoral departments.
- No feedback and communication for regional planning institutions from the settlement level, because there is little autonomy or capability.
- The financial and technical functionality has proceeded from the centre to the region but not to local bodies where administrative and participatory arrangements are well conceived.
- Inadequate powers of subnational institutions to negotiate between local and national bodies about resources and financial distribution between central and local bodies.

The main human resource deficiencies were as follows (UNCHS 1989a):

- Lack of capability in translating national socioeconomic goals into contextual objectives.
- Programming and investment-planning skills are weak at the subnational levels.
- Lack of skills in co-ordination, monitoring and project evaluation hinder the functioning of subnational planning and development institutions.
- A key deficiency is a lack of capability to prepare suitable plans at the subnational level and local level.
- Financial-management capabilities are poorly developed at all levels. This extends to poor resource mobilization, lack of analysis of comparative costs and benefits of investment options, inadequate project management and poorly conceived institutional accounting and auditing systems. Local bodies now face a crisis of high maintenance costs, because projects are evaluated on the basis of initial costs and not on life-cycle budgeting.
- Public-service reforms are lagging behind deconcentration and decentralization. It is very difficult to depute experienced personnel from national and provincial capital cities to district and regional headquarter towns. For example, Todaro (1989) points out:

“Many observers would argue that the lack of such managerial and administrative capability is the single scarcest public resource in the developing world. The problem is not only a lack of training or experience. It also arises out of the political instability of numerous Third World nations. When power is constantly changing hands, considerations of efficiency and public welfare are likely to be subordinated to political loyalty. Moreover, the larger the group of officials affected by a change of power, the more difficult it will be to maintain any continuity in the formulation and execution of policy. Public administration is unlikely to function efficiently when the rule of law is in question, when there is public disorder, or when there is little consensus on fundamental issues. Acute conditions of class, tribal, or religious conflict within a society will usually be reflected in the management and operation of government departments and public agencies. In a highly traditional society, where kinship ties are strong and such concepts as statehood and public service have not yet taken firm root, there is little place for a merit system. Similarly, where the dominant values are religious or transcendental, traditional incentives to perform in the wider public interest may not have much appeal . . . Virtually all LDC bureaucracies are hopelessly overstaffed at the bottom and hopelessly understaffed at the top. There is a chronic and desperate shortage of skilled competent managers capable of independent decision making. The greater the number of parastatal organizations set up—the more state-owned enterprises and nationalized industries, quasi-governmental bodies, development corporations, training institutions—the thinner this layer of managers is spread.”

The regional level institutions are engaged in the processes where many deficiencies were found. These interrelated processes were identified as management, communication and participatory processes. The deficiencies in processes hamper national development efforts, and the potential

roles of small and intermediate towns in national development cannot be exploited until these deficiencies are resolved. Deficiencies usually found in management process were as follows (UNCHS 1989a):

- Product-oriented, focused only on the technical efforts of getting projects implemented.
- Defining roles, assigning functions and tasks, programming investments, creating spatial plans and designing monitoring, feedback and evaluation systems are not seen as dynamic elements to be managed but fixed components to be directed.
- Subnational planning institutions are bypassed by central agencies and regional plans are undermined by funding of ad hoc schemes and projects outside the plan framework.
- The processes which determine how decisions are formulated and co-ordinated and flow from lower levels to higher levels are very weak or non-existent.

Deficiencies in communication process were as follows:

- Central planning institutions rely on quantitative statistical systems, the databases of which are questionable, to guide macroscale socio-economic programming.
- Development authorities lack facilitating procedures and are too weak to arbitrate between sectoral agencies and the private sector. They tend to cut initial emplacement costs of substantial infrastructural projects through questionable bidding processes. This results in hesitancy on the part of local bodies to assume the operational and maintenance costs of projects built under poor supervision and to low standards.
- The lack of coordination, both vertically, within sectors, and horizontally, between sectoral agencies.
- Regional development planning arrangements have not been able to link clearly with national socio-economic policy, and they have little input at the national level.

Deficiencies found in participatory process were as follows:

- Multilevel planning, rather than being dialogues, negotiations and decision-making between different groups, is merely a budgeting exercise, padded with budget trade-off exercises to give an appearance of participation.
- Involvement of local interests and people in prioritizing, choosing, locating and implementing activities is inadequate. Thus the plan targets are not based on absorptive capacities or requirements at the local level.
- Deconcentration of central agencies to regional and local branches has led to a top-down processes, lack of horizontal co-ordination, duplication of effort and competition.
- Local bodies are often so weak in personnel and finances that their capability to perform participatory roles and planning procedures is severely hampered.
- Intermediate and local bodies lack the capability and freedom to make financial decisions but are also called upon to co-ordinate and integrate budget dependent activities.

Municipal level

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). Among the major constraints in providing urban services are the lack of financial means of local and national governments, the lack of skilled administrative and technical personnel, and the ineffectiveness of local communities in the local administrative and political decision-making (Stren and White 1989). Also solving the problem of use and ownership of urban land is fundamental to any improvement of urban services management. The attention should be paid to proper registration of land use to recapture tax resources.

Stren and White (1989) reports that local councils are not the sole locus of decision-making bodies

in large African cities. More important in Francophone, and almost as important in most Anglophone cities, are central government and parastatal agencies responsible for urban services and regulations. In the Francophone African cities the financial controls over local councils has been more effective than in the Anglophone cities. One reason has been shortage of qualified accounting staff, both at the local level and central government. The other reason was that in Francophone Africa the powerful government ministries have the supervisory controls over the major urban centres.

The Alexandria Water General Authority is accountable to six ministries and to the Governorate of Alexandria for its operational activities. According to Hamza (1989) it has thus only little freedom in external accountability, rate setting, operating procedures and service areas. The accountability in such a situation tends to emphasize more procedures than results. The low water rates and unpredictability of state subsidies make the long-term planning difficult. Elaborate procedures against possible misuse of public funds have affected negatively the performance of most institutions responsible for water supply, sewage and refuse collection. Those agencies operating on a post-audit basis have flexibility in day-to-day-operations, and they can implement work programmes more efficiently.

The infrastructure component in the Guided Land Development Plan for Jabotabek Region in Jakarta had focus on roads between key settlements, small town development programmes (markets, schools, health facilities), industrial estates and possible land development for low-cost housing. Douglas (1989) reports that three main institutional obstacles preventing effective translation of the plans into action are the following:

1. The absence of effective coordination between government bureaux charged with various aspects of land use management;
2. The absence of sufficient incentives to guide private land development away from environmental sensitive areas; and
3. The absence of consistent political will to implement existing regulations.

Yepes (1990) reports that in 1988 five Latin American regional water supply and sewerage companies were visited by the World Bank consultants as part of a study to identify and disseminate information about the management and operational practices of well-run companies in the region. These companies were considered among the best run of those in the sector. Yepes concludes that the most important economic, political, and social problems and constraints are:

- High inflation.
- Difficult access to capital markets.
- Rapid and uncontrolled urban population growth (also pointed out by Perry 1988).
- Significant proportion of low-income population to be served.
- Politically appointed managers and controlled rates.
- Instability of technical and managerial positions.
- Low salaries and an untrained labor force (leading to inadequate motivation to be creative in the management, Perry 1988).

McAuslan (1985) summarizes the problems associated with local government or municipal administration:

- Boundaries are illogical or have not kept pace with population movement;
- Revenues from local sources do not keep up with outgoings;
- Central governments are expected to make up the difference, and increasingly demand a say in local policies;
- Municipalities lose their best staff to the central government, where pay and prospects are better;
- Local counsellors are often willing, even eager, to be influenced by commercial interest.

Financial and economic causes

The shortage of foreign exchange has several impacts on urban management, especially on operation and maintenance of services based on imported materials (Stren and White 1989). In Dakar and Ibadan, for example, water supply may be cut because of lack of treatment chemicals. The fact that most of the governments are short of capital is used as the main justification for privatization of infrastructural services. The development of basic infrastructure and services requires quite large capital investments.

Usually large cost savings if the different components (streets, roads, bridges, water pipes, wastewater sewers, storm water drainage) are implemented together. There are two main reasons, why public companies are not willing to provide these services especially to lower income areas; the components of these basic infrastructure require large investment costs which cannot be recovered in short term; if these services are not profitable, they hardly can be removed elsewhere.

Local property and land taxes are a vital source of revenue for infrastructure provision. These tend to increase land prices which the poor have to pay, and cannot easily be collected outside municipality boundaries where speculation and future development occur (Zetter 1984). The urban administration is also facing a difficult task trying to reduce the land costs and values so that it could be obtained cheaply, but at the same time trying to increase the revenue base. If the land values are rising and taxes on them levied efficiently, this would contribute to the revenue base for services provision.

Tym (1984) offers rather cynical view that since the urban poor are politically less able to ensure that they are provided with off-site infrastructure out of regular municipal budgets, it is more realistic that the shelter programme participants themselves finance those works. If the participants have financed the investment on infrastructure, this should be taken into account in service charges, if the municipality is responsible for routine operation and maintenance, and incremental improvement of services.

If the charges would be uniform with those, who have not contributed fully to the municipal infrastructure investments, this would be clearly inequitable. There will also anomalies if, e.g. the water supply or sewerage systems serve other areas or solid waste containers are included in the costs to be recovered from participants even though they are provided free of charge to public housing or privately built high- and middle-income areas (Kirke 1984).

Mayo and Gross (1987, cited by McKitterick 1987) found that of the seven World Bank sites-and-services projects studied, all were subsidized to varying degree. Their median subsidy from governments was about 62 percent of total resource costs. McKitterick pointed out that the subsidies make it impossible to recover the costs of a project, and therefore governments cannot afford to initiate sites-and-services projects on a large scale.

Experience in Mexico (Ward 1984) suggests also that site and services programmes are too costly for their target populations. The beneficiaries are expected to pay regular instalments for the land, for initial service installation, and services consumed, local rates and taxes, and also to invest in housing and mutual-aid improvement schemes to the settlement. The low-income households facing economic hardship may not be able to generate a surplus to invest in site and service plots and housing.

Table 4.11 indicates that in Kenya at constant 1982 prices both the recurrent expenditure and the development expenditure in the fiscal year 1988/89 have been almost at the fiscal year 1979/80 level. One reason that the recurrent expenditure has not increased in real terms, is that the water tariffs have not been increased sufficiently leading to intermittent services and deterioration of infrastructure (Figure 4.6).

Table 4.11 Ministry of Water Development, Kenya, the actual expenditure 1979/80-1988/89 (K£ million, Hukka, Katko and Seppälä 1992).

Year	Recurrent		Development	
	Gross Actual	Constant 1982 Prices	Gross Actual	Constant 1982 Prices
1979/80	9.0	12.4	24.6	33.9
1980/81	13.2	16.3	27.9	34.4
1981/82	13.7	14.7	31.1	33.4
1982/83	13.1	12.2	17.1	15.9
1983/84	16.4	13.7	28.1	23.4
1984/85	16.0	12.2	21.3	16.2
1985/86	18.3	12.9	23.2	16.3
1986/87	21.3	14.1	40.7	27.0
1987/88	21.2	12.9	28.7	17.4
1988/89	24.3	13.4	54.5	29.9
1979/89	166.5	134.8	297.2	247.8

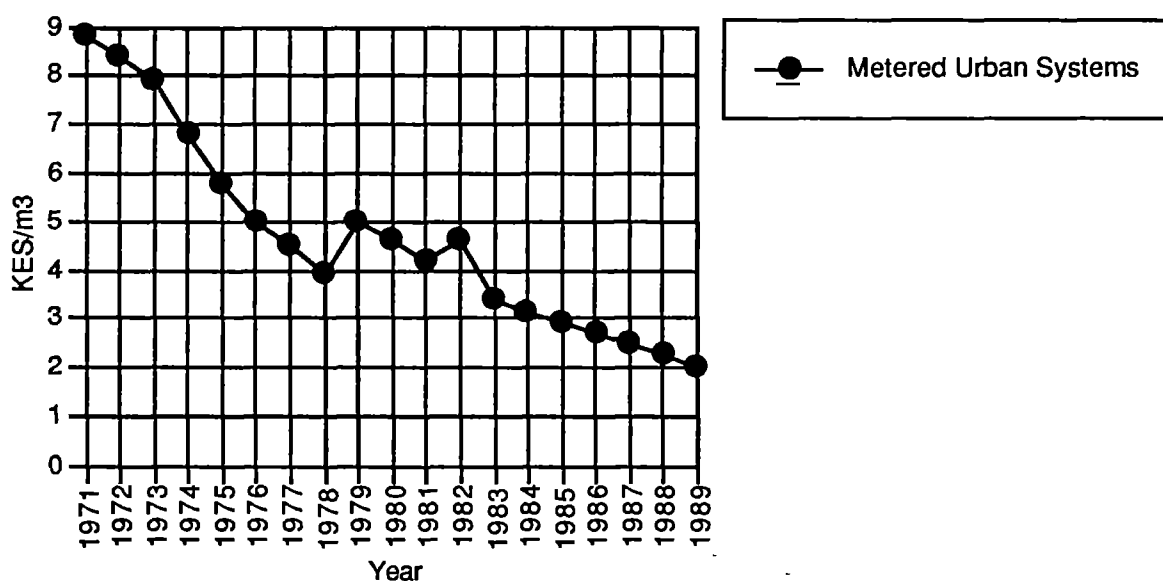


Figure 4.6 Water tariffs at 1989 price level in Kenya, 1975-1986 (Hukka et al 1992).

Geographically uniform national tariffs are widely used in developing countries (Katko 1989). The water tariffs, for example in Kenya, are submitted to the Parliament for approval (Hukka et al 1992). In general, the tariff levels are well below the cost of water production (e.g. WHO and UNICEF 1992). Katko and Mashauri (1993) draw the conclusion from the urban water tariffs and cost recovery developments in Tanzania over the last three decades:

- The urban water utilities, vested with the power to supply and sell water to urban people, are not billing all their customers. They are collecting perhaps a half of what they could and should;
- Real tariffs have fallen disproportionately to the cost of production. This has further deteriorated the utilities' capacity to cope with the problem;
- The official utilities have largely failed to deliver the service at least to the fringes of cities and the rural areas. Therefore, people in rural and urban areas still have to pay resellers and vendors for water;
- Having no other choice, consumers have to pay for the operative services of vendors and resellers. The amount paid by the poor consumers to resellers and vendors is evidently several times the official rate; and

- Vendors and resellers make money out of the inefficiency of the water utilities. They pay only a small percentage of their vending and reselling revenue to the utilities.

In Kenyan urban and rural water systems only about 50 to 70% of total billed revenue are collected (MOWD 1989b). Tables 4.12 and 4.13 show the financial performance of the utilities run by the Kenya's local authorities (Odada and Otieno 1990, compiled by the author). The billed revenue as a percentage of expenditure ranges from 11% to 50%, with an average of 46%. The collected revenue varies from 9% to 36%, with an average of 30%. On the basis of this data Odada and Otieno (1990) concluded that local authorities are heavily subsidizing their water, sewerage and refuse collection services. They also recommended that the municipalities should improve and intensify their revenue collection system.

Table 4.12 Monthly revenue collection performance by Kenyan local authorities in 1986 (KES thousand).

Local Authority	Total Expenditure	Total Revenue Billed	Total Revenue Collected	Billed Revenue as % of Expenditure	Collected Revenue as % of Billed	Collected Revenue as % of Expenditure
Nairobi	62 863	31 205	20 983	50	67	33
Kisumu	4 745	1 783	962	38	54	20
Nakuru	4 884	1 423	927	29	65	19
Eldoret	3 345	1 220	525	36	43	16
Thika	2 655	1 054	834	40	79	31
Nyeri	1 169	474	418	41	88	36
Kericho	1 046	240	213	23	89	20
Kitale	n.a.	1 017	259	-	25	-
Nanyuki	n.a.	1 019	470	-	46	-
Nyandarua	n.a.	450	350	-	78	-
Kiambu	n.a.	100	54	-	54	-
Bungoma	421	100	46	24	46	11
Machakos	555	60	51	11	85	9
Murang'a	394	95	n.a.	24	-	-
Total ¹⁾	82 077	37 654	24 959	46	66	30

1) Kitale, Nanyuki, Nyandarua and Kiambu not included.

Table 4.13 Unit cost of produced water and revenue per unit in Kenyan local authorities in 1986 (KES).

Local Authority	Unit Cost of Production	Billed Revenue per Unit	Collected Revenue per Unit
Nairobi	3.9	2.0	1.3
Kisumu	3.6	1.4	0.7
Nakuru	1.9	0.6	0.4
Eldoret	1.6	0.6	0.3
Thika	2.0	0.8	0.6
Nyeri	1.9	0.8	0.7
Kericho	2.5	0.6	0.5
Bungoma	2.6	0.6	0.3
Machakos	1.2	0.1	0.1
Murang'a	0.6	0.1	-

In Hanoi, Vietnam the Hanoi Water Supply Company has issued tariffs to cover operation and maintenance costs, taxes on equipment and properties, and 10% of the water tariff of O&M sharing for sewerage fee. Service fee for excreta and solid waste collection and for emptying of septic tanks have also been introduced. The implementation of the consumer charges is not efficient, and violators are rarely fined strictly (Hjorth and Nguyen Thi Dan 1993).

Inadequate pricing of resources and urban services (Lee 1988) 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; and
 - inadequate services for the poor.

The global water supply and sanitation sector monitoring in 1990 shows that water services to high-income populations are generally being subsidized by as much as 70 percent of the operation and maintenance cost (WHO and UNICEF 1992). Also Katko (1991a) states that the policy of "free water" has proved to be unrealistic and has led to inequitable situations: often the rich get the service, whereas only the poor pay the market price for water.

In Kumasi, Ghana, 90 percent of human waste is left in the urban environment until it decomposes, is carried away by small streams or drainage ditches, or dries and becomes airborne. Total household expenditures on sanitation amount to about USD 900 000 annually for a system that essentially moves untreated nightsoil small distances around the city without substantially reducing the public health risk or environmental impact. That amount is only about USD 1.50 per capita per year, and it indicates that people are spending very little for sanitation, and, correspondingly, are getting very poor service (Whittington, Lauria, Wright, Choe, Hughes and Swarna 1992a).

The urban poor's lack of access to credit limits the people initiating and contributing to some of the micro-level strategies (such as paying for the services). This affects income generation and cost recovery, hence affecting how sustainable particular infrastructure projects can be (Menéndez 1991). Yacoob (1990) points out that poor or nonexistent plans for cost recovery may result in a low income-base for the system and, as a result, dependence on external agencies for support.

4.2.2 Service coverage and level of peri-urban water and waste infrastructure

"A family of six needs at least 300-400 litres a day to ensure enough for drinking, washing, cooking, laundry and bathing. That is equivalent to some 30-40 buckets a day. Anyone who has carried two full buckets of water will appreciate the difference between the level of service people need and what many governments or certain aid agencies might choose to call adequate standards."

Hardoy and Satterthwaite 1989

There is a 95 percent water service coverage rate for the urban high-income group compared to only 64 percent coverage for the peri-urban population. The same principle can be applied to sanitation, the coverage of which is 95 percent for the urban high-income group compared to 45 percent coverage for the peri-urban population (WHO and UNICEF 1992). The existence of service disparities and inequities are even further substantiated when access to water supply by technology is examined. Urban high-income populations have close to 80 percent access to domestic connections in comparison to a rate of 20 percent for the peri-urban population.

Peri-urban residents face a variety of difficulties related to their water supplies: there may be too little water; access to it may be limited and difficult; its quality may be poor; and distribution may be inequitable. This often reflects the temporary nature of the communities, whose residents generally have neither political nor economic power—at least one of which are usually necessary to obtain adequate services (McGowan, Hodgkin and Kaplan 1992). Cairncross, Hardoy and Satterthwaite (1990a) estimate that at least 600 million people living in the urban areas of the Third World live in what might be termed life and health threatening homes and neighbourhoods. Figure 4.7 shows urban water supply and sanitation service coverage in 1980, 1990 and 2000 in developing countries.

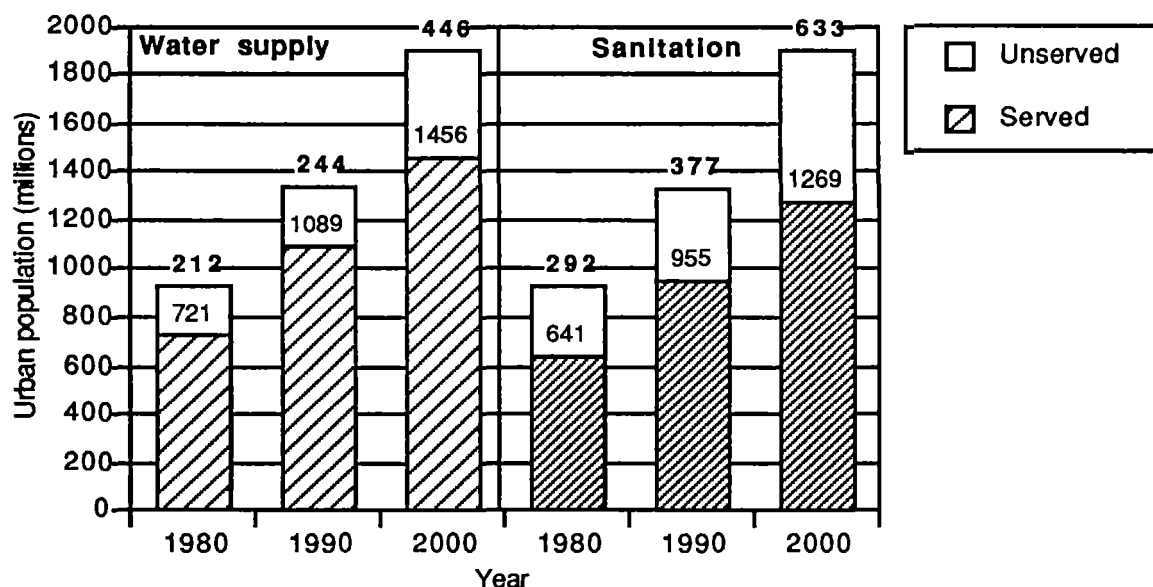


Figure 4.7 Urban service coverage in 1980, 1990 and 2000, all developing countries (UNDP 1990).

In India, for example, the number and population of Class II towns has increased by about 70 percent during the period 1979-88, whereas the total water supply increased only by 5.8 percent. Thus the per capita water supply of 125 litres per day in 1978 became 78 litres per day by 1988. Less than 5 percent of the total wastewater generated is collected and only about 2 percent is treated (Hukka 1992). Kumar (1992) also points out that the water supplies have become intermittent, e.g. the hours of daily supply vary from one and half hours in Baroda to six to nine hours in Calicut.

Most of the available surface water in India is now polluted according to official estimates. Most wastes are simply discharged untreated into the nation's water courses. Out of India's 3 245 towns and cities, only 21 have partial or full sewerage and sewage treatment facilities and domestic waste accounts for nearly 80 percent of the pollution load. Although groundwater is far less polluted than surface waters, even that is being increasingly affected. Table 4.14 shows the levels of water supply and sanitation service in India and Table 4.15 shows the position of water supply and wastewater in Class II towns in India in 1988.

Table 4.14 Levels of water supply and sanitation service in India in 1988 (Population in millions, WHO 1990).

Population			Population with services					
			Drinking water			Sanitation		
Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
818	221	597	610	174	436	104	83	21
	(27%)	(73%)	(75%)	(79%)	(73%)	(13%)	(38%)	(3.5%)

Table 4.15 Position of water supply, wastewater generation, collection and treatment in Class II towns in India in 1988 (CPCB 1990).

State/Union Territory	Total No. of towns	Population 1981 Census	Total Water Supply (Mld)	Per Capita Water Supply (lpd)	Wastewater (Mld)		Wastewater treatment capacity (Mld)	
					Gene-rated	Collect-ed	Primary only	Primary and Secondary
Andhra Pradesh	26	1 713 475	111.03	49	88.46	1.00	0.00	0.00
Bihar	10	648 643	43.11	49	34.46	0.00	0.00	0.00
Gujarat	23	1 542 683	151.56	79	121.23	8.65	4.50	20.25
Goa	2	122 760	13.00	82	10.60	1.00	0.00	0.00
Himachal Pradesh	1	70 604	23.61	282	18.88	0.00	0.00	—
Haryana	6	395 243	39.74	77	31.78	9.37	0.00	0.00
Karnataka	12	808 375	64.37	62	51.49	0.00	0.00	0.00
Kerala	7	456 275	88.74	182	70.98	0.00	0.00	0.00
Maharashtra	22	1 491 042	191.82	101	153.46	10.00	—	1.40
Madhya Pradesh	23	1 553 516	162.84	82	130.27	5.82	0.00	0.00
Mizoram	1	74 493	2.17	16	1.74	0.00	0.00	0.00
Orissa	5	320 383	35.09	73	28.07	0.00	0.00	0.00
Punjab	10	665 318	112.49	129	90.01	16.33	0.00	0.00
Rajasthan	10	660 790	44.80	51	35.87	0.00	0.00	0.00
Tamil Nadu	39	2 611 397	200.91	64	160.74	3.20	—	0.00
Uttar Pradesh	27	1 891 631	239.73	99	191.75	6.60	0.00	0.00
West Bengal	17	1 306 780	97.14	64	77.73	0.00	0.00	0.00
Total	241	16 333 408	1622.15	(78)	1297.52	61.97	4.50	21.65

Figures in parenthesis shall not be read as total.

During the 1980s the Government of Kenya provided improved services for about 3.5 million people, but during the same period the population growth was about 7.5 million. The service coverage according to WHO (1984) for 1980 and the World Bank (1990) for 1989 are shown in Table 4.16.

Table 4.16 Water and sanitation service coverage in Kenya (Hukka et al 1992).

	Population		Water Coverage		Sanitation Coverage	
	million	%	Population million	%	Population million	%
URBAN						
WHO, 1980	2.4	15	2.1	85	2.1	89
WB, 1989	4.9	22	3.8	78	1.9	40
Decade Target			4.9	100	4.4	90
(World 1990, estimate ¹)	14.46	36	9.83	68	5.50	38
RURAL						
WHO, 1980	13.5	85	2.1	15	2.6	19
WB, 1989	17.2	78	3.4	20	3.4	20
Decade Target			12.9	75	8.6	50
(World 1990, estimate ¹)	26.14	64	11.00	42	3.92	15
TOTAL						
WHO, 1980	15.9	100	4.2	26	4.7	30
WB, 1989	22.1	100	7.2	33	5.3	24
Decade Target			17.8	81	13.0	59
(World 1990, estimate ¹)	40.60	100	20.83	51	9.42	23

¹ Note: World 1990 figures are estimates from: Rietveld (1988).

In many urban centres in Kenya (such as Nairobi, Mombasa, Kisumu and Kisii) sewage is usually discharged into a receiving body of water. In 1919, the Nairobi river was found to be infected with typhoid and its water was considered unfit for human consumption. This river has never ceased

being an open sewer for the city ever since. Elsewhere, Mombasa and Kisumu discharge their sewage into the Indian Ocean and Lake Victoria, respectively. Kisii town's is discharged into the Daraja Mbili river, which supplies drinking water to the urban centres downstream (Obudho, Obudho and Mairura 1990).

Wambulwa and Kessen (1989, cited by Odada and Otieno 1990) estimate that only 5 percent of the water is supplied to the municipalities' rural population in Kenya. Their analysis indicates that water demand coverage in these local authorities ranges from about 93 percent in Mombasa to about 11 percent in Kiambu, with an average of about 80 percent (Table 4.17). Data for the 10 municipalities from the Ministry of Local Government survey on the Status of Water, Sewerage and Refuse Services in Local Authorities indicates that the ratio of water-to-sewer connections ranged from 3 percent in Bungoma to 77 percent in Thika, with an average of about 39 percent. The percentage of population served by the sewerage system ranges from 15 percent in Meru to 92 percent in Nyahururu with an average of 56 percent on the basis of data for 11 local authorities.

The study by the Ministry of Local Government (Wambulwa and Kessen, 1989) also shows that all municipal councils have very few refuse collection vehicles, and in some towns the ratio of the population per dust bin is high. Available data from 12 local authorities indicates that the percentage of urban population (excluding rural areas within a particular municipality) with refuse collection ranges from 2 percent in Kakamega to 71 percent in Eldoret, with an average of 29 percent. When the total population within the municipal boundaries is considered, the refuse collection service level ranges from 1 percent in Kakamega to 48 percent in Nairobi, with an average of only 20 percent.

Table 4.17 Population served with water among municipalities in Kenya in 1987 (Odada and Otieno 1990).

Local Authority	No. of Individual Meter Connection	% Total Population Served	Urban Population/ Connection	Urban Household/ Connection
CATEGORY A				
Nairobi	94 000	89.7	13	3.1
Kisumu	13 000	59.4	10	2.0
Nakuru	9 909	69.8	13	3.1
Eldoret	4 350	62.9	17	4.2
Thika	4 900	90.0	9	2.7
Kericho	3 900	82.4	10	2.8
Nyeri	2 054	48.1	9	2.2
Kitale	1 800	81.7	17	4.1
Nanyuki	—	81.1	—	—
Nyahururu	1 263	94.2	12	3.1
Sub-total (Excl. Nanyuki)	135 176	81.4	13	3.1
CATEGORY B				
Meru	2 658	8.7	19	3.2
Kisii	3 000	68.8	12	2.0
Kiambu	1 053	10.8	27	5.0
Bungoma	1 874	38.4	12	2.4
Embu	—	81.5	—	—
CATEGORY C				
Mombasa	—	93.1	—	—
Malindi	2 619	7.6	17	3.0
Machakos	139	24.1	19	3.2
Kakamega	—	48.4	—	—
Murang'a	833	60.5	14	1.3

In Ouagadougou, Burkina Faso the refuse collection service coverage is estimated at less than 25% (Meyer 1993). In unserved areas, families usually dump their refuse on nearby uncontrolled public land, vacant lots or carry it to one of the roughly 80 common dumping grounds, and/or burn it. About half of the collection is carried out by the municipality, the remaining service is provided against fees by a semi-public corporation, various small private enterprises and by cooperatives. The services are mainly used by upper-income households and enterprises due to high collection fees. In contrast, in Abidjan, Ivory Coast refuse collection reached a high coverage level of 77% when the city was serviced by a French company over a period of 30 years.

Robson (1990a) reports that the central government in India is allocating USD 117.5 million annually to a scheme which aims to provide 500 towns each year with sanitary low-cost Indian-made pour-flush latrines. The sanitation programme financed by the United Nations Development Programme (UNDP) and carried out by the water and sanitation programme that UNDP runs jointly with the World Bank, collected extensive data on sanitation in 211 towns across the country. The survey concluded:

- more than half the urban population did not have latrines;
- less than ten per cent of the latrines were connected to a sewerage system; and
- one quarter of the population used buckets or a crude hole in the ground.

Tables 4.18 and 4.19 indicate sanitation and water supply situation in selected slum and squatter settlements.

Table 4.18 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 4.19 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	Kampong Pandan	5 770	—	Public standposts (8)	721
					Kampong Maxwell	1 800	—	Public standposts (7)	228
Philippines	55	10	65	Manila	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	Cerro 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.

In the absence of formal municipal services the people use traditional water sources such as wells, rainwater collection, streams, tanks (in the Indian sub-continent), qanats (in the Middle East), and water holes in the beds of seasonal streams (Pickford 1990). The study (Lauria 1990) in a periurban community of squatters called Tierra Nueva adjacent to Guatemala City showed that 99 percent of the households purchased water from vendors in the dry season, and more than 90 percent used them in the rainy season.

In Madras, India, for example, the piped water supply system cannot meet demand below average rainfall year (Somasundaram, Ravindran and Tellam 1993). Therefore a significant amount of water is abstracted from the shallow aquifer below the city. The amount has been estimated at 10000 m³/d, and many of the hut-dwelling communities are dependent on shallow wells. The city sewerage system is also overloaded and thus the city rivers are more like open sewers. The hut-dwellers have no access to sewers.

Many low-income communities in developing countries consider stormwater drainage to be their most urgent need as far as urban infrastructure is concerned. This is partly because their houses are often built on unsuitable land. In areas sufficiently close to the city centre for the journey to work to be affordable, land prices tend to be beyond their means. The only land they can afford, or on which the owners will allow them to stay as squatters, is land that is unsuitable for other purposes. This is often on steep hillsides subject to erosion and landslides, or it is low-lying, marshy land often subject to flooding (WHO 1991a).

4.2.3 Effects of deficiencies in peri-urban water and waste management infrastructure

"One issue of fundamental concern to us is water. The first year the settlement was begun, we heard a rumour that typhoid fever was around, that some tanker trucks selling contaminated water were making our people sick. This turned out to be true. We had to stand in lines for hours to buy water from the tanker trucks. Then the vendors started raising their prices, until they finally were incredibly high. Yet we had to drink this water or buy clean water from the neighbouring town.

The problem of getting water to some of the families who lived on steep slopes was particularly difficult, for obvious reasons. In my own community about 30 percent of the people, some six hundred families, used to live on steep slopes. They were entirely relocated to flat areas where

water provision was less difficult. We introduced water provision to our community later that same year. I remember that we tried every means to persuade the government water authority to install a water system in our community. But they kept telling us that because we were squatters, we had no right to receive water services. But to what rights were we entitled? To thirst?"

Community leader cited by Lauria and Whittington 1989

Environmental consequences

The lack of adequate peri-urban sanitation provisions has grave environmental consequences that indirectly jeopardize human health (Hogrewe, Joyce and Perez 1993). Peri-urban areas are the largest nonpoint source of faecal contamination in a given urban locality. Figure 4.8 shows the spatial scale of environmental problems (WB 1990b).

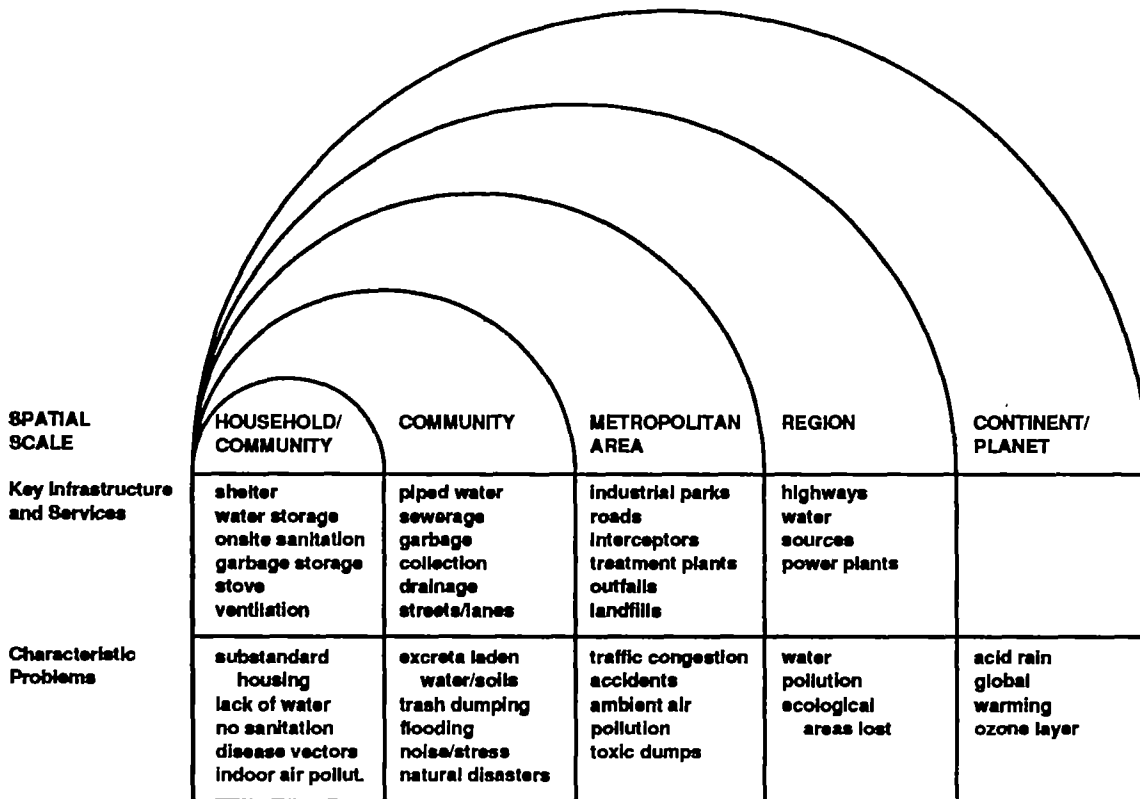


Figure 4.8 Spatial scale of environmental problems.

According to Lee (1985) inappropriate urban land development is another cause of environmental degradation that may impose heavy costs in the future. When steep slopes are stripped of vegetation and no ground cover is planted or contouring done before buildings are constructed, the soil will erode rapidly in tropical climate. Uncontrolled clearance reduces also the soil's capacity to retain moisture and causes rapid runoff that exacerbates flooding. 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 faeces 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 200 000 to 500 000 people sleep in the streets."

According to them Mexico City has so many people without sanitary facilities that a "faecal snow" often falls on the city as winds pick up dried excrement. Its air pollution is rated the worst on the planet. In Madras, India a citywide and local investigations indicate the gross pollution of ground and surface waters by a range of species including nitrate, heavy metals and micro-organisms (Somasundaram et al 1993). Recently cyanide contamination of surface water course led to death of several buffaloes. Many urban poor rely on dug and shallow wells for all their water needs.

Financial and economic impacts

According to Pouliquen (1991) the economic growth will be increasingly constrained by the capacity of ecosystems to perform two essential functions: to replenish resource inputs into the economy, and to absorb the wastes generated by production systems. In particular, improper maintenance of the water infrastructure can result (Robinson 1990):

1. Loss of original investment with unnecessarily high repair costs; and
2. Increased costs to users which can far exceed the loss in capital investment.

The reasons, why the operation and maintenance policy should be paid adequate attention are as follows (UNDP 1989a):

1. Inadequate O&M of urban services has serious macroeconomic consequences. In most countries, more than half of the Gross Domestic Product (GDP) is produced in urban areas, and this non-agricultural share of GDP is increasing. Cities, thus, serve as increasingly important driving forces in the regional and national economies of developing countries, but the cities' ability to sustain efficient public and private sector activities is contingent upon well maintained and efficiently operated reliable urban infrastructure and service delivery systems. In any cities, for example in some West African countries, manufacturing firms have to provide their own backup facilities for unreliable public water and electricity supply, etc. thus do not enjoy the benefits of the economy of scale inherent in collective service delivery. The World Bank's 1983 urban sector review in Lagos, Nigeria, estimates that this problem has led to a 30 percent increase in the production costs for goods and services in the city;
2. The failure to adequately operate and maintain public assets also has direct and sizable consequences for the balance-of-payments. This is particularly important in many developing countries with foreign debt problems and scarcity of foreign exchange. For example, poor maintenance of streets results in substantially increased vehicle operating costs in terms of fuel, tires, spare parts and reduced economic life of vehicles—in most developing countries these goods are all imported. Another example is the consequences of poor maintenance of water distribution systems. In many LDC-cities, 50 percent or more of the water that is treated and put into the distribution network, is "unaccounted for, i.e. lost through leaks, illegal connections etc. In the process of pumping and treating these large amounts of wasted water, substantial expenditures are incurred for energy, chemicals, wear and tear of mechanical facilities, etc.—again mostly imported goods. In many cases, rehabilitation, proper maintenance, and more efficient operations could provide sufficient additional water from existing production facilities to limit or eliminate needs for new facilities which often have a high foreign currency cost component. Thus, in many ways efforts to improve operations and maintenance of urban services can be considered an "import substitution industry";
3. Inadequate O&M leads to accelerated deterioration or even complete loss of assets. For the responsible authority, this often has surprisingly costly downstream consequences in terms of premature needs for rehabilitation, total reconstruction or replacement of assets. For example, on a net present value basis, the direct costs of premature reconstruction of roads alone—excluding the costs of increased vehicle operation costs—often are as high as 5 times the cost of a timely maintenance effort;
4. Inadequate O&M has serious consequences for the environment and for public health. Inadequate treatment of drinking water leads to a host of diseases. Poorly maintained drains with stagnant water provides breeding grounds for mosquitoes, etc. Inadequate solid waste collection and street sweeping provides excellent conditions for flies and

- other disease carriers. Missing drain and manhole covers, open utility trenches, large potholes, etc. cause many accidents and great social and economic cost; and
- The O&M problem has an important dimension of equity. The urban poor are the most vulnerable to deficient O&M because they usually have no alternatives to the public services and because they often live in urban fringe areas where roads may be unpaved and access conditions for public service vehicles very difficult, and where infrastructure and utilities are often installed in a haphazard manner, adversely affecting systematic O&M efforts. Microenterprises in the informal sector similarly suffer from inadequate O&M. In many cultures, women particularly suffer from poor O&M since they are the ones who for example have to walk long distances to fetch water when on-site supply is not adequate.

Whittington, Lauria and Mu (1989) describe the scale of water vending system in Onitsha, Nigeria:

"During the dry season households obtain approximately 11 200 m³/d from the vending system, for which they pay about USD 28 000. In 1987 the public water utility was supplying about 5 700 m³/d during the dry season, only 50 percent of the amount supplied by the water vendors. For this 5 700 m³/d the water utility only managed to collect about USD 1 100 in revenues. During the dry season the private sector water vending system was thus collecting about 24 times as much revenue as the water utility. In the rainy season the sales of water vendors were still 10 times the revenue collected by water utility . . . Households in Onitsha are thus already paying water vendors over twice the operation and maintenance costs of the completed piped distribution system, and 70 percent of the total annual costs."

The private sector vendors had over 95 percent of water sales in monetary terms in Onitsha. Therefore the public water utility should not only offer a lower-priced product than the the private water vendors, but also provide a higher quality product in terms of both water quality and reliable service to increase its market share. The finding show also that the poor in Onitsha are paying the most for water—both in absolute amounts and in terms of the percentage of their income (Figure 4.9).

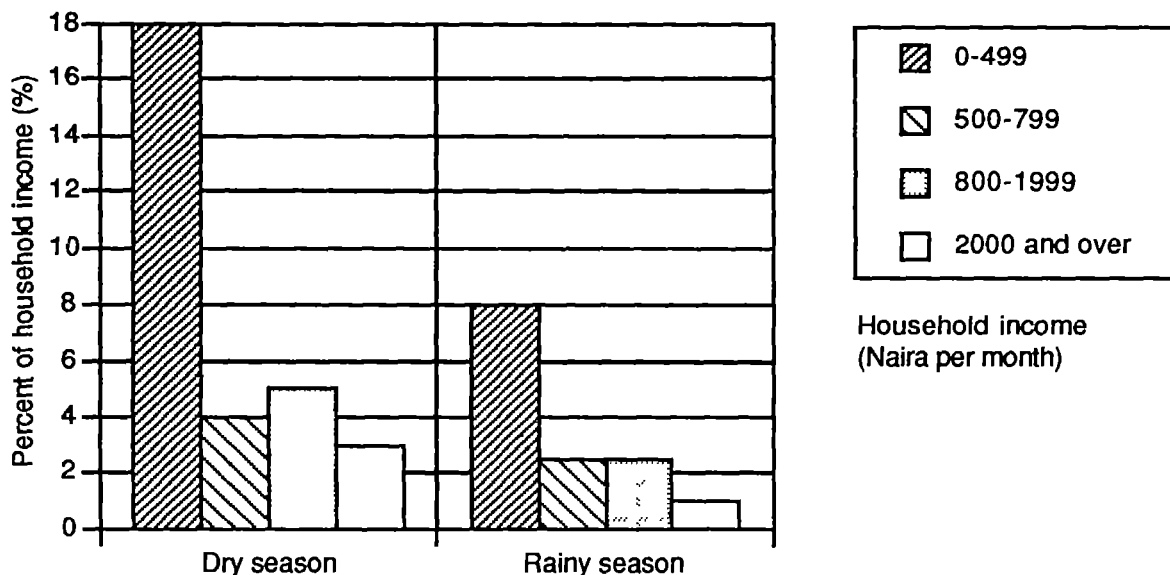


Figure 4.9 Household expenditure on water as percentage of income.

Friedlander (1990a) reports on the conditions in Honduras:

"The Honduran capital, Tegucigalpa, provides a classical example. In the last two decades its population has rocketed from 250 000 to over 600 000, with almost all of this growth in the "barrios

marginales”—these are marginal neighbourhoods in both the physical and economic sense. Such settlements have little or no basic infrastructure or services, and are located either on the steep hillsides which surround the city or along unstable river embankments. Of the more than 170 barrios in the city, only a very small number are connected to the city's water supply network. Even these receive supplies for only a few hours a day, often during the night when demand in the city is low. The residents are, therefore dependent on water vendors who sell poor quality stocks—usually unsafe for drinking—in 55-gallon drums or six litre tins from pick-up trucks. Despite the low quality, the water is still expensive, at around USD 1.75 per drum. The average household spends around 20% of its total income on water alone, a figure some eight to ten times higher than industrialised nations. This heavy burden means that high consumption activities, such as personal hygiene and laundry, are often neglected. Ironically, the amount paid by residents for vended water would be sufficient to provide and sustain a piped distribution system.”

Pini (1992a) confirms that in a *barrio* of Villa Nuevo in Tegucigalpa private water vendors charged prices up to 34 times higher than government rate. Estimates put the value of the private water market in Tegucigalpa at up to USD 2 million per year, and a family could pay more than 10 percent of its income just for poor quality water. The study (Lauria 1990) in a periurban community called Tierra Nueva adjacent to Guatemala City shows that average consumption was about 40 lcd and the average cost of water USD 1.37/m³ which would also be adequate to sustain a piped water supply system. Perry (1988) describes the conditions in Abidjan, Ivory Coast:

“A massive immigration has increased the city's population from about 16 000 in 1936 to a reported 8 million in 1986. Water is supplied by the SODECL, a joint French-Ivory Coast company that is one of the best in Africa; the system is on par with many modern systems in other parts of the world. The city is supplied primarily by groundwater, but increasing demand is expected to lead to use of some surface water by 1990. The majority of the city is metered, but a significant portion of the connections in some areas have been cutoff for nonpayment. When such cutoffs occur, residents must purchase water from street vendors, who purchase their supplies from SODECL. Prices for water from street vendors are approximately ten times the prices charged by SODECL.”

Health and psycho-social impacts

Figure 4.10 indicates the impacts in the city on the health of peri-urban dwellers.

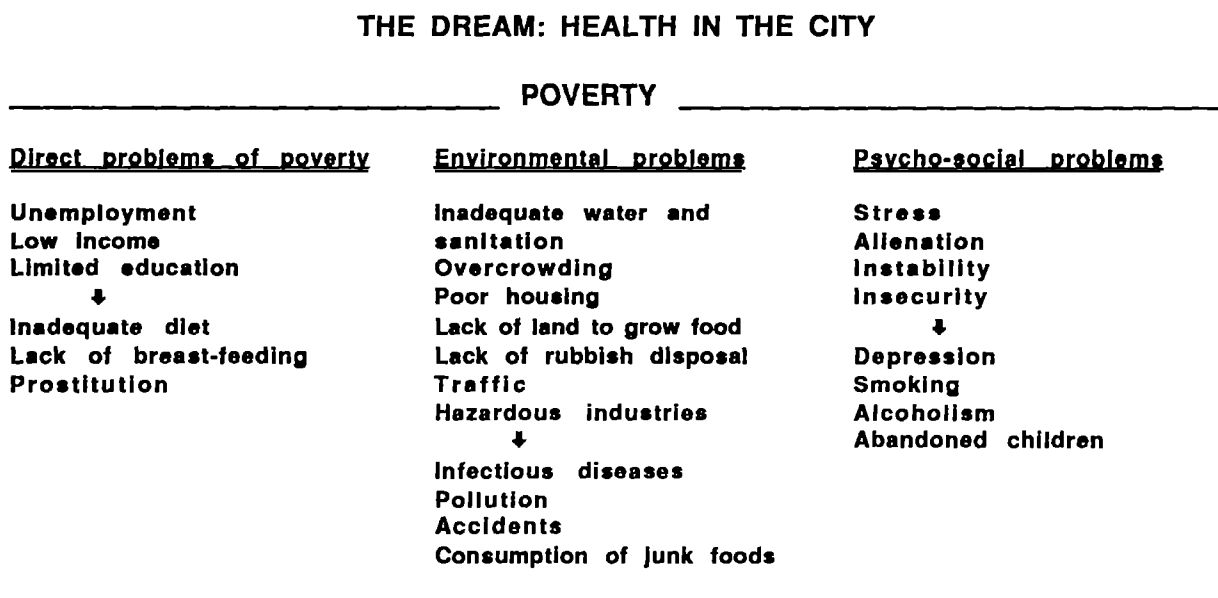


Figure 4.10 For many, poverty forms a barrier to the dream of a healthy life in the city (Harpman et al 1988).

Harpman et al (1988) states that one aspect which is rarely considered is the difference in health between poor urban communities within the city. They give some examples (Bapat and Crook 1984, Schensul). Schensul developed a typology of urban poor communities in Lima based on urban services and social organization. Preliminary results from Lima indicate that diarrhoea and respiratory problems may be associated with the communities having less urban services and less social organization, while malnutrition may be associated with the more developed communities. This supports earlier findings (M'Gonicle 1933) that the more developed stage demands a greater proportion of the family budget in building permanent housing and contributing to water, sewage, and electrification projects. This subsequently may mean less food for children in the family. Perry (1988) describes the conditions in Abidjan, Ivory Coast:

The water company provides house connections to most homes in the modern part of the city and standpipes in squatter communities. A great deal of technical and monetary assistance has been provided to the Abidjan water system, and the management staff views itself as professional. Problems, however, are evident. The need to incorporate a surface water supply will tax existing transmission and monitoring capabilities, and stresses caused by continuing immigration of the rural poor will increase water demand in areas of the city that are currently underserved. Some authors and reviewers who have studied the system suggest it is well designed and operated, whereas others suggest that standpipes in poorer areas provide an inadequate quantity of water of unpredictable quality to people who need it the most but cannot pay for it. It may be in the interest of economics to limit supplies to these marginal service areas, but these areas are where population pressures will continue to increase most dramatically. If water quantity and quality are less than acceptable in these areas, serious health problems can be anticipated."

Van and Turner (1986) narrate the conditions in the community of Colonia Felipe Angeles as follows:

"The community of Colonia Felipe Angeles is situated northwest of downtown Ciudad Juarez (Juarez) in Chihuahua, Mexico. The community presently has a population of approximately 40 000 inhabitants, and it is steadily increasing. According to some members of the colonia, the average number of people per household is approximately 10 and many live in only two rooms.

The Colonia Felipe Angeles does not have piped water supply. Water is supplied to the colonia inhabitants by means of tank trucks on a periodic basis. There is no set schedule for delivering the water. Community members have stated that they have been without water for as long as one month because the water supply trucks do not show up. Also, frequently the water trucks deliver water only to those people living near the better roads. The water trucks charge USD 0.50 for approximately 55 gallons.

Upon delivery of the water to the users, the water is stored in different types of containers—such as 55 gallon drums, concrete tanks, or plastic containers. Most water-storing containers are open to the atmosphere. The colonia has unpaved streets; and dust accumulation can be substantial during heavy traffic or simply under high winds, a condition which is typical of the Juarez/El Paso area.

The result of inadequate water supplies is poor sanitation practices, human suffering, and a high incidence of disease. The burden is greatest on children. Enteric bacterial infections, such as paratyphoid fever, bacillary dysentery, and skin diseases are common."

In Latin America, the recent cholera epidemic has been partly attributed to the contamination of water distribution system by adjacent leaky sewage pipes (Hogrewe et al 1993). The crowding of large numbers of people in peri-urban areas creates conditions to the rapid spread of a variety of infectious diseases. The health problems resulting from a lack of sanitation facilities (among other factors) are greater among the urban poor living in overcrowded peri-urban settlements than they are either in other urban areas or in rural areas. The urban poor have a lower life expectancy at birth and a higher infant mortality rate than higher-income urban dwellers and some rural populations (Bradley, Cairncross, Harpman and Stephens 1991 cited by Hogrewe et al 1993).

4.3 Peri-urban water and waste management Infrastructure—problem situation expressed

At the global scale, the peri-urban infrastructure cannot be considered sustainable in accordance with the concepts of the sustainability. Presently, it cannot satisfy the fundamental human need of permanence (or subsistence) as described in Chapter 4.2.3. The public institutions—hereafter called “the Utility”—responsible for the peri-urban water and waste management infrastructure that cannot be considered sustainable may be defined as follows:

The people and the patterns of regular, repetitive interactions among them that execute—in collaboration with other relevant institutions—planning, from strategic planning to implementation planning, finance, construction, operation and maintenance of infrastructure in order to achieve the objective of “universal access” to safe water supply and adequate sanitation that maintains economically, socially and environmentally sustainable development. This mission of the Utility, however, has not yet been successful due to the causes described in details in Chapter 4.2.1.

There are governments that regard peri-urban areas as illegal and thus they do not provide infrastructure for them. Some institutions may have no jurisdiction to define service areas and thus provide services, e.g. to peri-urban areas beyond the city boundary. However, these cases must also be included in the above definition because, as Satterthwaite (1991) cautions, they will be sustaining a status quo, not promoting sustainable development. In order to change the existing paradigm, the status quo must be attacked.

5 SUSTAINABLE PERI-URBAN WATER AND WASTE MANAGEMENT INFRASTRUCTURE

"Over the last decade or so, infrastructure is a word that has hardly been mentioned in the context of development. Infrastructure has been largely taken by granted. There is mounting evidence that this may have been a major mistake, since inadequate infrastructure, and more importantly inadequately operated infrastructure, can be a major handicap to development."

Pouliquen 1991

5.1 Future assessment

Various decisions are often based on past information and assumptions. The forecasting and assessment of bifurcation or chaos phases and their possible consequences related to water and waste management infrastructure is needed to safeguard the sustainable societal development. The assessment of the future will also give a better understanding of the present (Mannermaa 1991), and it will support the societal decision making, i.a. In the following:

- offering wide-perspective frameworks for decision-making in long-term and helping to predict dynamic processes;
- predicting threats and possibilities depending on the different decisions;
- offering various different alternatives for finding solutions to the problem; and
- multiplying the views regarding the future and thus promoting the discreetness (and the democracy) in decision-making.

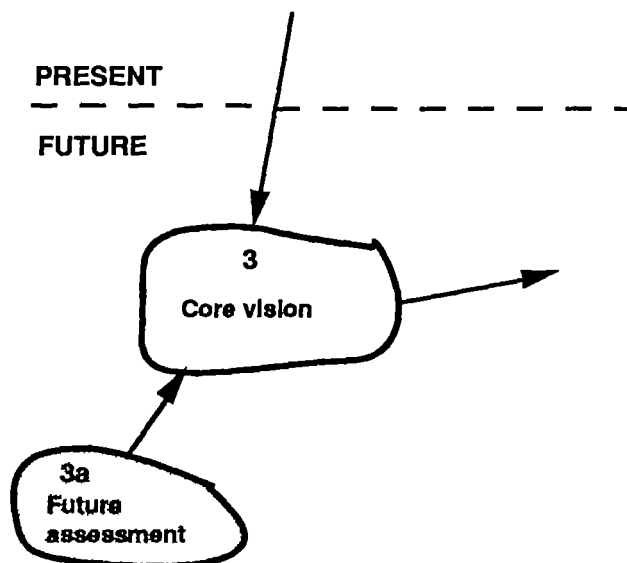


Figure 5.1 The methodology—stage 3a: Future assessment.

Briscoe and Steer (1993) suggest that greater attention should be given to "structured learning" concept, and its implications in water and sanitation sector. This "structured learning" approach is based on learning from innovative approaches used in "living laboratories" in many countries around the world. Therefore in this "future assessment" these approaches have been sought for in addition to other relevant aspects from the point of sustainability of the peri-urban infrastructure.

5.1.1 Importance of Infrastructure In economic development

The World Development Report 1991 (World Bank 1991) presents two global scenarios for the world economy. The baseline scenario assumes moderately favourable external conditions, and

the downside scenario assumes moderately unfavourable conditions. The baseline scenario suggests that the growth in some developing regions may be disappointing over the next few years. E.g., average per capita incomes in Sub-Saharan Africa are expected to grow less than one percent a year in the first half of the 1990s, and somewhat faster later. Even by 2000 average incomes in Africa will be less than in 1980. In the downside scenario, for the developing countries as a group, the average rate of GDP growth is similar to the 1980s (Table 5.1).

Table 5.1 Real GDP and real GDP per capita growth rates for low- and middle income economies, 1965-2000 (World Bank 1991).

Region or group	Real GDP growth			Real GDP per capita growth				
	GDP, 1989 (billions of dollars)	Population, 1989 (millions)	Trend, 1965-89	Projections for 1990s		Trend 1965-89	Projections for 1990s	
				Baseline	Downside		Baseline	Downside
All low- and middle-income economies	3 303	4 053	4.7	4.9	4.1	2.5	2.9	2.2
Region								
Sub-Saharan Africa	171	480	3.2	3.6	3.5	0.4	0.5	0.3
excluding Nigeria	142	367	3.3	3.6	3.1	0.4	0.4	0.0
Asia								
East Asia	895	1 552	7.2	6.7	5.6	5.2	5.3	4.2
South Asia	351	1 131	4.2	4.7	4.2	1.8	2.6	2.1
Europe, Middle East and North Africa	828	433	4.2	3.6	3.2	2.2	1.8	1.4
Latin America and the Caribbean	964	421	4.3	3.8	3.1	1.8	2.0	1.3
Income group								
Low-income economies	996	2 948	5.1	5.5	4.8	2.9	3.5	2.9
Middle-income economies	2 308	1 105	4.5	4.5	3.7	2.5	2.6	1.9

Note: Figures are annual percentage change, unless noted.

According to the World Bank most recent assessments the adequacy of infrastructure was found to be a major element in successful structural adjustment operations of the macroeconomic policies in developing countries. That World Bank report (1990a) draws lessons from the experience of countries that have succeeded in reducing poverty, with a view to identifying what kinds of policies work best. Pouliquen's (1991) conclusion is that they all have a two-pronged approach consisting of:

- Efficient, labour-intensive growth based on appropriate market incentives, physical infrastructure, institutions and technological innovation.
- Adequate provision of social services including primary education, basic health care and family planning.

"The water and sanitation sector is an essential component of both prongs in the strategy. It is obvious that as long as there are still over a billion people without access to a clean water supply, and many more without access to sanitation services, people cannot be healthy or productive, and poverty will not be substantially reduced. . . Infrastructure adequacy is therefore becoming a major focus of attention and the water and sanitation sector is an important part of it, with investment in the sector averaging between five to six per cent of total public investment."

Malaska (1991) calls the functional and productive entities the economic, socio-political and spiritual orders that work and should be capable to work more or less autonomously. When they are performing optimally, they obey different principles. The optimum spiritual functioning is achieved by individual freedom of creation and expression. The optimum economic functioning is reached through disciplined solidarity and sustainability that help to generate material diversity and effectivity on all levels (regional, national, and local). The optimum socio-political functioning requires obedience of the principle of equal rights for all humans. If the integration (Figure 5.2) is not

harmonious, the whole will sooner or later suffer, and perhaps collapse.

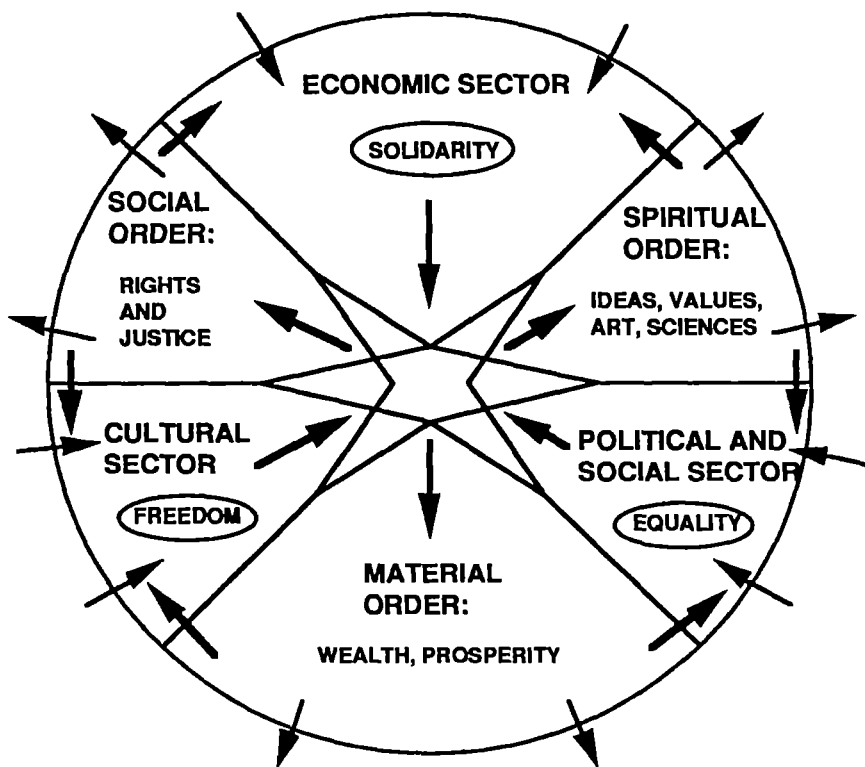


Figure 5.2 Gross-catalytic interactive threefold harmony of society capable to evolve (Malaska 1991).

The infrastructure supports a complex socio-economic system, represented in Figure 5.3, 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).

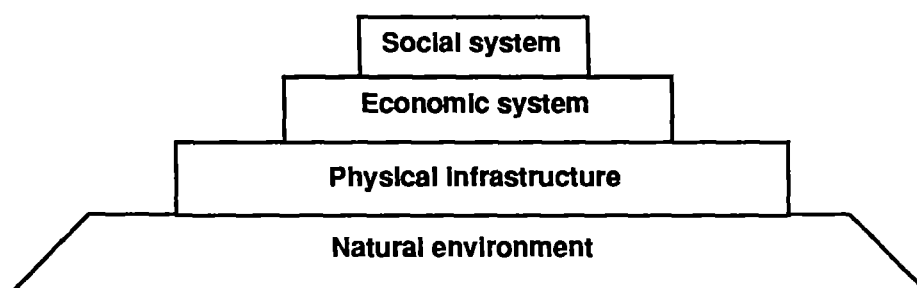


Figure 5.3 Relationship of infrastructure to socio-economic systems and environment.

The economic diagram (Figure 5.4) illustrates the points in the economic support system, where infrastructure is necessary.

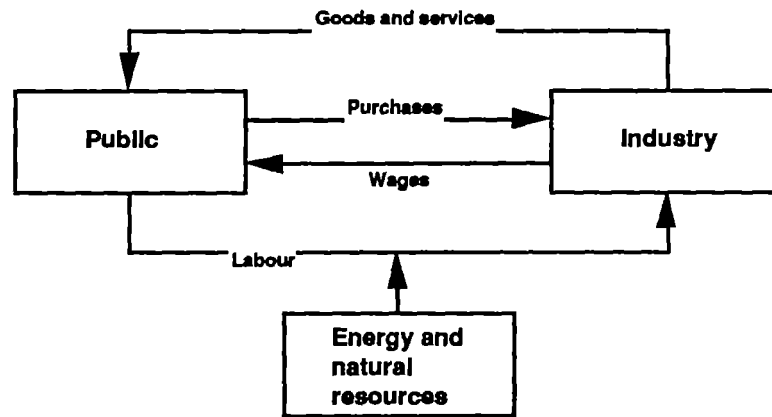


Figure 5.4 Economic system supported by infrastructure (Grigg 1988).

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

- 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; and
- 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.

The infrastructure investment can also be categorized to have the following overlapping and highly interdependent effects (UNCHS 1989b):

- (i) Financial effects (the financial means spent are not available for other purposes; infrastructure once built costs money to maintain and operate, thus prolonging financial effects);
- (ii) Land-use and environmental effects (in the case of cities the spatial structure becomes more rigid, planning alternatives are narrowed, and anomalies can arise which are impossible or very expensive to correct);
- (iii) Income effects (construction and operation of infrastructure creates new jobs and corresponding income and multiplier effects depending on the consumption level and pattern);
- (iv) Structural effects (investments in infrastructure, especially if there is a strong element of personal infrastructure, may modify the structure of employment and income);
- (v) Development effects (potentials can be created for further economic development and activity);
- (vi) Attraction effects (with improved infrastructure levels, in particular with improved relative levels, population and economic activity is attracted, structural changes, i.e., structural effects occur);
- (vii) Self-sustaining effects (infrastructure has the tendency to "attract" more infrastructure; infrastructure investment feedback or agglomeration effects occur); and
- (viii) Distributive effects (the existing level of equity of provision of services and development potential is affected).

Urban management and finance improvements focused initially on poverty groups have also other potential benefits:

- increased public revenues through better use of existing revenue sources and efficient use of new revenue sources;
- improved urban services for upper- and middle-income users;

- decreased costs of general urban administration relative to output;
- decreased capital and operating costs for public services and facilities relative to output;
- more efficient use of urban land through tax, leasing, and credit mechanisms designed to facilitate low-income urban settlement and discourage extravagant upper-income development;
- more efficient land use should reduce both capital and operating costs of services
- increased access to credit for the middle- and upper-income groups; and
- increment in the supply and /or reduction in the prices of essential services also for the middle-and upper-income groups.

Novick (1990) points out that an economic theory showing correlation between infrastructure and productivity developed by Aschauer (1988) justifies the funding new infrastructure expenditures and continuing major rehabilitation of existing public works systems. Aschauer compared the ratio of public investment/gross domestic product against productivity for the G-7 (Japan, West Germany, France, Italy, UK, Canada, and the US) countries over the period from 1983 to 1985:

- Japan, at one end of the spectrum, invested 5.1 percent of its output in public facilities and achieved productivity growth of 3.3 percent; and
- The United States, at the other end of the spectrum, has the lowest public investments, 0.3 percent per year, and the lowest productivity growth, 0.6 percent per year.

Aschauer concluded that the stability of these relationships indicates that a more balanced distribution of public sector resources—shifting from consumption into capital accumulation—will rejuvenate the economy. Israel (1991) adds that the World Bank studies of the 1980s gave the overall impression that the infrastructure of many developing countries are failing, or as inadequate to support growth. The macroeconomic component of the study examines the performance of 40 countries for a 25-year period to estimate the marginal productivity of infrastructure investments versus other capital investments. The microeconomic analysis identifies the mechanisms through which infrastructure investments affect economic growth.

According to Koehn (1993) infrastructure is the essential thread undergirding the economy and making economic growth possible. A study by U.S. Commerce Department (Aschauer 1991, cited by Koehn 1993) suggests that infrastructure spending and productivity move in tandem. The data suggests that infrastructure spending appears to be more effective than tax cuts for stimulating the economy. Investments in systems that aid in the production and distribution of goods and services tends to have direct impact on the profitability of industry, which stimulates private sector investments and increases national competitiveness (McManamy and Grogan 1988, cited by Koehn 1993). Several empirical results indicate a positive link between an increase in investment in public infrastructure and output and productivity growth rates, both at national and regional levels (Rakhra 1993). However, there is no agreement over the magnitude of this positive link. There is also a controversy over the direction of causality, i.e., where an increase in public investment leads to high output and productivity or vice versa.

Herbert (1979) classifies natural resources, manmade goods and services, and institutional mechanisms as the means through which a project's impacts are achieved. Public services can make land, capital equipment, and labour more productive (improvements in health) that may decrease commodity prices, and improve environmental quality. If the improvements are made in water services in the low-income areas, this can improve the value of assets controlled by the urban poor, if the low-income property ownership exist. Public revenues can also increase, if the property tax is applied effectively. Negative impacts of improvement of water services can be higher public capital and operating costs for services, requirements for the use foreign exchange for imported materials and equipment, manufacturing costs and prices of industrial products may increase as a result of introduction of user and polluter charges.

Linn (1983) states that extension of urban infrastructure services throughout a city is the most effective policy instrument for expanding the supply of urban housing, dampening land price increases, and stimulating private investment in shelter. He recommends the policy of labour-intensive technologies in urban public infrastructure provision for absorption of labour. However,

this should not lead to low productivity and high budgetary cost increasing cost per service unit, and thus reducing the service coverage.

Sundin (1990) concludes that in Sweden new technical solutions of water supply and sewerage during the second half of the 19th century gave a contribution to health. Economic growth increased the ability to strengthen infrastructures.

"A combined systems of piped water and sewerage was constructed in Linköping around 1875. Preliminary studies indicate that the improvement (on health) was almost immediate in areas where pipelines were drawn, particularly in areas where infant mortality had been higher than average. After some time, however, the conditions deteriorated when the system became inadequate for the growing population, for instance in poor peri-urban areas. Moreover, latrines were still poor in quality. Conditions improved slowly during this century with the spread of water toilets and the construction of new waste disposal systems."

The improvement of physical environment is an appropriate way to enhance also health in low-income communities. Hardoy and Satterthwaite (1987) point out:

"It is the house, the services and facilities it should contain (such as piped water and provision for washing, cooking, laundry, food storage and the removal of human wastes and waste water) and the neighbourhood within which each house is located which should provide much of the defence against injury and disease. A large part of improving housing and living conditions is reducing or eliminating the most serious health hazards present within poor quality housing. Indeed, an upgrading programme for inner city tenements or squatter communities could be one of the most effective ways to improve health and reduce accidents."

The impacts of the Hyderabad squatter settlement upgrading project in India have been studied and the surveys showed a considerable improvement in health conditions. Each house has access to water supply and sewerage, families can bathe, and unlike earlier, there is no need to store water for two to three days (UNCHS 1986b). The income of many families has also improved due to:

- a) An increased number of family members working;
- b) Better paid employment;
- c) Higher turn-over of small businesses; and
- d) Fewer work days missed through sickness.

5.1.2 Urban settlements

Robertson (1990) gives 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 de-centralized. 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.

The last 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 (see: Figure 5.5). 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.

Urban development policies and strategies

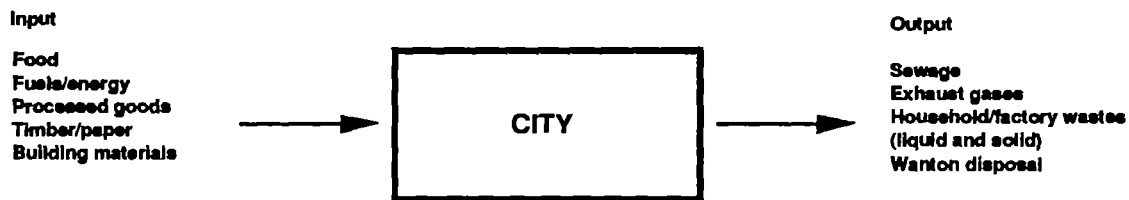
Hardoy and Satterthwaite (1988) emphasize that only through the urban system and its links with smaller settlements that rural inhabitants can be reached with agricultural extension services, inputs, credit, storage, marketing and processing. The government through them increase the proportion of population reached with health care, education, postal and telephone services, emergency life-saving, and transport systems. They divides the special programmes to develop small and intermediate urban centres within national or regional social and economic development plans as follows:

1. Support for local development and resource mobilization;
2. Integrating smaller urban centres within national development plans; and
3. Provision of basic services.

The issue how fast or slow a city is growing is of secondary importance, and the real issue is whether economic change is increasing the proportion of people with adequate livelihoods, and whether government agencies at national, regional, and local level are increasing the proportion of people having access to safe and sufficient water services, secure housing, education, health care, and provision for hygienic disposal of human wastes (Hardoy and Satterthwaite 1990). Linn (1982) also suggests that controlling city size is rarely the appropriate policy instrument to deal with urban inefficiencies, such as pollution, public service subsidies, etc. The appropriate policy intervention should focus directly on the sources of inefficiency, which would include the

pricing of externalities through pollution charges and the pricing of public services at cost.

(a) Present linear urban metabolism



(b) Future circular urban metabolism

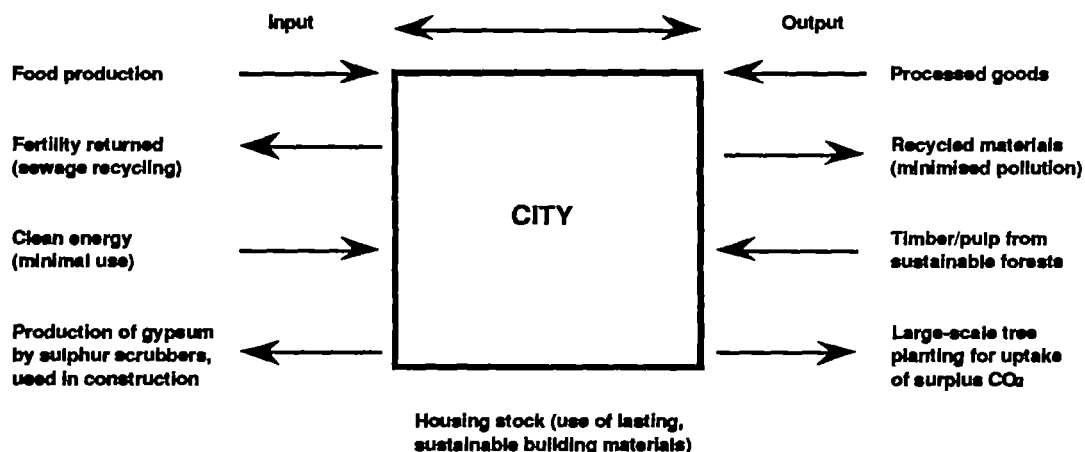


Figure 5.5 Present and future urban metabolism (Girardet 1990).

Unless there is firm political and financial commitment to the struggle against poverty with such commitment becoming evident in national development plans and in specific programmes no effective housing or settlement policy can emerge (Hardoy and Satterthwaite 1981). The national development plans must also consider their spatial implications. Todaro (1989) concludes with a summary of what appears to be the "consensus" opinion of most economists on the shape of a comprehensive migration and employment strategy as follows:

1. Creating an appropriate rural-urban economic balance
 - integrated development of the rural sector;
 - the spread of small-scale industries throughout the countryside; and
 - reorientation of economic activity and social investment towards rural areas.
2. Expansion of small-scale, labour-intensive industries
 - directly through government investment and incentives, particularly for activities in the urban informal sector; and
 - indirectly through income redistribution (either directly or from future growth) to the rural poor whose structure of consumer demand is both less import-intensive and more labour-intensive than the rich.
3. Elimination of factor-price distortions
 - eliminating various capital subsidies and curtailing the growth of urban wages would increase employment opportunities and make better use of scarce capital resources.
4. Choosing appropriate labour-intensive technologies of production.
 - reduce technological dependence of Third World nations on imported (typically

- labour-saving) machinery and equipment from the developed countries;
 - may be linked to the development of small-scale, labour-intensive rural and urban enterprises; and
 - develop of low-cost, labour-intensive methods of providing rural infrastructure needs including roads, irrigation and drainage systems, and essential health and educational services.
5. **Modifying the direct linkage between education and employment**
 - one way to moderate the excessive demand for additional years of schooling (which in reality is a demand for modern sector jobs) would be for governments, often the largest employers, to base their hiring practices and their wage structures on other criteria; and
 - the creation of attractive economic opportunities in rural areas would make it easier to redirect educational systems toward the needs of rural development.
 6. **Reducing population growth through reductions in absolute poverty and inequality along with the expanded provision of family planning and rural health services**
 - lowering of current high rates of population growth; and
 - together with the demand policies identified in paragraphs 1-5 above, the population and labor supply reduction policies provide an essential ingredient in any strategy to combat the very serious and worsening employment problems that developing countries face now and in future years.

United Nations Centre for Human Settlements (1989a) classifies development strategies to link national socio-economic goals with local changes in both the physical and economic structure of human settlements:

1. **Rural and small settlements development strategies** (Box 5.1 lists some of the reasons which can encourage the development of small and intermediate urban centres, Hardoy and Satterthwaite 1989) to create small centres for off-farm production and for rural industries, the regrouping of very-low-density settlements into new viable settlements, basic-needs programmes and secondary-city development schemes with the goals:
 - to increase agricultural output and to improve the physical quality of life of rural inhabitants; and
 - to provide user-end access to transport and communication systems.
2. **Colonization strategies to relocate populations within regions or transmigration to low-density regions with the objectives:**
 - to resettle refugees;
 - to exploit economically underpopulated regions with valuable resources; and
 - to support the objectives of the rural and small settlements development strategies.
3. **Intermediate cities development strategies:**
 - to improve the capacity of secondary cities to absorb the relocation of industrial activities from congested metropolitan areas;
 - to support the delivery of social services in lower-order centres as higher-order referral centres; and
 - intermediate city development strategies focus more on the town itself as opposed to rural development and small settlements approaches.
4. **Metropolitan growth management strategies:**
 - are common in countries where rapidly growing, very large cities have emerged and in which living and environmental conditions are deteriorating;
 - controls on the growth of primate cities and major metropolitan areas have not been effective;
 - a new emphasis on the management of this growth as opposed to its control;
 - to integrate planning with other sectors, such as finance, maintenance and land; and
 - some governments have attempted to restrict growth in major urban areas through

land-use controls, the creation of green belts, restrictions on building construction, investments in alternative "growth poles", and restrictions on industrial growth through the limitation of licensing combined with incentives to decentralize industry, as well as explicit attempts to limit migration to cities.

Box 5.1 Factors which can encourage a more decentralized pattern of urban development

Strong and efficient local government for urban centres other than primate ones, and a good data base to inform prospective investors about local climate/water availability/resources

Business support services like banking, development credit agencies, technical assistance facilities, etc. in urban centres other than primate city (to help in the birth and development of local firms) and good cultural/entertainment/recreation facilities for managers, executives, professionals and skilled labour plus good schools for their children

Businesses and middle and upper income groups in large cities being charged the full cost of the publicly provided infrastructure and services they use and also businesses not being allowed to dump solid and liquid wastes (including toxic wastes) and pollute the air

Relatively high per capita incomes and equitable income distribution nationally—so in areas other than that around the primate city, demand for goods and services encourages businesses to locate there

Good inter-regional transport and communications systems (e.g., telephone and telex systems, radio, television)

Industrial and retail/wholesale/service sector within a nation with size, diversity and concentration of units within single enterprises to allow the decentralization of branch units outside large cities to lower production costs or better tap markets there

Cheaper labour, cheap and plentiful land and basic infrastructure in urban centres other than primate city

High level of literacy and education among the inhabitants of urban centres other than the primate city including higher education located there- plus active regional/local business communities

Strong tourist sector related to natural sites (beaches, parks, lakes, rivers. . .)

No need for businesses to have long negotiations with bureaucrats, government agencies, located in primate city

Influential labour movements developing in existing industrially developed areas which businesses can avoid if they set up elsewhere

Advanced systems of management and control linked to sophisticated communications' systems allowing spatial dispersion of large enterprises' activities (each seeking location best suited to its operation) with no loss of management/control of whole enterprise from head office

Note: Many of these factors have contributed to a decline in population in many large cities or metropolitan areas in the First World and many seem to be acting in some of the Third World's most urbanised and industrially advanced regions within nations.

5. Regional development strategies:
 - productivity and economic growth linked to regional resources as their priority objectives;
 - generally technical approaches the objectives of which focus on production and which usually involve the emplacement of key infrastructure to achieve that production;

- focus on functional resource-based zones which have a potential for economic development; and
- usually incorporate aspects of the other strategies described.

Table 5.2 shows some policy measures for national urbanization strategies. E.g., Swilling (1990) suggests that the starting points for a democratic urban policy in South Africa should be the following:

1. The constraints on access to housing and services for the urban poor are not simply racial, they have become increasingly material in nature;
2. Given that the market cannot be eliminated, it must be regulated in specified ways;
3. Collective forms of social control, coupled creatively to individual private ownership, should be seen as the basis for development;
4. Grant, subsidised and loan capital must not only be made accessible to the urban poor, it must come under more direct forms of community control; that is, we need to devise a conception of "public capital";
5. Community participation and control must be the guiding principle of all urban development policies;
6. Finance capital should not replace the state as the dominant power in the urban structure;
7. Spatial dislocation must be prevented wherever possible;
8. Municipal financing mechanisms must stabilise communities, not divide and dislocate them;
9. Urban goods must not become commodities that can be traded and exchanged for profit; and
10. The state must continue to provide support for development in low income areas.

In most countries a national policy for sites and services is not alone sufficient, because they have significant proportions of low-income settlements. A policy of upgrading these is necessary (Bamberger and Deneke 1984). They recommend the following principles for both strategies:

- (a) mechanisms to secure land tenure;
- (b) integrated provision of urban infrastructure on a staged schedule according to affordability and preference criteria;
- (c) financing schemes that are replicable on a larger scale, and which emphasize cost recovery and restriction of subsidies, if they exist at all, to the lowest income percentiles;
- (d) the involvement of the community in the planning and implementation of both site and services and upgrading approaches; and
- (e) the improvement of urban management.

McKitterick (1987) concludes about the shelter policy:

- slum upgrading projects are more likely to be affordable by the poor than site-and-services; and
- shelter policy should also be shifted to focus more on rental housing rather than owner-occupied housing, because the poor, who are the policy targets, are more likely to be renters than owners

The government action to support urban development and housing provision may include (Payne 1984):

- (a) Formulating appropriate building and planning codes or regulations applicable in low-income area and distinguishing between initial and long-term standards;
- (b) Strengthening those informal housing systems already serving low-income needs;
- (c) Recognizing the need for local communities to exercise more influence over the

- development of their neighbourhoods;
- (d) Regulating the activities of informal land developers and building materials suppliers, etc.; and
- (e) Achieving a more equitable distribution of resources and services between income groups.

Table 5.2 Policy measures for national urbanization 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.

The execution of the national or regional development plans needs an effective local government with power, resources and trained personnel (Hardoy and Satterthwaite 1988). The legislation, building and planning codes, regulations and standards should be realistic to meet the needs and

resources of low income groups regarding housing and infrastructure. The official procedures required to approve the low income settlement or housing developments are often too bureaucratic, time consuming and can even give contradictory legal requirements for different national and municipal agencies.

Herbert (1979) recommends for projects to benefit the urban poor: the achievement of higher levels of essential consumption and the achievement of greater equity in the distribution of this consumption. The consumption includes all the essential services, food, water, sanitation, fuel, electricity, clothing, shelter, essential information, opportunities for social interaction, opportunities for participating in decision-making, and the benefits from a proper physical environment and recreation. Because the poor are the worst affected by fluctuations in public services and income, part of the goal should be a reduction of economic, physical, and social risks faced by the urban poor. This goal to achieve better life-styles can be achieved by introducing a more equitable tax structure, increasing employment and education opportunities for the poor and improving services.

Stage 5 of Table 5.3 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. 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 organizations 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.

The WASH report (1986) on Botswana's urban development policy states that faced with increased and rapid urban expansion, the Government of Botswana (GOB) in its National Development Plan (1975-1981) set forth an urban development policy based on:

- economic self-sufficiency;
- labor intensive techniques;
- restriction of subsidies; and
- provision of self-help housing areas to low income groups.

"In Botswana major housing programmes in newly developing areas are provided through the Botswana Housing Corporation (BHC) or the Self-Help Housing Agency (SHHA). The BHC was established in 1971 with the mandate to provide housing for all income groups (generally classified as high-cost, middle-cost, and low-cost housing). BHC homes are provided with water connections and waterborne public sewerage, whereas SHHA areas have public water standpipes and low-cost sanitation (latrines). The GOB policy of self-financing has been applied to the self-help housing schemes. Since 1982 the SHHAs have been required to charge plot-holders, through an "economic" service levy, the full costs (capital amortization and recurrent costs), including the operating costs of the SHHA and town council services provided to them. SHHA plot-holders do not pay owners' rates, although like other urban residents who are employed or who are self-employed, they are liable for a local government tax. The operating costs of educational, health, and social services are not recovered through the service levies but fall on the general funds of the town councils and are thus met from rates, local government tax, other local revenues, and any central government deficit grants. The government's policy on urban areas permits the financing of urban development through loan capital which is then repaid via some cost-recovery mechanism. In the case of the SHHA programme, most of the development has been financed through loans and grants from foreign donors. The cost recovery arrangement is decided by the Ministry of Finance for projects affected by soft loans and grants."

Table 5.3 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 to 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

continued

Table 5.3 Different attitudes by governments to housing problems in cities and the different policy responses (Hardoy and Satterthwaite 1989), 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. space	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.
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 although certain 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.

Figure 5.6 shows a process for the application of the basic minimum needs strategy in the development of congested communities in the Bangkok metropolis.

Land development and management

United Nations Development Programme (1989a) estimates that 20-40 percent of all urban households in developing countries live on land to which neither they nor their landlords have secure legal title. Because malfunctioning landmarkets affect most the poor the recommendation included:

- (i) improving the land information systems and the knowledge by policymakers of the existing conditions of urban land tenure and usage;
- (ii) identifying alternative registration techniques and improving the recording of land transactions; and
- (iii) simplifying the formal development control mechanisms and streamlining the existing regulatory framework such as land registration, planning documents, zoning regulations, building permit requirements and use of appropriate standards.

Full legal regularization of land tenure should not be considered a prerequisite for water and sanitation service provision. Local governments and utilities should work together to identify the minimum level of legal recognition of settlements that is necessary to guarantee security of tenure and to provide services. Governments should give utilities the legal right to provide WSS services to illegal settlements, by not subjecting this action to the unreasonable requirements of formal

master plans (WG/U 1993). For example, in Jakarta the government upgraded public infrastructure leaving land tenure reform for a later stage. Evaluation showed that the upgrading programme had no substantial impact on land ownership or rights pattern (Taylor 1983).

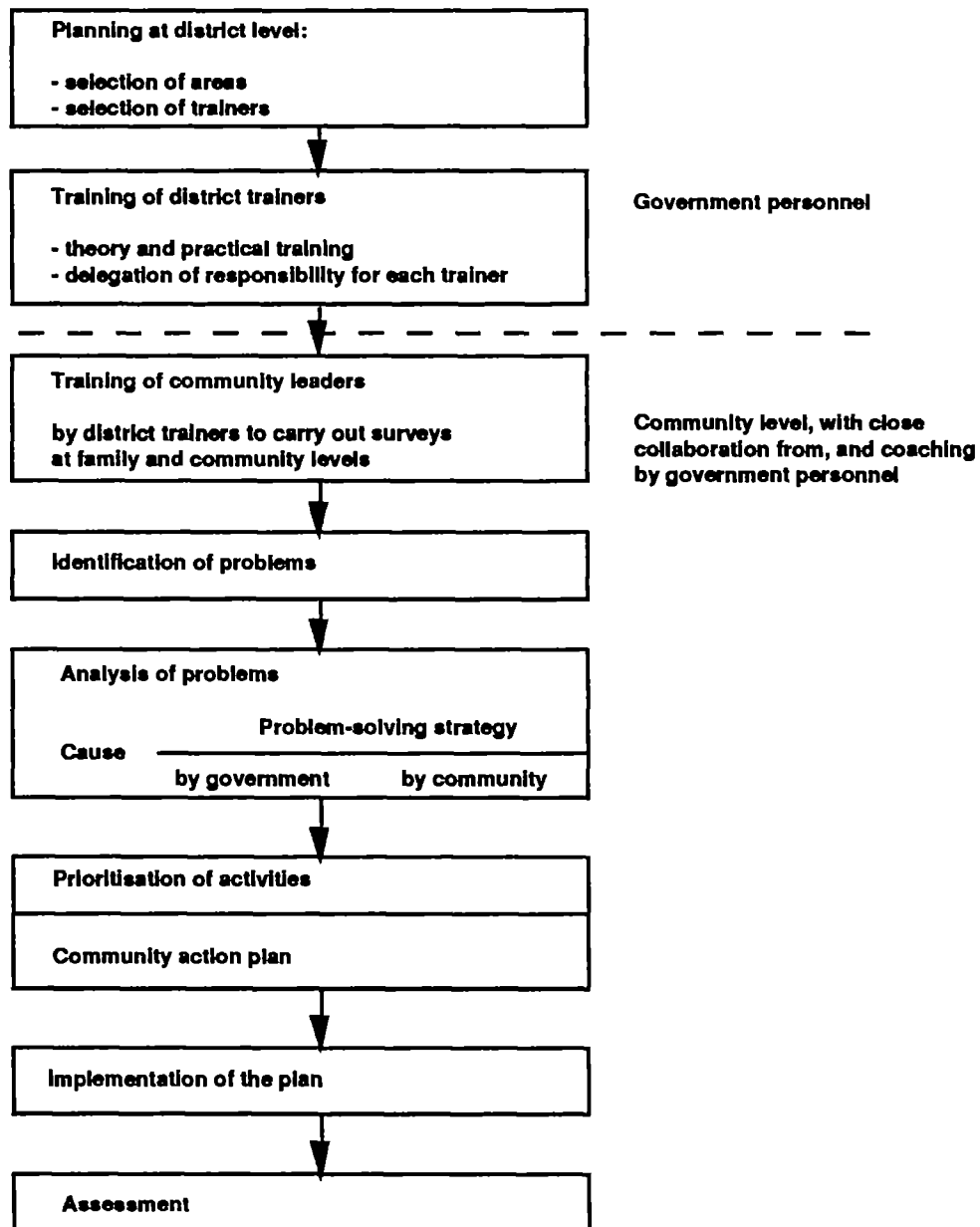


Figure 5.6 Process for the application of the basic minimum needs strategy in the development of congested communities in the Bangkok metropolis (Tabibzadeh et al 1989).

In Sri Lanka the main components of a million houses programme introduced by the government in 1984 (Pathirage 1990) were:

- provision of land and security of tenure;
- provision of infrastructure and services;
- assistance for house construction; and

- skill development and social promotion activities.

The provision of water supply, sanitation, drainage and roads is the responsibility of the National Housing Development Authority (NHDA), a semi government organization formed in 1978. The municipal councils are responsible of the solid waste management and electricity supply. Water supply is often constructed by the community development committees (CDCs) with NHDA funds. The beneficiaries has to pay back only £ 230 which is given for house construction. The NHDA invests £260 on land and £ 364 on infrastructure that are free for the beneficiaries. According to Pathirage (1990) the NHDA is making arrangements to recover costs of land and infrastructure from beneficiaries.

Tomaro et al (1984) report that the Thirty Cities and the Greater Tunis Complementary Program plans exhibit no bias in favour of excluding or including low-income neighbourhoods. The project plans were based on technical issues, applicable to the upgrading or installation of the sanitation systems. Office Nationale de l'Assainissement (ONAS, an autonomous sanitation agency) engineers and project directors seemed to be determined to take the steps necessary to ensure that the system ultimately provides full coverage for all inhabitants, irrespective of socioeconomic level, or quality of housing. The policy of the Government of Tunisia is to rehabilitate and upgrade conditions in the poor neighbourhoods rather than to destroy squatter settlements, and to force poorer residents to create new settlements.

Land consolidation approach or the land readjustment in Medan, Jakarta proposes that land owners in urban fringe (undeveloped) areas gives their land to the state. The state will make physical development plans, and a portion of land will be returned to the owners, when the plans have been implemented. This practice has the following advantages (Douglas 1989):

- (i) private owners would be compensated for their land loss through infrastructural improvements and increasing land values;
- (ii) the government would be able to gain land for public infrastructure, services and even low cost housing in a manner that would minimize adversial confrontations;
- (iii) the government would also be able to recover costs through selling of some portions of the land when land prices increase subsequent to development; and
- (iv) land speculation with urban expansion could be reduced because land is obtained in advance rather than after first-round development.

In Hyderabad, the Municipal Corporation and the Hyderabad Urban Development Authority decided that the in situ improvement of city slums was the most appropriate and realistic way (Cousins and Goyder 1986). The Hyderabad Urban Community Development Project started in 1967 indicates that the people wanted immediate results to solve their urgent problems, adequate physical amenities, housing and schemes of economic benefit. The project had a flexible approach, and a number of activities were started based on the requests by the local people.

In the beginning the project was concentrating on social welfare activities such as health, nutrition, and child care, but over the years it started emphasize programmes of physical and economic improvements. This included small loans for slum dwellers, establishment of marketing cooperatives, vocational training and nonformal education programmes. Table 5.4 shows strategies for pursuing this kind of participation.

The Hyderabad Urban Community Development Project demonstrates the importance of integration of physical improvements within the community development process, and linking of slum residents with financial institutions in the formal sector (Cousins and Goyder 1986). Urban planning including master plans and negative land use controls, such as zoning and building codes and controls with unrealistic standards, cannot usually solve the problem of providing the poor with land and services. The provision of those is a function of positive planning and action.

Table 5.4 Societal conflicts, and alternative strategies for pursuing participation (Korten and Alfonso 1985).

Arena	Nature of the Conflict	Alternative Strategies
Political	Local organizations designed to serve local level functions may also take on political identity and become actors on the national political scene. This threatens other political groups which can be expected to be antagonistic to programs supporting these organizations.	<ol style="list-style-type: none"> 1. Openly use the political process. Parties or movements used as source of initiative and means for vertical linkage of local organization to national forum. This strategy possible when programme is relatively independent of government yet government is tolerant of political diversity; or when there is high dependence on government but political affiliation of local groups is compatible with government and political situation sufficiently stable to allow long term development of the group. 2. Insulate local groups from political process discouraging political identification and focusing on local function of the group. This strategy appropriate when programme is highly dependent on government and local groups likely to be non-supportive of government political affiliation, or when political affiliation of government changes frequently
Legal	Meaningful participation may require legal or quasi-legal recognition of certain reform of the people expected to participate. But those rights may conflict with other rights valued by the society.	<ol style="list-style-type: none"> 1. Work directly for development of needed policy and legal frameworks. Strategy possible where a variety of reforms are being undertaken consonant with the desired reform and where values underlying needed reform are widely held; or where degree of conflict is small. 2. Search for existing legal and policy rulings that can be used to create intermediary rulings that foster conditions needed for participation. Strategy appropriate where major unresolved legal/policy issues exist which society is not ready to confront
Bureau- cratic	National governments have desire for central administrative and budgetary control as they try to forge national unity and retain national level flexibility in use of resources. Participation requires control and flexibility at the community level.	<ol style="list-style-type: none"> 1. Define program in ways to maximize flexibility within existing government rules. Strategy appropriate when government regulations provide for alternative programme frameworks that can allow flexibility at local level. 2. Insulate program from government procedures by developing special status for program such as government corporation or private organization. Strategy appropriate when government rules inflexible, not amenable to change and damaging to participatory approach.

McAuslan (1985) suggests that especially those countries adopted foreign models should ask: "What are our most pressing urban problems and how can planning controls assist in solving them?" rather than, "What are the latest concepts and systems of planning which seem to have international acceptance and are a good foreign model to import?" According to McAuslan the main positive control over land by the government is the acquisition of land. The term "land banking" usually refers to buying by governments in advance of need, but can cover all government land acquisitions.

Another form of land acquisition is "land pooling", where a public authority acquires an area with many plots and many owners, consolidates and develops the holding and eventually reallocates land in demarcated and serviced plots to its former owners in proportion to their original holdings. Costs and returns are shared between landowners and the authorities. Land pooling can help the provision of infrastructure and services by paying the works through the sale or lease of some of the serviced land.

Tomlinson (1990) describes land banking referring usually either to advance acquisition of sites for government use or to large-scale public ownership of undeveloped land for future urban use. The reasons for land banking include:

- (i) avoiding the premature commitment of too large a proportion of urban land for private use—land for schools, clinics and parks is obviously much cheaper if it is obtained in advance of urban development;
- (ii) enabling the government to recoup the costs of installing services (in effect, a form of betterment tax);
- (iii) stockpiling public land which may be selectively released with a view to restraining price increases;

- (iv) using public ownership of land as a means of determining the location and form of future development; and
- (v) obtaining land for urban growth, most often by getting it at its agricultural value in order to facilitate public sector housing efforts.

There are two essential factors for a successful programme of land banking: close connection with the planning and land-allocating authorities and coordination between the various agencies involved in development plans. This is difficult when:

- there are bureaucratic delays in preparing a site plan, undertaking the necessary investments in infrastructure and allocating the land;
- the land banking institution develops interests contrary to its mandate;
- when, as is often the case, it is difficult to achieve an honest appreciation of deserving locations and the maintenance of secrecy during the process of acquisition.

The five requisites of land sharing according to Angel and Boonyabancha (1988) are the following:

1. Community organization;
2. A land sharing agreement;
3. Densification;
4. Reconstruction; and
5. Capital investment.

Tribillion (1993) suggests that plot layout should be based on existing parcel subdivisions. The first advantage of this approach is that it preserves existing homes. Each existing plot must contain at least two new ones—one for the existing home, the other one “for the children” or for the market. This kind of development do not entail any land costs other than servicing expenses. Another important advantage is that it forces land developers to be more micro-based, i.e. to be aware of land conditions and the inhabitants’ own use of land.

Financial and economic considerations

Swilling (1990) points out that a democratic urban policy should aim to devise mechanisms that will improve the use value of the land, services and houses required by the urban poor without increasing the vulnerability of the poor because of improvements in the exchange value of those urban goods that urban development programmes tend to stimulate. He recommends that to avoid the displacement of the urban poor through market determined choices, land, services and housing should be made available on the basis of:

- (i) subsidised development capital;
- (ii) non-profit development organisation;
- (iii) non-profit loan finance; and
- (iv) anti-market collective tenure arrangements.

If the subsidisation for development capital need to be prioritised, he recommends that:

- (i) land;
- (ii) services; and
- (iii) housing

should be the priorities in this order. The subsidies taken from the tax base (local, regional or national) should be used as stimulants and incentives for non-profit development programmes. The subsidies should especially support the creation of non-profit (preferably community-controlled) organisations to deliver goods. This helps the urban poor to develop independent economic power bases that are not subordinate to either capital or the state.

Innovative systems for obtaining credit, notably community-based ones, are among the main instruments contributing to the financing of title regularization and housing improvement projects, and for cost recovery. Therefore their development must be encouraged (Durand-Lasserve 1993). In order to give independent community associations access to funds for title regularization, financing mechanism having a spillover effect on the mobilization of community resources must be introduced.

Bairoch (1998) reminds that although urban growth has positive effects, e.g. industrial productivity may in general rise, there must be added the negative consequences: the per capita cost of the urban infrastructure goes up as soon as the population exceeds 100 000. . . 200 000; the level of savings and consequently of investment capital drops.

Institutional and organizational considerations

"Many governments are still trying to plan and build cities for societies which only exist in the minds of their technocrats and politicians. . . The true planners and builders of Third World cities are the poor."

Hardoy and Satterthwaite 1989

Angel (1983) has noticed that among the 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. Williams (1984) suggests that in the settlement policy implementation the government should limit its role to providing services which families and communities cannot provide themselves, such as city-wide planning and construction of infrastructure. In slum improvement and sites and services programmes the municipal government should take the leading role.

The central government role should be that of establishing the main policy framework, allocating funds, and providing technical assistance and guidance on standards and procedures. Table 5.5 shows the responsibilities between different agencies for housing and related infrastructure and services (Hardoy and Satterthwaite 1987, see also Table 5.6).

Table 5.5 The division of responsibilities between different agencies for housing and related infrastructure and services.

Aspect of housing or related service	Private sector or level of government responsible for					
	planning	legislation	funding	construction/ implementation	management	
Low income groups hoping for better cheaper housing or better infrastructure and services in their current accommodation	Low-income conventional housing	national/provincial	local	national/provincial	private	national/provincial
	Water supply	national	national/local	national	private	national
	Sewers	national	national/local	national	private	national
	Garbage collection	local	local	local	local or private	local/private
	Electricity	national/local	national/local	national	national/private	national/local
	Road surfacing	local	local	local/private	local/private	local
	Pavements/sidewalks	local	local	local/private	local/private	local/private
	Public transport	local/national	local	local/private	local/private	local/private
	Hospitals	national/provincial		national/provincial/private	national/private	national/provincial
	Health care centres	provincial/local		provincial/local		provincial/local
	Schools	national/provincial/private	national/provincial	national/provincial/local/private	national/private	national/provincial/local/private
	Parks/playgrounds	local	local	local	local	local
	Land use planning	local	local			local
	Building norms	local	local	local	local	local
	Environmental norms	national/provincial/local	national/provincial/local		local	national/provincial/local

This table is just to illustrate the multiplicity of agencies at different levels whose responsibilities include some aspect of housing or related infrastructure or services. It is not meant to imply that the structure of government in Latin America (or in any other region) corresponds with the divisions given above. In addition, the list of items is not complete. 'Provincial' is meant to imply provincial or state level. 'Local' is meant to imply local or municipal.

Table 5.6 Matrix of housing supply agents and activities (Linn 1983).

Suppliers	Subdivision	Housing supply activities			
		Provision of on-site services ^a	Provision of off-site services ^b	Shelter construction	Provision of tenure security
Private					
Developers	H, M, L	H, M		H, M	H, M, (L)
Owner-occupants	H, (M, L)	L ^c	H ^d	H, M, L	H, M, L
Squatters and occupants of illegal subdivisions	M, L	M, L ^c		M, L	
Absentee owners	(H), M, L	(H), M, L		(H), M, L	(H), M, L
Renters		(M), L ^c		(L)	
Service providers		(M), L ^e	H, M, L ^f		
Public					
Urban government	(M, L)	H, M, L	H, M, L	(M, L)	M, L
Public utilities		H, M, L			
Housing agencies	(H), M, (L)	(H), M, (L)	(H, M, L)	(H), M, (L)	(H), M, (L)

H = High-income housing; M = middle-income housing; L = low-income housing

Parentheses indicate that supply activity is of secondary importance.

a. Water and energy supply, waste disposal, drainage services.

b. Transport, education, health, security services.

c. Includes water carrying, private energy supply, waste disposal

d. Private automobile transport.

e. Water and wood carriers; waste collectors.

f. Transport operators, schools, and health services.

International experience indicates that the nature of upgrading and serviced site projects often calls for the creation of a new administrative unit with specific responsibility (Davidson and Payne 1983). Existing agencies may not have the legal powers to act effectively. In selecting the institutional framework an essential element in any successful administrative unit is the political backing necessary to ensure the co-operation of other agencies in the provision of utilities and other components of the project. In the initial stages both high level and local political support is a prerequisite of success, to overcome prejudices, ensure an adequate supply of sites for development, and to obtain the agreement of other national and local agencies concerned in the provision of key services. According to UNCHS (1989a) the properly designed institutions have the following characteristics:

- (a) They have explicit purposes;
- (b) They have authority vested in them to achieve those purposes;
- (c) They have capacity to fulfil their obligations;
- (d) They have specific powers;
- (e) They have working procedures determined by the above.

The properly designed institution is not alone sufficient to guarantee a good service, i.e. which responds to needs, preferences and expectations of customers. The responsiveness is a basic criterion of service quality, and other dimensions cannot compensate it (Kiviniemi 1988). Kiviniemi concludes that the factor explaining the service problems is the lack of service culture in the public agencies. The service has a low valuation and the approach is bureaucratic and professional which emphasizes rules, regulations, administrative structures and internal system of information. The measures to improve the public services and creation of a new service culture in public administration include the following (Kiviniemi 1988):

- decentralization measures, especially decentralization from the administrative domain to service domain;
- clarification and simplification of rules and regulations, especially those concerning the service work;
- diminishing the slowness and red tape in services to the minimum possible;
- developing good conditions for accession to and information about the public services;
- emphasizing the responsibility for the care of every customer and the organization of that principle;
- developing and organizing competent and sufficiently independent service professions and occupations;
- rationing the internal linkages of service system in public administration; and
- organizing and stimulating citizen participation for the development of public services.

According to the UNCHS (1989a) a key policy issue from which action emerge is participatory versus top-down forms of decision-making to enhance participation through institutions. Therefore institutional arrangements are required to enhance the participation of the people through representative agents. Policy action involves the extension of participatory opportunities to decentralized bodies at different tiers which will facilitate the achievement of national development goals, regional objectives and local initiatives. New arrangements can be introduced whereby conflicting aspirations can be mediated through regional planning institutions and decision-making bodies.

National and regional institutions

According to the UNCHS report (1989a) there are important lessons to be learned from case studies, where the performance of different institutional arrangements for regional (subnational) development planning are examined and compared. Key questions in this regard include the following:

- (a) How should the decision-making process work?
- (b) How much should be invested in different activities?

- (c) Where should investment in urbanization and in productive activities be located?
- (d) What patterns of urbanization should be encouraged?
- (e) What criteria should guide the elaboration of development standards and goals?
- (f) How should conflicting goals and interests be resolved?

According to the findings of the UNCHS a national socio-economic policy is usually made at the top to be channelled through a vertical hierarchy at the regional and local levels. These territorial units are expected to coordinate horizontally at their respective levels. Each ministry is extending simultaneously its functional policies and programmes independently through its technical branches. The vertically sectoral approach (*deconcentration and delegation*) extends central functional competence efficiently but does not respond to contextual constraints and potential. The horizontally coordinated territorial approach (*devolution*) transfers resources and functions to subnational institutions which can be integrated with regional strategies, directed by decentralized bodies. The key policy issues in rationalizing institutional arrangements include:

1. Deconcentrated versus decentralized roles of institutions.
2. Sectoral versus territorial types of institutions.
3. Hierarchical versus multidirectional institutional links.

A balanced development of regional institutions with sufficient political, administrative, planning and supportive roles bring a synthesis between national goals and diverse local objectives. A regional institution would, e.g. prioritize trunk-road, electrical, irrigation, marketing and communication networks in support of regional strategies. The regional decentralized institutions should include representatives from local bodies who can negotiate for their share of regional investments to satisfy local needs. The local bodies would plan and manage user-end networks and local projects, e.g. productive, service, health, educational and recreational activities in support of their own objectives.

Appropriate institutional links would clarify relationships between decentralized bodies, administrative organizations, planning institutions and supportive agencies. A negotiations system should be developed which reflects different priorities within limited resources. The key issue is whether legal arrangements which have been designed to transmit decisions, information and resources down a hierarchical system should be made efficient or should be redesigned. Legislation should create procedures which promote "trade-off" and negotiating processes between local, regional and national decision-making bodies. Legislation should also develop functional capability. The local bodies should be authorized to levy sufficient taxes for performing their functions. At the regional level, administrative, planning and supportive roles should be in one territorial entity with adequate finances and appropriate legal powers to direct financial grants and loans.

However, abandoning the various institutional structures and arrangements may be impracticable depending on the political interests. These existing structures should be used as appropriate for particular tasks (Sivaramakrishnan and Green 1986, cited by Rakodi 1990). Less attention should be given to changing existing and devising new institutional structures, and more attention should be paid to improving the operations and results of, and co-ordination and relationships between, existing institutions. Different types of institutions are perfectly suitable for the management of development activities (development authorities) and ongoing administration (bureaucratic authorities).

To enhance communications within institutional systems a key policy issue is between arrangements which merely direct decisions and transmit facts and those which create a network for negotiation and the exchange of information among appropriate users. Policy action should be instituted for such a system of information exchanges, dialogues and negotiations to be effective. To enhance management of regional institutions the key policy issue from which actions emerge is closed versus process-oriented management (UNCHS 1989a):

- The management process often reinforces top-down hierarchical systems and is resistant to "process-oriented functions". Inefficiency, incompetence and corruption characterize

many existing regional-level management institutions.

- New management systems and cultures can be diffused from the regional to other subnational-level institutions. A system of rewards and obligations needs to be introduced which encourages effective management, and harsh penalties applied to combat corruption.
- Public service reforms should promote result-oriented behaviour to ensure that careers in regional management and planning are attractive to capable professionals. Permanent appointments to professional posts should be avoided, which encourages movement between the public and private sectors.
- Privatization can be used to bring into public-sector activities private-sector characteristics, such as efficiency and profitability.
- Financial management should be addressed through policy actions which promote resource mobilization, cost-effective utilization of resources, maintenance of existing infrastructure and effective investment planning.
- Regional institutions can use incentives to encourage effective financial management at the local level. They can objectively balance investments among local bodies and apply audit functions against local expenditures which local politics inhibit.

To enhance human resources development one policy issue is whether traditional personnel can handle the functions essential in a multilevel planning system or a professional cadre of planners and managers is required. A second policy issue is whether traditional governmental service standards and educational qualifications are adequate. Public-service reforms are required which provide status and opportunity at the subnational level and compensate capable people for the "cost" of living away from national centres. Such reforms must emplace procedures which enhance objective recruitment and promotion. Changes are needed simultaneously in public-service and institutional arrangements.

Municipal institutions

The design of a metropolitan management organization should concentrate on the following minimum tasks (Sivaramakrishnan and Green 1986):

1. Overall decisions on metropolitan development plans and policies; and
2. Overall choice of programmes and projects to be implemented, the allocation of executive roles, and the appropriate budgeting of financial resources.

Similarly the powers and functions of a metropolitan management organization should be determined not by what it can do, but what other organizations cannot do. Experience in South and East Asia suggests that, to meet the minimum organizational needs, networks of the existing institutions, in both the private and the public sectors, should be established to channel information and proposals to a metropolitan management team for overall planning purposes, and to recommend related development programmes and projects to it for review, selection and financing (Sivaramakrishnan and Green 1986).

Tomlinson (1990) suggests that a land development corporation should be established to avoid many of the current problems in South Africa. It should have the right to acquire, develop and sell land, and through cheap capital and a low level of services be able to serve the needs of the poor. The corporation would operate as the development agency of city governments and be subject to the direction of those governments. The supply of serviced sites is best located at this level of government, since higher levels have generally a poor reputation for serving the urban poor. The corporation would acquire land for the purpose of specific development projects and, due to the debt incurred when acquiring the land, would turn the land over as rapidly as possible. The private sector, including co-operative groups and employers, should participate in the housing market and in the development of the land. The proposed corporation would obtain the necessary capital from a central development bank and not from commercial banks, since the majority of projects would not be commercially viable, and the income and debts arising from projects would accrue to and/or be the responsibility of the local authority. Tomlinson points out:

"City governments will have an incentive to speed up administrative procedures and reduce standards—the former in order to minimise capital turn-around and the latter in order to lower the cost of serviced sites. The actual product the landcorps should provide is subsidised, serviced sites—large and small—within the city. This location is in contrast to large, greenfield sites outside the city which, if developed for the poor, will reinforce the form of the "apartheid city"—indeed, access to finance should be contingent on equitable locations. The difficulty this proposal creates is that a subsidy rendered to the poor in this fashion may not reflect their priorities. Surveys reveal that as the household income declines, so the relative focus on, for example, cheap food, free schooling and health services increases. Thus, if sites are provided at below market rates, and if the site allocation is to the poor, the sites would rapidly be reallocated through a process of downward raiding. The only way that the aid which the government offers the really poor will stay in their hands is to supply them with conditions which will not prompt downward raiding. It follows that probably the best way of reaching the poor is to deliver facilities which, on the whole, are unattractive to higher income groups and will not prompt downward raiding. This may seem like a cynical justification of doing very little for the poor but, in fact, the reverse is true. While one provides minimal help per household, this costs less and the government is able to reach more households. What it leads to is an argument for a subsidy for the supply of land with a low level of services."

A joint project (UNCHS, UNDP, UNCDF, and the Ministry of Public Works, Housing and Urbanization of the Government of Niger) to rehabilitate of an existing housing area (14 000 inhabitants), and to develop of a related new housing area (5 000 inhabitants) in Niger is based on the following key issues (UNCHS 1990):

- Introduce financial mechanisms assuring total cost recovery of infrastructure investments including maintenance cost;
- Introduce a credit system giving low-income groups access to house ownership; and
- Strengthen local administration's capacity to implement, monitor and evaluate the present and to formulate future similar improvement programmes in other urban areas.

The local governments have a major role in raising resources, and the central government has mainly supervisory, technical, advisory and monitoring role. The Directorate General of Human Settlements (Cipta Karya), Ministry of Public Works trains local officials in town planning, mapping, water supply, financial analysis, how to obtain foreign loan. It also evaluates the programmes before loans are allocated, and monitors the progress of the municipal government programmes.

Community based institutions and peri-urban dwellers

According to Herbert (1979) the target poverty groups among peri-urban dwellers can be defined as follows:

- (i) their levels of current consumption and their prospects for improving them under existing conditions and trends;
- (ii) the extent to which they already control or can be expected to control capital assets (earning capacity, property rights, access to credit that could provide a basis for future consumption; and
- (iii) their territorial orientation.

Three territorial orientation can be given:

1. externally oriented groups, where households or individuals are in urban area primarily to generate income for consumption and investment elsewhere;
2. transit groups, where households or individuals intend to remain in the urban area in which they are now located but are using the locality they are in merely as a staging area;
2. consolidating groups, where households or individuals expect to remain for a relatively long period in the locality they are in.

Each possible combination may call projects with different type of emphasis. Also other than urban poor target groups may benefit the projects: the improvement of an existing low-income settlement increases property value also in neighbouring areas, improved health may increase not only their incomes but also the profitability of the enterprises in which they are employed. The project can also have the impact on national objectives, such as gross domestic product, aggregate savings and investments, the balance of trade, external debt, and aggregate revenues from increased user charges. McAuslan (1985) suggests participation by action, which means sites and services and squatter upgrading programmes instead of massive public housing schemes with the emphasis on:

- (a) Bottom-up, or community-based, administration;
- (b) Discovering what facilities the communities want, in what order of priority, and where;
- (c) Allocating some funds for spending directly by the community. The possible waste or misallocation of funds will be a lot less than that involved in public housing schemes which never pay their way; and
- (d) Helping to build up community-based institutions for essential self-management roles.

Rakodi (1990) points out that the precise form of the community organization is less important than the extent to which is responsive and legitimate to residents, and the scope which is given for any real say in decision making:

"If community organizations are not themselves allocated resources in relation to which they can make expenditure decisions, then, even in programmes such as Hyderabad (which attempt to operate in a demand-responsive manner), leaders and community workers have an important gate-keeping role interpreting residents' needs, and mediating between them and public agencies. Where public or donor agencies have predetermined modes of operation, criteria, or standards, the scope for participation in decision making may be very limited—even if project planners and implementors are, in principle, willing this occur."

Rakodi also reminds that neighbourhood based organizations rarely provide the impetus for changes to the existing economic and political power structures. They are also excluded from the decision making structure in which the resources for infrastructure and services are allocated city-wide. There are many forms of local organization encouraging community involvement in cities in the developing world. Tabibzadeh et al (1989) gives some examples in Box 5.2. Yet, there is one element regarding community involvement that creates inequity among the urban residents as Hardoy and Satterthwaite (1989) points out:

"It is ironic that the poor with the least incomes and often the least free time are asked to contribute labour to the installation and maintenance of infrastructure and services while richer households receiving far better quality infrastructure and services (often at below market costs) have no demands on their time to help install and maintain it."

The conclusions made by Harpman et al (1988) from the several case studies regarding urban community development programmes are the following:

- They demonstrate that community development approach to the problems of the urban poor can be effective, both in providing improved social and health services cheaply and also in meeting many of the basic problems of poverty.
- They also show that despite poverty, there are potential large economic resources in most slum communities which can be realized with the help of sensitive community development workers.
- They show that a major key to success in community development is the project staff and their approach. In fact, the selection and training of staff is probably the most important element in any community development programme.
- They demonstrate the importance of co-ordination in achieving the most effective use of community, local government, and external resources.
- They also demonstrate the importance of certain basic linkages in the development process. These include:

- (i) integration of physical improvements within the community development process;
- (ii) systematic linking of voluntary organizations with slum communities; and
- (iii) systematic linking of slum residents with financial institutions in the formal sector of urban economy.

Box 5.2 Community Involvement in cities in the developing world.

In Indonesia, the "Community Resilience Boards" act as bridges between government and community. These boards, which exist all over the country, have a variety of sections, including health sections.

In Pakistan, elected local bodies form committees for various purposes. The health committees (including, for example, mullahs, teachers, and elders) provide a link between the health authorities and local communities.

In Mozambique, the pattern of community organization is basically very much the same as in Indonesia, with a village-level set-up supplemented by neighbourhood and block associations.

In Colombia, there are, in the big cities, Community Action Boards similar to the Community Resilience Boards in Indonesia. These are organizations of the urban poor and are strong because they are rooted in their communities, but their health component is relatively weak.

In Manila and other cities in the Philippines, the Barangay Council is the political body at the neighbourhood level for population units of 2000 or thereabouts. The Council is supplemented by a barangay network consisting of, among others, purok and unit leaders, volunteers (including health workers), and sometimes representatives of nongovernmental organizations. Religious bodies may also form committees to deal with selected aspects of primary health care.

In Juba (Sudan), there are "Quarter Councils", which elect representatives to the municipality. Health is one of their interests. Initiatives are passed down from the Ministry of Health to the counsellors, then down to the different communities. The feedback from each community indicates whether it is enthusiastic about taking ideas further. If there is a positive response, a community committee will pursue the matter.

In Somalia, there are community organizations (known as tabella) in all cities, each covering 50-100 families. The tabella-level committee, whose members are chosen by the local community and are unpaid, is responsible for all communal activities within the tabella and has full executive authority.

In Thai cities, not all communities have recognized organizations. Where these do exist, community health workers may be attached to them to promote primary health care. Otherwise, as community health workers are trained, special committees have to be set up to provide a focal point for their activities.

Korten and Alfonso (1983) gives a list of community level obstacles and mechanisms for overcoming them (Table 5.7). In settlements upgrading projects Harrington (1984) recommends that self-help house construction should not be organized by project administrators, but people themselves should take the initiative after the major infrastructure is developed. Shah (1984) points out that sites and services, squatter upgrading and environmental improvement programmes should be seen as an economic investment with full cost-recovery and not as charity or social welfare. The role of people should be therefore not that of receivers but partners. Table 5.8 categorizes the objectives of community participation and Table 5.9 objectives and actual community participation in implemented projects reviewed by Moser (1989). The locations of the projects are shown in Figure 5.7.

Table 5.7 Community level obstacles and possible mechanisms for overcoming them.

Community Level Obstacle	Possible Mechanisms for Overcoming the Obstacle
Lack of an Appropriate Community Organization	Community organizer works to spread awareness of program and to develop needed organization or strengthen existing organization.
Lack of Organizational Skills	Informal training by organizers helping leaders plan meetings, bring issues to membership, etc. Formal training in some specific skills such as record keeping.
Poor Communication Facilities	Local organization builds communication networks within its membership and breaks down some tasks and discussions to smaller groups that can meet more easily.
Factionalism and Differing Economic Interests	Program or project structured to minimize need for cooperation among strongly conflicting groups; incentives designed to strengthen local organization; community organizers support processes unifying people who must cooperate.
Corruption	Procedures developed for system checks; broad understanding developed among members regarding nature of programs and members' roles; member access to all decision-making and organizational records encouraged.

Table 5.8 Categorisations of objectives of community participation (Moser 1989).

Oakley and Marsden (1984) Moser (1983)	Paul (1987)	UNCHS (1984a, b)
Means	Project cost sharing Improving project efficiency Increasing project effectiveness	Means to improve project result
End	Building beneficiary capacity Empowerment	Building self-reliance, co-operative spirit Right and duty to participate

Table 5.9 Objectives and actual community participation in projects reviewed (Moser 1989).

	Paul's objectives and actual community participation				
	Empowering	Capacity building	Effectiveness	Efficiency	Cost sharing
World Bank					
Lusaka					O A
FUNDASAL	A	O A	A	O	A
Dandora				O	A
Government					
Villa El Salvador	O	O A		O	A
San Judas	O A	O A			
M.L. Agencies					
Hyderabad		O A		O	A
Baldia		A	A		A
NGOs					
Orangi		O A	O A		A
Kebele 41		O	O A		

O — The objectives of community participation.

A — The actual community participation that occurred.

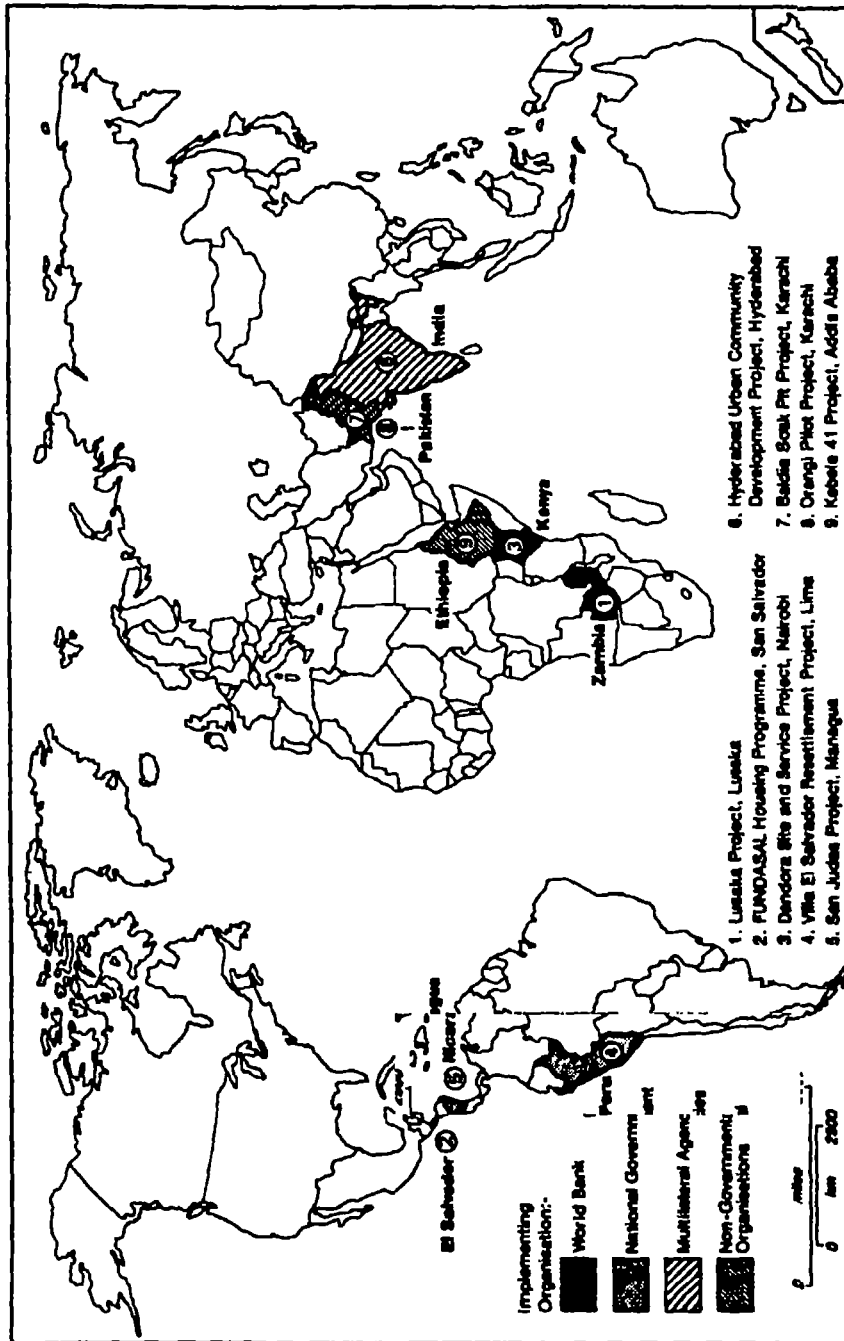


Figure 5.7 Map showing Implementing organizations and geographical locations of urban projects reviewed (Moser 1989).

Wray (1990) points out that the quality and durability of the finished project is important not only to satisfy long term financing requirements but also the desires of the householders. The infrastructural projects can be undertaken without the participation of consumers, while production oriented cannot be undertaken without the participation of the producers (Moser 1989). Moser lists the critical factors affecting community participation as follows:

1. Factors at national government level:
 - (a) Project scale and empowerment: The scale of the project may influence national government attitude towards community participation. Rather than supporting projects with wider and social and economic issues, the government may restrict

participation to small projects specifically directed development goals such as construction of houses. The government may have also fear that grass-root organization will lead to empowerment of local communities;

- (b) Government mechanisms to restrict empowerment: The most important constraint faced by implementing agencies is clearly political. The national governments accept participation in project design but do not provide the political or financial support at the implementation stage. The donor agencies, such as the World Bank, avoid this problem quoting that "wider social objectives must be defined internally within each country". UNICEF often avoids this problem by concentrating on the politically non-threatening group of children and women; and
- (c) The limits of empowerment without government support: Many projects have successfully included capacity building as an objective of community participation without government commitment. These projects have most often undertaken by NGOs. Moser gives two reasons for their success:
 - NGO projects are not seen as politically threatening; and
 - NGOs do not suffer the political consequences of empowerment as do government projects.

2. Financial factors:

- (a) Grants or loans: The input of capital is often exceeding the absorptive capacity of the urban poor communities. The projects have requirements for spending commitments with matching time schedules that are obviously too demanding for people with low and uncertain incomes;
- (b) The question of land: For many communities, landownership is the precondition for the community participation. The provision of free land has been according to Moser been the basis for the development of entirely self-supporting community projects. However, it has been also pointed out that security of tenure is more important than ownership per se (UNCHS 1981);
- (c) The funding of expert and community level support staff: The adequate payment of professionally trained staff or local personnel to assist the community in developing their project is essential;
- (d) The recycling of grants: Project grants can be converted into individual loans, and recycled as a revolving development fund under community control. This would enhance community's capacity to repay the loan;
- (e) Financial constraints of the project format and the demonstration effect: The rigid project format with the funding structure does not persuade the people to join in the project (demonstration effect). The funding structure often prevents from starting the project in one small community before extending it to larger scale; and
- (f) Method of channelling funds to NGOs: The NGOs could be used more in channelling the funds of donor agencies for the greater effectiveness in implementation of projects, and for matching the capital absorptive capacity of target groups. NGOs could also administer revolving funds from donors.

3. Internal organizational factors:

- (a) The technical as against social components of the project: Often the project success or viability are determined by economic and technical rather than social project components, which reflects the budget allocations and the number and skills of personnel at the organizational level;
- (b) The financing of community departments: Critical factors in project success are adequately funded community development departments and skilled personnel; and
- (c) The status and training of social staff: Usually technical departments are controlled by senior men and community development departments are manned by junior women. This reinforces the thinking at the organizational level that social components are of lesser importance. The training of community development officers and social workers in community participation may also be considered of

lesser importance or is not adequate.

4. Factors relating to community structure:

- (a) Homogeneity in communities: Many of the communities are actually economically, politically and socially heterogeneous, and the effective local level organization development requires often high degree of community homogeneity. There is also contradiction between the collective solidarity required for local level organization and the individualism generated by the survival strategies of low-income groups. The important role of women in household and that in community participation is not often recognized. Also top down projects often include only home owners, the particular needs of renters and squatters should not be ignored;
- (b) Choices in local organizations for community participation: There are several types of local level organizations with different implications for community development projects. There might not exist organizations at the community level to be selected by the project to cooperate with. There might also exist competing association disputing for official recognition (UNICEF 1984). Basic urban services such as water supply, sewers, garbage collection, and transportation can be obtained with or without an official development committee in slum and squatter areas, depending on the resources available to the residents and attitudes among municipality officials (UNCHS 1982) ;
- (c) Community level training: Even though a community with little formal education can manage projects successfully, some specific skills might be needed such as running meetings, keeping minutes etc.; and
- (d) The importance of women in community based projects.

Moser (1989) gives the reasons to include women in urban community projects in Table 5.10.

Table 5.10 Reasons for the inclusion of women in community participation.

Project type	Policy approach to third world women				
	Welfare	Anti-poverty	Efficiency	Empowerment	Not mentioned
Lusaka					.
FUNDASAL		.			
Dandora			.		
Villa El Salvador					.
San Judas				.	
Hyderabad	.				
Baldia			.		
Orangi			.		
Kebele 41			.		

According to Hardoy and Satterthwaite (1989) some governments have given support to community groups formed by lower income residents to improve existing illegal settlements and to develop new low income settlements. A few governments have made the formal financial system more responsive to low income groups, need for housing finance, or supported informal finance organizations such as self-help co-operatives, savings and loans associations and credit unions. Figure 5.8 shows possible organizational and other support for self-help. A study (U Tin U et al 1988) in the dry-zone township of Ayadaw, Myanmar, has shown that the success of health development activities is largely attributable to:

- collective leadership;
- viable community organization;
- balance between local and central priorities;
- the use of appropriate interventions and technology;

- community participation; and
- the maintenance of a proper community financing system.

Ward (1989) states that in the case of land acquisition community leaders may exercise a crucial role, especially, where the land has to be captured through invasion.

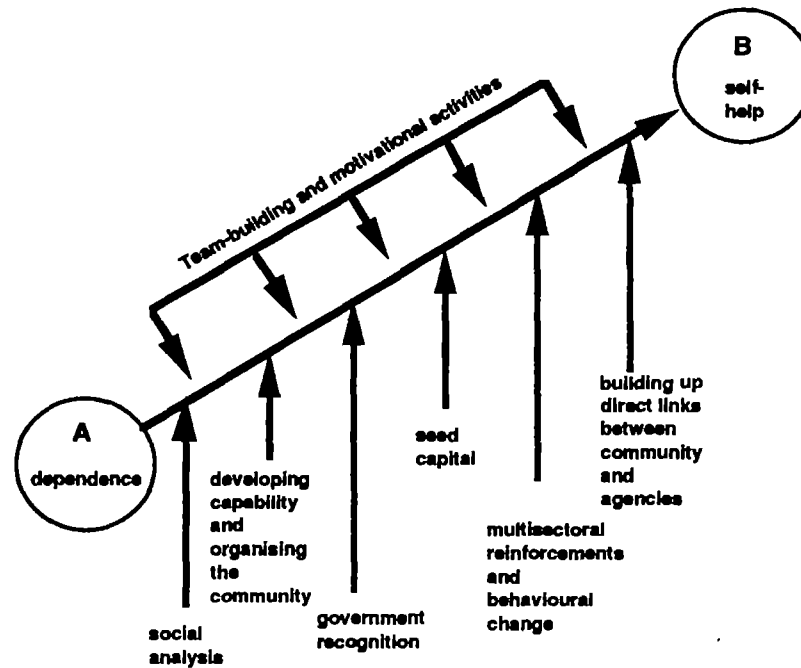


Figure 5.8 Organizational and other support for self-help (Tabibzadeh et al 1989).

Non-governmental and non-profit organisations

Hardoy and Satterthwaite (1989) describes that the non-governmental organizations (NGOs) can help in low income settlement developments by :

- giving technical advice and training;
- assisting in formation of community organizations;
- being guarantors for community organizations' loans;
- evaluating new plans and proposals; and
- developing local solutions based on local knowledge and resources.

The non-profit organisations (Lee and Buntman 1989, cited by Swilling 1990) are those where:

- no individual owns the automatic right to a share in the profit or surplus made by the organisation;
- they are accountable to the consumers of their services rather than to the state/political process or private shareholders;
- they are highly dynamic and flexible—responsive to rapid technological innovations and to changes in the social composition of local communities, and can meet heterogeneous and differentiated consumer demands more effectively than the state or large-scale private corporations.

Non-profit development organisations be cooperatives, membership-based associations,

development organisations with a community-elected board, trusts or any other form that the community feels comfortable with. Non-profit loan finance has proved to be an important component in effective urban development programmes. The purpose of non-profit loan finance institutions would be twofold (Swilling 1990):

- (a) They would provide a conduit for state, corporate and international aid capital. In other words, instead of moving development capital through the conventional profit-making financial institutions, this capital could go through non-profit financial institutions that are accountable to the lenders rather than to private corporate shareholders; and
- (b) They would also ensure that finance capital is prevented from becoming dominant in the urban power structure.

5.1.3 Urban environmental management

"It is undeniable that the growth of cities and the growth of illegal settlements has been accompanied by growing poverty and environmental degradation—but it is possible to argue that one of the main causes of this poverty and environmental degradation is neither the growth of the cities, nor the growth of these illegal settlements, but the unrealistic attitudes and actions of governments and aid agencies to such growth."

Hardoy and Satterthwaite 1989

Within the policy framework for urban development, key criteria for assessing important environmental problems are: health impacts; economic impacts; the reversibility (or otherwise) of environmental deterioration or damage to ecosystems; and whether resource-use patterns can be sustained (WHO 1991b). The World Bank/UNCHS report (1989) summarizes the responsibilities of the governments regarding the promotion of urban environmental quality (Box 5.3). The lack of appropriate institutional arrangements and the low financial and technical sustainability of existing systems have been the the main reasons why the inappropriate situation regarding water supply and sanitation services still dominates in less developed regions. The World Bank gives three scenarios for the development regarding safe water and adequate sanitation (Figures 5.9 and 5.10, World Bank 1992).

According to Pouliquen (1991) a major issue in the water and sanitation sector is the natural scarcity, depletion, and degradation of water resources, and the growing and major challenges will be in the future:

1. Managing water resources; and
2. Improving sanitation in the urban environment.

"The importance of the water resource issue is already manifesting itself through sharp increases in the cost of water production. For example, all water and sanitation projects financed by the World Bank in the past four fiscal years have recently been reviewed. This is a large sample reflecting a lending volume of over USD 3 000 million and a total investment cost of close to USD 8000 million. In these projects the incremental cost of water per cubic metre was estimated to be USD 0.55, compared to an average price of USD 0.32.

The difference between these two figures is large enough to suggest that on a global basis the water resource availability is already becoming a major issue. Internal Bank reviews provide another dramatic example. In a sample of successive expansion projects in the same cities incremental cost per cubic metre in real terms has, typically doubled between the first and second project, and doubled again in the next project. . . These figures show that the water resource issue is increasingly becoming an urban water-supply problem as well."

Box 5.3 Government responsibilities to promote environmental quality in urban centres at different geographic scales.

Geographic scale	Government provision or supervision of private provision	Government control
Home	Water, sewers (or regular service to empty latrines), 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 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.

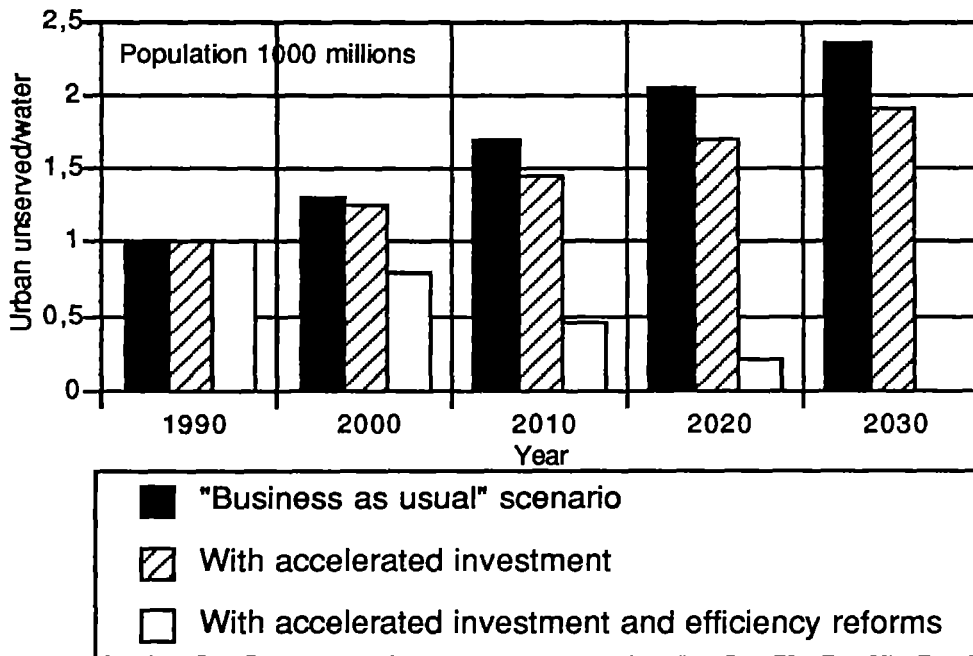


Figure 5.9 Safe water: three scenarios, 1990-2030.

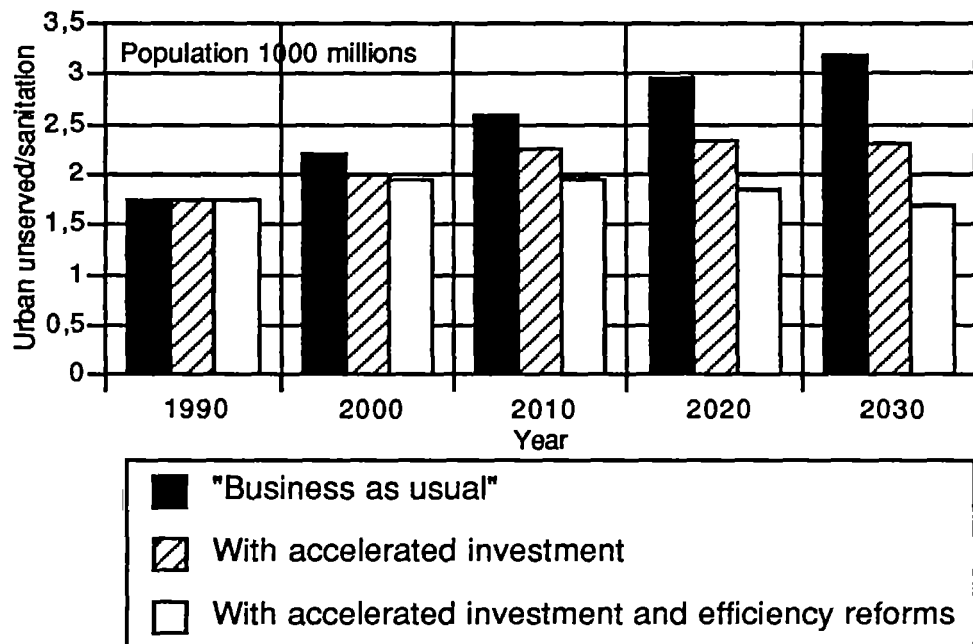


Figure 5.10 Adequate sanitation: three scenarios, 1990-2030.

The future constraints related to water scarcity is clearly expressed notably, i.a. by Biswas (1991) and Falkenmark (1989). In India, for example, it is estimated that by the year 2025 almost all the total utilisable water resources will be in use for irrigation and for the urban-domestic sector (Hukka 1992). In Egypt, the importance of the Nile for the economy and the development is unquestionable. With the current population growth, and the settlement structure with the vast majority of people living along the River Nile severe environmental, social and economic problems may be expected due to the limited water resource and pollution of the river (Table 5.11, FINNIDA 1991). There are already years in Egypt, when practically no water in the Nile entering Egypt reaches the Mediterranean. Without the cooperation among the riparian States in the catchment area of the Nile there can be expected conflicts regarding the transboundary water resources and

their use in the near future.

Table 5.11 Water available and water required for Egypt.

Year	Population million	Total water required			Water available Gm ³	Percentage of security %
		M & I Gm ³	Agriculture Gm ³	Total Gm ³		
1990	55	8.6	56	64.6	60.1	93
1995	61	9.2	62	71.2	60.1	84
2000	69	9.8	70	79.8	62.1	78
2005	75	10.6	76	86.6	64.1	74
2010	83	11.3	82	93.3	64.1	68
2015	90	12.0	90	102.0	64.1	63
2020	97	12.8	96	108.8	64.1	59
2025	104	13.5	102	115.5	64.1	55

M & I — municipal & industrial water demand.

Table 5.12 shows an analytical framework for urban environmental problems.

Table 5.12 Analytical framework for urban environmental problems (World Bank 1990b).

Manifestations	Impacts	Causes	Cures
Deteriorated living environment and services	Health impacts - infectious and parasitic diseases - malnutrition - accidents - stress, drugs, violence - acute and chronic toxicity - genetic effects - cancer Lost urban productivity Degradation of the natural environment - resource loss - amenity loss	Substandard housing Lack of water and sanitation Disease-carrying insects and rodents Indoor air pollution Excreta laden water/soils Trash dumping Noise/stress Traffic congestion Natural disasters	Appropriate housing and land development regulations Housing finance Provision of affordable infrastructure and plots Provision of affordable water, sanitation, solid waste services at cost Targeted subsidies Improved efficiency and effectiveness of infrastructure and service provision Pollution control Community participation
Ambient air pollution	Localized primarily in large cities - health problems - lost aesthetic, cultural, recreational values - property damage (including historical monuments) At present more of metropolitan area problem than regional/global problem	Urbanization/Industrialization Fuel/energy pricing and urban energy demand Vehicle ownership Space heating Use of highly polluting fuels: - leaded gas - high-sulphur lignite	Pricing of industrial and energy inputs Regulations and standards Emission charges Monitoring and enforcement Energy conservation Technological interventions - scrubbers, baghouse filters - vehicle emissions controls - fuel substitution
Indoor air pollution	Chronic obstructive lung disease Acute respiratory infections Low birth weight and associated problems Cancer	Biofuel use for domestic cooking and heating Passive smoking Cottage industry exposure	Pricing of commercial fuel and energy Targeted fuel subsidies Improved housing and ventilation Public awareness

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Table 5.12 Analytical framework for urban environmental problems (World Bank 1990b) (continued).

Manifestations	Impacts	Causes	Cures
Solid waste pollution	Health hazards Amenity impacts Blocked drainage and flooding Water pollution (leachates)	Inefficient management (collection and disposal) Impacts not recognized or external to community	Improved collection - 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) Disposal technology and management Resource recovery/recycle
Fecal contamination	Diarrheal diseases Parasitosis Malnutrition High infant mortality	Lack of basic sanitation services Excreta laden water/soils Proliferation of garbage/insects	Provision of affordable sanitation options Community-based approaches Hygiene education
Hazardous waste pollution	Acutely affects groundwater, but often multimedia impacts Damage at low concentrations - Health damages (e.g. acute and chronic toxicity) - Foodchain accumulation "Timebombs" (hidden dumps that build up over time)	Insufficient regulations/management Pricing of inputs into industries producing waste Impacts removed in space and time	Regulations, standards and charges Monitoring and enforcement capacity Licensing Waste minimization - process modification - resource recovery/recycling Treatment and disposal technology and management
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 salinization 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

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Table 5.12 Analytical framework for urban environmental problems (World Bank 1990b) (continued).

Manifestations	Impacts	Causes	Cures
Degradation of land and ecosystems	Loss of wetlands/wildlands (rich genetic diversity, migratory birds, hydro-logical 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 5.13 shows the links between health and government action at different levels to improve housing conditions in urban areas.

5.1.4 Water and waste management infrastructure

"I have asked, what above everything else is it necessary to know for effective water planning? The answer comes back to me in five categories—political, financial, procedural, technical, and evaluative—and the importance seems to be in that order."

Grigg 1985, cited by Ridgley 1986

Water and waste management infrastructure policies and strategies

The Working Group on Urbanization of the Water Supply and Sanitation Collaborative Council (WGU/WSSCC), has identified six inter-related strategic elements, and has developed a basis for action and guidelines for immediate action for each element (WG/U 1993). These elements are the following:

- security of tenure and other legal issues;
- people's participation;
- adequate cost recovery and resource mobilization;
- availability of technological options;
- institutional reform and capacity building; and
- water resources conservation and management.

Table 5.13 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	Technical and financial support for educational campaigns. Coordination of housing, health and education ministries
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 construct./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	continued on the next page

Table 5.13 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
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 Discussions with individuals and community organizations about some minimum changes in site layout to improve emergency vehicle access and create fire breaks	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 Discussions with individuals and community organizations about some minimum changes in site layout to improve emergency vehicle access and create fire breaks	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	

United Nations Centre for Human Settlements report (1986a) describes that when national governments are to provide safe drinking water supply, adequate sanitation, improved refuse collection and disposal, and improved drainage, countries may consider any or all of the following options:

1. Develop specific sector policies, plans and programmes within an overall human settlements programme which give emphasis to abating present day inequities in services to various sectors of the population.
2. Ensure the co-ordination of water supply, sanitation and other service planning with overall human settlements planning as well as with overall economic development planning.
3. Adopt appropriate, cost-effective standards and technologies for infrastructure that are consistent with the resource constraints of the country and with the overall objective of optimizing service coverage.
4. Examine legislative and administrative instruments concerning the provision of infrastructural services, to see that they permit and promote the use of appropriate, cost-effective technologies among all sectors of the population.
5. Review the institutional structure for infrastructure to ensure autonomous self-financing operation of sector departments under an overall coordinating umbrella institution.
6. Incorporate, in each department, a specialized unit to meet the needs of the poor and to encourage community and informal-sector participation.
7. Adopt policies and strategies for providing and strengthening sector-related training to professionals, subprofessionals and local skilled artisans.
8. Adopt pricing policies and other incentives that will promote the increased use of local resources for sector development while taking due account of social objectives.
9. Promote improved operation and maintenance of service facilities, giving priority to harnessing local efforts towards this end.

Katko (1991a) summarizes the key dimensions of sustainable water supply—operative technology, appropriate institutions and adequate cost recovery—within a developing country in Figure 5.11.

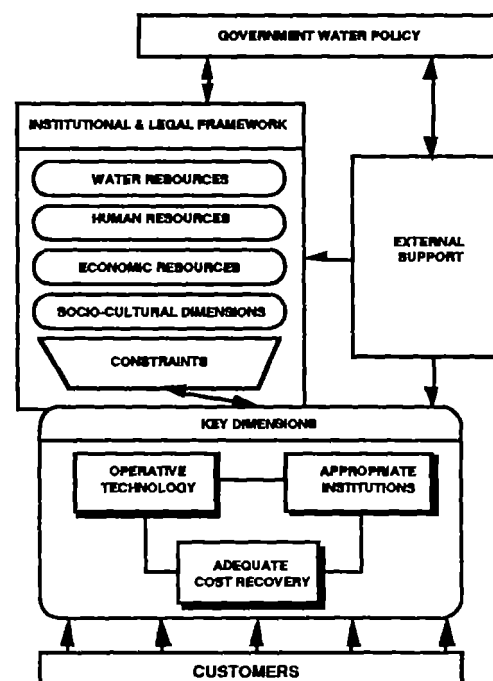


Figure 5.11 Key dimensions of sustainable water supply: operative technology, appropriate institutions and adequate cost recovery and their relationship with government water policy and external support (modified by Katko in 1994).

The environment, where these dimensions are working and evolving, is formed by different kind of resources and constraints, and by socio-cultural dimensions. The government policy dominates and defines most of this environment. Project-level interventions, such as shelter projects often do not have much influence on the overall urban policies of recipient countries (World Bank 1990a). Some old planning and design criteria have given way to lower-cost solutions, but the laws, codes and regulations that provide the framework for housing development have been generally left unchanged. Similar problems concern also water supply and sanitation projects favoured by many of the external support agencies (Hukka, Katko and Seppälä 1993). Therefore much greater attention has to be paid to wider policy issues (Figure 5.12), not only to execution, implementation and planning as earlier.

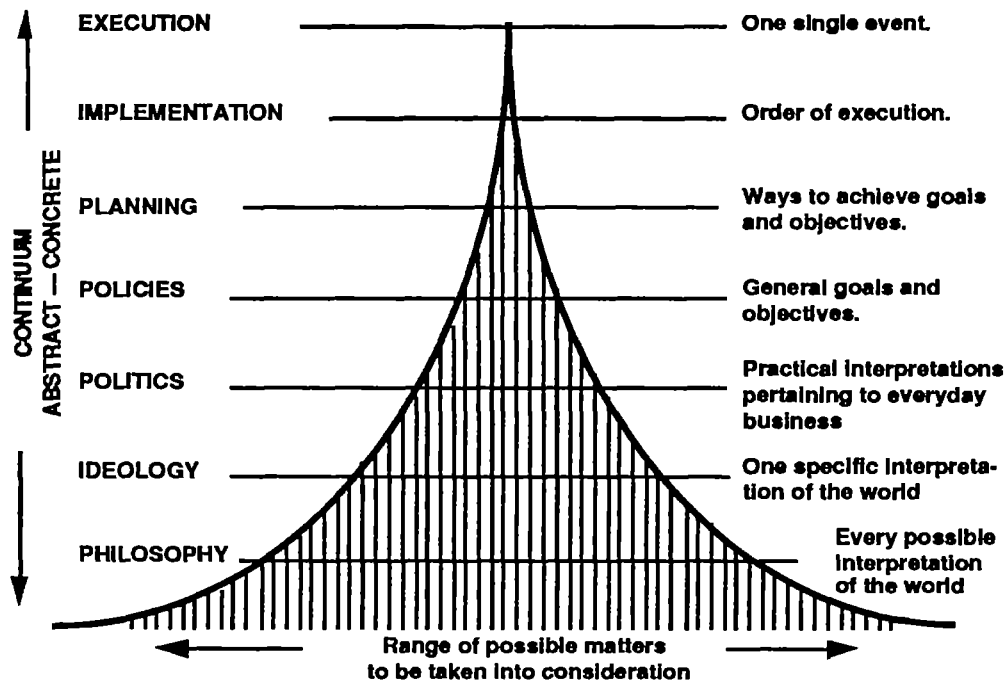


Figure 5.12 Hierarchy of consideration on matters (Mänty 1979).

Priority issues in urban water resources management include (UNCHS 1991):

1. Access to water, sanitation and waste-disposal services:
 - Adequate water, sanitation and refuse-disposal, particularly for the poor;
 - Bridging the gap between the increasing cost of water and user willingness/ability to pay;
 - Sustainable services and reliable supplies; and
 - Maximizing health impacts.
2. Depletion and degradation of water resources:
 - Preventing surface- and groundwater contamination and depletion;
 - Reducing environmental impacts; and
 - Providing surface water drainage.
3. Allocation of water resources:
 - Balancing competitive uses;
 - Water demand management;
 - Pricing policies and instruments; and
 - Industrial water use.
4. Institutional/legal/management aspects:
 - Integrated water management;

- Effective monitoring, surveillance and enforcement of standards;
 - Legal, administrative and social constraints on water use;
 - Regulatory instruments; and
 - Institutional capacity building.
5. Resource mobilization:
- Mobilizing and generating financial resources;
 - Management and human-resource capacity building;
 - User participation and involvement; and
 - Economic and fiscal instruments.

Katko and Hukka (1991) suggest several implications for developing countries based on the water sector evolution and experiences of one century in Finland:

1. The sector development goals of many developing countries and external support agencies can be considered too ambitious. Even with high development and economic growth in Finland it has taken a long time to develop the sector—actually the process has evolved gradually;
2. Improved water supply and sanitation have created possibilities for health improvements and socioeconomic development;
3. The process has been dynamic: several types and levels of technologies have been used simultaneously;
4. The decentralized, opposed to deconcentrated administrative system has given the required autonomy to the local levels. The central government has concentrated on policy issues, and various types of institutions have been in charge of implementation and operations;
5. In the development of the sector important parties are health authorities and the private sector especially in planning and construction of utilities, and in manufacturing of materials and equipment; and
6. Consumers have paid the major share of the costs.

The World Development Report 1992 (World Bank 1992a) argues that large gains—in environmental quality, health, equity and direct economic returns—can be realised by:

- Managing water resources better, taking account of economic efficiency and environmental sustainability;
- Providing, at full cost, those "private" services that people want and are willing to pay for (including water supply and the collection of human excreta, wastewater, and solid wastes);
- Using scarce public funds only for those services (specifically, treatment and disposal of human excreta, wastewater, and solid wastes) that provide wider communal benefits; and
- Developing flexible and responsive institutional mechanisms for providing these services, with larger role for community organizations and the private sector.

The framework for improved sector planning requires a linkage between sector monitoring, planning and advocacy (Figure 5.13, WHO and UNICEF 1992). The focal point in the framework should be the policy change with respect to the life cycle management perspective. A comprehensive approach is required to implement peri-urban infrastructure, e.g. sanitation programmes may need complementary projects in water supply, solid waste collection, drainage, and health education (Hogrewe et al 1993). Implementation may be a multistep process, starting with simple interventions and becoming more complex as finances and institutional capacities allow. The problems regarding external assistance arise when the lender or grantor has objectives other than just assistance to the applicant (Okun 1991). The driving force for granting or lending may be political, diplomatic, or commercial. Thus, certain countries may be targeted for assistance irrespective of their expressed needs and whether the country can use the funds effectively.

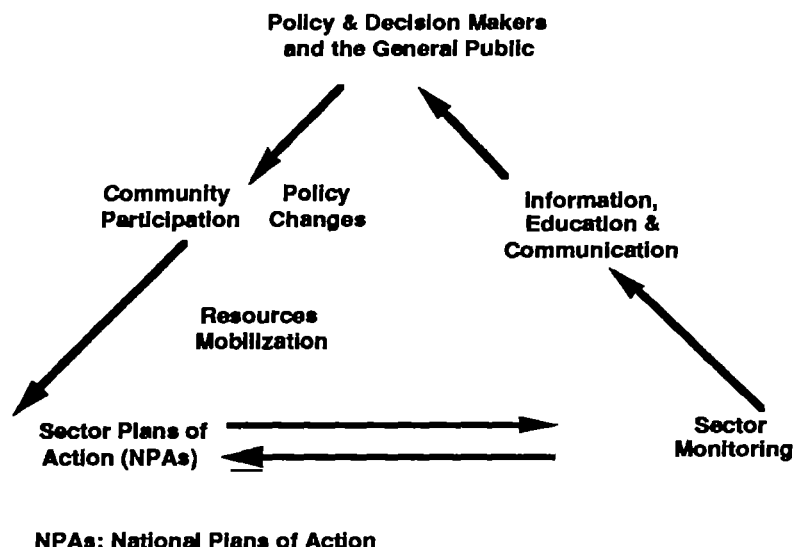


Figure 5.13 Conceptual framework linking monitoring, planning and advocacy (WHO and UNICEF 1992).

A recent review of World Bank financed projects showed that the effective price charged for water is only 35 percent of the average cost of supplying it (World Bank 1992a). The proportion of total project financing generated by utilities points in the same direction: Internal cash generation accounts for only 8 percent of project cost in Asia, 9 percent in Sub-Saharan Africa, 21 percent in Latin America and the Caribbean, and 35 percent in the Middle East and North Africa.

Experience shows that institutional weaknesses and malfunctions are a major cause of ineffective and unsustainable water services. This requires urgent attention to building institutional capacity at all levels (Alaerts, Blair and Hartvelt 1991). Capacity building consists of three basic elements:

1. Creating an enabling environment with appropriate policy and legal frameworks;
2. Institutional development, including community participation; and
3. Human resources development and strengthening of managerial systems.

Capacity building is foremost a global concept and a strategic element in the sustainable development of the water sector (Okun and Lauria 1991). Capacity building depends on two interrelated concepts:

1. *Strengthening of institutions* at all levels to deal, more effectively and efficiently, with all aspects of sustainable water resources development, including the creation of a favourable policy environment, water resources assessment (both quantity and quality), planning, management, and program and project formulation, implementation and evaluation
2. *Development of human resources* at all levels including education, training, and the creation of working conditions conducive to job satisfaction and performance.

The operational strategy for capacity building involves several approaches (Alaerts, Blair and Hartvelt 1991):

- Developing improved policy and legal frameworks, institutional development and a commitment to development of human resources and managerial systems for the sector;
- Managing water and environmental resources, including modifying demand by pricing, conservation, reclamation and reuse of waste water, thereby reducing fresh water demands and pollution;
- Having the external support agencies (ESAs) adopt capacity building as an essential

element of their assistance efforts, including such initiatives as supporting community and water user associations, on farms and in the cities, so that they can participate productively in investments made on their behalf; continued attention needs to be given to the pivotal role of women in water related activities, and their proven capabilities to fulfil managerial tasks at all levels;

- Urging governments to coordinate ESA activities in their countries, and encouraging the ESAs themselves to coordinate their agendas;
- Involving, where appropriate, the private sector in managing or providing water related services;
- Encouraging local and foreign universities, institutes, consulting organizations, professional associations and others to participate in capacity building as is most appropriate to their own capacities; and ESAs are urged to facilitate this effort;
- Encouraging countries to conduct water sector assessments; these assessments must include the need for capacity building in addition to traditional technical, social and economic aspects; and
- Creating awareness of the vital role and finiteness of water on the part of decision-makers and the public at large.

In policy planning the improvement of public accountability should also be considered. It is defined as the "spectrum of approaches, mechanisms and practices used by the stakeholders concerned with public services to ensure a desired level and type of performance" (Paul 1987, cited by Kudat and Fon 1990). It is a system of securing efficient service delivery, of meeting the needs of different clients and of monitoring responses. In many developing countries the public/beneficiaries do not have the ability or incentive to demand efficient services or to insist on greater public accountability. Inadequacies of water and sanitation sector services coupled with the weakness of democratic institutions and the weak political status of the poor increases the concern with public accountability. Accountability can be enhanced by improving the supply side:

- design of services; and
- incentive structures.

Accountability may be improved from the standpoint of the public through the use of exit and voice options (Hirshmann 1970, cited by Kudat and Fon 1990). Both options may be exercised simultaneously. Exit options are opportunities for the public to find alternative suppliers of services:

- migration;
- self-help;
- privatization;
- deregulation;
- technological alternatives;
- vouchers and grants;
- public competition;
- contracting out; and
- the purchase of water from vendors.

Voice options refer to forms of participation or articulation of protest/feedback through which outcomes may be influenced:

- community organizations;
- local governments;
- boards;
- referenda;
- public surveys;
- evaluation;
- legislation;
- external organizations such as NGOs.

According to Arlosoroff (1989) in planning its strategy for the future, the UNDP-World Bank Water and Sanitation Program has identified four major issues in the Asia region on which it will focus in the upcoming years. Although these issues are of global concern, their applicability to the countries of Asia is particularly strong. They are :

1. how to increase coverage, particularly in light of the region's growing urban population;
2. how to address the neglected sector of waste management;
3. how to establish appropriate institutions to deal with urban, periurban, and rural water supply and sanitation; and
4. how to further refine and demonstrate appropriate technologies to ensure their implementation in large-scale investment programs.

Perry (1988) recommends the establishment of professional networks and twinning with utilities in the industrialized countries to improve the quality of regional water supplies in West Africa. Other measures are development of information management system for water quality data, improved performance indicators for in-plant processes, and development of innovative management techniques.

In Indonesia the Integrated Urban Infrastructure Development Programme (IUIDP) is a nationwide programme being focused on (UNCHS 1988):

- i) stimulating multisectoral urban infrastructure improvements in a planned and co-ordinated manner;
- ii) decentralizing planning and implementation of urban development to local governments and strengthening the higher levels of government to enable to support local governments with technical assistance, training and project appraisal;
- iii) stimulating increases in local revenues to help finance new investments and improve the operation and maintenance of assets;
- iv) developing longer-term resources and rationalizing the system for loan financing of urban investments.

The assumption behind the approach is that local rather than central government knows what local people need and can afford. Each urban centre is to have a comprehensive infrastructure investment programme considering population trends, infrastructure needs, institutional capacities and financing possibilities. The investment programme is initially limited to the following components:

- roads;
- drainage;
- sanitation;
- solid waste disposal;
- markets improvement;
- kampung (village communities) improvement;
- flood control; and
- water supply.

Service d'Hygiène et d'Epidémiologie and Education Sanitaire (Public Health and Health Education), both located in the Ministère de la Santé Publique et des Affaires Sociales, have devoted considerable attention and programming to household and community-wide sanitary conditions, and a three-pronged approach of physical upgrading, household and community level sensitizing, and regulation was considered the most powerful attack on the problem of public hygiene in Djibouti City's low-income communities (Mason and Cutbill 1989).

Kudat and Fon (1990) find that in Chittagong, Bangladesh at extreme levels of poverty, software investment alone cannot be effective instruments of behavioural change. At higher income levels, such investments, especially when accompanied by investments in physical infrastructure, may produce high returns. They summarize the following observations as policy implications:

- (a) Poor women carry a much greater burden of water-related transport drudgery than women from higher income classes. This consists of carrying water to the household and household tasks to the water source;
- (b) Poor women's ability to obtain access to safe water is limited;
- (c) Poor households rely on women's income; ensuring compatibility between household and non-household tasks is critically important for poor women;
- (e) The time value of improved and regular water supply is high for poor women. This value would increase if community and shelter specific improvements, such as drainage, reduce the need for the transportation of tasks to unsafe water sources;
- (f) The irregularity of water supply services, the difficulties of their provision to densely populated slum and squatter communities, and anticipated operations/maintenance problems suggest careful examination of the relative effectiveness of standposts, handpumps and other water supply options for serving the needs of poor women; and
- (g) The time value of handpump investments can be particularly high in Chittagong slum and squatter communities.

Malombe (1992) suggests that in urban centres in Kenya the local authorities should enable the households in squatter settlements to provide themselves with services. For example, they should give water connections if the households have money for deposit instead of arguing that the settlements are illegal. Hogrewe et al (1993) summarizes the key principles that should be considered when devising project strategies for improving community excreta sanitation in peri-urban areas:

- Improving the health of the rapidly growing number of families living in peri-urban areas and protecting the urban environment are urgent needs and compelling program objectives that host country governments, as well as external support agencies must address. In reaching these objectives, improving community sanitation should be accorded the same (if not higher) priority as water supply;
- To improve health in densely populated peri-urban areas, sanitation programs must target the community rather than individual households. Individual households with improved sanitation will not experience improved health if their neighbours are still disposing of fecal matter in ways that contaminate the general environment of a peri-urban settlement. In addition, improved community excreta sanitation may not improve health if other environmental factors such as solid waste disposal and drainage are not also considered;
- The current planning paradigm for formal urbanization, which begins with the installation of basic urban services, does not coincide with the actual peri-urbanization process, which begins with the informal and/or illegal settlement by poor urban families on land that has not been urbanized. The peri-urbanization process is a reality for 50 to 80 percent of most cities in developing countries. Therefore, authorities must recognize that providing sanitation services to existing densely populated peri-urban settlements must follow a different paradigm than that of traditional urbanization. Additionally, officials must acknowledge the need to reform existing service provision agencies to coincide with the particular needs of the peri-urban sector;
- The economic, social, legal, and physical conditions generally found in peri-urban areas present unique challenges to water supply and sanitation sector specialists attempting to improve community sanitation. In large measure, conventional engineering approaches and standard technical solutions used for formal urban and rural sewerage systems must be significantly modified or even rejected for peri-urban areas;
- Installing a sanitation technology can be done relatively rapidly. Setting up and implementing a long-term sustainable peri-urban sanitation program that successfully improves community health and protects the environment takes significantly more time. Also Laike (1992) emphasizes the importance of a long enough time period for health education;
- To improve health, changing individual and community behaviours that cause fecal-oral contamination is at least as important as constructing new sanitation facilities. For efforts to change behaviour to succeed, projects must be designed around a thorough and correct understanding of existing knowledge and hygiene practices in the community and a thorough knowledge of the social, cultural, and religious context in which high-risk behaviour takes place. Moreover, efforts to change behaviour must be institutionalized

- and enjoy strong support from donors, governments, and other key actors;
- Recognizing that improving peri-urban community sanitation is a complex process, project planning should involve the many institutional actors that influence or have responsibility for peri-urban sanitation, including the respective agencies that handle sanitation, the agencies responsible for hygiene education, and nonhealth agencies such as municipalities, urban planning agencies, and credit institutions. The most effective way to ensure that cooperation is elicited from the widest possible range of agencies and institutions is to take an inclusive, participatory approach to the planning process;
 - Peri-urban sanitation projects should not be solely technology driven. Successful sanitation interventions should also consider health, economics, social, legal, and institutional factors;
 - The conceptualization, design, and construction of peri-urban sanitation systems pose extremely complicated engineering challenges that require skilled, experienced, and innovative engineers working on interdisciplinary teams along with planners, social scientists, environmentalists, lawyers, economists, and others;
 - Citizen involvement and community participation are critical to successful peri-urban sanitation programs. Community participation can lead to initial cost reductions, increased acceptance of program interventions, increased cost recovery, and more effective operation and maintenance; and
 - Institutions providing peri-urban sanitation services should seek to recover as much of their costs as possible in order to reach some level of financial sustainability and be able to expand services to other peri-urban areas. Individual households should be expected to pay for the real value of the sanitation services. Providing access to credit can greatly facilitate people's ability to pay for the services. If subsidies are necessary to reach the extremely poor, they should be clearly accounted for. Successful cost recovery results from providing services that families are able and willing to pay for and from developing effective institutional capacities to collect tariffs, loan payments, and other fees.

Financial and economic considerations

"The issue of enforcement and collection of charges for water supply and wastewater disposal services is becoming critical in many developing countries, and is being currently addressed by their governments in order to improve the performance of sector institutions. Lack of economic data and inadequate tariffs and cost recovery procedures affect the financial capabilities of WSS organizations. These agencies must rely on government subsidies, or lower the standards and levels of coverage of the services provided, rather than apply demand management procedures required to optimize the use of scarce water resources. Wastewater collection and disposal charges and penalties to prevent environmental pollution are seldom assessed and enforced.

In addition, there are cases of legally valid private water abstractions which have the collective effect of diminishing the critical mass of financial resources needed for the adequate operation of drinking water supply and sanitation services.

With regard to planning, the drinking water supply and sanitation sector suffers from a general inability to translate policy priorities into operative actions and plans; to ensure and safeguard the viability and sustainability of programmes and projects; to assess the different alternatives for the satisfaction of drinking water supply and sanitation needs (including monitoring of unaccounted-for and unpaid-for water); and to critically assess water supply and sanitation standards commensurate to the problems, needs and resources of the systems and the populations which they serve."

WHO 1990b

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 4 000 million, with urban

and rural areas having 1 330 and 2 670 million people, respectively. The total population among developing countries, by the year 2000, is estimated at 4 810 million, with urban and rural areas having 1 900 and 2 910 million 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 (Figure 5.14).

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 357 000 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 247 000 million for high-cost in urban areas;
- USD 26 000 million for intermediate technologies in mainly peri-urban areas;
- USD 11 000 million for low-cost in (the remaining) peri-urban areas; and
- USD 73 000 million for low-cost in rural areas.

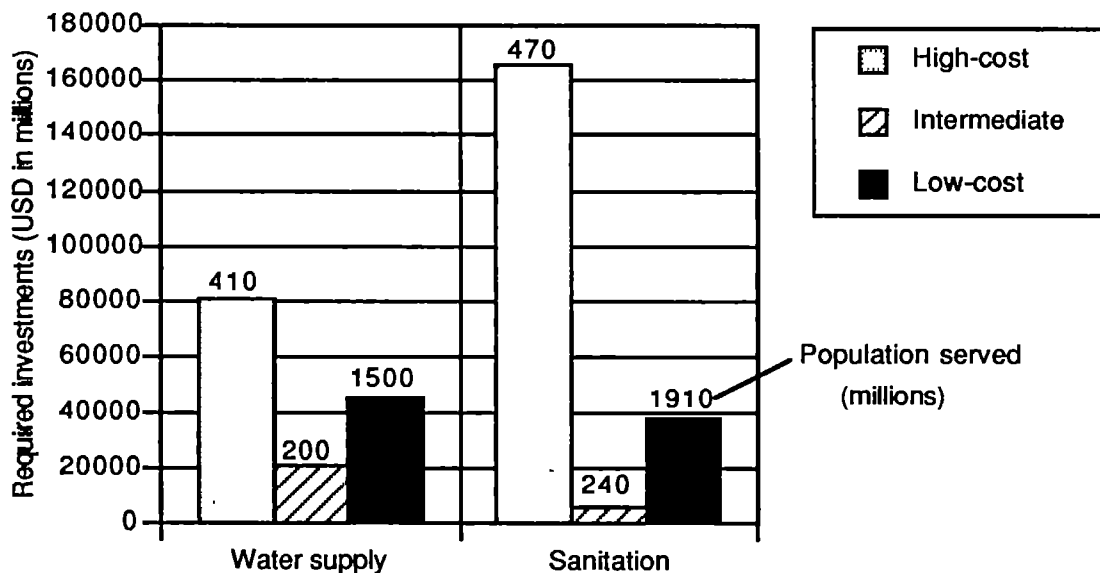


Figure 5.14 Required investments and population served by the year 2000 (Christmas and de Rooy, compiled by the author 1992).

Box 5.4 provides 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 37 000 million, i.e. just about 10 percent of the total investment of USD 357000 million.

In Kenya, for example, the World Bank (1988) estimates the investment requirements in water sector by the year 2000 (Table 5.14). This estimate indicates that the total development expenditure in water sector should be annually on an average about K£ 350 million during 1990-2000 (at 1990 price level), if the GOK targets are to be met. This would require 44% annual increase to the sector development expenditure starting from the fiscal year 1990/91 (K£ 95.05 million). In order to extend the service coverage in water sector in Kenya, the investment level should be about fourfold in 1990-2000 compared to the present development expenditure (Hukka et al 1992).

Box 5.4 The geographic groups with their corresponding technology categories.	
Technology category	Cost per capita in 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

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.

Intermediate technology is applicable to peri-urban areas essentially, comprises pipe-borne water supply (no allowances for elaborate treatment) leading to public standposts, and on-site sanitation including technologies such as pour-flush and ventilated improved pit-latrines.

Low-cost technology is 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.

Table 5.14 Investment requirements in water sector in Kenya by the year 2000.

Estimated Coverage Costs and Population	Urban Water	Sanitation	Rural Water	Sanitation	Total
Population Served 1990	2.9	1.9	3.9	4.7	
Coverage Target 2000	9.8	8.8	21.4	14.3	
Shortfall/Unserved	6.9	6.9	17.5	9.6	
Cost USD	1035.0	1139.0	438.0	480.0	3092.0

- Population and costs in millions.
- Assume 1988 population 4.7 M urban, 18.6 M rural; year 2000 9.8 M urban, 28.5 M rural.
- Assume urban growth rate of 6.3 %
- Assume % of access to water supply 1988 61% urban, 21% rural; year 2000 100% urban, 75% rural.
- Assume % access to sanitation 1988 40% urban, 25% rural; year 2000 90% urban, 50% rural
- Assume per capita cost urban water supply USD 150, sanitation USD 165; Rural water supply USD 25, sanitation USD 50 (Costs are based on IDWSSD, FINNIDA, MOWD, and the Netherlands Lake Basin Development Authority Rural Domestic Water Supply and Sanitation Programme, Nyanza Province).

The sources of financing of recurrent and capital expenditures to sustain local authorities' operations and maintenance of urban services, may be classified into four main categories (United Nations Development Programme 1989a):

- (a) Cost recovery directly from users through user charges (although often heavily

- subsidized);
- (b) Earmarked levies on specific population groups and dedicated taxes;
 - (c) Allocation from general revenues mobilized locally through taxes and fees; and
 - (d) Financial transfers from higher levels of government funded by national/regional taxes and levies.

In some peri-urban sanitation programs, access to credit should be considered as a mechanism for mobilizing the economic resources of peri-urban inhabitants (Hogrewe et al 1993). Significant constraints may occur as follows:

- high transaction costs;
- lengthy approval processes;
- high interest rates and loan security requirements;
- legal land registration, mortgage requirements; and
- an insufficient number of personnel allocated to serve customers in low-income brackets.

Hogrewe et al (1993) provide two examples of NGOs that are successfully overcoming many of these barriers to provide peri-urban dwellers with access to credit for sanitation improvements:

1. In Honduras, the Cooperative Housing Foundation (CHF) and UNICEF hope to improve unhealthy sanitary conditions through a sanitation loan program for low-income families.

The program aims to increase interest in using credit to make sanitation improvements, and to raise awareness of the need for better environmental sanitation. Loans are available to participating families to build shower stalls, construct water storage tanks and wash stands, implement rooftop rainwater collection systems, or make other improvements, such as devising an appropriate way to dispose of human excreta. People have the option of building alternatives to simple pit latrines, including ventilated improved pit (VIP) latrines, dry compost latrines, and pour-flush toilets. Loans also can be used to make a legal connection to a city's waterborne sewerage system when possible.

By offering a variety of options in a broader price range and linking them to well-managed credit programs, CHF and UNICEF hope to increase the demand for urban sanitation (Peri-Urban Network on Water Supply & Environmental Sanitation 1992).

2. The Grameen Bank has gained international acclaim for its novel approach to economic development and poverty reduction in Bangladesh—making small loans at commercial rates to groups of poor people in rural areas. Today, it has nearly one million borrowing members in over 24 000 communities; nine out of ten borrowers are women from families that are landless and without assets.

Each individual who receives a loan must agree to the bank's "Sixteen Principles," one of which states, "We will not defecate in the open. We will use pit latrines. To date, more than 100 000 latrines have been financed. A subsidiary loan program also has been developed through which a latrine can be purchased with a USD 14 loan repayable over a one-year period (Kinley 1992a).

Boang and Saptorini (1992) states that one crucial item is the Revenue Improvement Action Plan in Semarang/Sukarta integrated urban infrastructure programme in Indonesia. With an adequate source of the own revenue, local government will be able to finance future programmes. Equally important is that also the maximum use of private sources of finance is made, e.g. in Semarang a private consortium proposed to provide a new bulk supply of water on a build, operate and transfer (BOT) basis. Hersch (1990) suggests based on an assessment for long-term improvement of the infrastructure in the United States that it is necessary to involve state infrastructure financing agencies (SIFAs), which have been developed since fifties:

"SIFAs are entities that provide subsidized assistance for diverse water and wastewater (among other) projects. Assistance includes revolving-funds, direct-credit or debt instrument loans, bonds, grant programs or credit enhancements (such as bond insurance). Most SIFAs exist as separate authorities or as distinct divisions of a larger agency; and most exist strictly for purposes of providing financing although some work on technical and regulatory requirements. SIFA funding comes from assorted sources."

Cost recovery

Burton and Lee (1974, cited by Thomson 1984) suggest that initially a minimal standards approach, i.e. a certain minimal provision of services for the whole community, should be undertaken. Further expansion should be on the basis of strict financial criteria, i.e. only projects which are self-financing should be undertaken. Thomson (1984) gives two major reasons for programmes to be self-financing:

- (i) The overall shortage of resources that characterizes most developing countries. Self-financing prevents an oversupply of a service relative to what a country can afford. When there is no effective pricing mechanism to regulate the demand for the service, some form of rationing either formally or informally occurs, such as the water supply becomes irregular because of excessive use, or waste through leakage. Self-financing is also more likely to encourage the development of an adequate financial management system for collecting the payment and an effective system to control unaccounted-for-water.
- (ii) Self-financing programmes tend to be stronger in terms of their ability to withstand changes in the political and economic climate.

The importance of appropriate pricing of water has been widely recognized, i.a. Katko (1989) concludes the following:

- (a) The policy of supplying free water to some has in practise lead to very inequitable situation. Since the governments, in spite of external support, have not been able to arrange water supply to all, only a part of the consumers can receive the service. A better and more equitable way is to collect water charges from medium and large consumers and then improve and expand the system; and
- (b) The level of water charges should be related to the real costs of water production. A geographically uniform national or regional tariff does not take into account differences in local conditions and is, therefore, not recommended for consumption exceeding the minimum basic need.
 - Charges based on actual consumption decrease wastage of water which is important especially in areas with scarce water resources;
 - Seasonal tariffs could be considered for the dry season;
 - Municipal and industrial sewage charges should be introduced in developing countries to safeguard the environment; and
 - Social marketing and public education are needed to deal with the different interest groups appropriately.

Friedlander (1990b) points out the importance of the cost recovery:

"External support can meet the needs of but a fraction of the urban marginal areas population. It has become clear that for these efforts to continue, a cost-recovery system is necessary that goes beyond securing operation and maintenance and aims at a full or partial recovery of initial costs. A revolving fund is therefore being set up to enable a greater number of *barrios* to have access to a dependable supply of safe drinking water. The idea is that water tariffs will be set to include operation and maintenance costs and full or partial recovery of the initial costs of SANAA and UNICEF, depending on the resources of the community. The funds for operation and maintenance will remain in the community, while the recovered initial costs will be paid quarterly to UEBM over a period of two to four years. All terms are to be agreed upon and spelled out in specific

contracts before construction begins. Agreements between all parties will be signed together, giving the community insight into all relevant documents and making it clear to the community the level of support it is entitled to from the government."

In a workshop launched by the Economic Development Institute (EDI) of the World Bank, the participants stressed the need to achieve a better balance between capital and operation and maintenance expenditures and to improve the quality and sustainability of infrastructure services (Menéndez 1991). Protecting recurrent expenditures was also cited as an important component to prevent the deterioration of productive infrastructures. Okun (1989) suggests the following approach regarding the cost recovery:

"Funds from external financing agencies will never be sufficient to provide for all presently unserved communities. Loans can be most effective when invested in a revolving fund and used in communities that show promise of capital repayment so that the funds can then be collected for use in other communities. . . If even a small portion of what is now paid to vendors could be dedicated to a piped system, sufficient funds would be generated to cover O&M and the annual charges of the capital investment."

The American Water Works Association (AWWA) recommends that each utility strive to allocate the costs of supplying water to various classes of water users, and then recover those costs through rates that will sustain the water system and not discriminate against any class of users (Giardina 1990):

"The rates should be cost-based and nondiscriminatory. A second common goal in rate setting is stability. Frequent or unexpected rate increases should be avoided. Regardless of how fair a rate structure may be, sudden or large increases may upset consumers and cast doubt on the competence of the utility manager."

The rate-setting process involves three steps:

1. identifying revenue requirements;
2. determining the costs of service; and
3. designing the rate structure.

Giardina (1990) proposes that after revenue requirements have been identified, they must be allocated to classes of customers, based on the cost of service to those customers. Classes of customers include:

- i) residential (broken down by geographic area, such as in-city, out-of-city, single-family, multifamily, and so forth);
- ii) commercial;
- iii) industrial;
- iv) institutional, including hospitals, schools, and colleges; and
- v) governmental, including water districts, municipalities, and military bases.

Rate structures are designed after costs are allocated to appropriate user classes. The major factors to be considered when selecting a rate structure include:

- generating sufficient revenues to recover operating and capital costs;
- encouraging customers to make efficient use of scarce resources;
- identifying growth-related costs and recovering those costs from new customers;
- charging customers or customer classes in proportion to the costs of providing service;
- implementing the rate structure efficiently, without having to spend an unreasonable amount of money on reprogramming computers, modifying procedures, or redesigning forms;
- complying with local, state, and federal laws and regulations;

- minimizing the financial impact on customers;
- updating the rate structure as necessary; and
- producing rates that are reasonably constant from one year to the next .

The decisions regarding many of these factors are based on policy decisions that reflect the philosophy of the utility and the community. E.g., a rate structure that promotes conservation reflects a policy and philosophy that conservation is good and/or necessary. Likewise, growth-related charges can be established in such a way to either encourage or discourage growth. Other factors that must be considered include (Giardina 1990):

- the availability and quality of water resources;
- the utility's geographic location;
- age of system;
- demand, customer constituency;
- level of treatment;
- infiltration and inflow problems;
- rate-setting methodology;
- level of general fund subsidizations;
- level of grant funding.

During the preliminary planning for a new rate structure, all of the influencing factors should be identified, evaluated, ranked in order of importance, and then used or set aside. A utility should:

1. Identify criteria related to the utility's philosophy.
2. Rank the objectives that are most important to the utility.
3. Compare and evaluate various rate structures for their ability to fulfil those objectives.
4. Select or design the rate structure that best meets the utility's goals and philosophies.

Franceys (1990) describes one of the philosophies:

"A water utility has to receive an adequate level of funding if it is to provide the services that consumers desire and need. Where the government tax base cannot support the utility in the long term then finance has to be obtained through user-tariffs. Modern management ideas reject the concept of subsidization from other sectors of the economy because of the lack of control of income on the part of the water utility.

The poorest consumers can be supported effectively through differential pricing structures within the water sector, but long-term reliance on local authorities to pay for water delivered through standposts may not produce the desired benefits. The wastage that is apparent at most standposts devalues that water and lessens the potential for resulting health benefits. The process of extending utility management over the financial aspects of water supply will have to cover standpost users in addition to other consumers, either through community-association control or through vendor kiosks."

Mason and Cutbill (1989) describe the situation in Djibouti:

"The *Projet de Développement Urbain de Djibouti (PDUD)*, responsible for implementing infrastructure upgrading in the Old Quarters, raises the question of sources of funds, which ultimately comes back to the matter of cost recovery. If payments are made by beneficiaries/users for land, homes, and services acquired, then a continuing source of funds is made available to the unending flow of new "borrowers" who are queued up to "purchase". The linked concepts of buyer/borrower and lender/creditor seem somewhat foreign in Djibouti when it comes to land, shelter, and services. That situation is by no means rare in developing countries. Clearly there is a relationship to the foreignness of those concepts and the perception of the limited economic capacity of low-income residents. But low-income people in certain developing countries have demonstrated that where there is the political will to develop or improve human settlements and related services on a "pay-as-you go" basis, then it can be done. The case of the dispossessed, the rock-bottom poor in Djibouti who are unable to pay for anything but bare means to survival,

comprise a different category, but would seem to represent only a limited proportion of low-income Djiboutians.

PDUD suggested that where the well-to-do (much less others) are not being charged enough for land and services to cover basic costs, then certainly low-income Djiboutians cannot be expected to carry the financial burden. Matters such as these all seem to fall on the doorstep of policy and the political will of governments."

According to the Institution of Water Engineers and Scientists (1983, cited by Franceys 1990) four principal objectives of tariffs may be described to meet the conflicting demands of water utility and consumers:

1. **Adequate:** A level of resources must be produced which will meet the financial commitments of the utility and provide some contribution towards future investment;
2. **Fair:** This level of revenue must be allocated between consumer groups in a fair and equitable manner, giving particular consideration to the needs of the poorer members of the community;
3. **Simple and enforceable:** The tariff should be simple to administer and easy for consumers to understand. For tariffs to be effective there has to be a political willingness to accept the need for disconnections when bills are not paid. This remains true even where the worst offenders are other government institutions; and
4. **Water conserving:** The structure of the tariff should influence consumption to the extent that consumers will purchase enough water to satisfy their needs without being wasteful. To meet the criteria of simplicity and water conservation there is a choice between using a flat rate charge or a metered charge. For household or individual connections tariffs have been charged according to:
 - size of the connection pipe, with different flat rate charges for domestic, institutional, commercial and industrial users;
 - property values; property characteristics, that is the number of taps, basins, showers or baths;
 - the amount of water used measured by household meters.

There are various approaches to setting rates that can be considered (Franceys 1990) :

- Increase the tariffs modestly in line with inflation—the resulting revenue may not be sufficient to enable the utility to do its job but at least it is more or less acceptable politically;
- Aim for full recovery of operation and maintenance costs, assuming that the capital costs were a donor gift to the people;
- Set tariffs to recover operation and maintenance costs plus full amortization of the capital costs, that is, paying back any loans, including interest;
- Aim for a target rate of return on fixed assets employed in addition to operation, maintenance and amortization costs—it is desirable for a surplus over and above the immediate cash requirements to be generated to provide a contribution to future investment; this will then give a measure of independence and reduces reliance on outside sources. It is also the method any commercial enterprise would use;
- Use long run marginal costing, also known as Average Incremental Cost (AIC); this is a method of charging the full life-cycle costs of extending the water supply system to meet increased demand.

In order to meet the four objectives of tariffs in practice Franceys (1990) recommends not to have a single rate but to incorporate the marginal rate as the second or third block in a block rate structure. Initial consumption providing for basic needs at a household level of about 10m³ per month would be charged at a lower rate, estimated according to affordability. Higher or discretionary consumption could be charged according to consumers' willingness to pay at full historical costs or even at the long-run marginal rate. E.g., the World Bank evaluation of SODECI (Société de Distribution d'Eau de la Cote d'Ivoire) in 1983 states that the very efficiency and profitability of the service permits the

company to charge low rates for smaller users, so the poor can afford to service (Stren and White 1989).

A tariff structure will be in practice determined based on social and political considerations. Franceys (1990) gives an example on Usman's (1988) study on updating of tariffs for the Borno State Water Board in Nigeria. It was recommended that:

- tariffs should be based on increasing block rates;
- connection charges payable by low-income households should be levied as a standing charge spread over many years. Also Linn (1983) recommends the replacement of lump-sum connection fees by recurrent charges to maximize the poor's ability to connect to the services;
- tariffs must be levied on all users of water;
- the system of charging should be widely comprehensible, fair and water conserving;
- metering can be a useful approach to meet these requirements and the Board should aim to meter all services to medium- and high-volume consumers. These meters should be checked and consumption recorded monthly;
- charges for standposts should be paid by local government, deducting it from the monthly allocation they receive from the State Government;
- strict penalties should be imposed on the illegal resale of water and on the construction of private underground tanks; and
- the Board should organize health education workshops with the assistance of the Ministry of Health in all towns so that the need for improved water supplies and its related costs can be understood by all.

Franceys (1990) finds different problems associated with standposts where tariffs have been based upon:

- a flat rate charged on all surrounding households;
- a water rate charged as an addition to local council taxation or as a percentage of ground/property rent;
- an agreed water rate paid by government to the water utility as a social service;
- a meter on the standpost with the cost shared out in the community per family, per person, or by property value—but with considerable difficulties deciding who organizes the share out;
- an individual or community council concession or water kiosk where access to the standpost is controlled and water is sold at fixed rates, usually determined by government.

To avoid the problems he recommended that:

1. The community association takes up full responsibility for the distribution of water in a defined area;
2. The community association collects a suitable tariff from householders and pays the local council for bulk delivery of water to the distribution system.

By this method the utility gains only having to collect money from a single customer. The community gains by having much greater control over their own water supply. The studies by the UNDP-World Bank Water and Sanitation Program discovered that the residents in a peri-urban settlement of Villa Sebastian Pagador, Cochabamba, Bolivia were willing to pay for the more expensive water yard, rather than less costly stand posts (Pini 1992b). They would also be willing to participate actively in a water committee.

Therefore affordability of services must be linked with "willingness to pay" which depends not only upon income levels but also upon perceived benefits gained from the service, the characteristics of any existing service and the level of service being purchased (Cotton and Franceys 1991). According to Briscoe (1987) the willingness to pay for basic urban water supply services is high

among the poor. Willingness to pay for any service depends upon the priority given to that sector. The survey in Kibera, Nairobi, for example, shows that 72% of the interviewees were willing to contribute labour for upgrading of sanitation services, 52% were willing to contribute financially and 74% of the interviewees were willing to be involved in full cost recovery sanitation projects (Macharia 1992).

McPhail (1993) describes that despite the plentiful supply of water available through a standpipe-piped network at no cost in Rabat's shantytowns, a household survey in 1990 showed that most residents in these areas desire and could pay for individual house connections for water service. Results from the study also indicate that shantytown residents could pay for an individual water connection even if the water was sold on a flat-rate schedule with a tariff well in excess of the water company's average cost to supply residential customers in other parts of the city. The study also shows that peri-urban dwellers often can afford public utilities at realistic tariff levels—if only the service was made available.

In the *barrios* of Tegucigalpa, under the conditions set out by SANAA-UNICEF, the monthly water tariff is adjusted to recover capital costs as well as expenses for operation and maintenance, including salaries for tap attendants, administration, electricity to run the pumps, and repairs. As the community pays back the initial investment, the money goes into a revolving fund that can be used by other *barrios* for water supply (Pini 1991a).

When the higher rates are required the American Water Works Association (1990) suggests that public education should be used to prepare public:

"The trend across the country is to support public utilities through user fees. This means the people using the services pay the costs. But even with pressures to make water systems financially self-sufficient, local officials are most reluctant to increase user charges. If not done correctly, the political backlash and public resistance can harm a sound operation. Basically, the public is quite willing to pay a fair price for something it values. Citizens just need to be educated that they're getting their money's worth. . . It is crucial for citizens to understand that the treatment of water is an essential service. Show how regulations and increased services benefit each individual and society at large. Public education is a necessity, not a luxury. It is the best means of accomplishing your goal of increasing user fees. Ideally, your efforts to teach the public about drinking water will benefit your system in a number of ways. Users will appreciate the importance of having a reliable water supply. They will understand that it reduces disease and provides a better environment. Users will see the link to community growth and economic development. Clean water means more jobs and increased property values. Users will understand that clean water is relatively inexpensive."

The work of implementing a user fee increase should start a year or so before the target date. The problems that need attention should be pointed out:

- Regulations are demanding more testing, a better-run plant, and qualified people.
- Worn-out equipment is breaking down too often and increasing maintenance costs.
- Portions of the system need upgrading.
- Costs are going up, particularly those you have no control over. Inflation alone will force a rate increase.

Parker (1992) concludes that a prerequisite of a successful policy of charges to allocate water efficiently is volumetric recording of consumption. However, the meters may not give reliable information on the consumption. Parker, for example, reports that between 60% and 90% of meters in Nagpur, India were tampered with, defective or damaged. Briscoe (1991) states that because the costs to install metres are high, they should only be placed where they will be most effective. Since 80 percent of water in developing cities is used by 20 percent of the population, it is best to begin metering the few domestic and industrial customers that consume most. Arlosoroff (1991) cautions that if water utilities demand to be paid for house connection costs immediately, many low-income families legitimately unable to do this will continue to use public standposts or hook-up illegally to another family's pipe.

Meyer (1993) lists the following findings on cost recovery with respect to municipal solid waste collection during a mission to Ouagadougou, Burkina Faso and to Abidjan, Ivory Coast:

1. There are conflicting public and private interests as regards the reaching of full community collection coverage and full cost recovery; and
2. Mixing of community involvement with collection organisations to reach a high level of cost recovery in primary collection operation, however, does not necessarily provide the best form of organisation for reasons of conflicting communal and individual interests. Small local enterprises contracted by communities have shown to be quite an appropriate form of organisation. Direct incentives and private sector initiative have shown to be important tools for reaching high efficiency and high cost recovery.

Allocation from general revenues mobilized locally through taxes and fees

Improving the living conditions in low-income areas enhancing municipal services cannot be done without raising sufficient finance for local government (van Ryneveld 1990). Spending on basic infrastructure and services would also offer considerable opportunities for needed employment and skills development. To make local authorities financially viable it would be advisable to increase income from existing sources considering the following:

- (i) it should be easy to administer;
- (ii) it should promote sustainable economic growth;
- (iii) it should transfer resources from the rich to the poor areas; and
- (iv) as many people as possible contribute on a progressive basis to local government finance.

E.g., the Francophone cities have had better local tax base than the Anglophone African cities, and thus they have been able to maintain their infrastructure and services in better condition (Stren and White 1989). To finance the local government the following sources can be used: property taxes or rates, levies on business activity, service charges, sales tax, or value added tax, local tax, and local income taxes. Property taxes or rates paid by owners of land and buildings can be made progressive, but commercial and industrial property taxes and rates are commonly borne indirectly by consumers.

Levies on business activity are generally more buoyant than property taxes or rates. They can lead to capital intensive production, if the levies imposed at each stage of the production will make the total wage bill high. Source of income of local authorities can be obtained from the trading of services. Water and sanitation service charges should be structured so that everybody is assured of a basic minimum provision. The surplus could be earned using differential charging for services the certain classes of consumers pay more and charges increase with increased consumption.

Local tax can be used as a source of local government income. Because it is generally more widely spread than property tax it tends to enhance accountability between the local authority and the voters. A local tax could be imposed on a progressive basis becoming thus a local income tax. Local income taxes have the advantage being borne by a fairly large number of people and being progressive. They are also buoyant. Because assessing and collecting the incomes of individuals is a major task, it is more easily done by central government on behalf of the local government. However, central government can redistribute resources from richer to poorer areas, if central government revenues will be increased and more extensive grant financing for local governments will be introduced rather than expansion of local taxes.

Sales and value added tax are effective ways of raising revenue; they are buoyant and widely spread. However, they are not progressive, and deciding which authorities should benefit from which revenues can be problematic.

Van Ryneveld (1990) comments on one form of informal taxes in South Africa:

"We need to take into account the phenomenon existing quite widely in South Africa at present,

especially in informal settlements, of what might be termed "informal" taxes. Payments made to funds run by local organisations or leaders for development and improvement of urban services are clearly a form of local taxation, as are contributions of materials or labour. The advantage of such forms of taxation is that in being organised at a very local level they tend to be locally sensitive and accompanied by strong demands for accountability. However, they have sometimes proved open to quite severe abuse, and have given rise to accusations of extortion and corruption. The phenomenon of informal taxation and its integration with more formal taxation systems needs to be thoroughly researched if we are to develop a fair and appropriate system for raising local government revenues."

The loans and grants can be raised for capital projects through specialised municipal credit institutions independent of the central budgeting process or large local governments capital development funds. However, increasing the size of the revenue base does not automatically translate into benefits to the poor (Menéndez 1991). The distribution of that base must also be restructured internally.

Financial transfers from higher levels of government funded by national/regional taxes and levies

Hardoy and Satterthwaite (1989) suggest that since the development possibilities and constraints are unique to each urban centre, local governments should articulate local needs and influence resource allocations at higher level. The role of national government should be that of strengthening of local government institutional capacity, allocation of resources, both finance and skilled personnel, improve the conditions and capability of the local governments to collect sufficient revenue from the basic infrastructure and services provided.

There is a need to introduce mechanisms to recapture the increments in land value that land-owners receive as a result of government-funded infrastructure development. This should be re-invested in public services. They suggest that governments charge the rich the full cost of all the public investments which they benefit, their revenues would increase enormously. If they would charge businesses and industries for the investments of basic infrastructure and for the pollution they generate, governments revenue would increase and pollution levels would fall.

Since the urban poor pay especially indirect taxes and taxes levied by local government, the policy should therefore be designed to reduce those taxes (Linn 1983). Other policy measures to redistribute urban income through fiscal policy are:

- elimination of subsidies in public services where these benefit mainly middle- and upper income groups, also in public utilities; and
- expenditure policy in provision of shelter and urban infrastructure should be diverted to alleviate the poverty.

Briscoe (1987) suggests that because the positive marginal impact on health increases as service level increases, it will be cost-effective way to use health sector funds to services for the poor. Accordingly, limited use of public funds for basic sanitation will generally be cost-effective. Experience has also shown that many people do want to improve their sanitation in urban areas, usually for reasons of privacy and convenience, and that they are quite prepared to pay (Franceys 1991). Like any other purchase they make their decision on grounds of costs and quality and perceived benefits—and often welcome the opportunity to purchase with credit facilities.

Institutional and organizational considerations

"Inadequate maintenance in developing countries has various causes, but only institutional failure can explain the extent of inadequacy. At the heart of this failure is the absence of public accountability. All activities to strengthen institutions, enhance incentives, and improve the internal workings of (road) agencies should be judged by their ability to increase accountability."

Harral and Faiz 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. Tables 5.15 and 5.16 summarize these municipal services management options.

Table 5.15 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 5.16 Comparison of management options for private institutions (Coyaud 1988).

Institutional Alternatives	Private, or Mixed Government-Private, Company				
	Service Contract	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

Accountability regarding the use of scarce resources is often of paramount concern, especially in the case of donor-financed facilities. Without adequate accountability, the target groups are unlikely to receive benefits of donor-assisted projects, and resources can more easily be wasted (Ostrom et al 1993). Rietveld, Kalbermatten and Berna (1991) confirm that the need for better accountability and demand orientation are key issues in the new thinking about infrastructure. The evolution of most infrastructure services has resulted in a heavy supply orientation and little accountability vis-a-vis users, clients, or beneficiaries. Infrastructure has largely operated with inadequate checks and balances either from markets or political processes.

The truly creative organization is one that integrates the concepts of total quality and empowerment (Gerstberger 1993). It is founded on the concepts of continuous improvement and continual innovation, is guided by the clear anticipation of customer wants and needs, and develops a sense of commitment and team spirit throughout the organization that supports self-responsibility and personal growth and development. Therefore it is essential that the management culture encourage employee contribution and provide training. The goal of Total Quality Management (TQM) is to create an environment that responds quickly to customers' changing requirements. Three principles underlie total quality (Gerstberger 1993):

1. Total quality is customer-driven. The needs of the customer must be met in a

consistent manner. Identification of both the ultimate customer and process customers is necessary. A method must then be developed to identify the customers' needs and expectations and to measure the degree to which the needs and expectations are currently being satisfied. This is accomplished through activities such as in house surveys, personal interviews, focus groups, and research studies.

2. **Total quality requires employee participation.** An important aspect of total quality is changing traditional philosophies about managing people. It is essential that the management culture encourage employee contribution, provide training, and value and respect employees.
3. **Total quality is process-oriented.** The critical operations of the organization are measured according to attributes that both ultimate and process customers consider important. A process orientation is based on the understanding that most problems evolve from processes, not people. Everyone in the organization becomes responsible for fulfilling the functions of their job descriptions and for improving the processes in which they are involved.

Deming's philosophy of total quality has 14 cardinal points (Scherkenbach 1991, cited by Gerstberger 1993):

- Create constancy of purpose toward improving products and services, allocating resources for long-range needs rather than short-term profitability;
- Adopt a new philosophy of management. Western management must awaken to the challenge of a new economic age, learn its responsibilities, and take on leadership for change;
- Eliminate the need for inspection to achieve quality by building quality into the product in the first place;
- End the practice of awarding business on the basis of price tag. Instead, minimize total cost. Move toward selecting a single supplier for an item and maintain a long-term relationship based on loyalty and trust;
- Constantly improve the system of production and service; improve quality and productivity, and thus constantly decrease costs;
- Institute training on the job;
- Institute leadership. The aim of leadership should be to help people and machines do a better job. Leadership of both management and production is in need of overhaul;
- Drive out fear, so that everyone may work effectively for the company;
- Break down barriers between departments by encouraging team problem-solving, which combines the efforts of people from different areas such as research, design, sales, and production;
- Eliminate slogans, exhortations, and targets asking the workforce for zero defects and new levels of productivity;
- Eliminate work standards (quotas) and substitute leadership. This includes eliminating management by objectives, management by numbers, and numerical goals;
- Remove all barriers that inhibit the worker's right to pride of workmanship. This means abolishing the annual reviews and merit rating systems based on numerical goals;
- Institute a vigorous program of education and retraining to keep up with changes in materials, methods, product design, and machinery; and
- Put everybody in the company to work to accomplish the transformation. Transformation is everybody's job.

One approach to the implementation of a total quality program that has proved successful is based on a two-stage model consisting of an organizational assessment and a process analysis. An important input to each stage is the identification of customer needs. The organizational assessment involves determining the organization's purpose, identifying stakeholders or customers, agreeing on factors critical to the organization's success, and determining appropriate measures of the organization's effectiveness. In the process evaluation or process analysis stage, processes are evaluated, alternatives are developed, and if appropriate, the process is improved. A total quality program can be started in either the organizational assessment or the process analysis stage (Gerstberger 1993).

Leadership and people are basic elements of a successful quality organization. The primary emphasis by management must be shifted away from producing, controlling, and directing toward helping people develop trust in their own instincts and the willingness to take responsibility for the success of the business. The managers must promote the self-management of employees, so the employees can take responsibility, be accountable, and play a role in determining the organization's future. The managers have to create an environment that supports employees' choices about themselves and establishes policies, practices, and structures that encourage self-responsibility. Employees must be afforded the opportunity to fulfil individual needs, desires, and goals by encouraging them to break free of their limited perceptions of themselves and their work situations.

Three feelings are characteristic of an empowered person: (1) survival is in his or her hands; (2) she or he has an underlying purpose; and (3) he or she has a strong sense of commitment to achieving that purpose quickly. The manager's job is to develop and support these feelings. The organization itself is strengthened because creative ideas and input from stakeholders increase their initiative and commitment. "The challenge is the same for all of us: To be all we can be, individually and collectively. The goal is more productive response-able organizations where people make as important a contribution as they are capable of and are recognized for that contribution." Each person must accept responsibility and create his or her own vision of a true quality organization (Gerstberger 1993). Any organization will benefit from employing creative individuals (Farid, El-Sharkawy and Austin 1993). A creative professional can be described as:

1. Highly motivated;
2. Open to feelings and the subconscious;
3. Curious and inquisitive;
4. Tolerant of psychological and physical isolation;
5. Persistent and focused;
6. Tolerant of uncertainty;
7. Technically knowledgeable;
8. Sensitive to problems;
9. Analyzer and synthesizer;
10. Highly imaginative;
11. Highly original;
12. Very flexible;
13. Quite selective;
14. Brave enough to be different;
15. Distrustful of pat formulas and conventional wisdom;
16. Intrigued by bold ideas;
17. Quick with suggestions; and
18. Seeker of higher productivity.

Institutional performance is always greatly impacted by the political environment. Weaknesses and corruption that exist in the government as a whole will almost certainly be reflected in the water supply and sanitation sector (WASH 1992). Ostrom et al (1993) focus on the five objectives for institutional arrangements that can lead to sustainable development: economic efficiency; equity through fiscal equivalence; redistributive equity; accountability; and adaptability. The capability of the organizations could also be assessed in the following areas (Robinson 1990):

1. Institutional capability:
 - Legal powers to undertake maintenance;
 - A rational and functional administrative structure;
 - The employment and training of staff of a sufficient calibre;
 - Funds to undertake maintenance and for administration, salaries and expenses; and
 - Financial control.
2. Managerial capability:
 - Existence of an up-to-date inventory;
 - Works effectively planned, programmed and monitored;
 - Budget related to actual costs and ability to disburse;

- Effective cost control;
 - Adequate plant and equipment available and effectively utilised; and
 - Availability of materials as required.
3. Technical capability:
- Appropriate criteria for planning;
 - Materials test facilities;
 - Effective quality control of all operations;
 - Implemented work inspection and monitoring systems; and
 - Access to research and information.

Franceys (1991) suggests that initially the output measures of an institution are assessed to determine whether a more detailed analysis is required. These output measures or performance indicators (or objective verifiable indicators) are also invaluable for development, control and evaluation. The most common performance indicators for water supply institutions are:

- Percentage of population served;
- Per capita consumption of water;
- Percentage of household connections/standposts;
- Unaccounted for water;
- Quality of water delivered;
- Extent of interruptions of service;
- Pressure range throughout the day;
- Average time to repair leaks;
- Affordability of tariffs;
- Willingness to pay for services;
- Bill collection efficiency;
- Connections per employee;
- Population served per employee; and
- Financial ratios.

An approach from the Local Water Utilities Administration in the Philippines takes this even further with details of 26 indicators (some of which may vary according to population size) divided into four categories of importance. If the output measures indicate that there are problems within the institution a more detailed analysis is required (Franceys 991). The WASH approach (Cullivan, Tippett, Edwards, Rosensweig and McCaffery 1988) identifies nine performance categories for institutional analysis:

- (i) Organisational autonomy;
- (ii) Leadership;
- (iii) Management and administration;
- (iv) Commercial orientation;
- (v) Consumer orientation;
- (vi) Technical capability;
- (vii) Developing and maintaining human resources;
- (viii) Organizational culture; and
- (ix) Interactions with key external institutions.

If the performances of country's water supply and sewerage systems are poor, the government should not hesitate to consider changing its institutional arrangements. Pragmatism and flexibility should be exercised in choosing the proper institutional alternative, with due consideration being given to local circumstances. Ownership does not seem to be the key issue in performance efficiency. The following approaches are more important to efficiency (Coyaud 1988):

- Separate social and political objectives from commercial objectives. It is often better for a government to let an institution operate on commercial lines and then use its profits to achieve social or political goals;

- Achieve a proper balance between control and independence. The role of the government is to provide the proper environment for good competition and to monitor and regulate the private companies. It is not to interfere in the management of water supply and sewerage systems;
- Monitor the performance of public and private institutions. Profitability is a good index of managerial performance when there are no distorted prices, subsidies, or monopoly rents. However, profitability should be looked at in parallel with other financial information to take into account activities with future benefits but current costs, such as planning, maintenance, replacement of assets, training, research, or development; and
- Hold managers accountable for results. Design incentives and sanctions for improving performance. Incentives can be pecuniary or nonpecuniary (more management autonomy, recognition, greater responsibility, promotions, and national honours). A bonus system could cover all the labor force and be based on salary according to a performance ranking.

Campbell (1987) recommends that national governments must give utilities more autonomy, utilities have to strengthen their management operations, and improve their attitudes towards low-income communities to improve community participation in the improvement of sanitary environment. Local governments and WSS utilities should establish specialized units or cadres to deal with periurban communities and should implement awareness and information programmes to encourage positive attitudes towards people's participation (WG/U 1993). WSS utilities need to adopt modern management practices and information systems, including appropriate cost accounting, customer account management, and a consumer-oriented approach (collection of users' complaints, information, suggestions, etc.), to improve their efficiency and create an atmosphere of trust for potential investors.

Based on Asian experiences Sivaramakrishnan and Green (1986) suggest that municipal government should be revived and appointed metropolitan development authority staff should be decentralized to help the municipalities, both technically and professionally, to undertake a larger share of the local development activities themselves. The study on the Arusha Municipality (Kiwango and Minja 1985) also recommends that the Arusha Municipality should be given autonomy to make its own policies and development plans for urban services. The municipality should be allowed to have its own source of finance to implement the plans rather than depending on the central government subventions or ceilings that are not realistic for all towns.

Onibokun, Oyediran, Adeniji, Ayodele, Egunjobi and Agboola (1986) suggest that the state water agencies in Nigeria should be given the autonomy, and water agencies should be involved in all major development projects. Herbert (1979) supports this approach by recommending that the establishment of an areawide entity responsible for bulk water supply, water distribution, sewerage, drainage, and solid wastes is desirable in developing countries. That entity should be responsible for planning, development, operations, maintenance, and pricing of the services. The quality of regional water supplies could be improved by including (Perry 1988):

- professional networks and twinning with utilities in the developed world;
- development of information management systems for water quality data;
- improved performance indicators for inplant processes or community-level social services;
- development of innovative management techniques;
- short- and long-term training to be provided for utility operators in host countries or in schools and water supply systems in developed countries; and
- opportunities for consulting services, such as development of improved performance indicators and alternative management practices.

Public sector water supply and sewerage companies should assess a mix of alternatives to achieve effective management (Yepes 1990):

- (i) To start with a firm commitment to improve and an open mind to trying new ideas that may run contrary to the way things have been done in the past;

- (ii) To improve effectiveness (percentages of population served) and efficiency, utilities should set specific and attainable goals and unequivocal priorities along with measurable indicators to monitor progress;
- (iii) To improve operations companies could use twinning operations, targeting and bonus systems, and contract plans:
 - twinning operations imply an horizontal cooperation between, and transfer of experience from, a well-run and an emerging company (Cooper 1987);
 - targeting and bonus systems have been established to improve the efficiency of state-owned enterprises, and such approaches also can be applied to sector companies. The focus is on operating efficiency, not financial returns, and on motivating management. These incentive systems could include rewarding managers who reduce operating losses as well as those who increase profits, allocating bonuses on an individual basis, and increasing managerial autonomy;
 - contract plans have been implemented to improve performance of public enterprises based on contract plans (CP). CPs are negotiated performance agreements between governments acting as owners of a public enterprise and the managers of the enterprise itself (Nellis 1988). CPs help to clarify goals, increase managerial autonomy, and open a dialogue between management and the state;
- (iv) Associations of utilities or central government organizations should perform research and development to help overcome the endemic weakness of most of their institutions. Areas deserving further attention include organizational decision making, investment strategies, and cost-effective local technologies;
- (v) Governments should devise mechanisms to overcome economic, political, social, and institutional barriers that influence the adoption and effective implementation of adequate rates. Governments can learn from the U.S. experience, in which the government has created strong public utility commissions (PUCs). PUCs approve tariff requests and also look at the efficiency of the companies they regulate, including reviewing demand forecasts and expansion programs, and also responding to customers' complaints;
- (vi) Sector companies should assess the potential for improvement offered by privatization of the management of operations. The prevalent path followed by most European countries has been to contract the operation for the supply of services through management contracts between municipalities and private companies; and
- (vii) Good management practices should be placed at the centre stage of any company striving to reach high levels of effectiveness and operational efficiency.

Burchi (1991) list the objectives of the legal/institutional segment of a future strategy for institutional capacity building in the following key domains:

- a. policy analysis, with special regard for the legal ramifications of policy options and, wherever appropriate, for the implications of "shared" water-body development options;
- b. conceptual design of laws and regulations for the implementation of policies, and the drafting of comprehensive legislation covering such basic aspects of water resources management as planning, water allocation and use, and pollution prevention and control;
- c. design of governmental institutions, with particular emphasis on mechanisms to ensure consistency, of direction and purpose, in all aspects of water resources management;
- d. implementation and enforcement of laws and regulations, with particular regard for the establishment of procedures for water sector planning, water rights administration, and control of polluting discharges; and
- e. where appropriate, systematic surveying of customary practices in the field of land and water use among rural populations; and
- f. compilation and dissemination of information concerning water laws and regulations, and awareness-raising of the people as to their rights and obligations with respect to water resources use and protection.

Because problems are becoming more and more complex in developing countries, there is also a continuing need for technology research and development (R&D), particularly as related to peri-urban and water-scarce areas (Global Consultation on Safe Water and Sanitation for the 1990s). Developing appropriate technological options and design solutions for the complex and difficult physical and socio-economic conditions in the majority of peri-urban areas demands a higher level of engineering skills than is traditionally required for rural and formal urban WSS services (WG/U 1993).

Therefore the curricula of engineering education and other sectoral training for capacity building in developing countries has to be developed to face the complexity of the problems related to peri-urban drinking water supply and sanitation. Engineers are utilitarians and have historically functioned as trustees of the public trust (Vesilind 1993). Engineers have all been carefully taught to be pragmatic, logical, rational, sensible and systematic in their approach to engineering problems. Now they should learn to appreciate the philosophical outlook of lay people and to incorporate these values in to their decision making process. Although the engineers cannot meet the challenges alone as shown above, they have definitely an increasingly important role to play in the future (Katko 1991b, Pietilä, Katko and Seppälä 1992, Seppälä and Sandelin 1992, Hale 1993). Hoover (1961, cited by Vesilind 1993) described the liability of the engineer as follows:

"The great liability of the engineer compared to many of other professions is that his works are out in the open where all can see them. His acts, step by step, are in hard substance. He cannot bury his mistakes in the grave like the doctors. He cannot urge them into thin air or blame the judge like the lawyers. He cannot, like the architects, cover his failure with trees and vines. He cannot, like the politician, screen his shortcomings by blaming his opponents and hope that the people will forget. The engineer simply cannot deny that he did it. If his works do not work, he is damned forever."

Agenda 21 (Chapter 34) suggests that indigenous capacity-building in developing countries must be supported if they are to assess, adopt, manage, and apply environmentally sound technologies. This can be achieved via (Hale 1993):

- Human resources development;
- Strengthening institutional capacities for research and development and programme implementation; and
- Integrated sector assessments of technology needed in accordance with countries' plans, objectives and priorities as foreseen in the implementation of Agenda 21 at national level.

Private sector

Coyaud (1988, cited by Triche 1990a) describes four types of contractual arrangements for private sector participation in water supply operations:

1. **Service contract:** A government-owned entity enters into a small management or service contract with a private firm for the provision of specific services. This is the type of arrangement under which technical assistance services are typically provided, but more operational services (such as metering, billing and collection, maintaining private connections, or operating production facilities) may also be contracted. The public authority retains overall responsibility for operation and maintenance of the system, except for the specific services contracted. It bears all of the commercial risk and must finance fixed assets as well as working capital. Compensation may be on a time basis; on a lump-sum, cost-plus, or fixed basis; or it may be proportional to some physical parameters. Service contracts are usually for periods of less than five years;
2. **Management contract:** The public authority transfers to a private company the entire operation and maintenance function of the municipal service. Compensation is usually proportional to physical parameters. This arrangement is similar to a service contract, except that the private company assumes overall responsibility for operation and maintenance of the system, with the freedom to make day-to-day management

decisions but without assuming the commercial risks. A profit-sharing arrangement, under which the private firm would bear a small part of the commercial risk, is possible but unusual. The duration of management contracts is generally about five years;

3. **Lease contract:** The system owned by the public authority is leased to a private company for operation and maintenance, but unlike a management contract (with or without profit sharing), the financial risk for operation and maintenance is borne entirely by the lessee. Moreover, the lessee must finance working capital and replacement of components with a short economic life, but not extensions to the fixed assets. The equipment must be returned to the authority in good repair at the end of the contract. The lessee retains a portion of tariff revenues as compensation and pays the remainder to the authority as a rental fee. The portion retained by the lessee is established in the lease contract as a result of competitive bidding or negotiation, and it may be adjusted regularly to reflect changing cost conditions or renegotiated at a specified time during contract execution. The tariff level and the rental fee are usually specified by the public authority or a regulatory body. The duration of this type of arrangement is usually from six to ten years, with the possibility of renewal for up to twenty years; and
4. **Concession contract:** This arrangement goes a step further than the lease contract in that the concessionary must also finance investment costs. Compensation is through tariff revenues, part of which may have to be turned over to the public authority if it has contributed to capital costs. Such contracts are usually for a longer period (maximum fifteen years) than service, management, or lease contracts to allow the firm to recoup capital costs.

The World Bank (1992b) cautions that by itself, privatization is not enough to guarantee better company performance. For instance, a private company benefiting from a monopoly position will not necessarily be a more efficient producer than a public enterprise. However, selling state-owned companies can make sense in the context of overall reforms of economic policy such as deregulation of markets, liberalization of exchange controls, and better economic management. According to Ostrom et al (1993) privatization of production activities, though this may increase efficiency, does not solve the wide array of provision problems.

Triche (1990b) states that since water supply is usually a natural monopoly, the public regulation is essential, if the operational functions are delegated to private sector. The public authority must provide and monitor incentive mechanisms to promote efficiency due to the lack of impractical competition in day-to-day operations. The mechanisms can include:

- periodic competition for contracts to operate the water utility or provide other services;
- introduction of incentive environment (tax policies); and
- sector-specific regulations (water quality standards and pricing policies).

Although the private sector can relieve the public sector of routine operations so it can concentrate on policy making, planning and regulation, the performance of public authority will depend on technical skills, high ethics, political support, and a minimum political interference. In 1987, the Government of Guinea began to restructure the water supply sector, with assistance provided through IDA's Project Preparation Facility (Triche 1990). Two new companies were established to replace Directorate for Energy Services and the national water company:

1. A state-owned national water authority, Société Nationale des Eaux de Guinée (SONEG):
 - It owns the urban water supply facilities in Conakry and secondary centres; and
 - It is fully responsible for sector development including identification, preparation, financing and implementation of new projects, and for issuing sectoral consolidated accounts and servicing the debt.
2. A water management company, Société d'Exploitation des Eaux de Guinée (SEEG):
 - It is jointly owned by the state and a professional private partner, Foreign Investor-Manager (FIM);
 - It is responsible for operating and maintaining urban water supply facilities and billing

- customers and collecting charges within the framework of a ten-year lease contract with SONEG; and
- It has a management contract with the FIM under which the latter will provide home-office support for day-to-day management, regular audits of procedures, and assistance for procurement and selection of SEEG's expatriate staff.

Triche (1990a) conclusions of the restructuring of the Guinea water supply sector are:

- (i) The competition has been introduced into a public service through the bidding process for a lease contract to operate the water supply system;
- (ii) The incentives have been created for both technical and economic efficiency through the linking of the revenues of the lease contractor, SEEG, with cost control and the effectiveness of collection;
- (iii) The framework for effective training and the transfer of skills and responsibility to local staff have been established, because FIM is a shareholder in SEEG, and the fees of FIM as a management consultant are linked to SEEG's revenues;
- (iv) The time-frame of the lease contract, ten years, is more realistic for achieving technical assistance objectives than the usual two- or three-year technical assistance contract;
- (v) The important tasks of proposing tariff adjustments, renegotiating the lease-contractor rate, monitoring the performance of SEEG, and planning and implementing investments remain with the state enterprise SONEG;
- (vi) The government has indicated a willingness to raise tariffs to a level that covers operating expenses and sector debt service and yields a financial return on SONEG's assets so that it can contribute to future investments; these increases are essential for the viability of the arrangement;
- (vii) The arrangement in Guinea is a remarkably simple one, because it is limited to the urban water supply sector;
- (viii) The responsibility for planning, investment, and debt service is separated from responsibility for operations giving each entity a large degree of accountability;
- (ix) SONEG may not be best placed to make wise investment decisions, and it works under a certain vulnerability vis-à-vis SEEG; SEEG has no voice in planning new investments, and therefore its incentives to operate efficiently may be compromised. Therefore it may be advisable to convert the lease contract to a concession or partial concession when the main investments have been completed.

The management option introduced in the Ivory Coast is described in Box 5.5 (Roth 1987).

In some localities government support to make vendors more efficient and improve water quality might be the most cost-effective solution. In some particular city areas it may be feasible to make use of local water sources for small independent networks rather than extending the main municipal network (Caimcross, cited by Hardoy and Satterthwaite 1989).

In Kumasi, Ghana, an experiment was launched in 1990 to determine whether private companies could do a better job of running the management of public latrines than the city administration. Twelve latrine sites serving more than 20 000 people daily were selected for franchised management. Five private contractors took charge, paying the city 15 per cent of their total revenues (Kinley 1992):

"The conditions of these public latrines were deplorable when we took them over," says Albert Joseph, a local entrepreneur whose small company now manages a sanitary complex used by almost 5 000 people a day. "Now the tanks are emptied twice a week and insecticides are applied regularly to control disease. Our customers are much happier and the city is making money where it used to lose it."

Box 5.5 Water supply system In Abidjan, Ivory Coast

The private firm responsible for water supply in Abidjan is the Société de Distribution d'Eau de la Côte d'Ivoire (SODECI); a counterpart is responsible for sewage disposal. A unit in the Ministry of Public Works is responsible for planning and building all large new investments in water. This unit is also responsible for supervising SODECI. Under its contracts, SODECI is paid a fee related to the volume of water sold. The fee is calculated on the basis of agreed standards for staff, equipment, energy, and other inputs, plus a margin based on agreed overheads and profits, which is indexed against inflation. SODECI therefore makes a reasonable profit, whereas other (usually public) water supply companies in West Africa generally operate at loss. SODECI's fee is about one-third of the water tariff, which is set to cover not only operation and maintenance costs but also debt service. Despite the rapid expansion of the systems in Côte d'Ivoire, the standard of water supply there is among the highest in West Africa. The systems are well designed, equipped, maintained, and operated. Water quality and pressure are uniformly good. Consumption is metered and water losses are low. Several factors contribute to these good results:

- The institutional separation of investments from operations makes it easier to evaluate SODECI's performance and ensures government control over the expansion of the system.
- By setting water tariffs to reflect total costs fully, Côte d'Ivoire can finance its existing services. Water rates are among the highest in Africa; thus consumers, rather than taxpayers, pay for the services they receive. The low rates for small quantities help the poor to afford the water.
- During periodic tariff reviews, the government can carefully scrutinise SODECI's costs.
- As a private company, SODECI is free (within the contracted limits) to hire, fire, and compensate its staff. This freedom, plus a strong emphasis on training (SODECI operates its own training centre), enables the company to attract, train, and keep qualified people.

Community based institutions and peri-urban dwellers

Water cooperatives are common in Argentina, Bolivia, and Chile, in the Philippines, and in the Middle East. They can be particularly helpful at the village level, where informed consumers, sharing common interests within small communities, can take the place of the professional management that can be afforded only by large systems. Roth (1987) gives an example in Box 5.6.

The Working Group on Urbanization (WG/U) of the Water Supply and Sanitation Collaborative Council, an international organization, recently reviewed 271 documents describing 67 peri-urban water supply and sanitation projects. Thirty-one of the 67 projects were reported to have been successful; 19 of these attributed a major role in their success to citizen participation (Hogrewe et al 1993).

Hardoy and Satterthwaite (1989) caution that when the governments and aid agencies are involving low income groups and community organizations in the upgrading programmes they must understand the possibilities and the limitations of such involvement. They often have false assumptions that low income groups can contribute their time to community project or they do not understand the contradictory demands and priorities within households and the community. Close coordination between the agencies responsible for managing basic infrastructure and services and low income settlements or neighbourhoods is essential, but when the upgrading programmes are implemented, the agencies should be aware that community organizations may not represent the needs of all households or individuals.

The intensive individualism generated by the struggle to survive in marginal areas often inhibits development of community spirit, which impedes group effort (Friedlander 1990a). Those

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The construction and management of water systems has served as a catalyst for other community efforts. Most of the communities in Tegucigalpa, Honduras have tried to address other community needs, such as improved drainage and excreta disposal, clean-up campaigns, garbage pick-up, and construction of a community centre or school.

Maskrey and Turner (1988) reports that Peru's largest squatter settlement Villa el Salvador has been developed through community's own autonomous organizations. The government has supported the development with provision of land, site planning and programming of infrastructure installation. The block and neighbourhood development, and the planning and management of the settlement is the responsibility of Villa's own community organization, CUAVES (Comunidad Urbana Autogestionaria) and the Municipality of Villa el Salvador (officially constituted in 1984). The development started in 1971 and by 1984 this self-governing community with nearly 200 000 low-income people had 31 034 housing plots: 15 827 had permanent brick and concrete houses; 22586 had electricity connections; 17 938 had domestic water and sewerage connections, and 8038 were served via external standpipes.

The non-governmental organizations (NGOs) which have implemented large scale projects or programmes on low income housing with official approval and support are FUNDASAL in El Salvador, Human Settlements of Zambia and CENVI and COPEVI in Mexico (Hardoy and Satterthwaite 1989). In Costa Rica a private non-profit making organization Fundacion Promtora de Vivienda (FUPROVI) was established in 1987 with the following objectives (Wray 1990):

- (i) contribute to improvements in the living conditions of the urban and rural poor and to the development of existing squatter settlements;
- (ii) assist low-income groups in the identification of their housing and community development requirements; and
- (iii) support the organization and participation of communities in the development of housing and upgrading projects using self-help concepts, particularly that of mutual assistance.

The programme of the FUPROVI consists of the following components:

1. credit for materials for the construction or improvement of housing;
2. credit for materials for minor infrastructure work and community facilities;
3. provision of technical, legal and social assistance, training and supervision; and
4. provision of equipment and tools to assist the construction activities of the community.

The loan to residents covers the purchase of land, legal costs, a fixed sum for infrastructure and the cost of materials used in the house construction plus 15 percent for technical assistance. The following conditions have been applied for financing:

- FUPROVI is providing the financing during the construction period at no interest, and it is only secured against the materials delivered;
- the housing banking system is purchasing the loan after the house is completed, and the loan is converted to long term (15 year) loan secured against the property; and
- the finished products must be adequate to guarantee the loan, and the household will eventually qualify for a clean land title and a mortgage.

The FUPROVI funds can thus be used to other projects although they need to be replenished periodically.

Non-governmental organizations (NGOs) in Kenya have participated in the development of community water supply and sanitation both in rural and urban areas. *Harambee* self-help projects reflect a bottom-up rather than a top-down development project initiation. *Harambee* projects are normally initiated, planned, implemented and maintained by local communities. *Harambee* self-help activities are heavily biased towards the use of local resources, such as human labour and use of donations, like individual material property. The participation of individuals in *Harambee* self-help is

guided by the principle of the collective good rather than the individual gain. The choice of projects is guided by the principle of satisfying the immediate need of participating members or groups.

The Ministry of Water Development supported self-help water programme was started in early 1970s. In mid-1970s MOWD established the self-help section, which was in charge of coordination of all the government efforts to develop and assist in operation and maintenance of the self-help water systems through technical assistance. With the introduction of District Focus for Rural Development Strategy in June 1983, this section has been decentralized to District Water Offices. The sources of funding for the self-help water programme have been (Mwangi 1990):

1. **Local finance:** The Government of Kenya (GOK) has financed many self-help water projects either through the Rural Development Fund (RDF) at the district level or through the normal voted estimates of MOWD. The beneficiaries have contributed time, money and labour to the self-help water projects;
2. **Non-governmental organizations (NGOs):** Several NGOs have financed self-help water projects in Kenya. The NGOs may be classified to those directly affiliated with a church organization and to those working independently;
3. **External support agencies (ESAs):** Many foreign donors have contributed also to the self-help water programme, mainly through loans provided to the GOK. In most cases the loans are in form of commodity aid.

The Orangi Pilot Project started in 1980, and about half of Orangi township lies in the project area, which amounts to some 800 hectares and contains 3 181 lanes and 43 424 housing units. Mustafa (1985) describes an unconventional approach for a self-help programme on this low-cost sanitation in the largest squatter colony (katchi abadis) in Karachi, Pakistan:

"There were three barriers preventing the improvement of Orangi on a selfhelp basis. First, there has been a 'psychological' barrier both at the 'top' and at the 'bottom'. At the 'top', government departments perhaps feel that the problem of katchi abadis cannot be solved because they have insufficient resources. At the 'bottom', some people in Orangi still expected the Karachi Metropolitan Corporation (KMC) or the Karachi Development Authority (KDA) to do the work for them. They also feel that the work of sanitation, water supply, drainage, and so on, is beyond their own abilities and resources.

Secondly, the cost of constructing a proper sanitation system through conventional methods involving government departments, vested interests and corruption was too high for people to afford.

The third barrier was technical. Where residents have been interested and motivated in constructing a sewerage system, they have lacked the technical know-how to do it competently and satisfactorily. The result has invariably led to failure sooner or later.

The Orangi Pilot Project (OPP) has attempted to remove the three barriers. With regard to the sanitation programme the experiment has been (a) to persuade the residents that if they do not organize themselves to improve their living conditions, nobody will do it for them, and they will face greater hardships; (b) to try to reduce the cost of a standard sewerage system; and (c) to provide the interested residents with a low-cost technology and the technical guidance and assistance for constructing it, and to train them in its maintenance and upkeep."

The sanitation programme of the Orangi Pilot Project has shown that the condition of the poor can be improved through a development strategy in which the people participate, provide finance and take over some of the functions of government agencies (Hasan 1988):

"There are two major impediments to providing a sanitation system for a squatter colony. The first is that the local authorities do not have the finances for constructing a sewerage system. Where international finance is available the question of repayment arises. Furthermore, international loans can only deal with a small part of an immense problem: there are over 362 squatter colonies in Karachi alone, comprising over 4 million people. Secondly, the cost of urban services as developed by local authorities is five times the actual cost of labour and materials. Squatters cannot afford to pay the resulting charges.

Three concepts were central to the sanitation programme: community participation; modification of standard engineering technology and implementation procedures to make them suitable for such participation; and redefinition of relations between the community and local government.

The first step towards creating a sewerage system was to form community organizations with the lane, which in Orangi consists of 20-30 houses, as the basic unit. This was a small cohesive unit with no problem of mistrust. Moreover, it was judged that the traditional leadership, which functioned at neighbourhood level, would not feel threatened if the programme was limited to one lane at a time."

Vines and Reed (1990) illustrates that:

"In Karachi, the OPP, a nongovernmental organization, has employed social organizers from within the project area, the squatter settlement of Orangi. The focus is on individual lanes, where the social organizers arrange meetings to explain the need for sanitation, and introduce the idea of OPP sewerage as an affordable solution to the problem. The community then has to decide whether it is sufficiently interested to select two of its number to act as lane sanitation managers. The lane managers approach OPP formally and request the organization's help, which may extend to:

- providing plans and other design documents;
- training the community's representatives in fundraising and construction management;
- recommending reliable craftsmen; and
- loaning tools, shuttering and other equipment; or supervising construction.

The community is free to reject the OPP'S help and advice at any time. The community is responsible for raising and spending all the money needed for construction. The maintenance of the sewer they build is also their responsibility."

Nearly half Karachi's population of close to nine million live in crowded *katchi abadis*, the Urdu words for unfinished settlements. Several of Karachi's slums have provided basic infrastructure and facilities for themselves, with little outside help. Communities like Issa Nagri, a squatter settlement of 10 000 people have built latrines water supply and sewerage systems, demonstrating that much can be achieved through community initiative alone. Robson (1990b) describes:

"The predominantly Roman Catholic community of Issa Nagri, squeezed up against a neighbouring Muslim graveyard, began translating need into action two years ago. With a small contribution from the Aga Khan Foundation, the international non-governmental organization, and the tacit approval of the authorities, the community first tapped into the metropolitan water supply and installed public standposts in each lane. Sanitation was the second priority. With an average of six people cramped into each badly ventilated room, families were aware of the importance of hygiene and owning a latrine. . . With no outside assistance, nearly all the residents have now installed hygienic pour-flush latrines. With some logistical support from the Aga Khan University, they also built an underground drainage system which feeds to a main, open sewer now connected with the city's sewerage system. It is not well constructed—during the rainy season drinking water, waste water and sewage all will down the community lanes—but it is better than nothing."

In a squatter settlement of Baldia, Karachi, the first group to become involved in the sanitation programme was not the mosque committee or the health authority but the local cricket club which wanted to clean up the neighbourhood so that it could play cricket in the streets without constantly getting the ball soiled (McGarry 1986).

Municipal solid waste management is usually managed and operated by the municipal authorities. Any type of organized community involvement is rather the exception and is mainly concerning the primary collection and communal street cleansing activities. Secondary collection, transportation, and ultimate disposal are usually beyond the capacities of a community (Meyer and Schertenleib 1992). District or neighbourhood-level garbage collection schemes devised and managed in collaboration with residents are often the cheapest and most effective solution. This is especially true when reclamation of materials (metals, glass, and other wastes) and recycling organic wastes as compost are involved. Scavengers, rag pickers, and recycling businesses can be made an impor-

tant part of garbage management systems, but need a supportive framework, especially to address their health problems (Caimcross, Hardoy and Satterthwaite 1992a).

In Kathmandu Valley, Nepal the institutional project concept of the solid waste management project (SWMP) specifies the division of responsibilities between the various groups and it describes the guidelines for the administrative and operational structure (Nicolaisen, Plog, Spreen and Thapsa 1988). The Solid Waste Management Board (SWMB) under the Ministry of Works and Transport concentrates primarily on those activities which require a centralized approach:

- Distribution and collection of bulk waste containers;
- Recycling/composting;
- Transport to the sanitary landfill site and final disposal;
- Maintenance and repair of equipment and vehicles;
- Collection and administration of fees; and
- Public relations and participation.

The municipal administrations (Town Panchayats) and the wards are responsible for:

- The provision and regular cleansing of container sites; and
- The cleansing of streets, lanes and squares.

The population of the cities is responsible for:

- Taking its waste to the public containers which normally will be located within 200 metres in the areas served by the project. Many containers have been placed to promote their acceptance by the population at sites which have traditionally been used for waste storage in the past.

Jensen (1990a) describes some examples on community-based solid waste management:

- In Cairo, Egypt, an elaborate, century-old system of handling household refuse provides an income for 16 000 Zabbaleen, or garbage collectors, who recycle nearly half of the 5000 tons of trash produced by that city daily;
- In Douala, Cameroon, garbage collection in certain low-income neighbourhoods is being successfully organized by communities themselves; and
- In Medellín, Colombia, former landfill scavengers have formed co-operatives and have begun processing industrial and household wastes.

According to the report by Jensen (1990b) the solid waste management system in Cairo is partly handled by squatter communities (Zabbaleen) mainly because:

- Municipal waste system (trucks, sanitation workers, plants processing recyclables, composting) would have cost at least USD 57 million a year (which is the total operating budget of the city at present); and
- Centralization of recycling could have wiped out thousands of workshops and small industries scattered around the city. These are receiving through the Zabbaleen's network of middlemen cheap recycled material.

The role of women in solid waste management could be in three principal areas (Furedy 1990):

- (i) reuse of wastes to meet household needs;
- (ii) informal work in waste recovery and recycling; and
- (iii) municipal solid waste services.

Ward (1989) states that local community leaders may also exercise an important role in securing resources for community development in the form of legal recognition and the provision of essential services such as water, electricity, schools, clinics, transportation, and policing, etc.

External Support Agencies

The external support agencies (ESAs) should help national governments to form competent urban/municipal governments and provide loans for investments on basic infrastructure and services. The ESAs should recognize that even successful projects are solving the problems within the projects, not removing the constraints on the vast majority of people who were not part of the successful project (Hardoy and Satterthwaite 1989). It should also be recognized that aid is only a tiny proportion of the needed investments on basic infrastructure. Therefore the local governments capability to make initial investments and to make revenue is in utmost importance. Without sufficient revenue it not possible to manage infrastructure and to make new investments to extend the services to respond the citizens' needs, especially those of lower income groups. The ESAs should not promote the use of scarce resources on projects, if the capacity and competence of local governments cannot guarantee the sustainability of services provided. Figure 5.15 shows the role of the ESAs in an impact network.

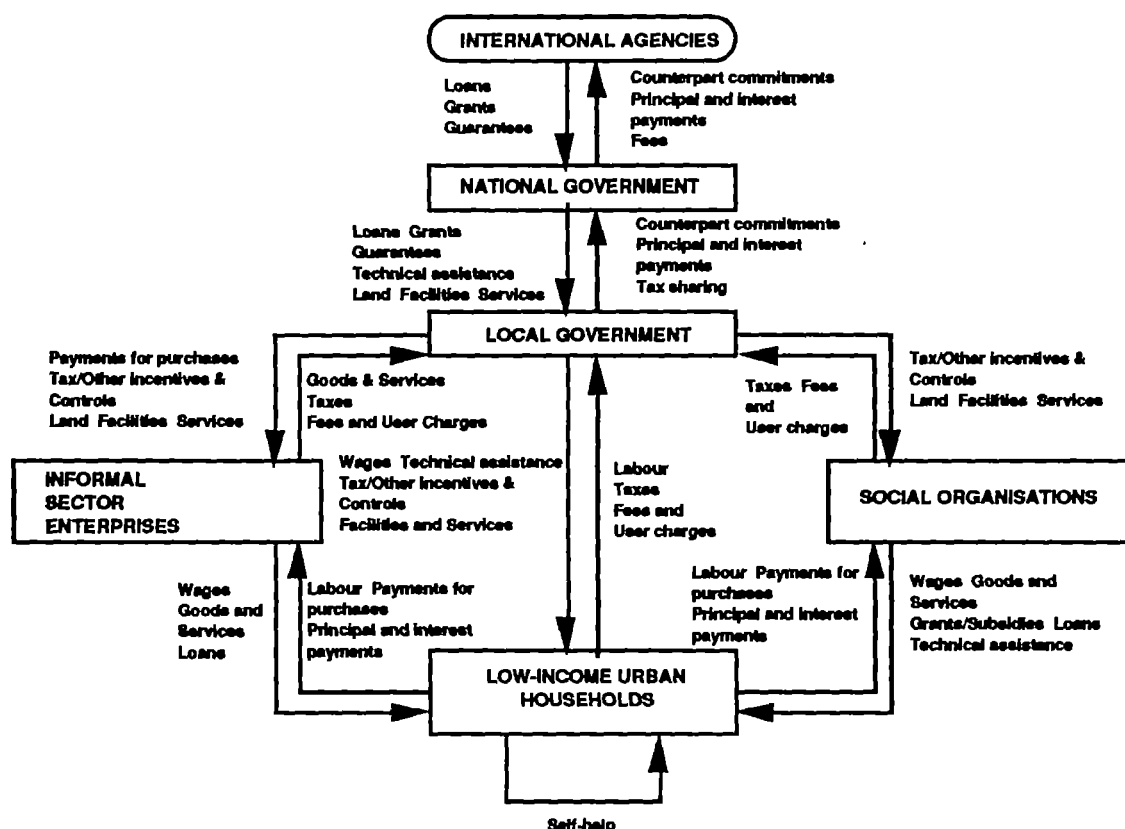


Figure 5.15 Illustrative section of an impact network (Herbert 1979).

The donor's appropriate choice of local implementing agency can also improve coordination with different related sectors (Cairncross 1992). For example, the implementation of the urban sanitation schemes in Botswana through the ministry responsible for planning and housing was essential for their success, and particularly for the system of cost recovery through plot charges. Choosing an implementation agency from another, richer sector can also help capture some of the resources of that sector and increase the amounts available for water and sanitation.

The International Water Supply Association (IWSA) has responded to the challenge to create the best possible conditions in order to realize in practice the conditions to promote and to stimulate

the transfer of technology towards developing countries (Dirickx 1989):

"The Foundation for the Transfer of Knowledge, an independent non-profit making Trust, has been established to fulfil this need. It has the support, and can call upon the human resources of the International Water Supply Association, which has over a hundred member countries and is the world's foremost water supply organization. The aims of the Foundation are essentially practical:

- to provide management and operational staff of water undertakings with up-to-date information and knowledge;
- to disseminate the benefit of practical and managerial experience elsewhere; to improve operational performance and therefore standards of service; and
- to increase the cost effectiveness of operations.

The strategic objective of the Foundation is to protect capital investment and ensure a higher return, in terms of sustained operational levels, for those providing the necessary finance. Equally, the recipient countries benefit from more reliable and permanent standards of water supply and a sound management environment to encourage additional future investment funds when required in those countries."

Planning, management and operations

Grigg (1986) recommends the following categories for success in life cycle management of urban water systems (Figure 5.16):

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; and
5. Get the most from the system through life cycle management, especially with effective maintenance strategies.

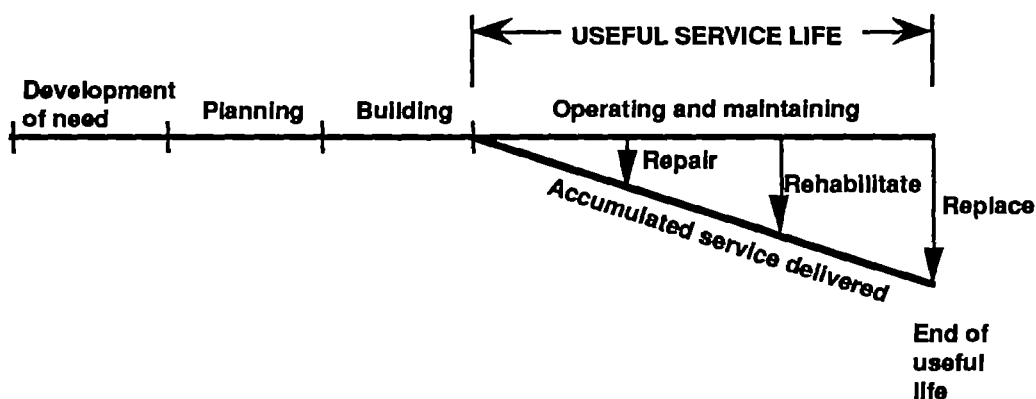


Figure 5.16 Life cycle of an urban water system (Grigg 1986).

The first one, obtaining a commitment, can be defined as a combination of political consensus building and management planning (Figure 5.17). 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.



Figure 5.17 Process of developing commitment to build or make major changes in a system (Grigg 1986).

Grigg (1986) comments:

"The first phase shown in Figure 5.17, 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."

Two key elements in the water supply planning are common (Hebert 1984):

- (i) the need to select service levels; and
- (ii) the need to choose design capacities of facilities.

The selected service level affects the costs of systems and affordability for consumers. The chosen design capacity affects the economic efficiency of investments and investment costs. Hebert proposes a dynamic approach to water supply planning instead of static planning:

1. Instead of planning for a single, static level of service, improvements are staged over time and tailored to a community's ability-to-pay;
2. A mix of service levels is considered for different sections of a community based on ability-to-pay;
3. Capacity of water facilities are selected so as to minimize present value costs over the planning period; and
4. The cost implications of sanitation are considered along with water supply service.

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."

A management system with sub-systems for urban infrastructure is presented in Figure 5.18. The eight sub-systems that are included are the following:

- Plans and programmes;
- Organization and work management system;
- Decision support system;
- Capital and operating budgets;
- Financial management system;
- Projects control or management system;
- Operations management system; and
- Maintenance management system.

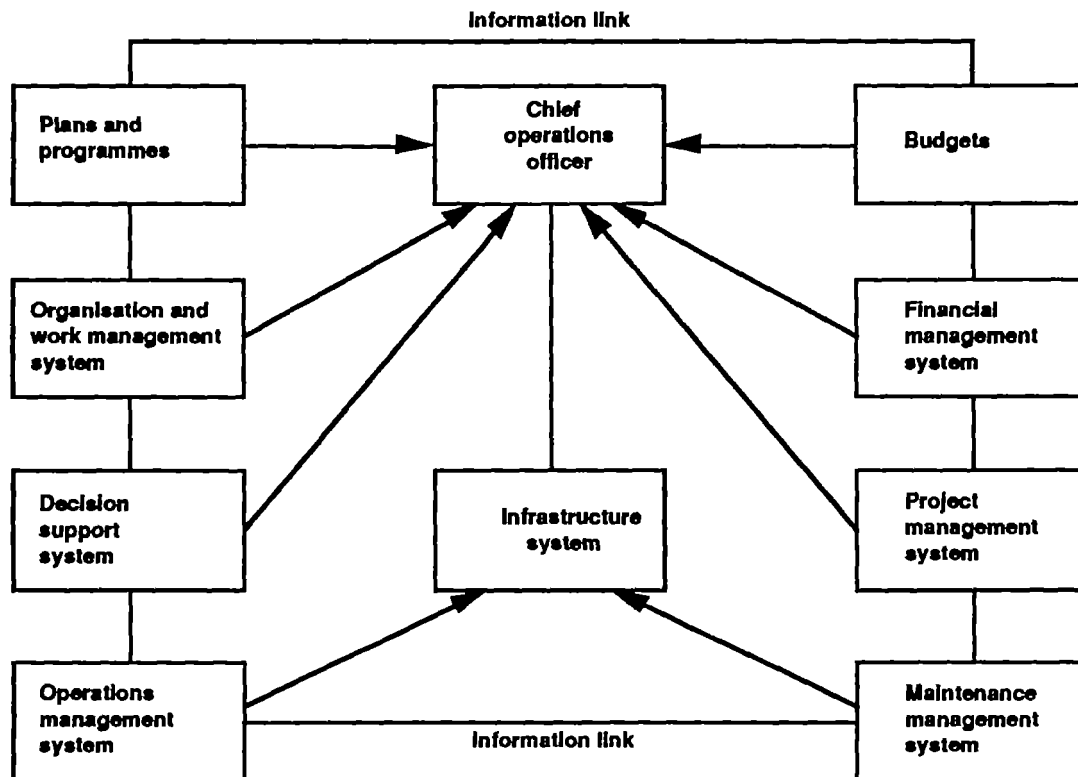


Figure 5.18 Infrastructure management system, with sub-systems (Grigg 1988).

Table 5.17 illustrates the management tasks, along with some of the management system elements that are necessary to be successful in managing infrastructure (Grigg 1988). He points out that in operations the mission of the organization needs to be clear. Planning must be effective, and engineers and managers need to be competent and well trained. Excellence in contracting and supervising the work of contractors is required. Operations and management need to be well planned and executed. It is essential that no corruption is tolerated in the organization.

Table 5.17 Management system elements.

Planning	Organizing	Directing	Controlling
Effective planning/ programming, and budgeting	Effective organizational structure	Leadership and decision making	Maintenance management system
Ongoing program evaluation	Workable decision support system		Effective operations ^a management Quality control

^a Operations include operation of the physical systems as well as the organizational system that delivers services.

Grigg (1988) presents three basic strategies and 30 “ideas” in new directions needed in capital, such as infrastructure, management based on the several studies:

Strategy 1: Better Identify Capital Needs and Priorities

1. Establish a facility condition assessment process to obtain on a regular basis information of major facilities within the jurisdiction;
2. Create and maintain a comprehensive inventory of facilities;

3. Encourage interagency cooperation to undertake joint maintenance work and joint inventory;
4. Start small and develop your inventory system as demand for it becomes clearer;
5. Encourage agencies and central staff to evaluate a variety of maintenance strategies;
6. Encourage operating agencies to reduce their dependence on crisis maintenance and on automatic maintenance without need;
7. Periodically scrutinize maintenance rules of thumb, such as repair or replacement cycles;
8. Resurrect preventive maintenance as a major maintenance strategy;
9. When the need for a facility is in question, consider abandonment or turnover to the private sector;
10. Require agencies to identify instances of deferral of planned maintenance activities; identify reasons for the deferral, and provide an estimate of the consequences of the deferral;
11. Require that each major maintenance decision by an agency be backed by an economic comparison of alternatives;
12. Be sure that agencies consider life-cycle costs when deciding on maintenance actions;
13. Require that major new, replacement, or rehabilitated facilities be designed for maintainability;
14. Require that all capital budget proposal submissions include backup information on the potential effects of each proposal on service quality;
15. Incorporate a more formal, systematic way to consider new maintenance technology when examining maintenance options;
16. Require a systematic process for reviewing capital proposals;
17. Require that information on capital proposals be provided according to a preselected set of evaluation criteria so that the proposals can be more easily compared; and
18. Require that all requests for capital improvements identify impacts on the operating budgets.

Strategy 2: Build Community Support for Facility Maintenance Need

19. Initiate a joint public-private investigation of the jurisdiction's facilities and need for future action;
20. Involve citizen representatives in various parts of the capital facility project review and selection process;
21. Use the evidence provided on proposals to help market those proposals—such as evidence that a proposal will improve service quality or reduce future costs; and
22. Encourage operating agency heads to improve their communications about the capital budget with central, administrative, and elected officials.

Strategy 3: Identify Financing Options

23. Estimate the local capital financing gap;
24. Make aggressive use of the pricing system to finance capital investments.
25. Make full use of revenue bonds for capital financing;
26. Modify local institutional arrangements, if necessary, to achieve full application of user pricing, for example, by use of enterprise funds or independent authorities;
27. Dedicate specific tax revenues to capital investment or capital maintenance to provide a more stable source of financing;
28. Look for new ways to cooperate with the private sector and the business community in capital provision and capital financing;
29. Finance capital facilities in part or in whole by requiring private developers to install such facilities; and
30. Use the same public-private cooperative efforts that are used for capital financing to gain support for capital bond issues.

It seems that the modelling technique applied to the operation of a water supply utility simulates quite well the financial and water stocks of the utility (Grigg and Bryson 1975, cited by Grigg 1988). The model of the urban water supply system had four subsystems: population and business which drove the demand for water and the revenue forecasts; the water stocks subsystem that showed the supply and availability of water; the facility subsystem that showed the quantity and condition of capital facilities; and water rates subsystem that allowed planning for revenues and adjusting charges.

The critical role of information in management urban water and waste management infrastructure is illustrated in Figure 5.19, which shows the central role of the data base and the decision support system in handling the functions of planning, financing, building, operating, and maintaining the systems.

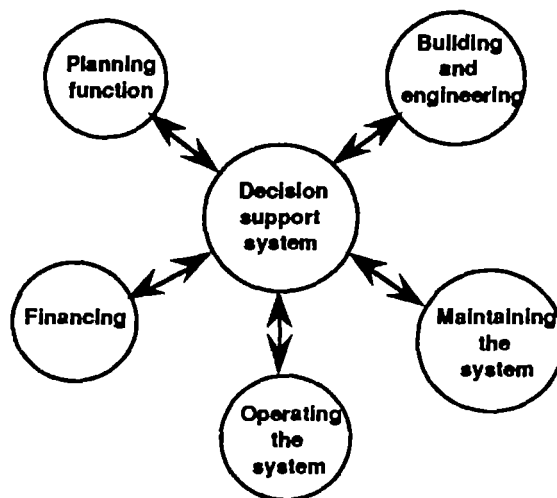


Figure 5.19 Key role of decision support system in management activities (Grigg 1986).

Okun (cited by Grigg 1986) describes his perspective of the principles of water management as follows:

1. Uniqueness of water projects. Water projects defy generalization since the unique settings for implementation of projects are all different;
2. Economies and efficiencies of scale. There is merit in the concepts of consolidation and regionalization of water systems;
3. Sound financing. There must be provision for sound financial underpinning of water projects;
4. Preference for pure rather than polluted sources of drinking water. This will minimize the cost, complexity, and risk in treating potable water; and
5. Integration of water supply and pollution control services.

The provided facility must be kept operating at a satisfactory level of service as long as it is cost-effective so to do. Thus the objectives of maintenance are according to Robinson (1990):

- to ensure that facility is kept in serviceable conditions for users; and
- to protect investments that have been made in the past.

The model Grigg (1986) prefers is to regard management during an operational phase of a project to consist of two parallel but equal tasks: operations and maintenance. In other words:

Operational management = operations + maintenance.

Maintenance is a particularly important subject, the purpose of which is to make sure that the operations can take place. The purpose of operations is to achieve the mission of the organization. Ostrom et al (1993) caution that maintaining a facility simply for the sake of maintaining it is not an appropriate objective. From the sustainability point of view maintaining past investments is justified only if the benefits of doing so exceed the costs, regardless of the amount of resources previously used. Programmes to conserve drinking water can be used to improve the overall supply situation and thus also low-income settlement supplies (UNCHS 1989c):

- (a) Reducing the amount of water lost through leakage in the distribution system, which may often be as high as 50 percent of the water put into it; and
- (b) Reducing the often excessively high level of water consumption in middle-income and upper-income communities, which can be readily achieved without sacrificing the high levels of user convenience favoured by these communities.

The benefits are:

- 1. Existing water supplies can be used to serve more people than before;
- 2. The requirement for large capital investments for new water sources may be deferred, thereby delaying the need to increase water tariffs; and
- 3. Cost-effective on-site sanitation facilities become feasible in middle- and upper-income communities.

Water conservation programmes should include:

- (i) Leakage detection and repair programmes;
- (ii) Review of water tariff structures with the aim of introducing equitable and resource conserving structures;
- (iii) Public education programmes;
- (iv) Adoption of water saving plumbing fixtures;
- (v) Importation and/or manufacturing of water saving plumbing fixtures; and
- (vi) Modification of building regulations/codes to permit the use of water saving plumbing fixtures and require their use in all new buildings.

Improving the operation of public services within existing capacities have generally high impact on the service coverage and level for the urban poor. Herbert (1979) lists some related to water services:

A. Optimization of existing water supply systems

A1. Reduction of losses

- leakage control programmes;
- introduction of metres;
- overflow valves for private tanks;
- elimination of illegal connections; and
- reduction of financial losses through better accounting, budgeting, and collections.

Possible savings can reduce or postpone new major capital expenditures, and can be used to improve the service coverage and level of the low-income areas.

A2. Rationing, reallocation, and pricing changes

- rationing to prevent wasteful consumption by upper- and middle-income users;
- water can be allocated to low-income areas especially during critical shortage; and
- water pricing to establish more equitable unit costs (higher levels of consumption are subject to progressively higher rates).

- A3. Differentiation of water quality
 - savings in the use of high-quality water can be achieved by using lower-quality water for the consumption not requiring high quality treatment.
- A4. Reduced industrial water consumption
 - introducing water conserving technology for processes supported by credit, tax relief and other incentive programmes.
- B. Optimization of existing sanitary systems
 - B1. Latrine improvement programme
 - introduction of regular maintenance system.
 - B2. Upgrading and maintaining existing networks and treatment plants
 - introduction of efficient preventive and corrective maintenance systems.
- C. Optimization of storm water drainage
 - improvements in refuse collection and in sanitation reduce the amount of human waste in storm drains;
 - erosion control by stabilizing natural drainage channels, by regulating land use, by regulating run-off, and by protection of ground cover; and
 - introducing regular maintenance and clearance programme.
- D. Optimization of solid waste management
 - improvement in collection; and
 - recovery of reusable wastes.

The German Agency for Technical Cooperation (GTZ) considers promising the following concepts in solid waste management in the Third World (Nicolaisen et al 1988):

- (a) If possible, urban planning aspects as well as traffic and transport aspects should be taken into consideration in the planning of an urban waste management;
- (b) The partner organization in the developing country should be assisted in establishing the legal preconditions for solid waste management and in clearly defining the administrative as well as the technical and financial competence and responsibilities;
- (c) The waste disposal technologies chosen must be appropriate, i.e. they must be understood and accepted by the population; they should be as simple as possible and allow initiative and self-help activities by the users. Donkey carts, for example, may not only be cheaper as compared with special waste transport vehicles, they may also be the more effective solution—e.g. in case of narrow roads and relatively short distances to sanitary landfills;
- (d) The project should aim for an integrated waste management system. This would for example include separation of waste materials for recovery of resources (recycling): Sorting out of metals, glass, plastics; composting of organic waste. In many cities in developing countries a simple form of recycling is carried out by so-called scavengers. We feel that this type of resource recovery should not be stopped but that hygienic problems should be carefully analyzed and that special precautions must be taken especially at the landfill sites which even may have to be completely closed for scavengers;
- (e) The responsible institution in the developing country must be strengthened and advised in the following fields:
 - Technical know-how;
 - Structural, organizational and management problems;
 - Financial management, cost accounting, fee collection; and
 - Training of staff.
- (f) Awareness, information and education campaigns must be organized to make the population familiar with health and hygienic problems and especially with adequate

waste handling. Good results can be expected from activities in schools and from advisory services for mothers; public relation work can be made via posters or radio transmissions;

- (g) The introduction of regular preventive maintenance is of utmost importance for the preservation of the investments in vehicles and equipment;
- (h) Waste collection fees should be imposed which ideally cover total cost including depreciation—as a minimum, operating costs should be recovered. Where this is not possible, cost must be reduced through substantial participation of the population in waste collection, e.g. transport of waste from the "waste producer" to waste containers or to small intermediate dumping sites.

The public education campaign should be started within the public utility. The staff should be a public relations team. The utility should target audiences outside the utility and identify what information they will need (AWWA 1990) as follows:

1. Local government—Public officials, including board members and public utility commission members, must buy into the proposed user fee increase and public education program. Governing officials should be given more detailed information than the general public—budgets, operational reports and audits;
2. Community groups—Community groups include civic groups, business and industry associations, senior citizen groups, garden clubs, churches, and recreational groups. The utility should talk to leaders of community groups to understand their views and try to tie the message of a self-sufficient utility operation to each group's special interests;
3. Media—The utility should work with the media, not against them. There is no better vehicle for getting information to the public than the newspaper, radio, or TV station;
4. Youth—Focusing part of the public education campaign on youth is like putting money in a savings account. The effort will pay dividends in the future; and
5. General public—Part of public education effort should set aside for mass appeal to the general public because there will be those who don't belong to a civic group, read a newspaper, or have children. The most effective way to reach these audience members is at their homes. The utility should send information to each house, include newsletters with water bills, initiate a house-to-house walking campaign to hand out leaflets, and hang door flyers. The utility should also use public hearings to communicate directly with customers.

Although the public education program will be successful AWWA suggests based on a survey conducted by the USEPA the following:

- Continue the education program—Send information to customers with their bills. Thank them for their continued support. These are low-cost ways to keep information before the public;
- Make small annual adjustments—Incremental rate increases indicate good management. Costs for power, chemicals, materials, and labor will continue to rise due to inflation alone. It makes sense that revenues must be increased proportionally. Large, infrequent increases could lead customers to suspect poor management. Substantial rate adjustments call for extensive public education programs. Small increases still need to be explained, but you can do it with less effort and expense;
- Start billing monthly—Consider optional fixed payments. It's easier for customers to make smaller monthly rather than larger quarterly payments;
- Start billing separately—Clearly separate the charges for water, sewer, trash disposal, etc. Charges should be based on costs so the customer knows the actual value of each service. This method of billing doesn't allow one operation to supplement another; and
- Move the utility operations out of the political realm. Put water and operations under an authority separate from the political body.

Peri-urban water and waste management infrastructure—planning, management and operations

"In urban areas, households cannot fend for themselves for water; they must be provided with some type of service to survive. Those in the inner city generally have access either directly or through standposts to the piped public water supply system. The major problems arise in the periurban areas where the municipal authority cannot or, for administrative or political reasons, will not provide piped services. . . The situation with sanitation in peri-urban areas is even more difficult. In rural areas, the relatively low density of population offers at least the possibility of safe disposal of human and household wastes in or on the ground. Hygiene education can do much, at low cost, to minimize the transmission of disease. In urban slums, which characterize periurban areas in developing countries, the very high density of population ensures that all the population and especially the children will be exposed to human excreta directly or through water and food."

Okun 1989

Water supply and sanitation services having focus on serving the urban poor should be provided on the basis of strategic planning (UNCHS 1991). Strategic service planning and delivery embodies the following basic principles:

- (a) **Broad coverage objectives:** The objective is to serve as many people as possible within the planning area with sustainable systems;
- (b) **Use of multiple technologies:** A range of technologies should be used, each one selected to suit particular site conditions and in true response to community preference and affordability. High service standards can be used in cases where they are appropriate and sustainable;
- (c) **Focus on service required:** The priority provision of those services that the communities want, wherever possible, in an integrated manner that will ensure the maximization of both the environmental and health impacts of service interventions. Implicit in the principle of integrated service provision is decision-making on multi-sectoral cost-benefit analysis and environmental impact assessment and accounting and requisite project communication support;
- (d) **Flexibility:** The plan should be as flexible as possible and capable of adapting to future growth patterns, perceived community needs and requirements. Reliable monitoring, evaluation and feedback processes should be built into the planning process and institutional framework;
- (e) **Upgradability:** The provision of services should permit the progressive upgrading of the systems;
- (f) **Community participation:** The planning, implementation and upkeep of services should be based on community consultation and participation. A gender perspective in targeting such involvement at those intimately affected or interested is essential for success, resource optimization and for ensuring sustainability;
- (g) **"Effective demand" as a prime selection criterion:** The level of service, technology utilized and ways through which services are to be delivered should be selected in response to community preferences and declared commitments and willingness to pay. Informed decision-making based on accurate information and, perhaps, user experience with demonstration units are essential for determining genuine effective demand. The role of communication support in demand stimulation might prove essential before large-scale sanitation programmes can be launched;
- (h) **Sustainability:** Services provided must be both technically and financially sustainable and must be designed and operated with this clear objective in mind. Special emphasis must be placed on supporting and strengthening the anticipated weak links in sustained service provision;
- (i) **Institutional framework:** Strategic service provision will require the close collaboration of many sectoral agencies. The overall responsibility for providing water supply and sanitation to informal settlements should, however, rest with a single agency. Where government authorities are willing to assume this responsibility, the creating of a special unit with existing water and sanitation authorities is usually the most effective. Considerable external support will, however, be needed to develop a cadre of professionals to plan and deliver services embodying the principles of

strategic service planning.

It should be noted that environmentally sound waste management goes beyond the safe disposal of the wastes that are generated. An international framework for waste management has recently been established founded on a hierarchy of policy objectives: first, minimize waste generation; secondly, recycle to the extent possible the waste that cannot be avoided; and thirdly, dispose the non-recyclable fraction of unavoidable wastes in an environmentally safe way (UNCHS 1991). E.g., Niemczynowicz (1992) and Chan (1993) emphasize the concept of ecological engineering. Niemczynowicz (1992) describes that new technology which must be developed should be rooted in a new technical paradigm comprising up-to-date knowledge and the present level of understanding of the connections between human actions and environmental consequences. For a proper analysis of the role of the cities on the status and functioning of the ecosystems, Appasamy and Lundqvist (1993) suggest that it is necessary to relate the dynamics of the socioeconomic system—which induces the flow of material—to the physical and environmental context.

Based on the case studies of peri-urban water supply systems in Sudan and Nepal, McGowan et al (1992) recommend for donor and NGO organizations to consider the following:

1. **Political Considerations:**
 - Determine the perceived needs of peri-urban dwellers to confirm the priority that they attach to improved water supply;
 - Investigate the possibility of peri-urban areas being absorbed into urban or "planned" areas; and
 - Help peri-urban areas gain formal government recognition so that they can use normal government powers to mobilize resources for water supply activities and also have the option of establishing formal relationships that may attract government resources for developing and sustaining local water supplies.
2. **Engineering Design Elements:**
 - Design the physical infrastructure (and associated level of service) based on a clear understanding of (a) the role vendor competition plays in protecting consumers and (b) the financial constraints that will affect long-term system sustainability;
 - Decide beforehand whether the goal is to create a temporary relief system or to address emergency relief needs while also laying the groundwork for more permanent installations; and
 - Try to incorporate consumer water storage into system designs.
3. **Program Design Elements:**
 - Design peri-urban water supply programs to include formal, enforceable rules that guarantee consumers reliable access to the water supply;
 - Identify and take advantage of existing informal and formal water supply and distribution arrangements. Selectively discourage and encourage participation in development activities by using incentives (for instance, through assignment of tariffs, inclusion in training programs, etc.); and
 - Carefully allocate responsibility for critical tasks, and then ensure that proactive training and support programs are available to strengthen local capabilities.
4. **Environmental and Health Issues:**
 - Before designing a system, first evaluate the environmental impacts of program implementation and then promote specific training and education programs that relate to findings; and
 - Include health and hygiene programs in project designs.

The governments and donors should resist target driven "supply" projects and should concentrate on creating demand and market mechanisms to serve this demand (Boydell and Quarry 1990). The priorities of peri-urban dwellers should be clarified before the actual implementation phase (Tables 5.18 and 5.19).

Table 5.18 First priorities for improvement of low-income residential communities in six Asian cities (Angel 1983).

Type of low-income settlement	Bombay	Colombo	Dacca	Jakarta	Manila	Taipei
Squatter settlements	toilet facilities	water supply	water supply	road&walkways	water supply	road&walkways
Slums on rented or free land	toilet facilities	water supply	water supply	road&walkways	water supply	road&walkways
Private housing (both owned and rented) in low-income use	water supply	electricity	sewage& garbage collection	road&walkways	water supply	road&walkways
Peripheral commuter villages and towns	transport facilities	water supply	sewage& garbage collection	road&walkways	water supply	playgrounds
Employees' housing (on-and off-site)	water supply	electricity	water supply	sewage& garbage collection	—	road&walkways
Publicly constructed houses and flats	water supply	water supply	sewage& garbage collection	water supply	sewerage facilities	garbage collection
Government assisted squatter and private housing schemes	water supply	water supply	sewage& garbage collection	electricity	water supply	road&walkways

Table 5.19 Proposals in order of priority as selected by all six committees* of Kebele 29, Addis Ababa, Ethiopia in 1986 (Harpman et al 1988).

Priority	Score
(1) Improvement of housing	120
(2) Building latrines	120
(3) Improved supply of drinking water	83
(4) Improvement of feeder roads	72
(5) Flood protection	71
(6) Relief assistance for the poor and destitute	67
(7) Kebele office building	56
(8) Kindergarten	50
(9) Improved drainage	44
(10) Kebele meeting hall improvements	42
(11) New co-operative shop	42
(12) Income generating projects	34
(13) Clinic	25
(14) Recreation centre	24
(15) New grinding mill (for corn)	19
(16) Study room for poor students	8
(17) Street lighting	7
(18) Community shower	3

* Six Committees — executive, health, development, social, women, and youth.

The provision of physical facilities and extension of basic services (Table 5.20) will not alone improve environment and community health, but it is normally a prerequisite, if living conditions in crowded peri-urban areas are to be upgraded. Figure 5.20 shows a holistic approach applied in Addis Ababa, Ethiopia. In Santo Domingo, the Dominican Institute of Integral Development Inc. (Instituto Dominicano de Desarrollo Integral Inc.) has a four-part strategy of: community organization and social development; income generation; infrastructure construction; and health improvements (Luther 1993).

Low-income households can be induced to make investment decisions regarding services and housing by manipulating two factors (Campbell 1987): the variety of resources, both monetary and nonmonetary, and uncertainty. Before making investment decisions, households must be sure that investment will not be lost because of intermittent income, vagaries of health, natural catastrophes, or eviction. Also the cost in terms of personal time and effort must be appropriate to the household's budget and organization.

Table 5.20 Infrastructure components in selected slum improvement programmes and projects (Angel 1983).

Project/programme	Infrastructure component						
	water supply	roads& walkways	drainage	electricity	human waste disposal	solid waste disposal	fire protection
1. Slum Upgrading Programme, Bangkok	•	•	•	•		•	•
2. Environmental Improvement of Slum Areas, India	•	•	•	•	•		
3. Kampung Improvement Programme, Jakarta and Surabaya, Indonesia	•	•	•		•	•	
4. Slum Improvement and Resettlement Programme, Philippines	•	•	•	•			
5. Squatter Upgrading Project, Kingston, Jamaica	•	•	•	•			
6. Squatter Upgrading Project, Dar es Salaam, Tanzania	•	•	•	•			
7. Migrant Settlements Improvement Programme, Papua New Guinea	•	•	•		•		
8. Squatter Settlements Upgrading, Rangoon, Burma	•	•	•		•		
9. Improvement of Substandard Urban Areas, Karachi, Pakistan	•		•			•	•
10. Squatter Upgrading Project, Lusaka, Zambia	•	•		•			

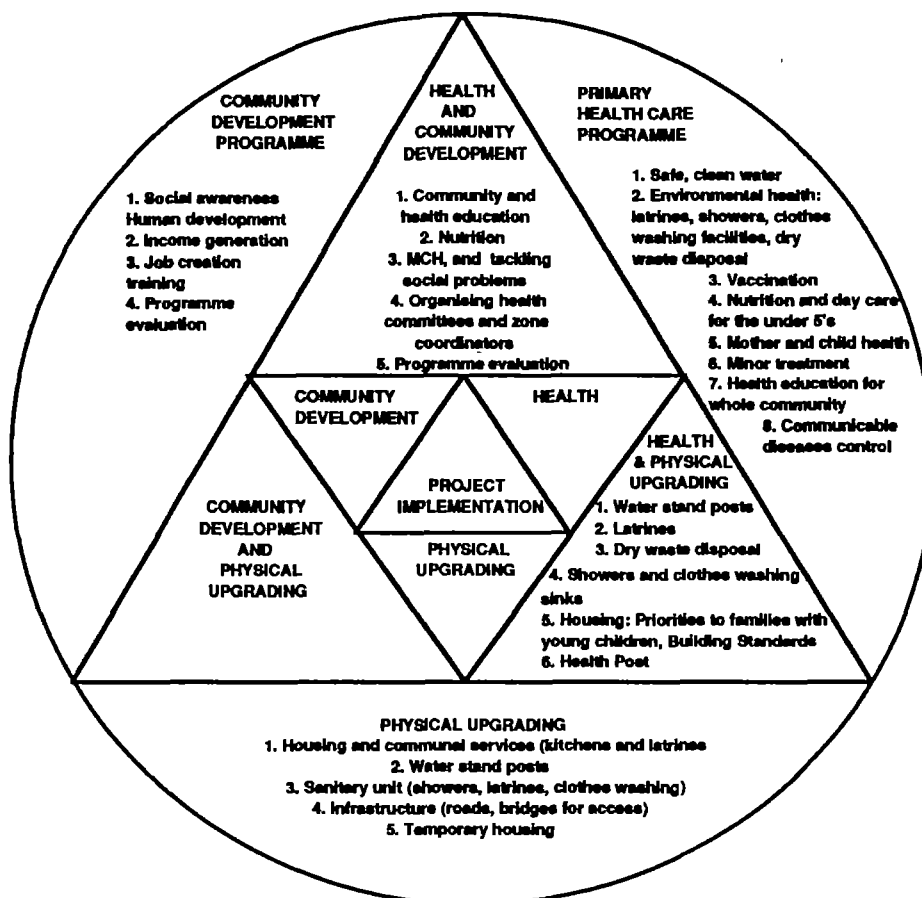


Figure 5.20 Holistic approach in community health in Kebele 41, Addis Ababa, Ethiopia (Harpman et al 1988).

An affordable approach for the would-be squatters in Tanzania was to provide land in surveyed plots (Mghweno 1984). This offers inexpensive plots in planned environment before squatting occurs. The layouts are designed for the same standard as serviced sites, but no services, except installation of water supply through standpipes, are provided before the housing construction. However, during the programme span (1974-80) the squatter population had increased by between 750 000 and 900 000 persons compared with the estimated figure of 470 000 people as project beneficiaries.

The basic concepts for planning of sites and services infrastructure are the following (Kirke 1984):

- (a) The opportunity cost of developable urban land is often the largest single element of project costs. Thus a small percentage reduction in land retained for non-revenue-earning public use (especially circulation space) will represent a far greater cost saving than any which may result from decreases in infrastructure costs, or even from reductions in standards and improved network design;
- (b) The major savings in the physical costs of infrastructure and utility provision will be made by reducing network lengths to a minimum. This is a function of site planning and layout; and
- (c) The actual on-site cost of any individual infrastructure item, once an optimum layout plan has been developed, will depend primarily on the level of service to be provided and the ability of the engineer to develop the most cost-effective physical design solution to provide the required service.

The following ways were recommended by McKitterick (1987) to reduce subsidies and make sites-and-services projects work:

- To reduce project standards. The actual housing patterns can be determined from local housing surveys or from a forecasting model that the researchers developed (Mayo and Gross 1987). Use of either method should bring sites and services down to more affordable levels.
- To revise pricing policies so that they reflect true project costs. The costs of land, infrastructure, administration, building materials, and such recurring expenses as utilities should be computed at their market values and charges set accordingly.
- To design a bundle of shelter and services that might induce households to increase their monthly housing expenditures. For example, a package that reflects household preferences for plot size and location, structure quality and access to community services might be more highly valued by households than their current housing. Long-term financing and secure tenure may also persuade households to pay more.

In site and services programme in Tamil Nadu, India, a radial layout pattern has been applied, where the sanitary core units of a group of plots are arranged around a central point (Ramamurthy 1990). This reduces the length of utility network, and still provides good accessibility to each plot. In upgrading schemes the land value as an influencing factor on infrastructure and utility design is less appropriate than in sites and services projects. The major infrastructural engineering task is to identify those improvements to basic services which are affordable to the existing inhabitants, technically and politically feasible to implement, and which are meeting the perceived immediate needs of the inhabitants (Kirke 1984).

The case studies in Cairo, Egypt, and in Manila, in Iloilo and in Bacolod, Philippines, indicate that urban water projects often have a spiralling pattern of investment in providing water to middle income groups and central city areas (Kirke and Arthur 1984):

1. Piped water supply increases;
2. Piped sewerage required when cesspools fail;
3. Households become accustomed to in-house water and install baths, showers and multiple taps, consumption rises;
4. Main pressure drops and householders complain;
5. Further investment is demanded;

6. Sewers become overloaded and further major investment is needed to cope with the increased volume of waste water.

Kirke and Arthur (1984) point out:

"Unless tariffs are carefully monitored and regularly increased such spiralling costs can only lead to increased inequality of service to the urban poor and oversupply to the more wealthy. There will be high losses within the system and widespread wastage with increasingly inappropriate and high cost levels of demand assumed in the design of new projects. Therefore the minimum service of the low-income areas should be guaranteed before the expressed demand of upper- and middle-income areas."

In 1988-89, the Nairobi City Council (NCC) and UNICEF agreed to undertake a water supply reticulation project in Kibera where NCC was to finance water pipes of 100 mm diameter, and above, and UNICEF was to finance pipes of 75 mm and below. Water was to be provided through kiosks to women groups. The immediate objectives of the project was to make water abundant and cheaper. Unfortunately the project had to be stopped as there is currently a water shortage in Nairobi. Yet, the Water and Sewerage Department in Nairobi, Kenya, although being very positive towards the need of water in the slum and squatter settlements, does not include the population of Informal settlements in estimates for future water requirements and in developing plans for increasing water supply to Nairobi (Macharia 1992).

In periurban areas supplied mainly by vendors or others that charge for water delivered on regular basis, a study of the existing market will give viable information for planning an improved system (Lauria 1990). Lauria examined household size, sources used, quantities water consumed, prices of water, household expenditures on water, convenience, quality and availability of water. Households were also asked whether they would be willing to pay a connection fee and their opinion of whether government should pay part of the construction cost. Based on the findings Lauria recommended the following:

- A. **Level of Service:** Most households had water available at the door, and therefore yard taps were more appropriate than public standposts considering the recapturing of the expenditures;
- B. **Reliability:** Water from vendors was usually available when consumers needed, and thus the water authority would need to provide a reliable improved system to capture revenues. If the authority cannot compete with the existing service, it should not even try;
- C. **Water Rates:** The consumers purchased water from vendors on the basis of the measured quantity, the adjacent Guatemala City was metered and the water authority had the institutional capacity to manage the metered system. Therefore the billing based on the meters would be appropriate;
- D. **Water Price:** A national system of water prices would have to be changed, if financial self-sufficiency in Tierra Nueva should have been achieved. The site-specific water price should perhaps be lower in the rainy season to be competitive with the existing sources. In the dry season the average cost was USD 2.00/m³ and in the rainy season USD 1.00/m³;
- E. **Method of Payment:** Because the households were paying for water on a continuous basis, the introduction of monthly or quarterly billing would not probably favour the financial self-sufficiency. The system closer to the present one would be more appropriate to capture the revenue;
- F. **Connection Fee:** Households were not paying any initial or connection fees in the existing market, and half of them were not willing to connect if the fee were more than USD 50. The Guatemala City residential customers were charged USD 210 for a water right; and
- G. **Excess Capacity:** It was illustrated that with a design period of about five years financial self-sufficiency was achieved. To examine the optimal excess capacity in periurban water systems economies of scale in construction and operation, the opportunity cost of capital, the size of the existing population to be served and equity

and financial-self-sufficiency should be considered.

The results of a study done in a small town of Ukunda, Kenya (Whittington, Mu and Roche 1989) indicates that households consider the time spent collecting water as a significant economic cost. When the households value the time savings high, the service level offered by piped water distribution systems with private yard or house connections may be an economically attractive technology. Therefore yard tap service for low-income communities should be highly attractive as an intermediate initial service (Hebert 1984). Also health benefits are significant especially with house connections (Bhattacharya 1982). There is relatively small difference in cost between this service and service by public faucets, despite the large difference in convenience. However, computing human costs associated with public standpipes—water haulage, queuing at the taps, contamination of the treated water, and general inconvenience—is a difficulty yet to be resolved adequately (Ridgley 1986).

Hebert (1984) recommends that water use should be kept below 100 lcd to keep investment costs and water charges low. Higher water consumptions also require large investments in sanitation to dispose wastewater. Therefore house connections with considerably higher than 100 lcd water consumptions may not be feasible for low-income communities, if the aim is to provide services that are affordable and self-sustaining.

Friedlander (1990b) reports on the water supply development of the marginal communities Honduran capital, Tegucigalpa as follows:

"The Honduran National Water and Sewerage Agency (SANAA), with the support of UNICEF, has been working with barrio settlements to construct non-conventional water supply systems. The first steps were taken in 1987 through the establishment of a special office within SANAA dedicated to working with the barrios on water problems. This section, called the Unit for Barrios Marginales (UEBM), was the first organisation in Central America to be set up as a permanent governmental section for such a purpose.

Since its inception, UEBM has developed a framework in collaboration with the marginal communities for the planning, construction, operation and maintenance of community water supply systems. UEBM now has 11 water projects under its belt, serving over 26 000 of the barrio population. The initiative for the construction of a system comes from community organisations such as the Patronato, an elected or government-appointed council. In response to such an application, the UEBM conducts a preliminary investigation to examine the feasibility of a system, which is devised largely as a self-help scheme. Once a barrio has been selected, UEBM representatives liaise with community leaders in organising a water committee, and conducting a socioeconomic survey. This forms the basis for subsequent planning.

The community is then responsible for all non-skilled labour involved in construction, the purchase of some materials, and the eventual operation and maintenance of the system after completion. UEBM designs the system, develops the source and supervises construction. UNICEF supplies water pipes, pumps and other construction materials. UEBM's design is based on three supply options:

- self-contained units supplied by boreholes;
- bulk supply from the main system through community-wide arrangements; and
- wholesale vending truck.

Funding from UNICEF has played a vital role in initiating projects, yet still only a small fraction of the barrio community has benefited. It has now become clear that for these efforts to continue a cost recovery system is vital. A revolving fund is now being set up which should enable a greater number of barrios to have access to a dependable water supply. The plan is to set tariffs which will cover operation and maintenance and recover SANAA and UNICEF costs in part or in full, depending on the resources of the community. These funds will then be ploughed back into further barrio schemes."

Local Water Utilities Administration (LWUA) is a government corporation responsible financing local water utilities outside of Metro Manila (Kinley 1990). LWUA feasibility studies for smaller population

centres showed that many proposed systems for poorer communities were not economically viable. LWUA engineers had to begin revising both system design standards and construction methods to make the new systems affordable. In cooperation with the Laguna Water District a pilot experiment in the community of Bay was chosen to test an unconventional water system. The combined use of cheaper local labour and reduced material expenses brought down the average cost of supplying a customer from USD 45 under the old system to just USD 25, nearly a 45 percent saving. Key features of the new low-cost system include:

- small diameter distribution pipes;
- lowering system pressure;
- eliminating emergency water storage;
- local labour teams are employed instead of conventional contractors.
- use of locally manufactured pipes, valves and fittings; and
- a mix of services is offered to each potential customer including house connections, yard taps and public faucets:
 - a) Direct connection to the house cost about USD 50 plus a monthly charge of USD 0.18 per 1 000 litres for the consumption of the first 10 000 litres of water. Beyond 10 000 litres per month, the unit charge rises, thus encouraging conservation;
 - b) Service through a yard tap has no connection fee and the same monthly rate as those with house connections; and
 - c) Service through public taps is less than half a US cent per 20 litre can, a small fraction of what they used to pay vendors.

After little more than three years, about 6 000 people getting water through 180 yard taps, over 700 house hook-ups and about six public taps.

Rivett-Carnac (1988) describes the planning and construction of a piped water supply in a peri-urban area of the Umqeni Valley near Durban in 1986. The community was involved from the initial stages and decision making at all stages of the process was done by close liaison between the project engineer and the local development committee. This resulted in a considerable saving in cost as compared to a conventional civil engineering contract. The laying of 13 km of pipeline supplying the population of 13 000 through 24 standpipes, and serving 8 schools was executed as follows:

- local labour was recruited and supervised by four local supervisors under the control of a site manager appointed by the project engineer;
- funding of the project was predominantly by World Vision;
- liaison with the development committee was co-ordinated by the Valley Trust;
- payment of construction costs and engineering fees was via the Treasurer of the Development Committee;
- all maintenance is undertaken by the Development Committee.

This labour intensive construction achieved three objectives: 1) unemployment relief; 2) community responsibility for the infrastructure; and 3) reduced costs. Operation of the water supply is on an economic basis, and users are charged by vending water coupons.

The most significant factor in infrastructure provision based on the life-cycle cost model is sanitation (Cotton and Franceys 1990). The study shows that considerable savings can be obtained by using on-plot sanitation on plot sizes 30 m² to 50 m². However, they recommend that the risks of environmental pollution regarding a high density of on-plot latrines should be investigated. They also identified the construction of a road-as-drain one of the reduced cost methods to improve drainage.

The study by Whittington, Lauria, Wright, Choe, Hughes and Swarna (1992a) highlights that a narrow focus on technological options for improved sanitation and financing of government subsidies is likely to overlook important relationships between the demand for improved sanitation and the demand for housing and capital. Sanitation facilities should be conceived as just one part of

a package of services provided by an individual's housing. Policy reforms in the financial sector which permit the operation of more efficient capital markets could have a direct and important impact on sanitation demand. A focus on "demand-side" issues in sanitation planning thus means much more than simply determining households' willingness to pay for a limited range of technological options.

Whittington et al (1992b) suggests that sanitation planning should be undertaken with close coordination with housing policy planning. E.g., in Kumasi, Ghana, they concluded that if housing policy reforms were introduced to eliminate distortions in the market, it is not possible to forecast the impact of such changes on the demand for improved sanitation. Households might prefer to purchase more space rather than improved sanitation facilities. Pickford (1990) points out that good low-cost sanitation is available with one of the improved types of pit latrine:

- Ventilated improved pit (VIP) latrines, generally most suitable for those who use paper and other solid material for anal cleaning. Vent-pipes remove smells and detract flies from escaping into the latrine building, which must be kept fairly dark;
- Pour-flush latrines with a water seal to prevent smells and flies from reaching the latrine from the pit—most suitable for those who clean themselves with water; and
- The lowest-cost simple pits with tight-fitting covers to put in the squat hole when the latrine is not in use—often with a cheap screen around it instead of the roofed hut necessary with VIP latrines.

"Many people think that pit latrines are only suitable for rural use. But in recent years millions have built in towns and cities and they can be entirely satisfactory. Urban pits are not a new idea. For example, in Dar es Salaam they are the traditional form of sanitation everywhere except in the very limited sewered districts. Some large, lined pits have been in use for more than forty years. Looking to the future it is reasonable to hope that the prejudice against urban pit latrines will diminish, and that the provision of improved versions of pit latrines will extend better sanitation and improved health to the tens of millions of families without adequate sanitation in the growing urban areas."

Aasen and Ocasio (1992) describe that despite the overwhelming need for adequate human excreta disposal, families usually assign a lower priority for their scarce resources to latrine building than to other needs. In Honduras, for example, while access to credit has been available to residents in a number of low-income *barrios* for all kinds of housing improvements, there has not been strong interest in borrowing money to build latrines. Many people believe pit latrines will smell, be unsafe to use, or will not last very long. Pit latrines are often inappropriate in densely populated urban areas with rocky soil or where the water table is high. Most people have taken out loans to make other kinds of improvements instead, such as home expansion, putting in cement floors, or installing a new roof.

The pour-flush latrine, a design which originated in India in the 1950s, was considered the best solution for India's nearly 300 million dwellers, whose numbers are growing four percent a year. The cost of a standard double-pit latrine is about USD 100 including installation. The Ministry of Urban Development's Housing and Urban Development Corporation (HUDCO) provides credit to the states, which finance up to half the cost of constructing a latrine through the municipalities. Low-income families pay half of the cost of latrine construction. They have to make five percent down payment, and pay 95 percent over 12 years with the help of an easy loan from HUDCO. Higher-income families can have loans from HUDCO only at commercial rates. The poorest of the poor, who are unable to pay USD 50 for a latrine, can use shower and pour-flush toilet complexes built by Sulabh International, India's largest non-governmental organization. Sulabh International was originally called Sulabh Shauchalaya, which means "cheap and easy toilet" in Hindi. Sulabh builds a complex on government-donated land, employs local residents, many of the former waste scavengers, as caretakers and cleaners. Male users pay USD 0.01, which is enough to cover costs. Women and children pay nothing. Sulabh has built more than 2000 of these complexes, which serve up to two million people a day. The biggest complex in Delhi is visited by 10 000 people a day and makes a profit which subsidizes unprofitable complexes (Robson 1990a).

Sewerage is often considered inappropriate for use in low-income communities because of the costs involved (Tayler 1990). However, on-site sanitation systems may not be feasible, e.g due to

the high population density like in Kibera, Nairobi (Macharia 1992). Technically the solution to the sanitation of Kibera is conventional sewerage, but the low affordability is not favouring this option. Hence other forms of waterborne sanitation systems must be considered. These are either smallbore sewerage or shallow sewers.

The high costs are often the result of the use of inappropriate construction standards. Tayler (1990) recommends that to reduce the costs sewers should be laid to shallow depths where there is no heavy vehicular traffic. The other lesson in introduction appropriate sewerage in Peshawar and Lahore, Pakistan, was that local people must be involved and on-plot improvements must form part of the work. Vines and Reed (1990) describe an alternative system adopted in the state of Rio Grande do Norte in Brazil:

- each drainage basin or small population centre has its own treatment plant; and
- pumping is eliminated and sewer lengths per household served are reduced.

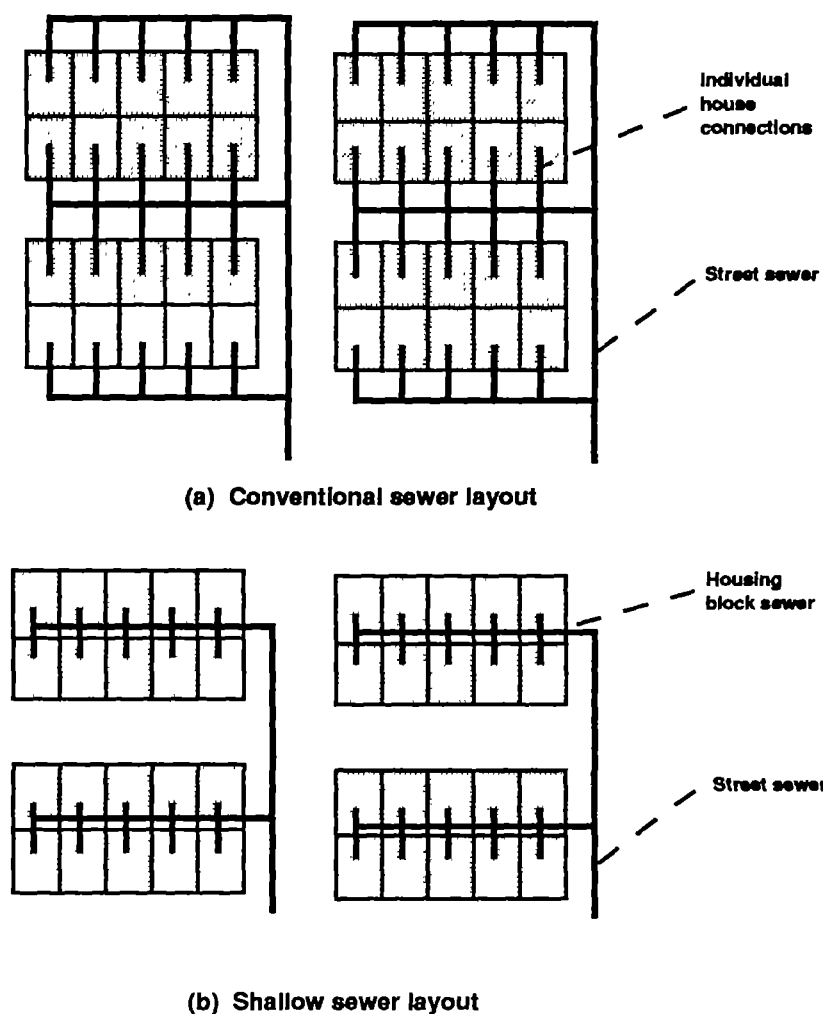


Figure 5.21 Schematic layout of conventional and shallow sewer-systems (UNCHS 1986c).

This unconventional sewerage has mainly been implemented by the state water companies. The implementation policy of the water company of the state of Rio Grande do Norte, the Companhia Estadual de Aguas e Esgotos do Rio Grande do Norte (CAERN) is based upon meetings with the community organized at housing block level. The company prefers to work through the relevant locally elected municipal authorities, which it considers to be the most appropriate body for the conduct of community mobilization:

- construction priorities are set according to the degree of enthusiasm shown by residents

- and municipalities in various districts;
- the residents are responsible for constructing and maintaining all sewers on private property;
- CAERN has produced leaflets showing how to connect plumbing appliances to the sewer and how to clear blockages and carry out simple pipe repairs;
- the municipality assists the residents with materials;
- CAERN designs and supervises the building of these sewers; and
- CAERN is responsible for designing, constructing and operating all other parts of the sewer network plus the treatment facilities.

Wiseman (1988) reports on a pilot project low-cost shallow sewer system based on community participation:

- the system is like a condominium or apartment block laid flat;
- within the condominium the sewer connections are collectively, but privately owned;
- public sewers are fed from each block of houses and run beneath the main sidewalks.

The following examples are given by Sakurai (1986) on pilot projects for the improvement of solid waste management in urban fringe areas of large Latin American cities:

- (i) Residents bring down their refuse to the communal containers placed at the foot of hills (Tijuana, Mexico);
- (ii) Garbage is composted in the backyard and utilized afterwards in family gardens, reusable items are salvaged and bartered for fruits, and the rest are collected once a week by private haulers contracted directly by beneficiaries (Lima, Peru);
- (iii) On steep hill sides, the refuse is carried down on the collectors' backs in big cloth wrappers (Valparaiso, Chile);
- (iii) Refuse is brought down steep hills through open ducts placed on the slope (Rio de Janeiro, Brazil);
- (iv) Garbage and domestic waste water without synthetic detergents are introduced to anaerobic digesters producing methane gas for the kitchen, and the remaining refuse is brought down the steep hill by aerial cableway (Rio de Janeiro, Brazil); and
- (v) Refuse is collected by small agricultural tractors which can move in the steep urban fringe areas without pavements.

The Solid Waste Management Project in the Kathmandu Valley tries to improve waste management by organizing motivation campaigns to specific groups (Nicolaisen et al 1988):

- (a) Women;
- (b) Teachers;
- (c) Local motivators;
- (d) Ward Committees; and
- (e) Self-Help Groups.

5.2 Core vision of relevant peri-urban water and waste management infrastructure systems

Checkland's so-called root definitions will be replaced with the core visions (Figure 5.22) in the soft systems methodology applied for the futures research (Mannermaa 1991). The objective of the formulation of the core visions is to name some systems which look as though they might be relevant to the formulation of the future alternatives of the system defined and described at previous stages. The goal is to get a carefully phrased explicit core visions of what these future systems are—as opposed to what they do.

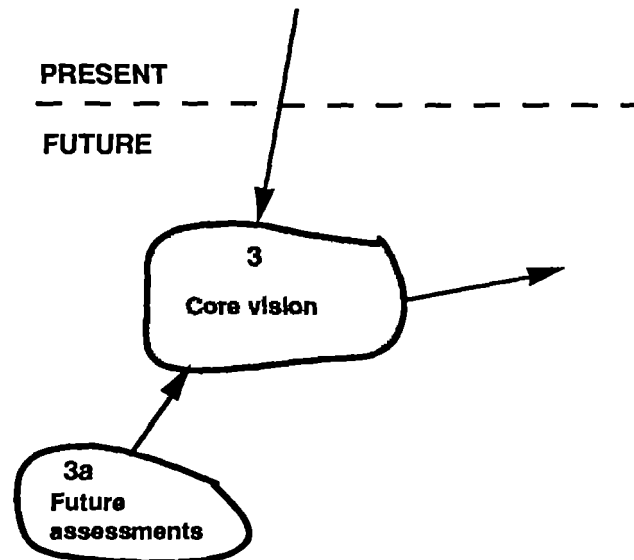


Figure 5.22 The methodology—stage 3: Core vision(s) of relevant systems

The core visions have the status of *the evolutionary hypotheses* concerning the formulation of the future through such changes which seem to lead to the possible and desirable or not desirable futures from the point of view of the systems target groups and analyst. The making of systemic future models and the comparison of the models with present realities will obviously offer a better understanding both of the present and the impending and impelling forces of the future (Mannermaa 1991). A core vision should be a concise description of a human activity system which captures a particular view of it. No core vision can ever provide a unique description of any actual manifestation of a human activity system. It will always be only one possibility out of a large number. A core vision will be a meaningful description of the relevant system according to a particular view of the world, or a world-image. There will be other feasible world-images, however, because human beings can always attach different meanings to the same social act (Checkland 1984).

The hypothesis based on intuition and experience was that an adequate core vision should contain five elements explicitly; if it does not, then omission of any of these elements should be conscious and for good reason. The five elements are as follows. The core of a core vision of a system will be a *transformation* process (T), the means by which defined inputs are transformed into defined outputs. The transformation will include the direct object of the main activity verbs subsequently required to describe the system. There will be *ownership* (O) of the system, some agency having a prime concern for the system and the ultimate power to cause the system to cease to exist. The owners can discourse *about* the system. Within the system itself will be *actors* (A), the agents who carry out or cause to be carried out the main activities of the system, especially its main transformation. Within and/or without the system will be what we call *customers* (C) of the system, beneficiaries or victims affected by the system's activities. "Customers" will be indirect objects of the main verbs used to describe the system. Fifthly, there will be *environmental constraints* (E) on the system, features of the system's environments and/or wider systems which it has to take as 'given'.

To these five elements Checkland adds a sixth item which by its nature is seldom explicit in a core vision but which cannot ever be excluded: there will be a world-image (*a Weltanschauung*, W), an outlook, framework or image, which makes this particular core vision meaningful. There will by definition be more than one possible W, of course; that has been argued to be the nature of human activity systems. But for the sake of coherent systems thinking, a separate core vision should be formulated for each W considered relevant, whether it is supplied by the analyst himself or expressed by people in the problem situation. These six elements covered in a well-formed core vision may be remembered by the mnemonic CATWOE.

The highly significant outcome of the research works evaluated was that 'ownership' and 'actors' were common omissions (Checkland 1984). A completely general core vision embodying CATWOE might take the following form:

A (. . . O . . .)-owned system, which, under the following environmental constraints, which it takes as given: (. . . E . . .), transforms this input (. . .) into this output (. . .) by means of the following major activities among others: (. . .), the transformation being carried out by these actors: (. . . A . . .) and directly affecting the following beneficiaries and/or victims (. . . C . . .). The world-image, which makes this transformation meaningful contains at least the following elements among others: (. . . W . . .).

The following **core vision** has been selected for the formulation of the future model:

The Utility is a professionally-manned system of providing universal access to water and waste management infrastructure, and of securing responsive, successful and efficient water and waste management service delivery to the customers. The system aims to integrate the concepts of accountability, and of total quality and empowerment, and follows the principles of continuous improvement and continual innovation. By this total quality management the system makes the best possible contribution to the economically, socially and environmentally sustainable development.

This system performs the basic **transformation process** (T) as follows:

The system takes in: financial resources; water and waste management technology; information on government's and/or owner's policies, strategies and action with respect to peri-urban infrastructure; information on the needs, preferences and expectations of different stakeholders; information on organization; information on the facilities and the environment including water resources; and information on innovative technology and management techniques.

The system uses these inputs, its acquired intellectual property and water and waste management infrastructure to generate—in co-operation with other relevant actors in related sectors (housing, public health etc.)—action concerning the provision of safe water and adequate waste management services to peri-urban areas which makes the best possible contribution directly to improve and sustain the environment in peri-urban areas, and indirectly to satisfy the fundamental human need of permanence (or subsistence) in the society at large. The system also generates information for the owner on the future development threats and possibilities of water and waste management infrastructure.

The actors (A) in the system are the professionals employed by the utility. The system's **direct beneficiaries or victims** (C) are the residents and the business (formal and informal) in peri-urban areas, and the utility as a whole. The system's other affected beneficiaries or victims are the residents and the business in the areas affected by the environmental impacts caused by peri-urban areas, the decision-makers including the professionals of the owner and the politicians, and the society at large.

The system's **owner (O)** is the government (local, regional or national) or other public agency. The utility can be managed either by a public or private institution. The main **environmental constraints (E)** which this system has to take as given are: underdevelopment; government's budgetary and administrative crisis; shortage of foreign exchange; weak revenue bases; the bias of discrimination against low-income families; absence of political will to change urbanization paradigm to peri-urbanization paradigm; the urban poor have limited access to credit; the national (regional or local) government's inappropriate policy on pricing of water and waste management services; the system's lack of financial self-sufficiency; inappropriate policies and legal framework regarding urban development; inadequate policies on peri-urban settlements and infrastructure; the system's limited power to influence government policies such as zoning and land tenure; some peri-urban areas often inaccessible; lack of penalties to prevent environmental pollution; lack of appropriate educational systems; lack of appropriate research&development systems; poorly conceived legal frameworks and accountability for public institutions; diminishing, polluted and poorly managed water resources.

The system acts in the **world (W)**, where the sustainable development and satisfying of the fundamental human needs of the world's poor are listed as priorities (e.g., World Commission on Environment and Development 1987, FINNIDA 1989). The environmental problems that damage the health and productivity of the largest number of people, especially the poor, require that the priority should be given to the one-third of the world's population that has inadequate sanitation and the 1 000 million without safe water (e.g., World Bank 1992a).

5.3 Making and testing future models for sustainable peri-urban water and waste management infrastructure systems

5.3.1 Building future models

The objective of the stage 4 (Figure 5.23)—building of future models—is to make a model of the activity system needed to achieve the transformation defined in the core vision. That definition describes what the systems *is*; the future model is an account of the activities, which the system must *do* in order to *be* the system named in the definition. (Mannermaa 1991).

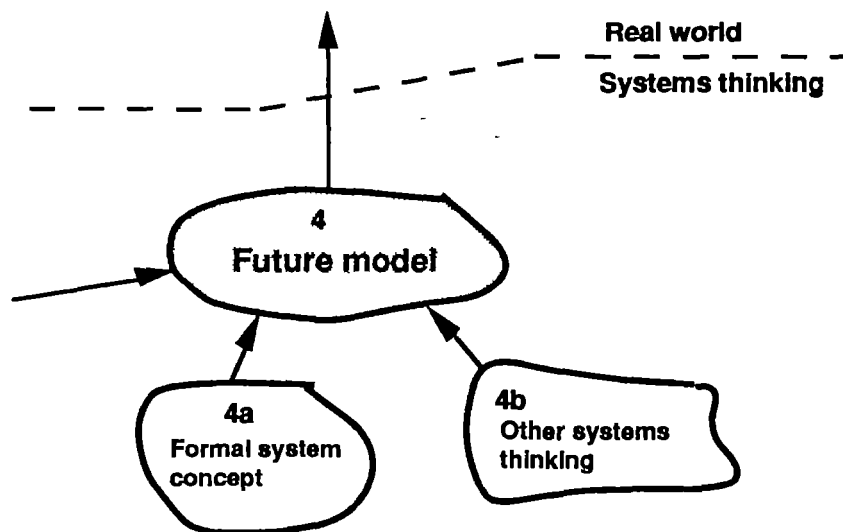


Figure 5.23 The methodology—stage 4: Building future model

Checkland gives two possible approaches to describe the concept of a whole which he chooses to regard as "a system". It may be described in terms of its "state" by describing the elements which comprise it, their current condition, their relationships with external elements, which affect the system, and the condition of those external elements (Checkland 1984).

Alternatively he provides a systems description by regarding a system as an entity, which receives some inputs and produces some outputs; the system itself *transforms* the inputs into the outputs. According to Checkland it seems the only feasible descriptive mode in the case of the human activity systems.

Any core vision may be looked at as a description of a set of purposeful human activities conceived as a transformation process. Therefore the future model of the activity system needed to achieve the transformation described in the core vision will be built in stage 4. The resulting future model is not a state description of any actual human activity system. It is in no sense a description of any part of the real world; it is the logical structured set of activities of the system, which is to be that defined in the core vision.

The step from core vision to future model is the most rigorous in the whole methodology, the nearest to being “technique”. Because the future model is a model of an *activity* system its elements will be *verbs*. The “technique” of modelling is to assemble the *minimum list* of verbs covering the activities, which are *necessary* in a system defined in the core vision, and to structure the verbs in a sequence according to logic—e.g., “define potential customers” would have to precede “locate potential customers”.

The model building is not quite “a technique”, in the sense that it would be a procedure, which properly applied will produce a guaranteed result—and the result would be the same, if the procedure would be repeated. There are always arguable issues about whether the model created by one person, a group or a research project is as adequate a representation of a core vision as another's. *Several different kind of future models can be derived from the common core vision* (Mannermaa 1991). Checkland (1984) summarizes the two laws of procedure which have emerged most clearly from action research:

- *The law of conceptualization* states that a system, which serves another cannot be defined and modelled until a definition and a model of the system served are available;
- *The law of model building* states that models of human activity systems must consist of structured sets of verbs specifying activities, which actors could directly carry out.

The basic structure of the future model for the Utility based on the core vision is shown in Figure 5.24. The system is divided into the three sub-systems—the Decision support system, the Management system, and the Performance audit and control system.

The basic task of the Decision support system is to provide and sustain the information required that the Utility is able to implement its defined mission and objectives. The Decision support system in the future model is shown in Figure 5.25.

The activities implemented by the Management system are based on the information produced by the Decision support and Performance audit and control systems. The Management system in the future model is shown in Figure 5.26.

The basic task of the Performance audit and control system is to secure that the Utility is functioning as planned, and the outputs are such that the needs and expectations of the customers are met or exceeded. The Performance audit and control system in the future model is shown in Figure 5.27.

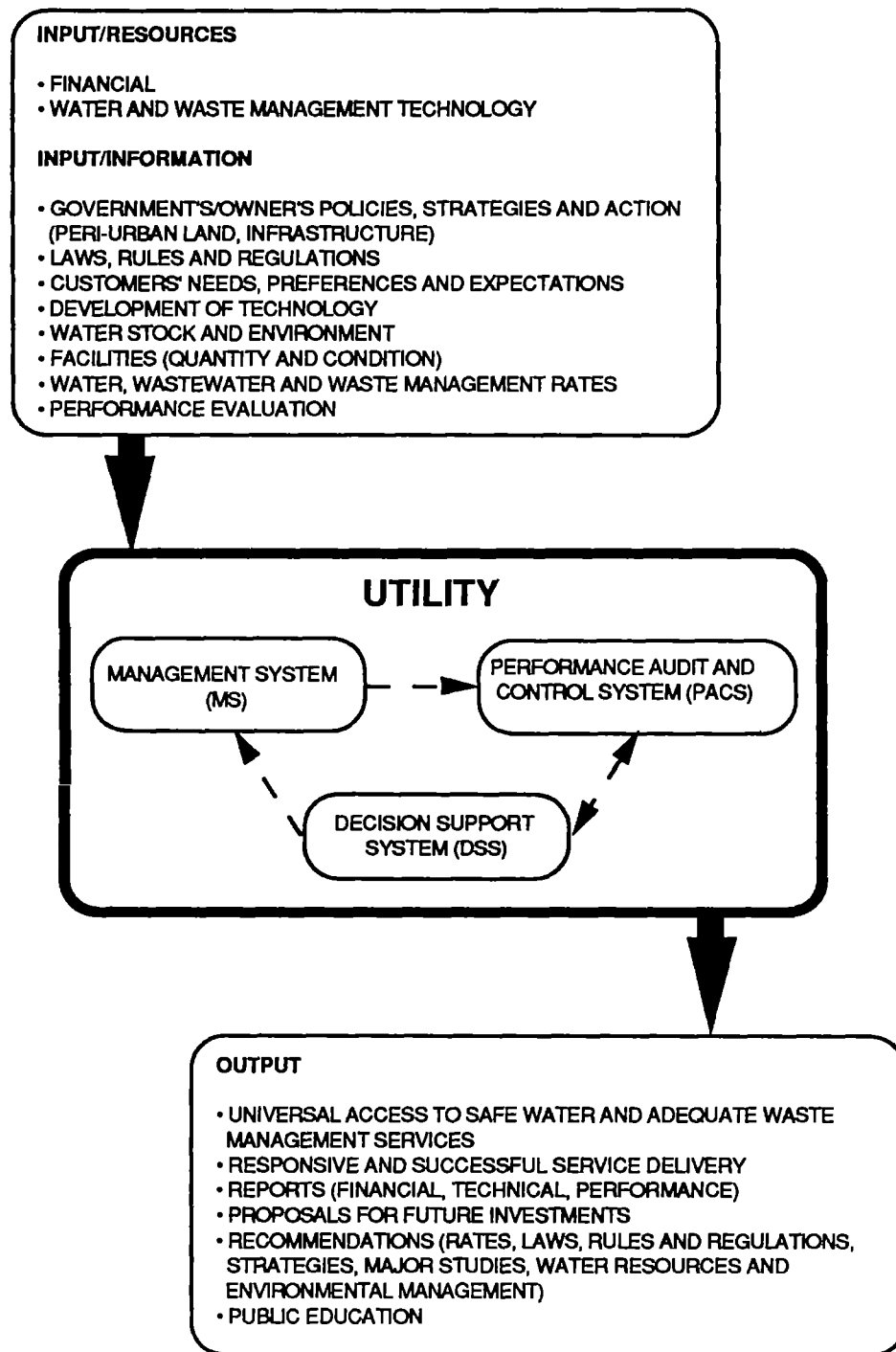


Figure 5.24 The future model of the Utility—the general structure.

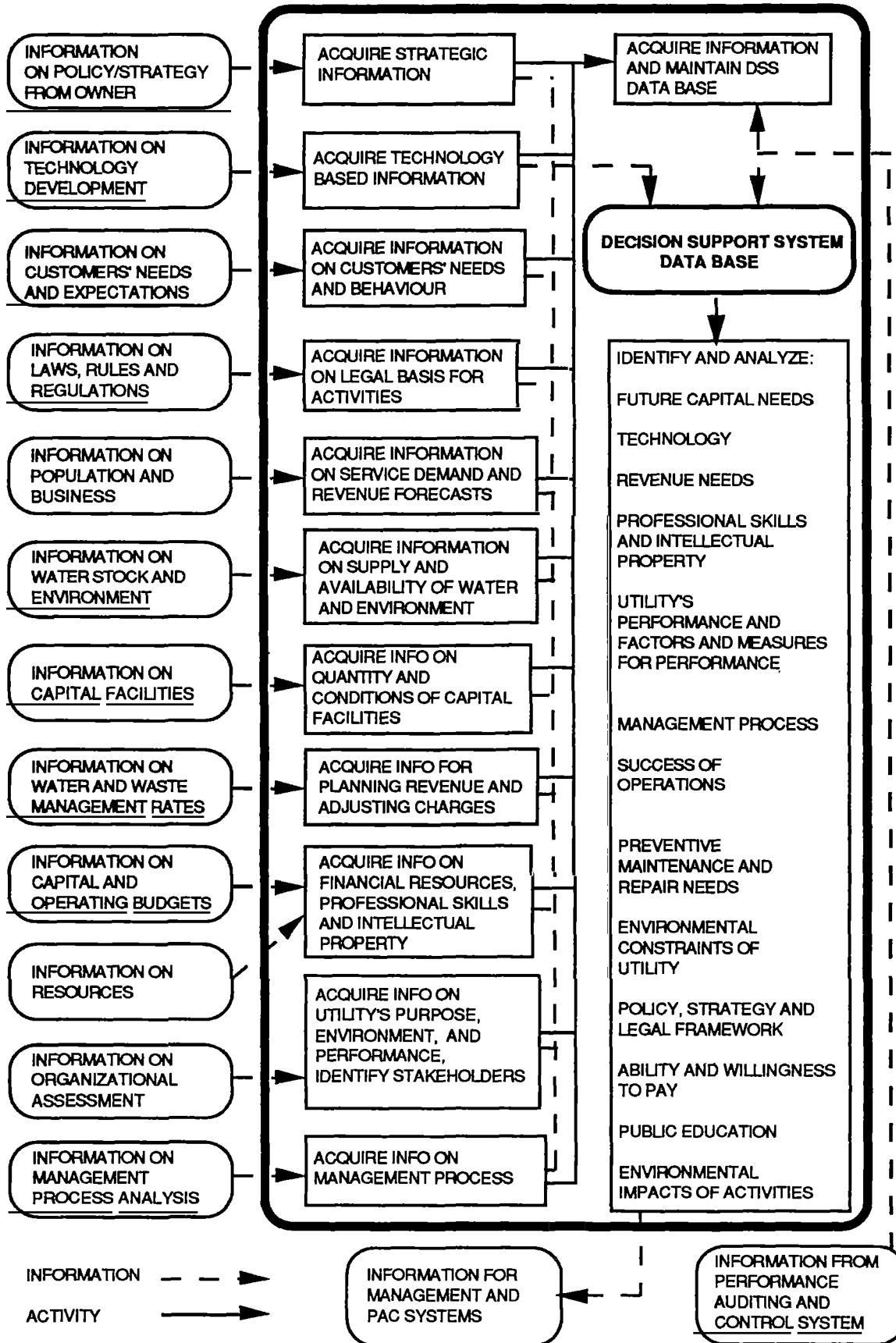


Figure 5.25 The Decision support system in the future model of the Utility.

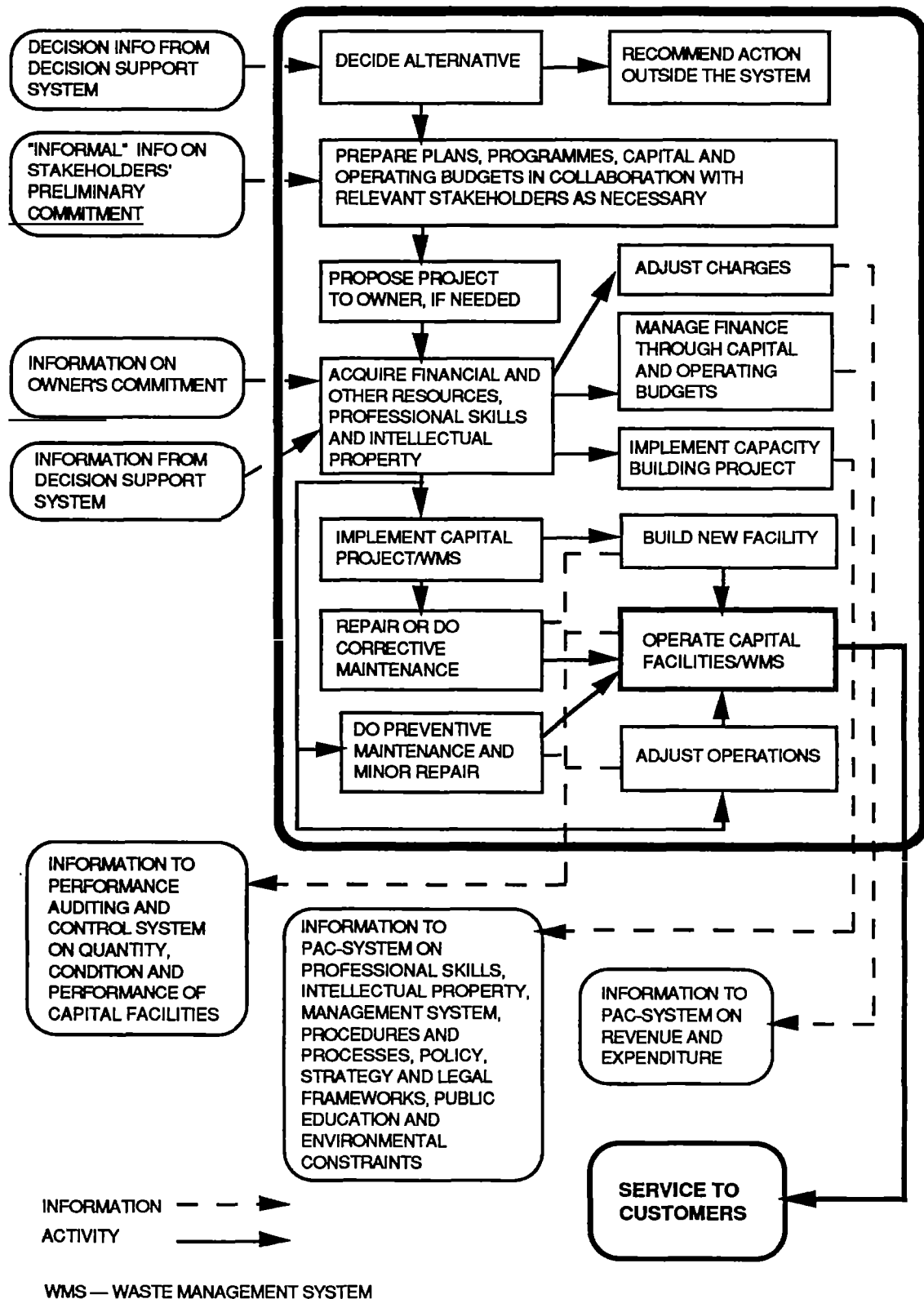


Figure 5.26 The Management system in the future model of the Utility.

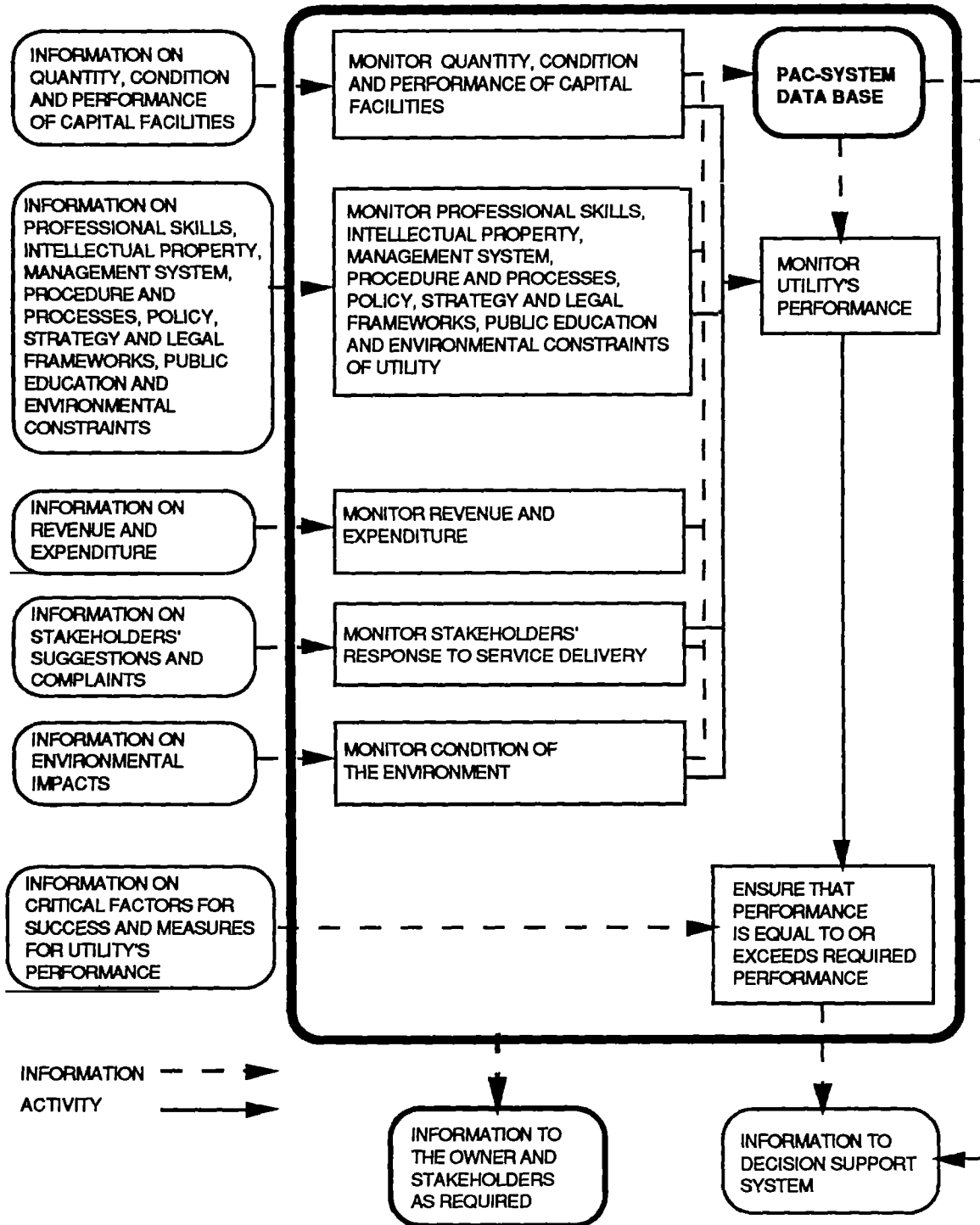


Figure 5.27 The Performance audit and control system in the future model of the Utility.

5.3.2 Formal system concept

The establishment of the validity of the future model based on the core vision cannot be done like e.g., in natural sciences by showing that the performance of the model on a computer simulates the observed performance in the nature. Therefore there are not valid future models and invalid ones, only defensible models and ones which are less defensible. However, it is possible to check that the future model is not fundamentally deficient, and this is done in stage 4a (Figure 5.28) by checking the model against a general model of any human activity system, which Checkland calls the "formal system" model.

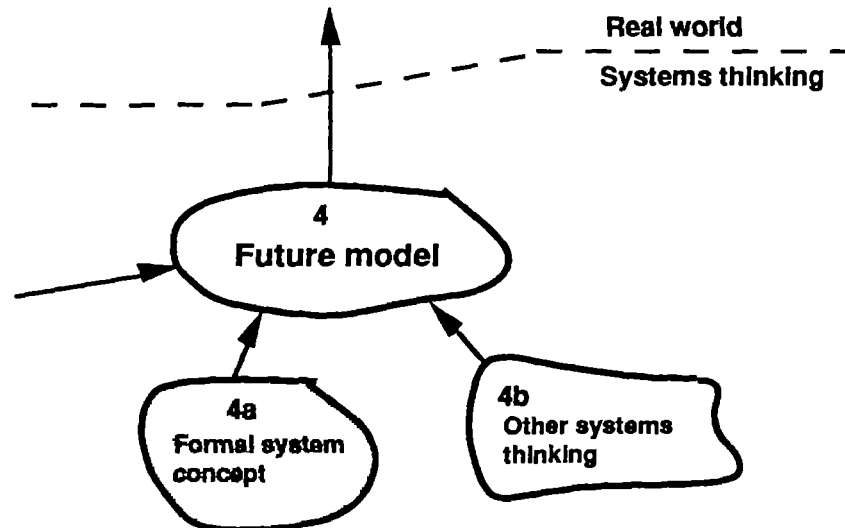


Figure 5.28 The methodology—stage 4a: Formal system concept

This model is not descriptive of actual real-world manifestations of human activity systems, still less prescriptive. It is a formal construct aimed at helping the building of future models, which are themselves formal. The formal system model is according to Checkland a compilation of “management” components, which have to be present, if a set of activities is to comprise a system capable of purposeful activity. The components of the model are as follows:

S is a “formal system”, if and only if:

- i) S has an on-going purpose or mission. In the case of a “soft” system this might be a continuing pursuit of something, which can never be finally achieved—something such as “maintaining relationships”. In harder systems this is what sharpens up into “objectives” or “goals” characterized by being achievable at a moment in time. It is meaningful to describe objectives as “not yet achieved”, “achieved”, “abandoned” or “changed”, but this is not so with the less precise “purpose” associated with soft systems;
- ii) S has a measure of performance. This is the measure which signals progress or regress in pursuing purposes or trying to achieve objectives;
- iii) S contains a decision-taking process—notionally “a decision taker”, as long as this is taken to be not a person but a role, which many people in a given system may occupy. Via the decision-taking process the system may take regulatory action in the light of (ii) and (i);
- iv) S has components, which are themselves systems having all the properties of S;
- v) S has components, which interact, which show a degree of connectivity (which may be physical, or may be flows of energy, materials, information, or influence) such that effects and actions can be transmitted through the system;
- vi) S exists in wider systems and/or environments, with which it interacts;
- vii) S has a boundary, separating it from (vi), which is formally defined by the area, within which the decision-taking process has power to cause action to be taken—as opposed to hopefully influencing the environment;
- viii) S has resources, physical and, through human participants, abstract, which are at the disposal of the decision-taking process.

Checkland gives to the formal systems one more component: ix) S has some guarantee of continuity, is not ephemeral, has “long-term stability”, will recover stability after some degree of disturbance. This might be helped from outside the system; it might derive internally from participants’ commitment to (i). However, according to Mannermaa (1991) societies (human activity systems) can be seen as dynamic, nonlinear systems, far from thermodynamic equilibrium, and consist of both stable and chaotic phases, the outcomes of which have a variety of possibilities for

different future development paths including even a collapse of the societal system. There are no guarantee for the continuation or for the long-term stability in the societal systems. Therefore the component (ix) has not been deemed appropriate and excluded, when the soft system methodology is applied to the evolutionary futures research.

The value of the formal system model is that it enables questions to be framed which, when asked of the future model, reveal inadequacies either in it or in the core vision that underlies it (Checkland 1984). Typical questions might be: "Is the measure of performance in this model explicit, and what would constitute "good" and "bad" performance according to it? What are the sub-systems in this model and are the influences on them of their environments taken into account in the activities of the system? Are the system boundaries well defined?"

The future model of the Utility can now be checked against the "formal system" model as follows:

1. The Utility has an on-going purpose or mission. It is to improve and sustain the environment in peri-urban areas, and to satisfy the fundamental human need of permanence (or subsistence) in the society.
2. The Utility has a measure of performance. It is defined in Figure 5.27 showing the Performance audit and control system. In practice, the water and waste management organizations should have various performance indicators, which have to be analyzed together in order to obtain the overall success of the system.
3. The Utility contains a decision-taking process. The Management system (Figure 5.26) includes a decision-taking process.
4. The Utility has components, which are the three subsystems having all the properties of the system.
5. The Utility has components, which interact and show the connectivity (e.g. flows of information, influence and resources) such that effects and actions can be transmitted through the system.
6. The Utility exists in wider systems (e.g., as a department in municipal administrative system) and/or environments (e.g., the governmental system).
7. The Utility has a defined area, within which the decision-taking process has power to cause action to be taken—as opposed to hopefully influencing the environment;
8. The Utility has physical resources, and theoretical and practical knowledge, which are at the disposal of the decision-taking process.

5.3.3 Other systems thinking

Although the use of the formal system model cannot ensure that future models are "valid", it can at least ensure that they are not so sloppily constructed as to be useless, when compared with real-world activities in stage 5 (Figure 5.30). Stage 4b (Figure 5.29) is the point, at which the future models may be inspected alongside any systems theory relevant to human activity systems.

E.g., Csányi's replicative model (Csányi 1989, Mannermaa 1991, Pantzar 1991) can be used according to Mannermaa (1991) in order to obtain further reassurance that the future models are, as Checkland (1984) points out, if not strictly "valid", at least defensible. Pantzar (1991) argues that replication in the business organization context refers to tendency of the everyday business practice and related structures to maintain (replicate) themselves. Participating people, cultural determinants, networks of agents, artifacts in transformation process and the spatial and temporal structural conditions of business are continuously renewed. The Utility as a system is divided into sub-systems, i.e. functional components, and it participates in higher level systems, e.g. the municipal public works department. The temporal replication of behavioural routines or activities within the sub-systems, e.g. monitoring of performance in PAC-system, means the continuous repeats of these practices.

Pantzar (1991) regards the perseverance in producing the output as the most characteristic feature of the business organization. The Utility is a replicative process since its output is, e.g. safe drinking water on sustained basis. The well-performing Utility with its well-functioning sub-systems may be also taken as building blocks to higher systems. At first, e.g. to the municipality public works, which in turn emerge as a result of the organizing process. In a hierarchic system this can support the

urban system, which can thus emerge. As a result of this organizing process, urban systems of interdependence may emerge. This may open up and support sustainable development paths for national economies. Therefore the model can be considered valid (see also : Chapter 5.1.1).

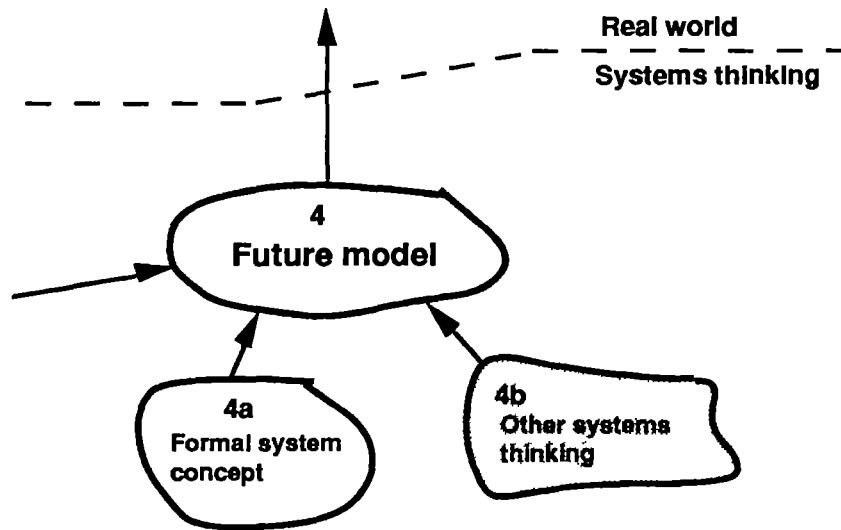


Figure 5.29 The methodology—stage 4b: Other systems thinking.

6 DISCUSSION

6.1 Comparing future model with reality

According to Checkland (1984) it is a matter of judgment as to when to stop model building and move on to a real-world comparison between what exists there and what is in, or is suggested by, the models of systems thought to be relevant to the problem. He suggests that it is better to move fairly quickly to this stage, even if models subsequently have to be refined. The objective of the comparison between the future model and the real-world situation (Stage 5, Figure 5.30) is to generate a debate with concerned participants about possible changes which might be introduced in order to alleviate the problem situation. The comparison embodies the basic systems hypothesis that systems concepts provide a means of teasing out the complexities of "reality".

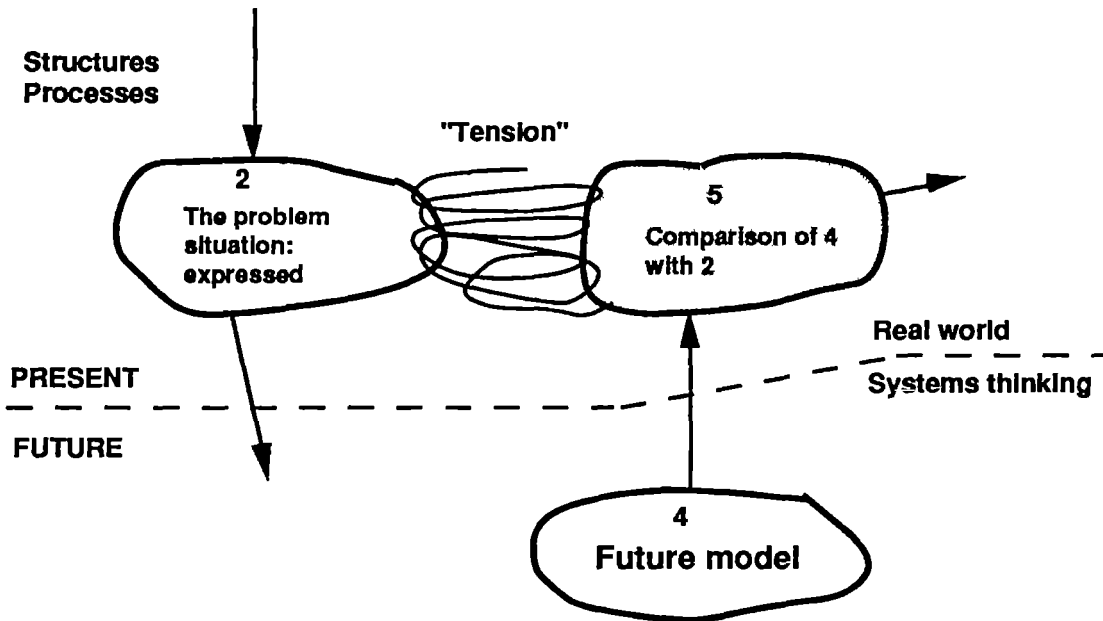


Figure 5.30 Stage 5: Comparison of future model with reality.

The comparison subsequently creates "tension" between the participants. There will be most obviously "resistance" to proposed changes in some parts of the system. There will be easily asked some fundamental questions like: "What are the real needs of our people and organization?" or "What kind of business are we actually running?" The further into the future the model tries to penetrate the greater the emerging possibilities and consequently the resistance to changes are (Mannermaa 1991). There are different ways of carrying out the comparison, and Mannermaa has identified three of them:

1. The first method is using the models as a base for *ordered questioning* in the problem situation, when it is obvious that the differences between the model and the reality are considerable. The objective is to use the systems models as a source of questions to ask of the existing situation in order to open up debate about change.
2. The second method is used, when the conceptualization stage of the future model raises major strategic questions about present activities such as: "Why do this at all?" rather than: "Is this done well?". In such cases, it is usually appropriate to make the comparison of stage 5 a general one, asking what features of the future model is especially different from present reality and why.
3. The third method is to make various core visions and the future models based on them. In such cases, the different kind of scenarios are used to assess the future before the formulation of the core visions.

All three methods help ensure that the comparison stage is conscious, coherent, and defensible. In any particular study it may be useful to adopt any one of them or to carry out several comparisons using different methods.

When a new human activity system is being designed the comparison is not in principle different from that described above, although the comparison cannot be with what exists, only with some defined *expectation*. It is likely in such cases that the comparison, though it might reveal some basic omissions, will be less fruitful than attempted implementation, which will quickly reveal design inadequacy. Hence, in such cases, trial and error are the wisest approach (Checkland 1984).

Since the comparison of the future model of the Utility with the real-world situation will be done at a very general level (see also: Chapter 4.2.1) and not with any existing organization, the conclusions also can be made at the general level. The real-world organizations can hopefully make the comparison with respect to their own problem situation. The following remarks, however, can be done:

1. The model assumes that in order to carry out all the tasks related to the activities successfully as defined the Utility has appropriate number of skilled professionals. Yet, in the real-world there is lack of qualified service-oriented professionals, especially at the top management level (see, e.g. Todaro 1989).
2. The model states that the Utility is a customer-oriented organization, but in the real-world the administrative approach would be dominant. Thus the Utility would not likely be accountable to customers (see, e.g. Rietveld et al 1991, Ostrom et al 1993).

The following remarks be done with respect to the environmental constraints:

1. In order to achieve universal access to safe water and adequate waste management services, there should be enough capital for investments. This is, however, one of the main environmental constraints in the real-world (see, e.g. Solo et al 1993, WHO and UNICEF 1992).
2. One of the environmental constraint is that the Utility is not a financially self-sufficient body. Thus the sustainable service provision is not achieved, if the owner or the other relevant stakeholders (the government, the parliament) are not supporting the concept of full cost recovery. The inadequate cost recovery is a key constraint in the real-world (see, e.g. Katko 1991, WHO and UNICEF 1992).

The other main environmental constraints which the Utility has to take as given are the following (Chapter 5.2):

- underdevelopment;
- the bias of discrimination against low-income families;
- absence of political will to change urbanization paradigm to peri-urbanization paradigm;
- the urban poor have limited access to credit;
- inappropriate policies and legal framework regarding urban development (e.g. the definition of urban areas excludes the peri-urban dwellers from public services);
- inadequate policies on peri-urban settlements and infrastructure (e.g. development of urban infrastructure and services follows the pattern of land uses and ownership which excludes the peri-urban dwellers);
- the Utility's limited power to influence government policies such as zoning and land tenure;
- some peri-urban areas often inaccessible;
- lack of penalties to prevent environmental pollution;
- lack of appropriate educational systems;
- lack of appropriate research&development systems;
- poorly conceived legal frameworks and accountability for public institutions;

- diminishing, polluted and poorly managed water resources.

These environmental constraints affects the capability and capacity of the Utility to serve the peri-urban areas successfully.

6.2 Planning and implementing development programme

The following issues must considered with respect to peri-urban water and waste management infrastructure:

- high levels of natural increase of urban population means that municipal governments have to cope with the increasing numbers of urban dwellers regardless of policies to affect rural migration;
- because of diversity between nations and urban localities an understanding of urban issues has to be based on detailed national, regional, and local studies;
- there are hundreds of relatively small urban localities having serious environmental problems even though populations have not grown rapidly;
- peri-urbanization process is reality for 50 to 80 percent of most cities in developing countries;
- the low-income majority receives little or no benefit from municipal government investments on urban infrastructure; and
- shanty town, slum, squatter and street dwellers are contributing to urban economies especially through informal sector.

The comparison of the future model of the Utility with the real-world situation is done at a general level, and therefore the following ideas regarding planning and implementation of the development programme are given to those organizations who wish to carry out the comparison and the planning and development programme stage in the real-world. The purpose of the comparison stage (5) is to generate debate about possible changes which might be made within the perceived problem situation. According to Checkland (1984) changes of three kinds are possible: changes in structure, in procedures and in "attitudes":

- i) *Structural changes* are changes made to those parts of reality which in the short term, in the on-going run of things, do not change. Structural changes may be to organisational groupings, reporting structures, or structures of functional responsibility.
- ii) *Procedural changes* are changes to the dynamic elements: the processes of reporting and informing, verbally or on paper, all the activities which go on within the (relatively) static structures.
- iii) *Changes in "attitude"* are changes to intended to include such things as, i.a. changes in influence, and changes in the expectations which people have of the behaviour appropriate to various roles, as well as changes in the readiness to rate certain kinds of behaviour "good" or "bad" relative to others. Such changes will occur steadily as a result of shared experiences lived through by people in human groups, and they will also be affected by deliberate changes made to structures and procedures.

Structural and procedural changes are easy to specify and relatively easy to implement, at least by those having authority or influence. Such changes may bring about other effects which were not anticipated, but at least the act of implementation itself is a definite one and can be designed. This is not the case of changes in attitudes. It is possible in principle deliberately to try to make this kind of changes, but it may be difficult in practice to achieve exactly the set objectives. Therefore it is essential continuously to *monitor* "attitudes" if changes are to be made in problem situations so that concerned actors agree that "improvement" has been achieved.

The purpose of stage 6 (Figure 5.31) is to use the comparison between future models and "what is" to generate discussion of changes of any or all of the three kinds discussed above. The discussion should be with people in the problem situation who care about the perceived problem

and want to do something about it. The defined changes based on the debate have to meet two criteria. They must be arguably systemically *desirable* as a result of the insight gained from selection of core visions and future model building, and they must also be culturally *feasible* given the prevailing characteristics and history of the situation, the people in it, their shared experiences and their prejudices. Checkland (1984) points out that it is not easy to find changes, of whatever kind, which do meet both criteria.

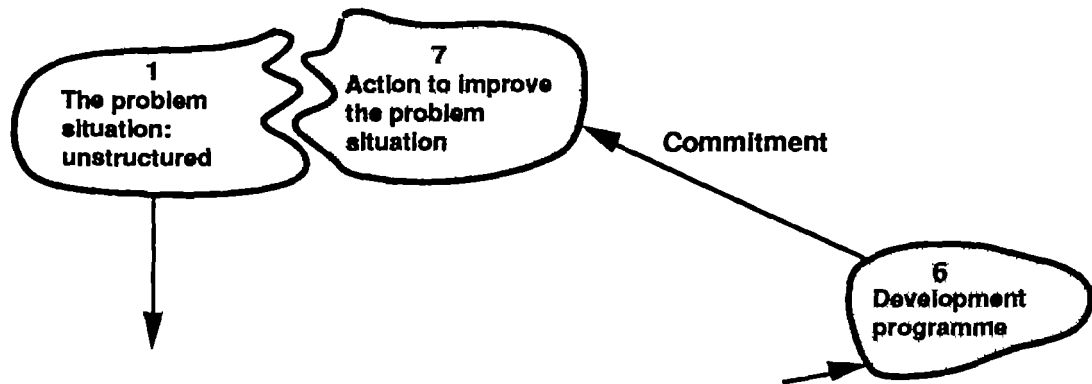


Figure 5.31 Stages 6 and 7: Planning and implementing development programme.

Stage 7 involves taking action based on stage 6 to improve the problem situation. Once changes have been agreed, the actual implementation process may be straightforward. However, it may change the situation so that although the "original problem" has been eliminated, new problems emerge. The activity of implementing changes may itself be problematic—and this new problem may also be tackled by means of the methodology. The methodology is not a once-and-for-all approach to "a problem" but merely a general way of carrying out purposeful activity using some formal systems thinking but does not require individual human beings to behave as if they were rational automata (Checkland 1984).

Mannermaa (1991) summarizes the elements of a "development programme" within the application of the soft systems methodology in the futures research as follows:

1. The definition of the desirable and feasible changes based on the systems analysis;
2. The operational objectives and priorities are set for the changes;
3. "Self survey". The sub-systems (e.g., of the company) will identify their situation, assess the changes and the implementation procedures;
4. Motivation (the need for social skills and ability to manage inter-relationships);
5. The steering group for co-ordination;
6. The commitment by all the participants to the changes; and
7. Action to change the reality.

6.3 Implications for development co-operation

It seems that in general, the current trend in the developing economies is to overinvest in the infrastructural facilities in the sense that they either deteriorate well before their life time or are not producing the planned services. Therefore the investments in this unsustainable development can be considered overinvestments. Yet, the number of those unserved has increased and will continue to grow in the future, i.e. there is the actual need to make sustainable investments in peri-urban water and waste management infrastructure. When the donors are thinking of making contributions to the development of peri-urban water and waste management infrastructure, they have to consider and define also the sustainability of the project. The World Bank considers a project sustainable, if it yields net benefits that exceeds the total costs (Ostrom et al 1993). This valid concept implies that the donors should undertake appropriate measures to carry out sufficient benefit cost analysis well before making the final commitment to support the project.

These analysis, however, cannot alone guarantee the sustainability. As pointed out earlier, the recent review of World Bank financed projects showed that the effective price charged for water is only 35 percent of the average cost of supplying it. Even if the water infrastructure have a potential to generate net benefits larger than the costs, this will be a strong implication that the long-term sustainability is endangered due to inadequate cost recovery.

There are also other reasons, why potentially sustainable infrastructure may be allowed to deteriorate before its planned life time. The institutional arrangements are found to be a major cause of ineffective and unsustainable water and waste management services. The cause of this is that incentives for the actors participating in the planning, finance, operational management, and use of facilities are rewarding or are not sanctioning them for making decisions leading to unsustainable infrastructure (see, e.g. Ostrom et al 1993). This implies that it will be an extremely difficult task to the donors to safeguard the provision of water and waste management services to the peri-urban beneficiaries without sufficient institutional arrangements. These arrangements include the improvement of economic efficiency, equity, accountability—responsiveness to customers' needs—and adaptability, i.e. flexibility in the changing environment.

This means consequently that capacity building is the most important element in the development of sustainable peri-urban water and waste management infrastructure. Capacity building is not only required in water sector but also in other sectors, e.g. responsible for urban development and land management, to create favourable policy and legal environment for successful water and waste management service delivery to peri-urban settlements. The international community has actually agreed the rapid extension of water supply and sanitation services in the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992. The "Earth Summit" formulated Agenda 21 consisting of several programme areas. Chapter 34 suggests that the donors must support institutional capacities for research and development in developing countries if they are assumed to apply environmentally sound technologies.

A crystal-clear implication is that in the current policy and legal environment dominating in developing countries the capacity building including human resources development is the most sustained development activity that the donors can support. Yet, it is necessary but not sufficient condition for sustainable peri-urban water and waste management infrastructure. Action-oriented research is a foundation for improving urban management and infrastructure. Especially the concept recommended by Briscoe and Steer (1993), the "structured learning" studies based on learning from innovative approaches would be appropriate for international technical assistance and funding.

6.4 Review of research

The methodology used in this study, Checkland's soft systems methodology developed further for futures research by Mannermaa, appears to be promising even in literature review and analysis based on that. It is originally developed for ill-structured real-world problem situations. Yet, it offers a systemic approach to such a "real-world" problem situation, where the literature review on the situation is used, especially when it would be rather comprehensive like in this study. However, it is highly recommended that in this kind of literature based studies there would be used a group of experts to formulate the core vision(s) and the future model(s). The comparison stage would also gain from this approach.

The methodology due to its certain flexibility offers a quite interesting and useful tool in the studies regarding human activity systems. Especially the stage that Mannermaa has added—the future assessment—makes the original structure's applicability even better, since it will show the possible development paths of the system and its environment.

The selection of the system in this study—the organization responsible for the provision of peri-urban water and waste management services—is conscious. It is the closest system from the peri-urban residents' point of view (and it should be the most responsive one!). It is also the system, the development of which the donors in addition to the financing the investments on infrastructure. However, the convenient characteristic of the methodology is that it would anyhow have revealed the key constraints, even if the selection would have been done differently. From the comparison

stage it can be seen that the key constraints are in the environment and in the systems interrelated to the the organization responsible for the provision of peri-urban water and waste management services. If the other systems or their systems as whole in the environment of the organization would have been taken as "a system", then the constraints would have appeared to be in their structures, processes and perhaps in their "climate".

The approach of the methodology with respect to the defined changes is also appropriate and useful in action research within development co-operation, since the changes have to meet two criteria. They must be arguably systemically **desirable** and simultaneously **culturally feasible** given prevailing attitudes and power structures, and having regard to the history of the situation under examination (Checkland 1984). Yet, one dimension should be added based on Mannermäa's further development of the methodology: having regard to the future of the system and its environment.

6.5 Need for further research

"A discussion of the objectives for infrastructure improvements in slums and squatter settlements runs a serious risk of degenerating into a boring list of worn out clichés ranging from eradication of urban poverty to the enhancement of the quality of life."

Angel 1983

There are many interrelated matters related to the peri-urban paradigm, and to the peri-urban water and waste management infrastructure problem situation in particular, which would require further research and empirical testing. The action research is required in relation to the following:

- (i) institutional alternatives for management of water and waste management infrastructure;
- (ii) Institutional incentives in infrastructure development process;
- (iii) requirements to legalize peri-urban settlements;
- (iv) options to provide informal settlements with formalized infrastructure;
- (v) procedures and mechanisms to obtain full cost recovery for services;
- (vi) development of management systems;
- (vii) integrated water resources management and protection;
- (viii) economic instruments in environmental protection;
- (ix) options to make land registration more simplified;
- (x) financing options and mechanisms for peri-urban projects; and
- (xi) the concept of the Total Quality Management (TQM) in water and waste management engineering.

7 CONCLUSIONS AND RECOMMENDATIONS

"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

The "Earth Summit" in Rio de Janeiro in June 1992 also set out a series of objectives in seven water resource areas in Chapter 18 of the Agenda 21. One of these areas is: Water and sustainable urban development. At the global scale, the peri-urban infrastructure cannot be considered sustainable, since it cannot satisfy the fundamental human need of subsistence. Presently from 30 to 60 percent of the cities' population lives in peri-urban settlements. In most cities 70 to 95 percent of all housing is built illegally. Because they are regarded illegal, most governments do not provide infrastructure and services for them. The authorities' land-use definition of urban land may be according to fully services area. Those areas, where low-income families live without access to water and sanitation, by this definition, are not considered urban land. Therefore this vigorous circle leaves peri-urban communities without adequate formal infrastructure and they have to rely on illegal services or they have to pay high price for the water vendors or resellers, whereas the rich get heavily subsidized services.

Peri-urban residents face various difficulties related to their water supplies: there may too little water; access to it may be limited and difficult; its quality may be poor; and distribution may be inequitable. The inequity may be easily exacerbated, since many countries already face a severe water resource crisis. The health problems resulting especially from the lack of sanitation facilities are greater among the urban poor living in overcrowded peri-urban settlements than they are either in other urban areas or in rural areas. The urban poor have a lower life expectancy at birth and a higher infant mortality rate than middle- or high-income urban and some rural populations.

The available evidence suggests that none of the methods to cope with rural-urban migration works particularly well. In several countries benefits of regulation were outweighed by the natural population increase. In developing economies during the next 30 years, urban environment should be constructed 1.5... 2 times more than there is now in the developed countries. The area needed for these structures corresponds the area of Europe. Especially large cities in developing countries contribute to the national budget more what they receive from it. They serve as increasingly important driving forces in developing regional and national economies. According to the World Bank most recent assessments the adequacy of infrastructure was found to be a major element in successful structural adjustment operations of the macroeconomic policies in developing countries. Infrastructure is a necessary but not sufficient condition for development. Infrastructure's ability to sustain efficient public and private sector activities is depending on well maintained and efficiently operated reliable urban infrastructure and service delivery systems. Proper maintenance, and more efficient operations limit or eliminate needs for new facilities which often have a high foreign currency cost component.

Water and waste management arrangements in peri-urban areas fall within a broad range of system configuration. The configuration may present a complex pattern of ownership that includes public institutions, voluntary organizations, and private enterprises. In the future developments pragmatism and flexibility should be exercised in choosing the proper institutional alternatives. Ownership does not seem to be the key issue in performance efficiency. For example, privatization is not a remedy to guarantee better performance. Privatization of production activities, though this may increase efficiency, does not solve the wide array of provision problems. Water supply is usually a natural monopoly, and the thorough public regulation is essential, if the operational functions are delegated to private sector.

Institutional performance is always greatly impacted by the political environment. Weaknesses and corruption that exist in the government as a whole will almost certainly be reflected in the water

supply and sanitation sector. The need for better accountability and demand orientation are key issues in the future of infrastructure. Without those elements the stakeholders are unlikely to receive benefits of water and waste management infrastructure.

The emphasis has been mainly on limited or pilot peri-urban infrastructure projects during the last three decades. Yet, project-level interventions often do not have much influence on the overall urban policies. The donors should recognize that even successful projects are solving the problems within the projects, not removing the constraints on the vast majority of people. Therefore much greater attention has to be paid to wider policy and legal issues, not only to execution, implementation and planning as earlier. Inadequate tariffs and cost recovery procedures affect the financial capabilities of water and waste management organizations. Wastewater collection and disposal charges and penalties to prevent environmental pollution are seldom assessed and enforced.

In the development and operational management of infrastructure, affordability of services must be linked with willingness to pay for services which depends not only upon income levels but also upon perceived benefits gained from the service. The willingness to pay for basic urban water supply services is high among the poor. They can be induced to make investment decisions regarding services by manipulating two factors: the variety of resources, both monetary and nonmonetary, and uncertainty. Before making investment decisions, households must be sure that investment will not be lost because of intermittent income, vagaries of health, natural catastrophes, or eviction. Yet, from the sustainable development point of view, only projects which are self-financing should be undertaken. The water and waste management organization's capability to make initial investments and to make revenue is in utmost importance. Without sufficient revenue it not possible to manage infrastructure and to make new investments to extend the services to respond the citizens' needs, especially those of lower income groups.

The donors should not promote the use of scarce resources on projects, if the capacity and competence of local governments cannot guarantee the sustainability of services provided. The governments and donors should resist target driven "supply" projects and should concentrate on creating demand and mechanisms to serve this demand.

The world-image selected, admittedly being subjective, is based on the concept of the sustainable development, on which the development efforts are focused. The study implies that even if "the Utility"—the organization responsible for the provision of peri-urban water and waste management services—would be properly organized, accountability and customer-orientation built in, management systems well functioning, employees well trained, the system itself cannot guarantee good services due to the constraints in the given environment. The formulated future model for the water and waste management organization indicates clearly that these environmental constraints hinders the sustainable development regarding the peri-urban infrastructure. One of the key environmental constraints is the lack of financial self-sufficiency of the organizations. Therefore they have a restricted power to provide the accountability and successful services to different stakeholders, since that power will depend on the environment of the organizations. Their responsibilities cannot exceed the given power and freedom to act. The obvious consequence is that the residents and business will suffer from the lack of services. This will cause negative impacts economy—even at macro level, health and environment.

Although there are number of important issues in development paths of peri-urban settlements such as land development and tenure, domestic energy, transport, health care, income generation, access to credit for the poor, the provision of basic infrastructure and shelter will have a key role in future efforts to improve living conditions and environment of low-income households and in proximity. The inadequate service coverage and level regarding the peri-urban water and waste management infrastructure are often due to the governments' policies within the existing legal and institutional frameworks. Negative land use controls with unrealistic standards are also causing high budgetary costs reduce service coverage and level. Therefore the key problem of land use and control in urban settlements and in the vicinity should be solved.

Sufficient quantity and quality of water and the environment free of toxic substances and pathogens should be considered as satisfiers of the human fundamental need: permanence. The Fourth World in the less developed regions is depending on external provision of the services.

Therefore the public authorities responsible for infrastructure must guarantee the universal coverage and adequate level of service. In order to improve the environment and living conditions of the urban poor the following action must be considered:

1. Physical development plans should follow and support national economic goals to assist balanced spatial allocation of services and benefits;
2. The planning paradigm for formal urbanization is not valid, and must thus be abandoned for peri-urbanization;
3. National and local governments should limit their roles to providing services which the families and communities cannot provide themselves, i.e. the government should concentrate on enabling the urban poor to meet their recognized demands, e.g. public acquisition of land with a commitment to providing serviced land for the poor, and settlement and infrastructure planning and provision within the peri-urbanization paradigm;
4. The implementation priority should be given to the infrastructural projects having the highest net social benefit or net-social-benefit-to-cost-ratio;
5. The programmes to improve the infrastructure and the environment should be considered as an economic investment with full cost recovery. Therefore people benefiting the improvements should be treated like customers;
6. The communities having the willingness to manage their own systems, e.g. in urban marginal areas should be guaranteed access to financial systems responsive to them and technical assistance, if the public authorities are unable to provide them with services;
7. National and local governments should strengthen their revenue base (property and land taxes, property rates, levies on business activity, local tax, sales tax, local income taxes) and introduce user charges covering the costs of the services produced;
8. When poor households are expected to make investments in public services and housing, the authorities should ensure that their investment will not be lost, e.g. through eviction; and
9. Local governments should give water and waste management utilities the right to provide services to illegal settlements, by not subjecting this action to the unreasonable requirements of legal regularization of land tenure or formal master plans.

When the performance of peri-urban urban water and waste management infrastructure is to be improved, the following two key matters should be considered:

- the institutions responsible for urban water and waste management services shall be required and allowed to be financially self-sufficient; and
- institutions responsible for urban water and waste management services shall be required and permitted to improve public accountability, i.e. by creating service culture to secure efficient service and to meet the needs and expectations of different stakeholders.

The donors must support institutional capacities for research and development in developing countries. The action research in collaboration with the research institutions in developing countries on acute and immense peri-urban water and waste management infrastructure problem situation would be a proper way to start the capacity building. This would be relevant especially in Eastern Africa, which is projected to have the biggest urbanization process in the world. The costs of water and waste management technologies should be reduced. Yet, there have been few and limited efforts to support the scientific co-operation in this field.

The donors and host governments alike should participate in the process of capacity building to create an enabling environment with appropriate policy and legal frameworks, to develop institutions and human resources, and to strengthen management systems. The concept of the Total Quality Management emphasizes that the leadership is the key element in demand-oriented organization culture. This would mean subsequently that top managers should be well educated and trained to cope with the essential change from administrative domain to service domain.

Some would argue that if the donors are supporting capacity building through their universities, municipal and consulting organizations, and professional associations, it would not be relevant in the socio-cultural context of developing countries, but, as professor J. Dator said in his addressing speech to the XIII World Conference of World Futures Studies Federation in Turku, Finland in August 1993, the cultures respond nowadays too slowly to rapidly emerging matters. We can presume that fast growing number of peri-urban residents without safe water and sufficient waste management services are sharing his point of view.

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