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Sanitation Planning: A Challenge For The 90s

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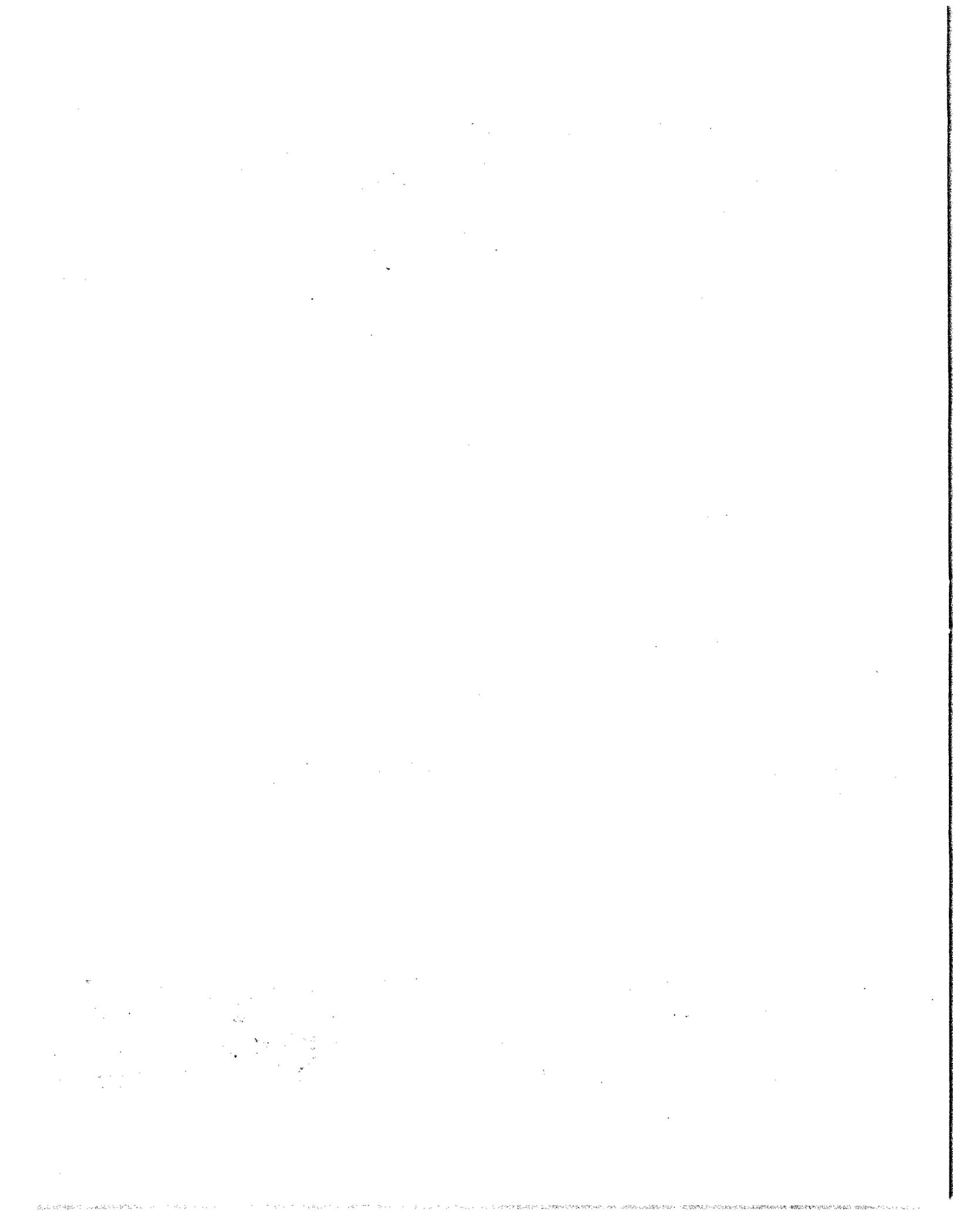
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Preface

The sanitation planning strategy described herein is based on concepts developed by Mr. Albert Wright of the UNDP/World Bank Water and Sanitation Program, and adapted to the conditions in Kumasi, Ghana by personnel of the City's Waste Management Department, in particular Ms. Eva Asare-Bediako and Messrs. Anthony Mensah, Kodwo Boakye and Peter Eduful. Naval Captain Amos Yaw Mensah, PNDC Metropolitan Secretary for Kumasi, was also instrumental in developing the sanitation strategy. The overall effort was led by Mr. Ato Brown, the project manager, with the assistance of Messrs. Joseph Gadek and Robert Roche, staff of the Program's Regional Water and Sanitation Group. Further information on strategic sanitation planning will soon be available in a report on the subject prepared by the UNDP/World Bank Water and Sanitation Program.

SANITATION¹ PLANNING: A CHALLENGE FOR THE 90s

Introduction

1. In response to the 1980s being singled out as the International Drinking Water Supply and Sanitation Decade, a major effort was made to provide improved water supply and excreta disposal facilities for all. Despite the good intentions demonstrated by the service targets set by many countries, progress was not as expected. There are many reasons for this: the world economic climate was much harsher than had been expected, population growth rates continued to increase, etc. Perhaps the basic problem was that facilities were given away with little or no user contribution to planning, operations and maintenance.

2. It is fair to say that most of the effort put into the Decade addressed water supply needs (both rural and urban). The many lessons which have been learnt during this time, apply however both to water supply and to sanitation. Governments have learned their limits, and are shifting from being providers of services to becoming promoters, planners, coordinators, and fund raisers. The trend is: to rely more and more on the private sector to provide goods and services; for government to become more explicit in promoting policies incorporating partnership with the beneficiaries in development through sharing the costs and allowing beneficiaries to be responsible for maintaining their facilities; to reshape sector institutions and strengthen them as advocacy groups that assist communities to obtain reliable services and provide an environment conducive to active participation by the private sector; to base technology choice on user preference, where government is prepared to finance a large part of basic services, and beneficiaries are encouraged to have the highest level of service that they want and can afford, it is they however who decide. Lessons have also been learnt about the relationships among health, water, sanitation, the key one being that sanitation should be taken more seriously. Finally, there is the value of human resources - this is where the real development effort lies.

3. There is a great need to address the deteriorating urban infrastructure services which suffered during the recession of the last decade. Urban populations throughout the continent are increasing rapidly. The annual urban growth rate in many African capital cities is about 8%, due both to high birth rates and urban migration. Improvements in basic services (water supply, excreta disposal, housing, etc.) for the numerous urban poor, this is an issue that needs immediate attention, in order to improve both health and the quality of life. Appropriate and affordable technical solutions are needed now for all neighborhoods of African cities, both the high-density housing at their

¹ Sanitation as used in this paper refers to the collection, treatment and disposal of excreta and liquid wastes from domestic, commercial and industrial sources. This term is normally applied also to solid waste management and stormwater drainage.

centers where sewerage is most likely the most appropriate technology and lower-density peripheries where on-site systems may be more suitable. Responsible agencies must broaden their thinking and find creative means of providing services and recovering costs in both high-density sewerred areas and low-density on-site areas. This is the challenge of the 90s.

Sanitation in Urban Areas

4. Urban populations in Africa can be divided into three broad groups:
 - (a) The affluent urban dwellers who have multiple water fixtures in their houses and each person uses over 100 liters of water each day, and much more if they have gardens and swimming pools. Most often their waste water is disposed in septic tanks connected to soakaways, and sometimes to sewers.
 - (b) The middle and low income urban dwellers who typically have access to yard taps and use between 40 to 80 lcd. They use a range of sanitation facilities - traditional or improved latrines, pan latrines, aqua privies, vault latrines and in some cases septic tanks.
 - (c) The urban poor who rarely have adequate human excreta disposal services and who normally have only limited access to water supply services. They are usually served by hand dug wells and standpipes or get their water from neighbors. Their water consumption is about 20 to 40 lcd. For excreta disposal, they have traditional latrines, improved latrines, or no services.

5. Conventional sewerage will require homeowners to install household water, sewer piping and fixtures and to increase the amount of water that they use. In addition municipalities often charge a substantial sewer connection fee. Provision of sewers without accounting for these direct costs to the homeowner usually results in very low sewer connection rates. Conventional sewage treatment (such as activated sludge and trickling filters) is widely employed in Europe and North America, but is costly in terms of capital costs and energy requirements. Such systems are designed primarily for reduction of the biochemical oxygen demand, but are very poor at the removal of disease causing organisms. This may not pose much of a problem in temperate climates where chlorine and spare parts are readily available but is of great concern in tropical climates where untreated (or poorly treated) surface water is often a source of drinking water. Alternatives to conventional sewers which require minimal or no water and innovative financing of both sewers and on-site systems need to be used if sanitation services are to be improved on a large scale.

Strategic Sanitation Planning of Human Waste Services in a City

6. Strategic sanitation planning is appropriate for all aspects of sanitation: human waste (excreta), sullage, solid waste, drainage and industrial waste. Strategic sanitation planning considers a whole range of technical solutions to meet the needs of all the different population groups in the city (the high income, the middle income, low income). It is based on demand where user preference and willingness-to-pay determine technology choice, with the municipality deciding how best to use government subsidies to achieve the greatest benefit. This approach is different from what is used for many master plans where only conventional solutions are considered. The approach re-orientes the planner to develop solutions for the needs of today taking into account those of tomorrow and the uncertain dynamics of urban growth. A relatively short planning horizon of 10 to 15 years is used emphasizing actions which can be taken now. Also, the approach requires greater involvement of municipal personnel in the planning process, as plans prepared solely by consultants tend to be forgotten and are not updated regularly as required in a dynamic strategic sanitation process. It also builds capacity in a learning by doing process, that starts small and is scaled up as waste management personnel and service contractors gain experience.

7. For the purpose of discussion, planning of human waste management services in Kumasi, the second largest city in Ghana is described as an example.² The planning process has several steps. First, a detailed review is made of existing conditions, user preference and willingness-to-pay for different technologies are assessed. Second, detailed analyses are made and recommendations proposed on technology options, institutional organization, financing strategies, human resource development (HRD) requirements, modifications of regulations, and an implementation strategy. As a basis for future operations and investment, Government may have to provide policy guidelines if none exist. The final step is implementation starting small and scaling up as capacity grows. In some cases it is advantageous to undertake pilot activities during the time that the plan is being prepared in order to gain practical experience, particularly concerning effective demand and revenue collection mechanisms, and to convince communities, decision makers in Government and financing agencies that the plan will work.

Step One: Assessing the Situation

8. The first step in the preparation of the sanitation plan is therefore a detailed review of the subject, in this case, human waste management. The review includes subjects such as water supply services; topography and drainage; collection, treatment and disposal of wastes; costs; roles of institutions (public and private); policy and regulatory factors; demography; and on-going projects by government or aid agencies.

² The sanitation plan for Kumasi was prepared by a national team based at the municipality.

- The City of Kumasi, which is built on a series of hills and valleys, had a population of about 600,000 in 1990. The current population growth rate is 3% per year and the population is expected to be about 1 million by the year 2010. The city has several housing types: tenement; indigenous; new government; and high cost. These housing types are found in clearly defined areas. The tenement area of Kumasi is the most densely populated with 450 persons/hectare, the indigenous has 125 persons/hectare, the new government 50 and high cost 12. The number of persons living in a house range from 100 in the tenement area to 5 in the high cost areas. There is a large central market and several small ones. Key industries are breweries, a bottling plant and lumber mills.
- The city has a good water supply service and consequently, the majority of the people have house connections. The least served area is the indigenous area where only 25% of the people have access to yard taps and the rest get water from neighbors or public standpipes. Water use in the city ranges from 40 lcd to over 100 lcd.
- Sanitation facilities in use are septic tanks, public latrines, and bucket latrines. There is no functioning sewer system in the city, although several master plans have been prepared in the past. In the new government and high cost areas, all the houses have septic tanks. 60% of the population in the indigenous area have access to public latrines and the rest use bucket latrines. In the tenement area, 40% of the houses have septic tanks and the rest are evenly divided between bucket and public latrines. Current expenditures on excreta disposal in the city are one million dollars a year.
- The Kumasi Metropolitan Authority (KMA) has overall responsibility for sanitation (excreta, solid wastes, drainage, street cleansing) management. It has several different departments which have overlapping responsibilities and activities in sanitation management. The Metropolitan authority is responsible for the development of policy guidelines for the city's operations.

9. A sanitation survey incorporating a study on the willingness-to-pay for services is conducted in association with the situation analysis. This serves two purposes, first, to get more accurate information about the existing infrastructure services in each neighborhood and first hand information on what people think about sanitation, and second, to get statistically valid data on willingness-to-pay for different technologies.

- In Kumasi, the majority of people with WCs, bucket latrines and pit latrines rated their systems as good in terms of cleanliness, privacy and convenience, but those with access only to public latrines were unsatisfied with them on the basis of the same criteria. When people were asked to compare WCs and KVIPs (Kumasi ventilated improved pit latrines),

preference was evenly divided. Those with a preference for the KVIP chose it because they would not have to pay for water and because it is more robust than the WC. Those that preferred WCs chose them because they would be able to get the wastes off their property and because they considered them neat and clean.

- Expenditures on basic services in the city were on average, \$2.3/month/family for rent, \$1.3/month/family for water and \$1.7/month/family for electricity. For sanitation, people are currently paying \$1.6/month/family for public latrines, 50 cents/month/family for bucket latrines, and 40 cents/month/family for a WC system. The WTP study showed that 50% of the population which uses public latrines were ready to pay \$1.4 for either a KVIP or a WC with a sewer connection. 50% of those who already have household facilities, were ready to pay \$1.1 for a WC connected to a sewer.

Step Two: Preparing the Plan

10. The second step in the strategic sanitation process is the preparation of the sanitation plan, including a summary of the current situation and recommendations on technology options, institutional arrangements, financing strategies and policy guidelines. Comparison and determination of technology options for different parts of the city is based on a range of primarily physical criteria. Recommendations on final technology options take into account the demand for improved services reflected in user preference and willingness-to-pay.

- In Kumasi, the criteria used as a basis for comparing technologies and subsequently recommending the technological options for improved household excreta disposal systems were: housing; water use; geological conditions; operations and maintenance requirements; user preference; population density and cost. Several factors were considered under these general criteria. For example, those reviewed under housing were: the availability of space for drain fields; the number of persons per building; the type of building (single - or multi-storey); and existing sanitation facilities. Technologies which were considered were the Kumasi ventilated improved pit latrine (KVIP), the pour flush toilet, septic tanks with drain fields, simplified sewerage, solids - free sewerage (small bore sewerage), and conventional sewerage.
- For the tenement area, the only technically feasible solution for proper disposal of excreta and sullage was sewerage because of the multi-storey housing, high population densities, poor accessibility/space for on-site systems and relatively high water use. Total capital cost comparisons (for collection and treatment) of the three sewerage options led to the conclusion that the most affordable and least cost solution for the tenement

area was simplified sewerage. The difference between this and conventional sewerage was less than expected because the nature of the terrain reduced the potential cost savings of the former over the latter (US\$15 million versus US\$18 million).

- For the indigenous housing area, cost comparisons (for collection and treatment) for both on-site systems and sewerage, showed that the least cost solution was the KVIP (US\$8.4 million) as opposed to the least cost sewerage system (simplified) which was US\$15 million. Taking also into account the lower population densities, housing type, and space availability, the technology recommended was the KVIP latrine. The pour flush latrine, although feasible on the basis of the same criteria, was not considered socially/culturally so since, the cleansing practices of users in the homes were mixed (some use water and others use paper etc.) and there would always be the potential problem of blockage of the pour flush trap.
- Households in the new government housing areas and the high cost housing areas, all already had septic tanks. Water consumption was high but population densities low. Sewerage was technically feasible. In the high cost areas total cost was about US\$21 million and in the new government areas about US\$6 million. It was considered that they could keep their existing systems which are primarily septic tanks.

11. The sanitation plan for Kumasi therefore comprises two components, simplified sewerage and on-site sanitation.

- Households in the tenement area (200,000 habitants in the year 2000, i.e., 25% of the population) will be served by sewerage comprising 150km of pipes, 4,000 connections, 16 hectares of waste stabilization ponds and the rehabilitation of four small independent networks.
- On-site sanitation systems will provide services to about 350,000 habitants (70,000 households) in the indigenous area; school latrines will be constructed or rehabilitated; 40 blocks of ten latrines will be constructed at 22 public sites serving 90,000 in the year 2000 (markets, car parks, community centers); 130,000 habitants will be served by septic tanks in the year 2000.

12. The institutional arrangements necessary to support the improvement of human waste management services are then elaborated. What role does the private sector play in construction, operations and maintenance, management, treatment of wastes? What are the HRD and other institutional requirements for a sustainable support mechanism for operation and maintenance, treatment and disposal of waste.

- In Kumasi, the recommended solution was the establishment of a new department to manage waste. Within this department, four divisions are being created. These are: pollution control, contracts management, strategic planning, and finance/administration, each with clearly defined tasks and responsibilities. Construction of new facilities, operations and maintenance of public facilities, the sewer system, and emptying of pits and septic tanks will be contracted out to the private sector. The department will work with the appropriate Ministry of Health's Education Department to market and promote improved sanitation services in the city.
- The construction of the sewers, the waste stabilization ponds and cost recovery from the consumers will be the responsibility of a lease contractor who will take on the commercial risks and will obtain revenues from the bills paid by the consumers. This contractor will pay a part of the tariff back to the municipality which will use it to cover operational expenses of the waste management department and part of the debt service.
- Public latrines will also be managed by private companies each of which will obtain an operating license from the municipality. These private operators will collect user fees which will be used to pay for operations and maintenance of the latrines, profit and municipality's rental fee.
- The sludge tankers which belong to the municipality will be transferred to private operators under lease purchase arrangements (similar arrangements are being made for solid waste collection and street cleansing).
- The municipality will no longer be directly involved in the day-to-day management of services. The existing casual staff base of 900 will decrease to 30 before the end of 1993. The majority of the workers who will be laid off will work for the private contractors described above.

13. The financing mechanism(s) need to be elaborated taking into consideration the following: results of the willingness-to-pay for different services; financial requirements for implementation including possible government and aid agency subsidies, bank loans and self help support; and cost recovery policy. For on-site systems, various questions can be asked. For example, apart from the construction costs, how will householders pay for their new facilities, what financing package will make an on-site sanitation project attractive to donors? For sewerage, there are costs to connect all houses to water systems and install internal plumbing, costs to convey the waste water away, costs to treat the waste water and costs to dispose of the treated wastes without an adverse impact on the environment. How can these be recovered? Many are the stories of beautifully prepared master plans which cannot be implemented or of systems once constructed to which the majority of the people cannot afford to connect.

- The total cost of the sewerage component for Kumasi is about US\$9.4 million, 12% of which will be financed by KMA and UNDP. The Government of Ghana will obtain a long-term credit for the balance, 35% of which will be passed on as a loan to KMA reimbursable in 20 years, and the rest will be a grant from the central government to the municipality. Operation and maintenance will be paid by beneficiaries connected to the network and will be managed by a lease contractor. Financial projections show that these conditions of financing can be met by a sewer fee to be collected by the franchise operator. The amount of the tax is equivalent to the amount that households were willing to pay in the survey that was conducted.
- The total cost of the on-site sanitation component is estimated at 17.8 million US\$ (not including septic tanks). This component will be financed through a sanitation fund managed by a local commercial bank and financed by a government loan of US\$11.6 million (65%), by revenues from the normal operations of the fund (35%). A 50% grant and 40% loan with 10% downpayment will be available to households for construction of home latrines. Also, a 90% grant from the sanitation fund will be available for school latrines, with the balance to be paid by the parent-teachers' association. Public facilities will be financed by proceeds from the Government's long-term credit to the sanitation fund, but full cost recovery will be achieved.

Step Three: Implementing the Plan

14. The third step in the strategic sanitation planning process is the implementation of the plan. At first this should be on a small scale so that government and private personnel can be trained. Also, this provides an opportunity for the implementation strategy to be tested and refined on a small scale while it is still easy to make changes in the design.

- In Kumasi, the strategy has been to have a demonstration project which incorporated elements of the two components of the full project. The demonstration project was therefore designed to include simplified sewerage (including construction of a treatment plant) domestic on-site sanitation, construction of latrines in schools and construction/rehabilitation of public facilities. Work on these individual components began in 1991 and the full scale project will begin in 1993 to be completed by 2000.
- The sanitation plan for Kumasi has taken about 18 months to prepare. The plan is considered as the property and working document of the KMA which is continuing with the planning process.

15. In conclusion:

- Master planning can be done differently. Users have an important role to play in the sanitation planning process. They should be consulted in technology selection and their financial means and willingness-to-pay should be considered.
- Government can provide clear policy guidelines as the basis for development of the plan, the appropriate institutional support mechanism for management of the systems which are installed, and the long-term planning for expansion of services. Government can also encourage the involvement of the private sector and take on the important role of promoter, planner, and coordinator.
- ESAs can support Government in the planning process and assist with large scale investment for capital expenditures. The sanitation plan, when developed, needs to be looked upon as an integrated package of components to be financed, which taken together provide affordable and sustainable services to all segments of the population. External aid agencies which have a tradition of financing sewerage projects, must be encouraged to consider on-site sanitation projects as viable for financing.
- Organizations such as the UAWS can provide a forum for discussions, applied research and skill development among professionals working on improving sanitation services. Those members of UAWS who are responsible for sewerage services must work closely with Government, the users and the private sector to adapt to the changing needs of the cities which they serve and help provide sustainable services.

16. There is still a lot to learn about management and improvement of urban sanitation services. We need to apply the lessons learned from the last decade; to improve management by institutions and allow the private sector to play an effective role; to consider appropriate and affordable technology options and financing mechanisms for provision of sanitation services; to improve the skills of sector personnel; and, last but not the least, to listen to the users of the services.

STRATEGIC SANITATION PLANNING PROCESS

Introduction

1. The strategic sanitation planning process considers a whole range of technical solutions to meet the needs of all the different population groups in a city. These solutions include improved traditional sanitation, other on-site systems and sewerage (simplified and conventional). Furthermore, the preferences, abilities, and willingness of the users to pay for services are considered, as well as financial and institutional issues.

2. The process is demand driven, comprising an initial stage where government identifies a need and then selects the institution which will be responsible for sanitation services in the city. A team of individuals from the institution is then established to be responsible for the preparation of the plan and subsequently to be responsible for its updating. This team will work with national and international consultants. The exercise is one of learning by doing, and during the preparation of the plan, the planning team and consultants will conduct pilot activities to gain experience and to test the applicability of the various proposals. Once the components of the preliminary plan are elaborated, an initial or demonstration project will assist with the refining of the various elements proposed. This project will go through detailed preparation and implementation. A process of monitoring and feedback will enable the planners to refine the plan in the preparation of subsequent larger scale projects during which detailed design of components will be completed where appropriate. The process is presented in the figure and the main activities to be conducted in preparation of the plan are described below.

The Sanitation Plan

3. The strategic plan itself is a master plan in which the methodology for preparation and the basic assumptions have been modified. A review of a range of technology options, establishment of responsibility for planning within a local institution, determination of the willingness of the population to pay for sanitation services, development of an institutional support mechanism (both private and public sectors) and a financing and investment plan, are all important components of the preparation of the plan. The implementation of the plan will depend on the demand of the potential beneficiaries who will be required to pay for the services to be provided. The first step is an analysis of the existing situation. This provides a basis for beginning the planning activity. Subsequently review of the various technology, financing and institutional options, makes it possible to propose services for different areas of the city. Development of a financing and implementation strategy as well as an initial project to refine the proposals are the final elements of the initial plan. In this regard strategic sanitation planning might more aptly be called "tactical" planning where the different factors affecting implementation in the city are weighed against each other in order to come up with appropriate solutions. Below is an outline of typical steps taken in preparing a sanitation plan.

4. Analysis of the Existing Situation

- Review the history of sanitation services in the city in the last 20 years and background information on the sub-sector including the involvement of ESAs.
- Prepare an overview of existing water supply and sanitation services in all areas of the city (domestic, commercial, industrial). Existing waste treatment and disposal facilities (and projects) and those planned by government or aid agencies will also be reviewed and assessed.
- Determine costs of the different levels of sanitation service, who pays for services and what are the current financing mechanisms.
- Determine the current needs for sanitation and the deficiencies in sanitation services throughout the city.
- Review the status, operation and responsibilities of sector and municipal agencies and organizations involved in the provision of sanitation services as well as their institutional, human resource operation and maintenance capabilities and financial situation.
- Review the current involvement of the private sector in sanitation services, for example, septic tank emptying, construction of on-site systems, and an assessment of the capacity of the private sector for participation in project implementation.
- Examine housing types and densities, demographic, socio-economic and industrial growth patterns and population growth projections.
- Review neighborhood, topographical and drainage maps and aerial photographs of the city and environmental considerations including soil and groundwater conditions.
- Review legal and policy guidelines as well as options for enforcement of regulations.
- Conduct a sanitation survey incorporating a study of the willingness of the users to pay for improved services.
- Write the sub-sector review chapter of the strategic plan.

5. Technology Options

- Identify and propose feasible technology options for each area/zone of the city to meet sanitation needs taking into account institutional, financial, human resource, legal, policy and social issues and considerations.

- Compare the different technological options for collection, treatment and disposal taking into consideration the costs of the different alternatives as well as other relevant criteria and propose feasible options for the different areas of the city:
 - (a) Assess the rehabilitation, upgrading and expansion possibilities for existing services (on-site and off-site systems);
 - (b) Propose and cost alternative options including operations and maintenance requirements;
 - (c) Review and propose options on the basis of clearly defined physical and other criteria and taking into consideration user preferences-demand for improved services (linked to willingness-to-pay);
 - (d) Propose and cost options for off-site transport, treatment and disposal;
 - (e) Review land requirements for the treatment and disposal of waste.
- Prepare a chapter of the SSP on proposed technology options for different areas of the city.

6. Financing Options

- Analyze the willingness of beneficiaries to pay for different levels of service through a representative survey (taking into account different housing types) and prepare a report on the willingness-to-pay for improved sanitation services.
- Review the mechanisms for financing the different on-site and sewerage systems and disposal services. For both on-site and sewerage options, identify the most suitable cost recovery mechanisms and determine the level of subsidy required, determine the need for credit to individual homeowners and propose suitable administrative procedures for loans (such as through commercial banks and or revolving funds).
- Prepare a chapter of the SSP on financing the delivery of different technology options (including institutional support needs, costs for construction, operation, maintenance and disposal services) and on possible financing mechanisms.

7. Institutional Options

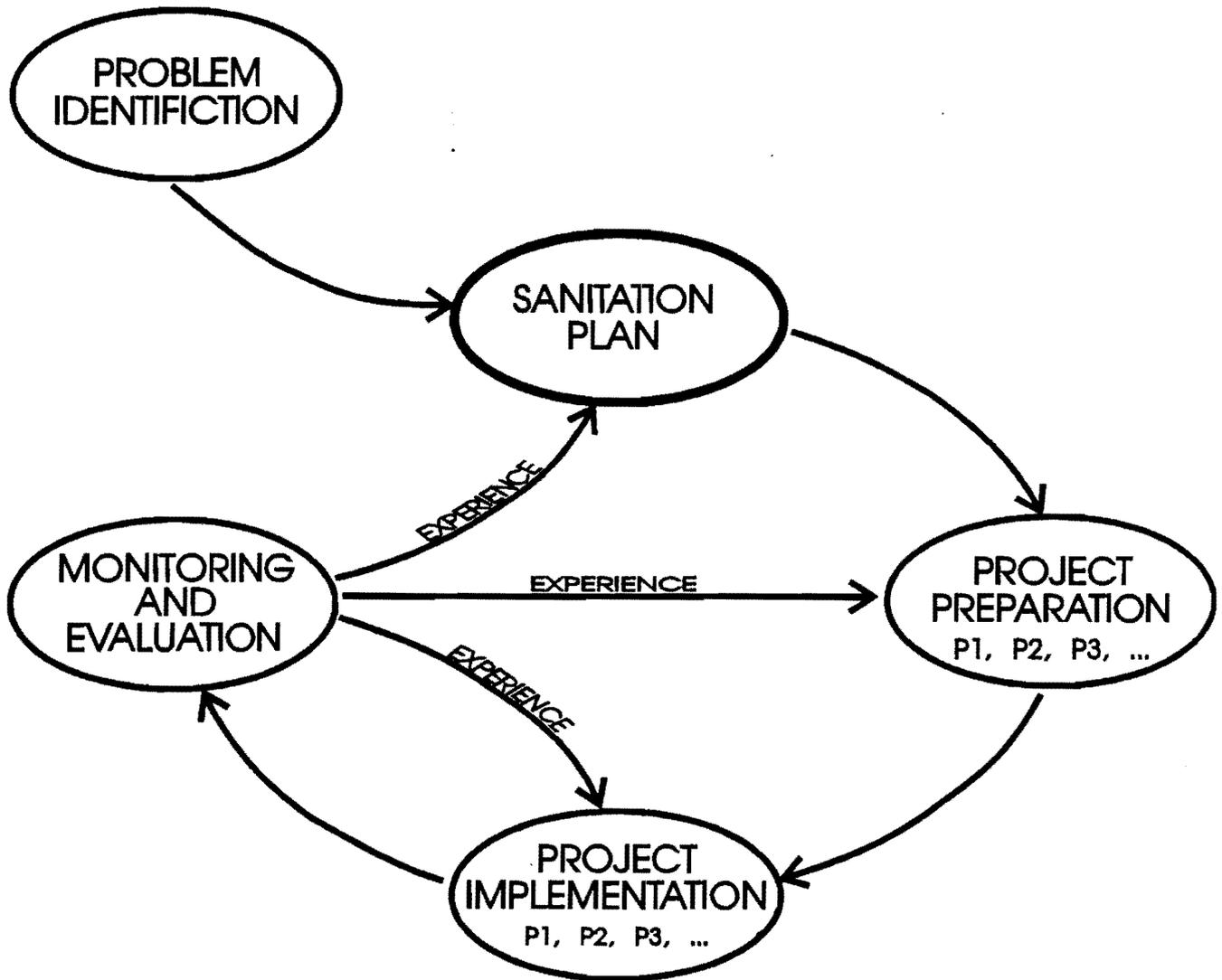
- Review the options for institutional support for the different technology options:
 - (a) for sewerage, other treatment or disposal at sea, review options for management by the municipality or by the water agency, or other private institution;

- (b) for on-site sanitation, consider the respective roles of the institutions currently charged with their management and the private sector;
 - (c) propose options for institutional support for the delivery of the different services describing the roles of both the public and private sectors.
- Review the existing human resource capacity and propose solutions for providing adequate human resources for management and implementation of the plan. All training requirements (immediate and future) should also be included.
 - Prepare a chapter of the SSP on institutional support strategy including revised institutional arrangements as necessary, to support the provision of proposed sanitation services in the city taking into consideration the current roles of the different agencies involved in the provision of sanitation services, legal and policy issues, O & M and management requirements.

8. Implementation Strategy

- Prepare the strategic plan chapter on the delivery of sanitation services incorporating all relevant technical, financial, institutional, issues, an implementation strategy, schedule and investment plan. The implementation strategy and investment plan will enable the preparation of a number of projects that will result in provision of services for the city. The solutions will be applicable to the conditions of the moment, but the implementation time frame may necessarily be up to 5 or 10 years because of the constraints in implementation. An on-going planning process will be identified for each service level.
- Using information collected during preparation of the plan, identify an initial or demonstration project (and prepare a project document) as a first step in implementation of the sanitation plan. This project will help in refining and modifying various aspects of the plan such as design, cost estimates, institutional changes and implementation strategy.

STRATEGIC SANITATION PLANNING PROCESS



Plan Elements

Situation Analysis
Technical Options
Financial Options
Institutional Options
Implementation Strategy



