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GUIDELINES SERIES

GUIDELINES FOR
SECTOR WORK IN THE WATER SUPPLY AND WASTE DISPOSAL SECTOR

November 9, 1973

Central Projects Staff
Public Utilities Department

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GUIDELINES FOR
SECTOR WORK IN THE WATER SUPPLY AND WASTE DISPOSAL SECTOR

ABSTRACT

These guidelines suggest the means for acquiring the information about the water supply and waste disposal sector needed in order to prepare plans for its development. Sector studies are primarily for the benefit of decision makers at the national and local level, but they also benefit outside agencies interested in efficient development of the sector. To be effective, sector work must involve both appropriate officials and the sector specialists in the country in question, and be seen as part of a continuous process for building up knowledge and improving decisions in the sector. Several typical sector issues are discussed, along with a number of practical considerations for organizing sector work. Detailed planning of sector work is emphasized. Annexes provide, among other things, checklists which help to assure that important aspects are not overlooked.

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I. INTRODUCTION

1. Few development projects have greater potential for directly benefiting the living conditions, health and eventually the productivity of large numbers of people than water supply improvement. Few will have a greater impact on environmental improvement than those concerned with the proper collection and disposal of liquid wastes. In most developing countries, more knowledge of the water supply and wastes disposal sector is required for decisions about its development, than is available. These guidelines suggest that means for acquiring this knowledge and beginning the decision making process which will lead to the appropriate actions for the sector's development.

2. A full study of the water supply and sewerage sector in a particular country should represent a comprehensive review of the organization or organizations responsible, its present state of development, its problems, and major development policy options. The study is primarily for the benefit of:

   a. National, regional and local authorities responsible for planning and allocation of resources among sectors;

   b. Authorities responsible for developing and operating water supply and waste disposal systems; and,

   c. International, regional or bilateral institutions which assist in preparing or financing development projects in the country, and which are concerned with the efficient use of development resources.

3. In its broadest definition, the water supply and wastes disposal sector encompasses all activities related to the provision of water for human consumption and for industrial, commercial and governmental uses, and the collection and disposal of all liquid and solid wastes.
These guidelines are oriented to a slightly narrower definition, i.e., to community (piped) water systems, and liquid wastes systems. In any given country, a broader or narrower definition may be adopted as a guide for the scope of planned sector work, but the approach as outlined below will be largely unchanged.

4. Given the wide range of climates, population density, size, geography and economic conditions of the developing countries, it is obvious that the scope and depth of sector work should be decided in each case only after thorough consideration of the objectives of the work, and the resources available for it. The work may range from a complete study of the country-wide water and sewerage situation to a sub-sector study such as rural water supply in a given region or state. Choices also need to be made about the depth to which the major issues (see Section II) are to be investigated. Careful planning can contribute much to the success of the work, help to avoid lost time and collection of irrelevant data, and help to assure that the judgments and conclusions will be well founded.

5. The IBRD has adopted standard terms which denote various kinds of sector work; these are listed in Annex 1. The term "sector study" is used in these Guidelines in a general sense, and is not intended to represent any particular scope or depth of sector work.

6. Given the "social" nature of water supply and sewerage, the basic objective in their development is usually to provide the maximum number of people with safe water in adequate quantities, and to collect and dispose of wastes in a manner that will avoid public health, environmental and aesthetic problems, at the minimum unit cost. In most cases, full satisfaction of these needs is not a realistic short-term goal; therefore development programs represent a selection among alternatives - i.e., levels of funding, degree of emphasis on urban versus rural development, quality of service, technical options, and the like. These judgments must be based on both qualitative and quantitative factors, but more and more emphasis is being given "social" factors, by both governments and lending institutions. Social effects have to be considered when deciding, for example, the urban versus rural emphasis, pricing policies, alternative tariff structures, the effects of programs on government revenues, and the degree of sewage treatment, and so on. These are largely political choices and must therefore be made by government. However, they should be made in the full knowledge of the financial and economic, as well as the social, consequences of the decisions.

7. The objective of sector studies is to provide a foundation for these decisions. In many cases, sector authorities are so preoccupied with day-to-day problems and emergencies that they have little or no opportunity to view the broad problems and policy issues facing the sector.
This not only adversely affects decision making at the sector level, but also means that the government's economic planners are not presented with information that enables them to make the best decisions in allocating scarce funds and natural and human resources among competing projects. Thus a full sector study after analysis of the necessary sector information, will (a) identify in physical and financial terms the principal problems and constraints of the sector; (b) analyze existing goals or propose alternative goals toward which a national plan for the sector can be directed; and, (c) recommend the establishment or modification, of organizations, policies, and practices required to achieve the goals, after consideration of whatever tactical alternatives may be available, and after discussion and consideration of the views of the government.

8. In most cases, further studies will be needed before certain sector and project investment decisions can be made. These may range from preliminary engineering and feasibility studies for individual projects, to those concerned with the structure and management of project entities, financial policies, legal questions, economic investigations, or training. Such studies are needed both to support sound decisions, and because most agencies financing water and sewer projects are interested not only in the works to be financed but also in the ability of the borrower to deal with all of the continuing problems of the sector. The Sector Report should identify and describe the specific studies needed.

9. Section II of these guidelines discusses a series of issues that are frequently encountered in sector work. Section III outlines some of the practical considerations of planning and executing studies.
II. TYPICAL SECTOR ISSUES

10. The experience of the Bank accumulated while working with a wide variety of water supply and sewerage sectors and projects suggests that certain issues are so frequently encountered that they can be termed "typical". The most important of these are discussed below.

A. Sector Objectives and Goals

11. It is common to find that specific goals or targets for sector development have not been established. The two main reasons for this seem to be the usual fragmentation of the sector, and the piecemeal planning that goes with it; and the fact that decision makers do not have a factual basis (for example, cost information) for setting such goals. An important function of a sector study is to provide a basis for setting sector goals by (a) looking at the sector from the national point of view, taking into account alternatives of making service available to various income groups and localities, quality of service, technical options, etc., as discussed above; and, (b) by providing an assessment of the constraints - human, financial and organizational - which will limit any development program.

12. Such programs (goals) may be described in various specific ways, e.g., percentage of urban or rural population with access to safe water, per capita consumption, connections per 100 population, funding levels, etc. But in all cases the full implications of the goals need to be considered, and the selected goals stated with as much precision as possible so that they provide effective guidance to those who will implement the program. Some countries subscribe, more or less seriously, to global or regional goals established by outside agencies. Among these are the "development decade" targets suggested by WHO, and the goals established initially for Latin America by the Charter of Punta del Este and later updated for the 70's by a regional conference in Chile (See Annex 2). In countries where these, or any other, specific goals have been established, the sector study should examine the feasibility of the goals and recommend modifications if necessary.

13. In most cases it will be desirable to present alternative goals, with the implications of each presented in a manner that will permit selection of the one which best fit the country's resources and development plans. Such decisions are clearly the prerogative of the highest planning level of government, and given the ultimate objective of providing safe water to everyone, tend to be a selection of the optimum "pace" and sequence for development. Whatever "pace" is chosen, the elements essential to success of the program are practically the same.
B. **Sector Organization**

14. The physical characteristics of the water supply and waste disposal sector suggest an organizational structure somewhat different from the power and telecommunications sectors, although in many other respects the sectors are similar. Systems can (and usually do) operate effectively without interconnection, and this gives them a strong local flavor. From the national point of view, however, effective coordination of sector development plans is necessary in order to consider the needs of different regions, uses and consumer classes, in light of the total resources available, and to assure consistent standards of technical and financial performance. These needs have to be balanced against the equally valid objective of giving managers of individual systems the authority and responsibility for achieving their goals by using the resources under their control without undue interference for political or other reasons. The organizational aspects of rural water supply, however defined, are particularly difficult, and usually need to be considered in conjunction with the administrative arrangements for rural development programs, which involve other sectors, e.g., transportation and agriculture.

15. Thus, there is no single organizational structure best suited to the sector. Experience suggests that a national water supply and sewerage authority organized internally so as to delegate to its regional or local sub-divisions appropriate authority and responsibility for day-to-day affairs, is an effective approach in countries where management skills are scarce and the country not too large. Other structures may be more practical for a variety of reasons, but the arguments in favor of combined water and sewerage operations are usually very strong. However, effective examples can be found of regional authorities, local organizations in which water and sewerage are combined or separated, private corporations, concessions, etc. In each of these examples, however, it will be noted the basic principles of good management have been observed. Thus organizational effectiveness seems to be more closely related to sound management than to organizational structure. Of course competent and dedicated people are more important than either of these.

16. Whatever structure is selected, good management requires clearly defined objectives, the attendant authority, and adequate human and financial resources. These establish certain necessary characteristics for an effective organization, such as:

1. A policy making body (national or local) to set objectives and broad policies, and to monitor the performance of management;
ii. A reasonable degree of financial independence, including powers to set charges, within appropriate guidelines and controls, to collect revenues, to control cash and to plan the financing of the entity's development - through an appropriate combination of internally generated funds, borrowing and capital appropriations;

iii. Effective minimum information systems which can provide the financial and operating data which is the raw material for day-to-day management and control, and technical and financial planning. The most important single element of such a system is well designed public utility accounting system;

iv. Authority to set salaries and wages at competitive levels in order to attract and retain competent staff, and the power to hire, dismiss or discipline staff members; and,

v. A continuing program of staff training at all levels within the organization.

Assessment of the capacity and limitations of the institutional arrangements of the sector, considering the above, is an important part of a sector study. Any programs planned or proposed need to be examined from this point of view, and the mission's judgment about the arrangements should be clearly stated in the report.

17. Where water and sewerage operations are decentralized, there is a need for a unit at the national level which can represent the interests of the sector in national planning and administration; collect, organize and disseminate sector data; promote observance of national standards; and provide a coordination channel for local and regional bodies.

C. Use and Development of Human Resources

18. A sector study should give particular attention to management and man-power needs. Water supply and sewerage systems are usually locally managed and financed, and thus require a relatively large management input at the local level. The need for management capability is typically underestimated by both national and local authorities. The importance of these
systems for community welfare, and the magnitude of present and planned capital investments, demand a fair proportion of available management talent. Nevertheless, it is common to find large and expensive systems being poorly managed by technicians who have little interest in management in the broad sense, or by civil service short-term appointees who lack technical knowledge and have little interest in the long-term development of the sector. Problems thus created are reinforced by legitimate government concern for cost control, which frequently translates into shortages of staff in both numbers and abilities, and rigid salary schedules. The waste of resources arising from inefficient management of entities in this capital intensive sector far outweighs the cost of adequate management, which is very small in relation to the size of the investments. This usually can and should be conclusively demonstrated to decision makers.

19. The lack of well thought out training programs for top management, as well as for all the other levels of operational responsibility, is often one of the major constraints to efficient operation of existing facilities, and rapid development of the sector. Sector studies should include a brief survey of educational institutions with theoretical and practical programs in the various disciplines important to the sector. The need for expansion of these programs and for short and long term training programs operated by sector entities should be specifically considered during the study. One factor which inhibits management development is the difficulty of getting highly qualified staff to accept assignment in outlying areas where there is a dearth of educational, health and other facilities. This problem is particularly troublesome in dealing with rural water supplies.

D. Sector Finance

20. The important financial questions of the sector are determined by its basic financial characteristics:

a. The systems require large investments of capital, and in most cases unit capital costs are rising rapidly because of the need to develop more distant sources of water, and because of the large backlog of needed sewerage works, especially sewerage treatment facilities;

b. Cash expenditures related to operations are relatively fixed, and usually heavily weighted with capital charges. This means that opportunities for cost savings are related as much to efficient system planning as to efficient operations;
c. Water and sewerage systems tend to be considered "social" services, and tariffs are rarely set to cover full costs; and,

d. Good quality financial management is extremely rare.

21. As with institutional arrangements, there is no generally applicable optimum approach to finance in this sector. Usually there are many financial entities, so that a study of finance from the sector point of view involves more a consideration of policies than of detailed financial statements. The financial position and performance of utilities have to be judged by looking at each one individually; generalizations may be misleading. The nature of the financial part of a sector study will be largely determined by the number and size of the financial entities in the sector, and the quality and amount of financial information available. As far as possible, the scope and depth of the financial work should be planned in advance, with the emphasis on a broad review of the financial facts and policies, with spot checks of details as necessary to acquire a thorough understanding of the situation. However, when the outlines of a proposed investment program begin to emerge, it has to be examined from the financial point of view. This requires at least rough projections of capital requirements and sources, and operating costs and revenues, so that some idea of the financial consequences can be fed back into the planning process. The completeness of this work will vary with the circumstances, but in most cases, time and other constraints will preclude a "detailed" examination of these questions.

22. While recognizing the need for flexibility in dealing with sector finance, particularly in the cases of sewerage and rural water supply, there are a few principles which have to be observed in any sound financial approach. The most important of these is a sound tariff policy, i.e., one which assures that revenues will be sufficient to meet operating expenses, debt service, and a reasonable portion of capital needs, and at the same time assures that water is not used frivolously. To accomplish the latter, from the economic point of view, tariffs should approximate long-run marginal costs; from the financial point of view, tariffs need to reflect the realistic cost of the capital invested in the system. This is accomplished by setting as the objective an appropriate rate of return on net assets in use. Social objectives frequently dictate concessionary charges for the poor, and these have to be offset in some way to meet the financial objectives. In practice, tariff policies usually reflect a blend of these objectives, and may employ such techniques as rate structures designed to favor the low water-use consumers and higher basic charges for the large users, provision for the municipalities to pay for water supplies for street hydrants, and special flow limiting devices that
allow modest flat-rate charges to be applied. For each situation the most suitable approaches have to be studied, and this is often difficult because of poor data on water consumption, income levels, etc. The sector survey should identify any deficiencies or inequities of the water pricing systems in effect and, where needed, make broad proposals for improving them or suggest the studies necessary to provide a basis for establishing sound policies.

23. Applications of such policies will usually involve tariff increases. Any increase in water charges evokes strong resistance, and with the concept of operating water systems as public utility enterprises not fully accepted, related practices such as metering, elimination of free water, and prompt collection of bills compound the problems. A policy that will reasonably satisfy the various objectives can usually be developed. An important part of sector work is to do this, at least in broad outline, and discuss it with national and local authorities.

24. Regarding sewerage, a surcharge on water bills is an administratively simple and a reasonably equitable means of charging for sewer service. Other means are commonly employed, however, such as property improvement taxes, fixed user charges, general property taxes, and general revenue allocations. All of these, or some appropriate combination, may need to be considered.

25. Excessive reliance on government or municipal budgets for capital as well as, in some instances, operating funds, has often hampered the development of the sector relative to other public utility sectors. The study should review the past, present and future finances of the important sector entities in sufficient depth to be able to outline financing plans which rely appropriately on self-financing from user charges; budget contributions reasonably related to the fiscal position of the government and/or municipal authorities, and the borrowings from local and foreign sources. Pricing policies need to be examined to ensure that they fit with the need to develop both feasible and well balanced financing plans.

26. For the purpose of a sector study, relatively thin examination of the finances of the enterprises representing the bulk of proposed investment programs may be more useful than deep coverage of only one or two of many. Ideally, for those entities examined in detail, the study should cover at least three years of financial history as represented by Income Statements, Balance Sheets and Cash Flows, with emphasis on the level of capital investment, sources and terms of capital, profitability and valuation of assets. Financial forecasts for five to ten years in the same format will allow more meaningful examination of financial trends. These fore-
casts are likely to be relatively crude, and the underlying assumptions should be recorded in detail somewhere in the report. The extent to which this detailed examination can be done is determined by the objectives of the study, as well as the amount and reliability of data available.

27. A separate forecast of the fiscal impact of the sector development plan, including various alternatives as needed, should be prepared in order to help clarify alternative financial policies such as the appropriateness of proposed claims on official budgets.

28. Within the limits of time available, and the scope of the study, a brief examination of the status (quality and quantity) of the accounting and auditing profession in the country is desirable. This will give useful insights into some of the staffing and training aspects of the development plan, and establish a basis for discussing the audit of accounts required as projects approach the lending stage. It may also be useful as background for discussions about management/institutional reform measures associated with the development plan. Interviews with leaders of the profession and one or two of the larger accounting/auditing firms should be sufficient for this purpose. Government policies regarding audit of publicly owned utilities should be examined. If audits of sector enterprises are made by some government audit group, they should be interviewed to obtain some appreciation of their procedures and competence.

E. Management of National Water Resources

29. In any thorough review of the water supply and sewerage sector, the methods of managing national water resources should be examined. The policies and procedures by which water resources are controlled may vary, but the end objective should be management of the nation's water resources in a manner which will ensure the most economic and environmentally appropriate use of the resources. This responsibility should not be vested in any agency which is a user, but all major users should be represented. Coordination of activities between water and wastes entities and other water agencies is important. Failure to collaborate will reduce the effectiveness of the water and sewer programs and may lead to serious conflicts as agencies try to protect their own interests. The urgency of the question of management of water resources will vary from country to country, depending primarily on the extent to which water resources exceed present uses. In countries or regions where uses are approaching the total supply, the sector work should be planned to take this into account.

F. Technical Policies and Practices

30. Many of the comments made in the preceding paragraphs concerning management, man-power, and institutions have a direct bearing on the technical side as well; without regard to these aspects, the technical resources available cannot be used to full advantage, no matter how competent the technical personnel may be. Some technical issues are discussed below.
1. **Studies of Alternatives**

31. It is not uncommon to find that future water sources have been selected without adequate study of the alternative sources. For example, groundwater, which will usually be the source of choice in countries where the required quality and quantity of water is available, is often overlooked. In other cases, the engineers accept without further question, administrative allocations of water, for irrigation for example, which may not be based on an adequate study of the economic consequences of the allocation. Selection of the source is an important determinant of capital and operating costs; all possible sources should be studied, and the selection based on sound financial and economic, as well as technical, principles. Where political influences seem to run counter to objective selection of the best source, they should be quantified where possible in terms of cost.

32. There are also alternatives in the amount and type of water treatment, which are determined in part by the source. The objective is to determine the least cost methods of treatment, keeping in mind the quality requirements determined by health factors and acceptability to consumers. In areas where water is hard and such elements as iron, sulphates, chlorides and manganese are present in quantities which, though high, have not proven a serious problem to the people accustomed to drinking such water, additional treatment can usually be postponed until such time as the consumers demand a better quality water. However, treatment processes should take account of those constituents known to have adverse physiological effects, and treatment should be to reasonable safety standards, such as those proposed by WHO. Methods for disinfection, reduction of turbidity, and stabilization should be those most suited to the capacity of local personnel to operate, and should take full account of problems of maintenance, supply of chemicals, and economy of operations. Similar alternatives exist for sewage collection and treatment, including factors like the potential for reuse of effluents.

33. Alternatives in system design should be examined during preparation of master plans. With an occasional exception, these will be prepared well after the sector study. Therefore, the sector work will normally consist of examination of whatever plans are available, and impressing on local authorities the need for a thorough examination of alternatives as future plans are developed. It is important to have a master plan within which the various sources of water to be utilised in future years are identified and water rights acquired, and the basic layout of the distribution system established. However, preliminary designs for each stage should be prepared only as required. Designs for individual components of the system should provide for the most economic staging under the prevailing conditions. This suggests that the design period for most systems will very seldom extend beyond ten years, without precluding design of certain units of the system for longer periods where this can be established as the most economic approach. Discounted cash flow techniques, using reasonable
interest rates, should be used for analyzing these alternatives, as well as others, such as pipe size, which involve trade-offs between capital and operating costs. While one of the major benefits of the water system is its use in times of fire, questions of whether or not the system should be designed for flows higher than those required to meet the normal domestic and industrial demand need to be raised and justified. There is frequent need to consider standpipes versus house connections in low income areas of cities and in rural or village systems.

34. Concerning materials and equipment, maximum use of those locally produced and available should be made. Particular attention needs to be given to quality control and production capacity in the manufacture of pipes, pumps, valves, fittings, meters, and other appurtenances to ensure that they will meet acceptable specifications and to identify possible constraints on the program. Materials which are particularly resistant to corrosion and are least susceptible to the effects of aggressive waters and soils should be employed.

35. It must be said that thorough consideration of alternatives, and decisions about them, will rarely, if ever be possible during a sector study. Time consuming (and expensive) studies may be needed to provide the necessary information. An important function of the sector study is to identify the need for such studies, and, if necessary, help design them, so that timely decisions can be made without causing delays in the program and any project which may be under development.

11. Leakage Control and Metering

36. One of the most common problems encountered in many water systems is the large quantities of water lost or wasted after entering into the transmission and distribution systems. Losses result from leakage in poorly constructed systems or when pipes become corroded, from illegal connections, from meters which under register, and from records which have been lost on customers receiving service. Because of the economic consequences of large water losses, including the health hazards of poorly maintained systems, technical sections of every water institution need to give high priority to prevention and correction of water losses. Consideration of metering policy should represent a deliberate choice of the extent to which consumer connections are metered. Some practices which may need attention are administration of the billing and collection system, meter reading, procedures, measures to avoid graft, illegal connections and so on.
37. One hundred percent metering is not necessarily the best solution where there are large numbers of consumers with very low consumption. Alternative degrees of metering should be costed, using assumptions as to the administrative, capital, and maintenance costs of meters, etc., and compared with revenues and savings due to reduced consumption. This will frequently involve a separate study. Where less than 100% metering is indicated, it is very useful to install meters on a representative sample of unmetered connections, which will be read for statistical purposes only. These will provide the basis for calculating consumption and losses which are needed both for operating and planning purposes. Accurate production meters installed at all production points are also important.

iii. Design Criteria, Construction Standards and Maintenance

38. A sector study should include examination of any nationally applicable design criteria, and local construction and maintenance standards to the extent practicable. The objective is to assure that standards are appropriate to the conditions of the country, and that they are being observed in practice. Where foreign consultants are engaged for planning and design, they may, without due consideration, apply criteria used in other countries that may not be appropriate. In such cases, suitable modifications should be discussed. Although the full effects of over-design, and poor construction and maintenance standards are not easy to quantify, experienced engineers should be able to reach conclusions valid for sector study purposes during the normal course of their technical work. Pipe sizes and materials, sizing of distribution reservoirs, treatment methods for both water and sewerage, meter types and specifications, minimum service pressure, hours of service, fire flows, and combined or separate sanitary and storm sewers are examples of the areas in which technical standards may become an issue.

39. The quality of construction work needs attention. This applies to concrete work, pipe laying, service connections, plumbing, mechanical and electrical installations, and structures of all kinds. High cost of maintenance and frequent disruption of service commonly stem from poor construction. Poor construction is the result of poor specifications, poor contractors, poor supervision by engineers, or all three. To the extent possible, the availability and competence of local contractors and technical consultants should be investigated.
A. Planning and Staffing

Experience has shown that it is desirable to make a brief reconnaissance before a water supply/sewerage sector study is undertaken. The purpose is to reach an understanding with national authorities about the objectives, scope and working arrangements of the mission. The discussions should cover such topics as the local staff to be assigned to the study, the towns to be visited, the officials to be consulted, the channels of communications to be set up, and the transport and office facilities to be arranged. They should also identify the means of obtaining the various kinds of information needed and assure that its collection has started. An inventory of previous studies of the sector or individual systems by foreign or local bodies should be made. The studies should be selectively reviewed before or during the field work, if relevant to the survey. Draft terms of reference for the full mission should be a part of the reconnaissance mission's report.

The time estimated for carrying out a sector study depends on a number of factors: among them are the size of the country; the number of organizations involved in planning, building and operating the water supply, sewerage and sanitation facilities; the number of experienced staff assigned to the study; and, obviously, the kind of study they are expected to make. In a small country with only a few urban water systems or where only one agency is responsible for all sector activities, it is possible to make a fairly thorough study in 4-6 man-weeks. On the other hand, a sector study in a large country with many administrative divisions and high population densities involving many water and sewerage systems might require several months if each of the provinces or regions of the country are to be covered. For medium-sized countries, when it is decided to undertake a comprehensive study covering water supply, waste disposal and rural needs, a period of one to two calendar months in the field, plus additional time for the analysis of data and preparation of the report, may be taken for planning purposes.

As was stressed in paragraph 4, careful planning of a study is critical to its success. Ideally, a study should cover the entire range of water, sewer and sanitation operations, from urban to rural. In some instances, however, it may be appropriate to concentrate as a first step, on one sub-sector, for example, on urban water supplies, particularly if the sub-sector is one where important decisions need to be taken. Where a limited study is decided upon, arrangements should be made for a brief survey of the other sub-sectors during the field work, or to make a more thorough study at an early date; otherwise, balance decisions are
more difficult to make, and the compatibility of goals of the national development plan may be improperly assessed. Sector work should be viewed as an on-going, long-term activity. The ultimate objective is for each country itself to establish and maintain a thorough knowledge of the sector for its own benefit.

43. Sector work should be carried out by the most experienced staff available. By definition, they must cover much ground in a short time, which implies the need for a well developed sense of the relative importance of the facts and circumstances examined; this comes only with experience. Also, since the focus is on broad policy issues rather than technical details, balance and good judgment are as important as technical abilities. Each study team should include at least an engineer, a financial analyst and an economist. Studies which do not adequately reflect these three points of view are very likely to be deficient. Much of the lasting value of sector work is related to the participation of local staff. Ideally, the work should be done primarily by them, supplemented only in special areas by outsiders. In some cases, this may not be a realistic short-term goal, but it should be kept in mind, and in all cases the training effect of local staff participation in studies should be maximized.

There are basically four ways studies in this sector can be staffed:

a. Local Personnel

In countries where engineers, economists, planners and financial analysts are available and have competence in the field of sector analysis and planning, a local team with the appropriate skills can carry out the sector study. Since this is a rather new type of activity it is not common to find personnel at operational levels who have the training and experience to competently undertake such a study by themselves. Hence, if this method is used, it is worthwhile to consider soliciting assistance for the national team from staff of the TBRD/WHO Cooperative Program, as noted under (d) below;

b. Employment of Consultants

Because study of sectors is a comparatively new field and is somewhat limited in its opportunities for employment, not many consulting firms in the field of water supply and sewerage have personnel who can carry out a sector study of the type
required. It should be possible, however, for some of these firms to affiliate with management and economic specialist groups, or with university professors, for example, to form teams with enough competence to undertake such studies. This has not been done on any scale to date.

c. Teams Obtained from WHO/IBRD Cooperative Program

Under this Cooperative Program, WHO has entered into an agreement with the World Bank to provide staff for carrying out sector studies. Teams from WHO's Pre-Investment Planning Unit (PIP), Geneva, are available for the purpose. Through agreement between WHO, the Bank, and the government of the country in which a sector study is to be undertaken, a team can be made available to help the government carry out the study. IBRD staff frequently participate in such teams where there is prospect for Bank lending in the sector.

d. Combined Teams - WHO/IBRD Cooperative Program

Staff and National Personnel

By far the most advantageous method of carrying out a sector study appears to be the one in which the government provides key personnel from water/sewerage entities and the national planning body to join with personnel provided through the WHO/IBRD Cooperative Program to form a combined team. This has the advantage of bringing to the study first-hand knowledge of the policies and resources of the local institutions, while at the same time bringing in specialists who can take a fresh, objective look at the sector problems and who have the experience gained from other sector studies. Arrangements for obtaining the assistance of the Cooperative Program staff can be made by contracting either WHO or the Bank.

Whatever staffing method is chosen, substantial and active participation of local staff is essential.
B. Data Collection

The amount and reliability of data available for studies of the sector vary widely from country to country. The main objective is to reach broad conclusions and judgments on the sector's status and development needs, and the quality of these judgments is strongly influenced by the amount and quality of the information on which they are based. The mission should try to collect the data needed, but should not indiscriminately gather all information remotely related to the sector. This may result in masses of material that remain unexamined and unanalyzed and divert attention from the more important work of the mission, which is more analytical than descriptive. Advance planning for collection of only the data really needed can help to avoid such problems. Annexes 3 and 4 may aid this planning, and references to the Checklist for Appraisal Missions, and the Water Supply and Sewerage Questionnaires may also be useful. To facilitate future sector work, authorities should be encouraged to set up a minimum national information system which will provide on a continuing basis carefully selected technical, financial, and socio-economic information, in a timely and well organized form.

C. Identification of Projects and Pre-Investment Studies

Water supply and sewerage projects which appear to be of high priority in the national program should be identified in the sector study. The concept of the project and its relationship to the national program, should be sketched out, along with the status of preparation, studies needed, preliminary cost estimates, and so on. The objective is to provide enough information to allow the government and lending agencies to decide on actions needed to move the project(s) toward the execution stage. Where the projects are of obvious urgency and priority they can and should be prepared without waiting for the processing of the sector work and the government decisions which will normally follow. The government should be notified and any long lead time actions (for example, legislation) which could delay financing or execution of the project. Pre-investment or other special studies should be noted where they appear to be needed for urgent projects, for longer range project development or solutions related to the program. A form for describing such studies is attached as Annex 5.

D. Preparation of Reports

Since a sector study report is aimed at several audiences, the report is an unusually important part of an effective study. Skillful presentation of the facts and judgments can both encourage busy officials to read it, and increase the acceptability of its recommendations. It should be incisive, factual, diplomatic, readable (especially to a layman), complete and brief. This means that good reports are difficult to prepare, and experience has confirmed this.
The basic structure of reports should be set up in advance. A suggested outline for a complete sector study is shown in Annex 6. It should allow readers with different degrees of familiarity with the sector and the country, and with differing amounts of time to devote to reading the report, to extract what they need without difficulty. This suggests a brief, but complete, Summary and Conclusions section; the body of the report divided into more or less independent sub-sections dealing with the description of the sector and its problems; a Recommendation section giving the detailed suggestions of the mission and the supporting arguments. Most of the purely descriptive and statistical information should be in annexes. The descriptive sub-sections and annexes should be prepared as much as possible in the field while the information is fresh. The broad recommendations should be discussed in the field with appropriate officials, but they can best be written in the calmer atmosphere of the home office, after discussion of the analysis and policy implications with supervisors as required. Whatever form the report takes, it should highlight the sector's problems and opportunities at this stage of its development, and provide a basis for decisions about its future development.

At some appropriate place in the report, there should be a listing of specific actions by the government, by individual enterprises, by consultants, by potential lenders, or others, required to move forward preparation of projects or other steps in getting sector development underway. These should be followed up in order to preserve the momentum that will hopefully have been produced by the study.
DEFINITIONS OF SECTOR WORK CATEGORIES
(Used by the IBRD)

Sector Survey

A broad analysis of sector potential and major sector problems, policies and issues cast in the medium of long-term perspective. Lending program development may also be an objective.

Comment

For work programming purposes, this category includes missions to select in advance the principal topics to be covered in the sector survey proper and follow-up missions to discuss the draft report and the country concerned. UNDP financed sector surveys by consultants, with the Bank or WHO as executing agency, should continue to be classified as a technical assistance activity.

Sub-sector Survey

Same as above, but limited to major sub-sectors (urban water supply, major city wastes disposal, rural water supply, etc.) or geographic regions.

Comment

Sub-sector surveys may be useful where general sector surveys are not considered feasible or where knowledge in some sub-sectors is already considered adequate on the basis of project work, previous sector work, or other sources.

Sector/Sub-sector Review

Of similar broad scope as survey but in considerably less depth. May involve an initial review of the sector or an updating of a previous sector survey. May also involve some lending program development.

Comment

While some sector updating missions have been carried out, most sector reviews are conducted in association with IBRD economic missions and often appear as appendices of economic reports.
Special Sector Study

Analyses of one or several specific sector problems, policies or issues (sewage treatment and disposal standards, water supply for low income groups, sector training needs, etc.) or of a sub-component of the sector too limited to be considered a major sub-sector. May deal with matters which cut across national boundaries (allocation of water from boundary rivers) or across sector boundaries (urban water versus irrigation water). Lending program development may also be an objective of such studies.

The United Nations Development Decade target figures are summarized as follows:

Urban water supplies: all urban dwellers to receive a safe and abundant water supply, either in their houses or courtyards, or from public standpipes.

Rural water supplies: 20 per cent of rural inhabitants to be supplied with safe water.

2. Goals for Latin America (1961-1971) Punta del Este

Urban population 70% to be served with piped water supplies.

Rural population 50% to be served with safe water.

3. Goals for Latin America (1972-1981) ECLA/Ministers of Health

Urban water supplies: 80% of the population to be served by house connections, or as a minimum, a reduction by 50% of the population without service.

Rural water supplies: the provision of water to 50% of the rural population, or as a minimum, a reduction by 30% of the population without service.

November 9, 1973
CHECKLIST FOR SECTOR INFORMATION

General Information on the Sector

1. Laws, codes and decrees regulating water sources, allocation, pollution and the organization of water supply and sewerage.
   Responsible authority at national, regional and local levels.
   Distribution of responsibilities between national and regional authorities, municipalities and management of water supply/sewerage systems.
   Legal status of the systems (government department, national authority, local authorities, commercial corporations, concessionaires, etc.).

2. Situation in rural areas; the agency or agencies responsible for rural water supplies and sanitation.

3. General health conditions in the country. Prevalence of diseases attributable to inadequate and unsafe water supplies and bad sanitation.
   Data by region and urban centers on waterborne and water-related diseases. Population trends, housing status and programs.

4. Priority and magnitude of investment for water supply and sewerage systems within the national plan.
   Comparison with total investments in the public sector, past and future.
   How are urban water/sewerage capital expenditure financed?

Basic Information on Water Supply and Sewerage Systems

1. Classification of urban centers by size and geographic sub-division.
   Number of cities and towns having both municipal water supply and sewerage systems.
   Number of cities having one but not the other.
   Number of cities and towns without any system.
   Percentage of urban zones covered by the systems.
   Number of centers with overall urban plans and status of such plans.
   Electricity and other types of infrastructure.
2. Broad statistics on water/sewerage operations by size of urban centers and geographic sub-division, giving general information on percentage of private, industrial and commercial customers served from public systems, numbers of public taps, income levels. Water consumption data on private, industrial and government customers. Broad assessment of the ratio of water consumption to water production, and analysis of difference. Past growth of the urban population and of the number of connections and water consumption by each category of customers. Per capita consumption of water in various areas and cities.

3. Investments in the past five years for new systems and expansions of existing systems. Number of systems newly constructed or expanded in water supply and sewerage. Their classification by size of the urban centers and geographic sub-division. Status and problems of implementation of past and on-going projects.

4. Analysis of past investments. Classification of financing sources (foreign loans, national departmental or municipal funds, internally generated resources). Share of each source. Changes in financing sources in the past five years.

5. Mechanism for determination and application of water and sewerage charges, and authority determining tariffs. National or departmental coordination. Tariff schedules for water and sewerage in several urban centers. Policy and criteria for determining the rates (e.g., consumption, category of customers, obligation for the system to cover costs or yield a certain return).

6. Financial situation and organization of the water and sewerage systems. Their profitability. In case of deficit, who subsidizes the systems? Changes in amounts of subsidies in the past five years. Accounting methods used in the systems.
Profit-and-loss statements, balance sheets of most important systems or relevant chapters of the national budget.
Auditing policy.
Effectiveness of billing and collecting.

7. Value of water supply and sewerage assets. How determined?

8. Investment program for water supply and sewerage for the next five years or any other period covered by the national plan.
Classification of investments by size of urban centers.
Financing planned for new investments.

9. Method used in the development of new projects or expansion of existing systems.
Design criteria for water supply systems; for sewerage systems.
Procurement procedures. Equipment manufactured locally. Preference given to local manufacturers and contractors.
Customs policy. Magnitude of import duties.
Responsibility for construction of civil works.
Technical support available for the national authority, number and competence of local consultants.
Availability and capability of local contractors.

10. Man-power resources in the sector. Problems of recruitment.
Use of foreign personnel in consultative or operational executive roles.
Training facilities and policy.
Is information being collected on hydrology and hydrologic and groundwater resources?
Responsible agency and status of the data.

11. Second Development Decade (1970-1980) target established by the UN for water and sewerage for urban populations have been established at 1.0% to be served by water in houses and 60% from public standpipes, with 27% to be connected to sewer systems in the next ten years.
After ten years, on the basis of present investment program?
12. For rural populations, the Second Development Decade target is 20% to be served by safe water. What is the present situation in the country? After ten years, on the basis of proposed programs?

13. Per capita capita cost estimates (existing and future facilities).

14. Housing conditions in major centers.

15. City planning and master plans for development.

CHECKLIST FOR IDENTIFICATION OF PROBLEMS

NOTE: The answers to many of the questions below are subjective judgments. Where these judgments are reflected in the sector report, the writers should try to make clear the comparative basis for the judgments.

Man-power

a. Are local personnel technically competent and sufficient in number to carry out the development plan?

b. How effective are man-power training schemes?

c. Could adequate skilled and semi-skilled man-power be supplied if the development plan were expanded?

d. What are the management, man-power and training needs, both water and sewerage? Detail as to professional, sub-professional and skilled labor by area: (i) investigation and design, (ii) construction and (iii) operation and maintenance.

Technical - Managerial - Planning

a. Is there sufficient knowledge of surface and groundwater resources, and how effective are methods of investigation?

b. Is investment planning of high standard? Are alternatives adequately examined?

c. Is there a backlog of investment? Why?

d. What are criteria for the selection of water supply projects - high incidence of waterborne diseases, grossly inadequate existing facilities, inability to meet future demands, etc?
e. Are design standards satisfactory?

f. Have past projects been well constructed?

g. Are existing systems adequately maintained and operated?

h. How is consideration of the need for safe quality as well as adequate quantity of drinking water reflected in frequency of water inspection and testing, nature of surveillance, adequacy of laboratory services, etc?

i. Are there particular health problems associated with the sector?

j. Are there major water pollution problems associated with industry, or with community sewerage systems? What are the criteria used for selection of sewerage schemes?

k. How severe are problems caused by conflicting demands for water use? What are the means for allocating water resources where they are scarce?

l. To what extent can or should equipment and materials be supplied locally?

m. Are procurement, contracting and bidding procedures satisfactory?

n. To what extent can local consultants or government engineers be relied upon to carry out hydrological, preliminary engineering and feasibility studies?

o. Are local contractors available and efficient?

p. To what extent will development of water supplies create additional waste disposal problems?

q. Are adequate pre-investment studies available or planned?

r. What are the needs of preliminary engineering and feasibility studies, in both the water and sewerage areas?

s. What are the country's water and sewerage targets for the Second UNDP Development Decade (1971-1980)? Have they been incorporated in the national development plan?
t. What attention is being given to solid waste problems? Are concepts reasonable? Are practices effective in terms of health and sanitation.

Financial - Economic

a. Are accounting systems satisfactory? Is there an adequate budgeting and financial planning system?

b. How are water supply and wastes services charged for?

c. Do charges reflect economic costs of providing the services?

d. Are water and wastes disposal undertakings financially viable?

e. Are water metering policies rational?

f. What has been the level of investment per year in the past?

g. What are terms and interest rates of local funds provided for the sector? What are the procedures by which they are made available?

h. Are methods of subsidizing the sector, if any, likely to result in misuse of resources?

i. Is foreign aid to the sector likely to be maintained, increased or reduced? Are terms and interest rates likely to be changed?

j. Where there are extreme budgetary constraints, has the possibility of raising funds in the private sector been adequately examined?

Organizational - Administration - Legal

a. How satisfactory are the laws, codes and decrees regulating water supply and wastes disposal systems, and the allocation and consideration of water resources generally? Are they enforced?
b. Is the division of responsibility for policy, construction and operation adequate?

c. Are the roles of national, regional and local public authorities clearly defined and satisfactory?

d. Is there need to change the legal status of any of the parts of the system (commercial corporations, concessions, administrative bodies, etc.)?

e. Are organizational structures of individual water and sewerage utilities conducive to efficient operation?

f. Are local officials aware of the requirements of international lending agencies for project preparation?

g. Is there sufficient coordination with other agencies with interests in water resources and waste disposal or with responsibility for industrial or infrastructure development, urban planning, and so on?
## PREINVESTMENT PROGRAM - STUDY DATA SHEET

<table>
<thead>
<tr>
<th>Area:</th>
<th>Country:</th>
<th>Sector(s):</th>
</tr>
</thead>
</table>

1. **NAME OF PROPOSED STUDY:**

2. **PURPOSE:**

3. **SCOPE:**

4. **BACKGROUND:**
   - (a) Related Studies
   - (b) Other Available Data
   - (c) Expected Data Problems

5. **TIMING:**
   - (a) Duration and Phasing of Study
   - (b) Desired Starting Date

6. **COMMENT ON POTENTIAL STUDY SPONSORS:**

7. **PROJECT(S) EXPECTED TO RESULT FROM STUDY (if known):**
   - (a) Description
   - (b) Estimated Investment (US$ equivalent)
   - (c) Financing Need and Potential Source

8. **ORDER OF MAGNITUDE OF STUDY COST (US$ equivalent):**

---

### SHEET PREPARED BY:
- Dept. or Agency:
- Date:

### SHEET REVISED BY:
- Item(s) Revised:
- Dept. or Agency:
- Note:
INFORMATION TO BE PROVIDED ON STUDY DATA SHEETS

Item 1: Give an appropriate name to the proposed study for identification purposes.

Item 2: State the purpose of the study, giving the main issues to be resolved and indicating development objectives relevant to the study.

Item 3: Summarize the scope of work envisioned. In this space give (a) limits of subject, geographic area and time to be covered by the study, (b) major types of required field investigations, mapping, laboratory work etc., (c) categories of analytic work, and (d) alternatives to be studied.

Item 4: Indicate related studies which preceded or are to be undertaken concurrently with or subsequent to the proposed study. Outline the types of basic data which will be used in conducting the proposed study and indicate any special problems in data collection which are expected.

Item 5: Indicate the likely duration and desired starting date of the proposed study and, where applicable, give the scope of suggested phases in which the studies are to be executed, together with the duration of each phase.

Example: "Phase 1 - Site selection and functional design ---------------------------- 4 months
Phase 2 - Preliminary engineering and economic analysis ----------------------- 6 months
Total duration (including approval of site selection) --------------------------- 12 months"

Item 6: If agencies are known to be potential sponsors of the proposed study, indicate their name and comment on the prospective role of the agency in conducting the study. For instance, give relevant information on government participation in the country of the study, such as the responsible ministry or technical agency dealing with the sector; mention any agency which may have expressed the intention to administer the study as "Executing Agency" (FAO, Bank, UNESCO, etc.); and record any expressions of interest in providing funds for the study.

Item 7: Give a brief description of the projects to be prepared by the study (if known), together with an indication of the estimated investments and the likely need for foreign financing. If the project is being discussed in terms of Bank Group financing, this should be indicated; if alternative sources of finance have been named, this should also be noted.

Item 8: Indicate the order of magnitude of the cost of the study, based on an assessment of the information given in Items 3, 4 and 5 of the "Study Data Sheet" and, where possible, support this information by filling in Items 1 and 2 of the "Study Data Supplement."

Item 9: Give staff's view on the priority ranking of the study, indicating year in which study should start and importance of study to sector development.

Note: Use "Study Data Supplement" to give any comments or data for which space on this sheet is insufficient.
1. TENTATIVE STAFFING

<table>
<thead>
<tr>
<th>Type of Specialist</th>
<th>Number on Team</th>
<th>Total Man-Months</th>
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<tbody>
<tr>
<td>(a) Foreign Professional Staff:</td>
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<td></td>
</tr>
<tr>
<td>(b) Local Professional Staff:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) Local Supporting Staff:</td>
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<td></td>
</tr>
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</table>

Total:

2. TENTATIVE STUDY BUDGET (US$ equivalent)

<table>
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<th>Foreign</th>
<th>Local</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>(a) Professional Staff Costs:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Equipment:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) Other (Travel, non-prof. staff, etc.):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d) Total:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. OTHER COMMENTS

Supplement Prepared by:
Dept. or Agency:
Date:

Supplement Revised by:
Item(s) Revised:
Dept. or Agency:
Date:
INFORMATION TO BE PROVIDED IN STUDY DATA SUPPLEMENT

Item 1: Indicate the likely staff effort required for completion of the study. In I-(a), give the mission's estimate of the main categories of foreign specialists, their number, and the total number of man-months of work (field and home office work combined). I-(b) should be completed only if it is intended that professional staff of domestic firms participate in the study; this part should be left blank if the only professional contribution by the member country will be "government counterpart personnel" of the sponsoring agency. (Tentative staffing and budgets should exclude personnel who would not be responsible for completing the study). In I-(c) indicate the type, approximate number and man-months of local supporting staff required (i.e. survey crews, draftsmen and other non-professional staff).

Item 2: Give the tentative budget estimate for the proposed study. This should be based on the staffing given in item 1 and on unit prices for various professional services of each category which will be provided for budgeting purposes by each Projects Department. The estimate should also include the cost of foreign and local travel, subsistence for foreign staff, and the cost of major pieces of equipment or supplies required during the execution of the study. (The estimate should not include amounts required for fellowships or other training related to the subject unless this is required for the execution of the study.)

Item 3: In this space give any comments or data for which space on "Study Data Sheet" is insufficient.
OUTLINE FOR SECTOR STUDY REPORTS

I. SUMMARY AND CONCLUSIONS

II. INTRODUCTION

Brief background of the reasons for the study, the importance on the sector in the economy, its social implications, Bank involvement in the past and future, etc.

III. THE SECTOR

A. Organization
B. Policies
C. Water Supply in 1971
D. Sewerage in 1971: Present situation
E. Sector Finances

IV. PRINCIPAL PROBLEMS AND CONSTRAINTS

V. PRINCIPAL ISSUES FOR SECTOR DEVELOPMENT

A. The Development Program (alternative goals)
B. Organization
C. Planning and Project Preparation
D. Man-power
E. Finance

VI. RECOMMENDATIONS

VII. SPECIFIC STEPS NEEDED TO ADVANCE DEVELOPMENT (or an Annex)

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1/ This outline is for a report reflecting a thorough and complete sector study. If the scope or depth of the study is restricted, the outline will need to be modified accordingly.

November 9, 1973