

GUIDELINES FOR HUMAN RESOURCE DEVELOPMENT PLANNING IN THE WATER SUPPLY AND SANITATION SECTOR



WATER AND SANITATION
FOR HEALTH PROJECT

Operated by
CDM and Associates

Sponsored by the U.S. Agency
for International Development

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WASH TECHNICAL REPORT NO. 20

OCTOBER 1983

The WASH Project is managed
by Camp Dresser & McKee
International Inc. Principal
cooperating institutions and
subcontractors are: Associates
in Rural Development, Inc.;
International Science and
Technology Institute, Inc.;
Research Triangle Institute
Training Resources Group;
University of North Carolina
at Chapel Hill.

Prepared for:
Office of Health
Bureau for Science and Technology
U.S. Agency for International Development
C Task No. 265

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Prepared for the Office of Health, Bureau for Science and Technology
U.S. Agency for International Development Under Task No. C-265

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October 1983

Water and Sanitation for Health Project
Contract No. AID/DSPE-C-0080, Project No. 931-1176
Is sponsored by the Office of Health, Bureau for Science and Technology
U.S. Agency for International Development
Washington, DC 20523

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PREFACE

This document was prepared as a guide for human resource development planning in the water supply and sanitation sector in developing countries. Member states of the United Nations have designated the period 1981-1990 the International Drinking Water Supply and Sanitation Decade with the goal of providing adequate drinking water and sanitation for all. Investments in human capital and development of the necessary skills in the labor force to accomplish sectoral objectives are major priorities.

These Guidelines are intended to assist those knowledgeable and experienced in HRD planning in developing country governments and others providing technical assistance to determine both demand for and supply of skilled labor for the water supply and sanitation sector and to prepare comprehensive HRD plans to meet future needs. This collaborative approach is presented in two chapters. The first introduces the general structure of the methods used, the planning model, and the composition of the planning team. The second chapter presents the 15 steps through which the planning team assesses sectoral skill needs and prepares the HRD plan.

The Guidelines are constructed so that Exhibits 5 through 8 (summaries of steps in each component) and the worksheets in Appendix 2 (Worksheets 1 through 7) can be put together to form a working package for field use. The accompanying text can thus be separated and can serve as a reference where necessary for the more compact working package.

This document is intended as a working document. Revisions therefore can be expected as the Guidelines are used in different settings, and user comments are welcomed.

ACKNOWLEDGEMENTS

Several people have assisted in the development and preparation of these Guidelines, and the authors acknowledge with appreciation the thoughtful reviews and constructive comments from the Agency for International Development, the World Health Organization, the International Reference Centre, and the International Labour Organization. Thanks go in particular to John Austin, Fred Rosensweig and Horst Otterstetter for consistent and knowledgeable support.

INTRODUCTION

Half the population of the world (excluding China) lives in developing countries, approximately 70 percent of them in rural areas. In 1975, it was estimated that only 22 percent of these rural populations had access to reasonably safe water, and 15 percent to sanitary excreta disposal facilities. In contrast, 77 percent of the urban population had access to piped water and 75 percent to sanitary excreta facilities. As a consequence of these findings, the United Nations Water Conference of 1977 recommended national development policies and plans where appropriate to give priority to the supply of drinking water and sanitary waste water disposal for everyone in need. The decade 1981-1990 was designated as the International Drinking Water Supply and Sanitation Decade (IDWSSD) and set as a goal safe water supplies and sanitation facilities for all by 1990. Formal mechanisms initiated by governments for policy and technical guidance have included national action committees in participating nations. There is an international consensus as to the critical needs of large segments of developing country populations implying the necessity for new technical assistance mechanisms and cooperation between donor agencies, national governments, and communities. It is therefore the purpose of this document to address one aspect of such technical assistance, namely the human resource development planning component of decade activities.

Successful implementation, maintenance and expansion of water supply and sanitation (WS&S) programs in a developing country depends on a number of factors, among the most important of which are education, training and retraining, and management of human resources. The success of IDWSSD strategies will rely on skilled workforces at all levels.

Without effective measures to recruit, train, and maintain skilled labor to establish and operate water supply and sanitation programs, government policies and available resources can have little impact.

It is difficult to estimate the total cost of personnel in water supply and sanitation programs in developing countries. Personnel costs for WS&S projects appear as a line item in the budgets of more than one developing country ministry or agency. Furthermore, personnel whose primary function is outside WS&S programs are often involved in these projects. Therefore, given the degree to which personnel with many different and complementary skills participate in WS&S projects, it could be suggested that personnel costs are as much as one-half of the project cost. However, not enough systematic attention has been given to defining the process by which human resources development (HRD) needs are assessed, and the necessary personnel recruited, trained, supported and supervised.* This is not to suggest that skill needs assessments

*The term "human resources" is intended to include youth as well as adults, women as well as men, providers of services as well as consumers, paid employees as well as volunteers. It includes decision makers and managers, planners, technicians, scientists, researchers, clerical and accounting staff, skilled and unskilled laborers. It includes not only those who help to create facilities, but those who operate and maintain them and those who support, monitor and control the quality of the services. It includes a variety of types of educators and trainers. It includes people working in other program which support the water supply and sanitation sector. "In fact the human resources term is saved from being broadened into meaninglessness only by its restriction to productivity, achievement and service" (Mangum, et al., 1979, p. 25).

"The term "human resource development" (HRD) means more than the education and training of people. It includes their employment, supervision, continuing education and training, and occupational welfare. The Decade HRD process should therefore embrace planning, skill development and training, and human resource management, with all three harmoniously geared to the achievement of specified goals" (Interagency Task Force on Human Resources Development for the International Drinking Water Supply and Sanitation Decade Basic Strategy Document, Geneva, 1982, p. 12).

for the water supply and sanitation WS&S sector have not been conducted. Indeed, there is a growing literature on HRD planning in developing countries (e.g., Ginzberg, 1967, 1975; Loken, 1969; Kidd, 1980; Connor and Carson, 1982), and corresponding adaptations to WS&S sector needs (Briscoe, et al., 1982; Milburn, 1981; Austin, 1980, 1982; Cairncross, et al., 1980; and Carefoot and Densham, 1978).

Yet, in spite of the important contributions to HRD planning made by these studies and others, important issues remain unresolved or have been inadequately addressed. There is, for example, little agreement on the terminology used in HRD planning. Little or no standardization exists in occupational classifications within, still less across bureaucratic jurisdictions. Developing nations also vary in the scope and accuracy of their current and forecasted estimates of occupational employment. In addition, the processes are not clearly understood by which water supply and sanitation personnel are (1) distributed throughout any developing country; (2) replaced as they migrate to other locations in the country or abroad; (3) integrated with indigenous and auxiliary personnel working in the same sector; (4) complement the activities of local communities; and (5) act as a catalyst to help local communities define their needs and implement agreed upon interventions. Any attempt therefore to provide comprehensive and formal guidance to HRD planners will not only break new ground, but will need to be general enough to accommodate differing national, regional and agency circumstances.

These Guidelines outline a systematic approach to conducting HRD needs assessments and preparing training plans. The approach is consistent with HRD planning designs referenced above but tailored to meet

the characteristics of the water and sanitation sector. The approach assumes that there are important interrelationships among agencies that should be addressed when allocating human and financial resources. Furthermore, countries for which this approach is designed will have assigned major priority to WS&S activities, will be actively committed to Decade goals, and are expected to have key ministry support and interagency collaboration in the pursuit of WS&S policy and programs. To assist in providing understanding of these interrelationships, a general model of the HRD system is provided in the following section.

A General Model for a Human Resource Development System

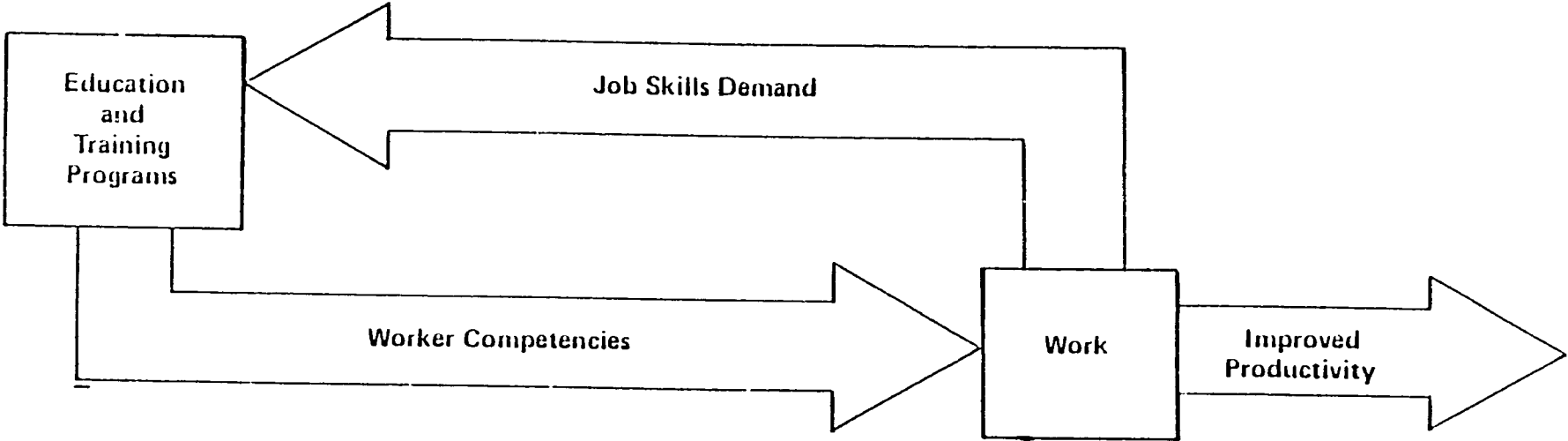
The approach put forward in these Guidelines is based on three assumptions:

- an effective HRD education and training delivery system should be responsive to shifts in occupational demand;
- HRD planning is best approached rationally and systematically; and
- HRD planning necessitates a coordinated team approach.

First, the interchange between education/training and the workplace should be dominated by the need to provide improved productivity in the workforce. Exhibit 1 outlines this relationship. Information on the demand for job skills must flow from the WS&S sector so that education and training programs can provide the necessary competencies for a skilled labor force. In particular, as new technologies create needs for new or changed occupational skills, this information flow needs to be continuous and up to date.

Secondly, effective HRD planning should include all parties concerned, their separate individual and agency jurisdictions and prerogatives, and the statutory, fiscal, and regulatory environments within

**Exhibit 1
Education and Training for Improved Productivity**



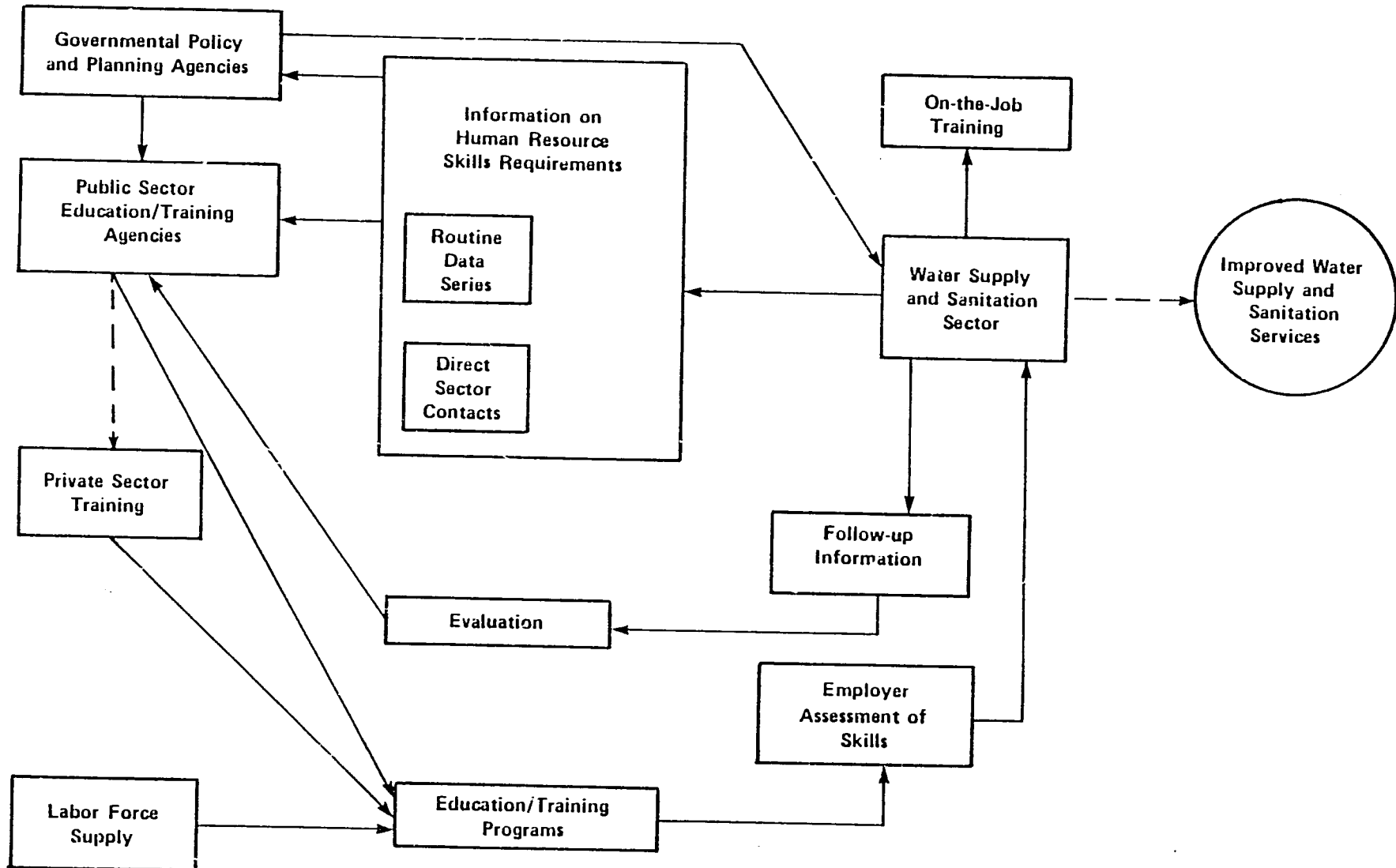
which any plans will be implemented. Agencies are assumed to act in their own interests and to base actions on anticipated consequences. These Guidelines therefore adopt a systems approach to HRD planning. Exhibit 2 outlines a general model for a human resource development system in relation to education and training.

The model assumes that governmental planning agencies in the the WS&S sector interact with other public (or private) education and training agencies* although this assumption may be overly optimistic for some countries. Individuals are employed in the water supply and sanitation sector after completing training, and their skills are assessed by employers in the water supply and sanitation sector. Employers may provide on-the-job training as a means to correct or upgrade skills. Information on employers' needs, in the form of specific skill requirements, can be obtained by agency planners either through routine statistical surveys, periodic needs assessments, or direct contacts with specific employers. Planners can also routinely receive information on educational and training programs and employ evaluations to determine progress and/or introduce new programs..

All elements of this integrated and coordinated HRD system are unlikely to be found in place in any country. Inadequate information, imperfect linkages between agencies, and uncertainty concerning policy and resource allocation are more often the rule than the exception. Statistical data series are often rudimentary at best. Yet HRD planning requires the application of principles within a structured process. In

*The interaction between public and private agencies in this regard, designated by a dotted arrow in Exhibit 2, may be particularly marked in countries where private schools are publicly regulated.

Exhibit 2
 Model for Human Resource Development System in Water Supply and Sanitation Sector



addition, where there is little formal organization or structure, these guidelines should be useful in promoting the required interrelationships. This model therefore provides a foundation for a systematic approach to human resource development and is the basis for the method presented.

Finally, the model also assumes that effective HRD planning should be viewed as a complex set of interlocking activities that are best addressed by a multidisciplinary consultant team working with in-country personnel. The composition of the team and its role in the planning process are detailed later in this introduction.

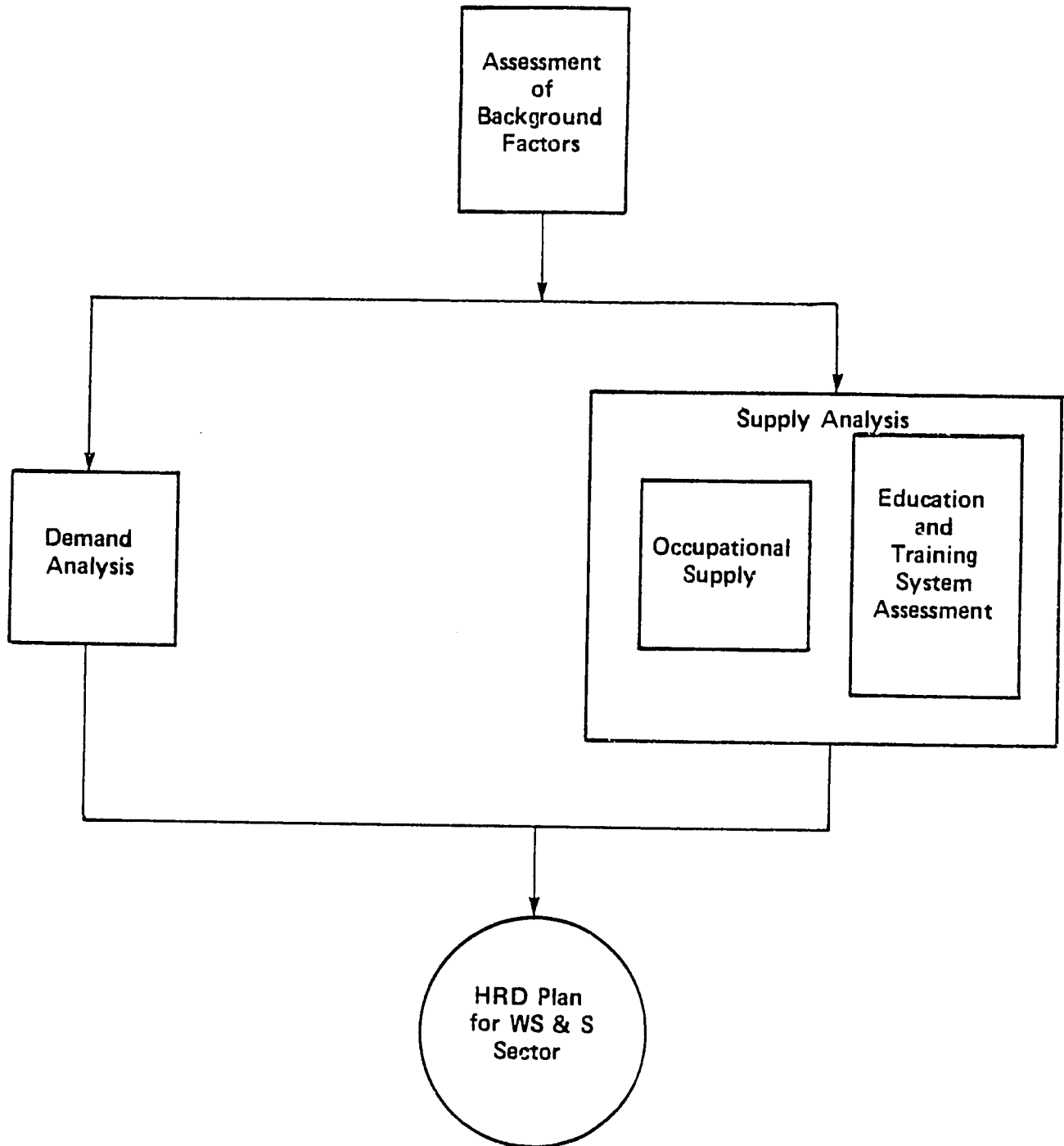
The basic structure of the approach is divided into four components:

- assessing the context within which IDWSSD human resource development planning is taking place, developing a full understanding of the country-specific water supply and sanitation system based on a review of both official and unofficial data, and determining the extent of and need for interministerial collaboration in the planning process;
- estimating demand by obtaining estimates of current and projected skill needs by occupation and level of skill;
- determining availability of skilled labor, estimating occupational supply by compiling an inventory of existing educational and training institutions and programs, and completing an assessment of their ability to provide the manpower required to meet skill needs and/or correct demand/supply imbalances in the water supply and sanitation system; and
- preparing a plan for providing the necessary skilled labor at all levels in the water and sanitation sector in the briefest time and in the most effective manner.

Exhibit 3 shows the interrelationships of these four components.

The first component involves definition of the purpose and anticipated uses of the plan, and identification of background factors such as the major ministerial, donor, and other agency involvement in the planning, legislation, and policy statements affecting WS&S operations as well as determination of availability of the necessary data to conduct the demand and supply analyses. Some of the activities in this first

Exhibit 3
- The Four Components of the HRD Planning Approach



component can be carried out before visiting the country by using secondary data sources such as IDWSSD position papers, recent sectoral manpower studies, and other relevant documentation. It is important however that the current and anticipated configuration of ministry and other key agency involvement be well understood prior to the development of HRD plans. Part of the background factor assessment will therefore need to be done in-country, particularly the final identification and meeting with representative "stakeholders" in sectoral HRD planning.

The second and third components address estimating the demand for and supply of skilled labor. Depending upon the availability of data on both occupational supply and demand (determined during the background assessment), the extent of reliance on existing data sources versus primary data gathering must be determined. Resources will limit the analyses to consideration of existing data in most cases. Detailed below are techniques for collecting new data should the need arise.

Estimates of occupational demand will require assessment of accuracy, coverage, and comparability of existing data series, with specific attention to such factors as homogeneity of occupational classifications across agencies, job titles and descriptions, and educational and training requirements for discrete occupations or occupational clusters. In general, the approach consists of accessing available data, reconciling interagency differences in classification and occupational statistics, and preparing tables showing current resources and estimated needs by subsector. Extensive review by stakeholders of agency definitions, skill needs requirements, and current and projected demand results in revised final tabulations. If appropriate, occupations can then be

ranked by such criteria as gross demand, perceived shortages, training time needed to reach proficiency and how critical they are to sector operations. Occupations so identified and ranked will serve as a guide in the analyses of occupational supply.

The two subcomponents in the determination of occupational supply estimation are: deriving numerical estimates of available skilled labor for identified occupational needs; and assessing the adequacy of the education and training system to equip individuals with the necessary skills. Data on all sources of occupational supply are more difficult to obtain than occupational demand estimates, since occupational supply includes not only the output from educational, training and other institutions into the labor force, but also those currently employed who may be available to change jobs (occupational transfers) or who may enter the labor force from outside regional or even national boundaries. These considerations should be addressed to the extent that data permit and estimates of occupational supply adjusted accordingly.

Assessment of education and training programs, facilities, staff and other factors affecting the supply of skilled labor will also be based on existing secondary data sources. For occupations identified as relevant to the WS&S sector, institutional and on-the-job training programs are identified by training institution or agency. Such an inventory not only indicates comparative sources of occupational supply, but also suggests where duplication and overlap is occurring. Comparison of supply estimates with data on occupational demand permits detection of major imbalances and provides empirical evidence of skill shortages. Assessment of education and training system capacity to meet documented demand illustrates directions in which resources need to be targeted.

The final component consists of the preparation of a comprehensive HRD plan for institutional, programmatic, staff or other modifications which need to be made to redress imbalances.

The Guidelines follow the above component structure in a series of fifteen steps as illustrated in Exhibit 4. Although the steps need not necessarily be conducted in sequential order, each step contains a set of discrete activities which should be completed during the development of the HRD plan. Each step is presented according to the following outline:

- Purpose;
- Outlines of Activities;
- Procedures;
- Data Needs;
- Approximate Schedule and Resources;
- Outcomes/Products.

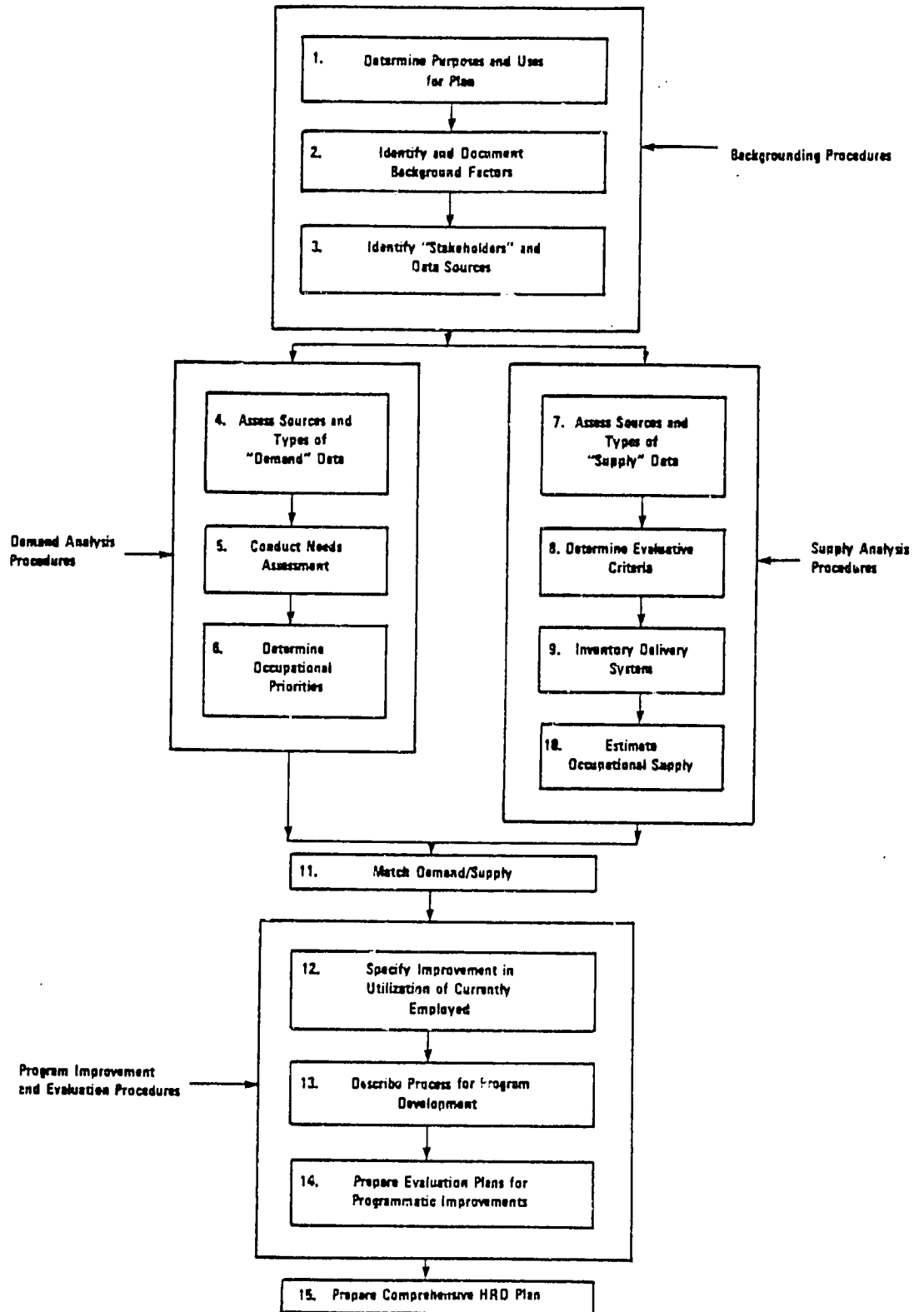
Users of the Guidelines: The Multidisciplinary Team

These Guidelines are designed for use by professionals relatively knowledgeable and experienced in HRD planning, whether consultants or in-country personnel.

The process outlined is ambitious, but can be completed by a two-to three-person team in just over three person-months. The team approach blends skills, facilitates collaboration, and produces a comprehensive plan within a brief period of time. The team calls for expertise that is seldom, if ever, found in one person, and flexibility will be needed in selecting team members according to relevant WS&S sector characteristics and needs within a particular regional and national context. The collective skills and relevant experience of the

Exhibit 4

Diagram of Steps for Preparing a Comprehensive Human Resource Development Plan for the Water Supply and Sanitation Sector in Developing Countries



team as a whole are more important than individual titles or particular designations of team members. Therefore the team composition and levels of effort provided in the guidelines are illustrative rather than prescriptive and focus on average team size and estimates of minimum person loadings per activity.

Expertise in at least two different areas is required. One person should have a thorough knowledge of water supply and sanitation systems in developing countries and be able to present the team's findings in terms relevant to policy makers and planners. Findings and recommendations must speak to cost benefits and cost effectiveness. A second person should be experienced in designing and evaluating HRD systems and in analyzing and developing specifications for training programs capable of providing the skills required to meet the needs of the WS&S sector. This person needs to be aware that time is scarce in HRD planning, that there is usually a long period between the the needs assessment and the provision of trained personnel, and that a range of short and long-term training programs (formal and non-formal) are required to minimize the possibility that needs will change before personnel are available.

The activities of these two professionals can be complemented by a third person with skills in assessing and/or initiating the community development process at the local level, for example in community health programs. Such a person could provide invaluable assistance by ensuring that the assessment and recommendations are framed in a manner that is politically and socially acceptable and that education and training programs are culturally appropriate.

The multidisciplinary team should be able to assess the qualitative and quantitative dimensions of the WS&S sector and develop an HRD plan that takes into account:

- the physical components of the water supply and sanitation system and the geographical characteristics of the country that facilitate or obstruct the maintenance, upgrading or expansion of the system;
- the political processes by which the society determines how resources are distributed;
- the social-cultural characteristics that suggest the degree to which the society is receptive to change; and
- the administrative structure that facilitates or obstructs policy development and the implementation of ongoing or new initiatives.

Implicit in the criteria for composition of the team is the understanding that the planning effort will only be effective with in-country participation and support. Since the likelihood that the assessment will be endorsed and the recommendations implemented increases with the involvement of in-country professionals in the conduct of the needs assessment and the preparation of HRD plan, it is assumed that effective counterpart relationships will be established with in-country personnel during all stages of the planning process to facilitate ongoing HRD planning once the project team has left the country. However, since the team will want to ensure that in-country counterparts have the necessary technical expertise and administrative influence, efforts should be made to identify key personnel before visiting the country. At the very least, the team should have preliminary information on those ministries and individuals responsible for water supply and sanitation activities and the training programs that provide the necessary personnel. In addition, consideration should be given to introductory training sessions for both the team and their in-country counterparts prior to beginning the process outlined in these Guidelines.

Approximate levels of effort are included within each step of the guidelines and are summarized for each component in Exhibits 5 through 8. Although specific levels of effort are not included for in-country counterparts, the levels of effort for the project team should serve as good estimates for the amounts of time spent by the counterparts. Estimates provided here do not include pretraining periods, and will vary with each country application, as will the allocations among team members. However, these are considered to be minimum estimates of professional involvement in each step. Where in-country agency personnel other than specifically identified counterparts are required to spend time associated with a particular step of the project, that time is also estimated. The total number of professional person days for the project team is estimated to be:

| | | | |
|-------------|---------|----------------|------|
| Component 1 | Step 1 | 5 person-days | = 12 |
| | Step 2 | 2 person-days | |
| | Step 3 | 5 person-days | |
| Component 2 | Step 4 | 6 person-days | = 19 |
| | Step 5 | 10 person-days | |
| | Step 6 | 3 person-days | |
| Component 3 | Step 7 | 5 person-days | = 15 |
| | Step 8 | 3 person-days | |
| | Step 9 | 4 person-days | |
| | Step 10 | 3 person-days | |
| Component 4 | Step 11 | 10 person-days | = 27 |
| | Step 12 | 3 person-days | |
| | Step 13 | 6 person-days | |
| | Step 14 | 3 person-days | |
| | Step 15 | 5 person-days | |

for a minimum total of 73 person days.

Use of the Guidelines

It is recommended that the Guidelines be used as a total document, and that all steps be completed during the process of developing the HRD

plan. A set of worksheets are included in Appendix 1 to assist the team in its work. The worksheets are provided in blank form for use by the team (Worksheets 1 through 7). In cases where exemplary (filled out) worksheets are illustrated, the Worksheet number has the suffix "a" after its number (Worksheets 2a, 5a and 7a). Thus for field use, the blank (and exemplary completed worksheets) can be detached from the document, added to the step summaries (Exhibits 5 through 8) to provide a field working package with the remainder of the text as a reference where necessary. To facilitate the reference process each worksheet indicates in the title which step to reference in the text for explanation of the procedure associated with that worksheet.

An additional use for the Guidelines (that may be particularly appropriate in applications where some technical assistance is needed, but there is some reluctance to rely solely on outside consultants) is in providing the basic structure for a 3-5 day workshop in HRD Planning. The four components of the approach facilitate blocking of training sessions by component, and focusing more specific explanation where the need is greatest. In this, as in any other use of the Guidelines, flexibility will be needed in adapting the document to specific situations and requirements. We believe the general principles underlying the approach are sound. No structure however can be developed that will be instantly applicable to all cases, and the utility of the Guidelines will be largely dependent on the degree to which they can usefully be adapted by experienced professionals to the needs of a particular country or region.

STEPS IN THE DEVELOPMENT OF THE HRD PLAN

This chapter details the 14 steps through which the HRD plan is developed. These steps are grouped into the four categories outlined earlier in Exhibit 3:

1. develop background information (Steps 1-3);
2. conduct the skills needs assessment of WS&S sector "demand" (Steps 4-6);
3. conduct the assessment of the WS&S occupational "supply" and the current education and training supply system capability (Steps 7-10); and
4. develop recommendations and a comprehensive implementation plan for meeting WS&S human resource development needs (Steps 11-15).

I. BACKGROUND PROCEDURES

Steps 1 through 3 involve assessment of the context of the planning process. The necessary backgrounding will consist of:

- determining the purpose for developing the eventual HRD plan, and the uses to which it will be directed;
- identify and document background factors with particular emphasis on available data sources; and
- specify the audiences, users and uses for the plan.

These three steps are not necessarily in sequential order, but should be treated as discrete though related activities essential to the completion of background work. Exhibit 5 summarizes the purpose, activities, data needs, approximate resources, and products for this step.

Step 1: Determine the Purpose for Developing a Human Resource Development Plan

Purpose

To define the purpose for developing the HRD plan, the user audience and uses for which the plan is to be designed, and to specify a work schedule capable of producing the plan within an approved period of time.

Outline of Activities

It is assumed that these activities take place in close collaboration with host country officials but not necessarily in-country. Activities will consist of:

- linking the plan for implementing these guidelines with IDWSSD plans, activities and policies in-country;
- identifying anticipated users and uses of the HRD plan;
- preparation of a purpose statement for the HRD plan; and
- preparing a project work schedule and outline for completing the HRD plan.

EXHIBIT 5

BACKGROUND COMPONENT--STEPS 1 THROUGH 3

| Step | Purpose | Outline of Activities | Procedures | Data Needs | Approximate Schedule and Resources | Outcomes/Products |
|------|---|---|---|--|---|---|
| 1 | -- To state the purpose of the HRD plan and its uses, and provide a work schedule for its completion. | <ul style="list-style-type: none"> -- Link in-country activities and national policy to HRD planning process. -- Identify users and uses of plan. -- Prepare purpose statement for in-country review. -- Prepare work schedule for completing HRD plan. | <ul style="list-style-type: none"> -- Review IDWSSD documentation -- Determine broad sectoral and needs and involvement in planning process. -- Specify audiences for HRD plan. -- Prepare broad purpose statement and outline for HRD plan. -- Obtain reviews of and refine purpose statement and project plan outline. -- Document proposed schedule and resources for completing HRD plan. | <ul style="list-style-type: none"> -- Relevant IDWSD papers and policy statements -- National strategy documents for WS&S sector and sectoral agency descriptions and documentation of IDWSSD) activities. | 5 person days | <ul style="list-style-type: none"> -- Purpose statement -- Outline of project plan -- Documentation of intended users and uses for plan. -- Proposed schedule and resource level for completion of HRD plan. |
| 2 | -- Obtain and synthesize relevant information on environment for HRD planning | <ul style="list-style-type: none"> -- Review contextual factors affecting decade HRD planning in the WS&S sector. | <ul style="list-style-type: none"> -- Develop fact sheet for major contextual factors | <ul style="list-style-type: none"> -- Information on context of IDWSSD activities | 2 person days | <ul style="list-style-type: none"> -- Country/area summary fact sheet |
| 3 | -- Identify and document key sector ministries and agencies, and assess extent of available data. | <ul style="list-style-type: none"> -- Identify key stakeholder agencies and contact persons. -- Determine WS&S sector roles and HRD information needs. -- Establish mechanism for continued input into the HRD planning process. -- Determine scope and accessibility of available occupational demand/supply data. | <ul style="list-style-type: none"> -- Review stakeholder documentation obtained in Steps 1 and 2. -- Prepare lists of stakeholder agencies and organizations, with contact persons where appropriate. -- Meet with contact persons if possible, or determine other mechanism for collecting relevant agency information. -- Collect information and obtain completed data checklists. | <ul style="list-style-type: none"> -- Background information on agencies. -- Names of contact persons--estimates of availability of general classes of data. | 1 person day per agency matched by 1 contact person day for each agency | <ul style="list-style-type: none"> -- List of stakeholder agencies and identified roles in WS&S sector. -- List of contact persons and date of contacts. -- Background documentation for agencies. -- Completed data availability checklists. |

Procedures

Broad sectoral plans for the country and regions or other appropriate geopolitical subdivisions will be identified and linked to IDWSSD plans where possible through existing documentation. Descriptions of relevant agency or organizational activities with actual or potential involvement in sectoral HRD planning will be identified in both the WS&S and the educational and training sectors. Audiences for the eventual HRD plan must be specified, and interagency coordination identified (both existing and needed). Appropriate institutions for implementing and evaluating the HRD plan should be determined. A statement of purpose for the process of carrying out the steps in these guidelines should be prepared with an outline of the proposed project containing a schedule and required resources. In preparing the statement of purpose and the project outline; the following should be considered:

- short/long term HRD planning priorities;
- formal/non-formal education and training capabilities, programs, and resources;
- sectoral agency and interagency planning mechanisms; and
- role of external support team vs. in-county personnel.

Data Needs

Documentation required for this initial step will be as follows:

- strategy papers, policy statements, conference proceedings and other documentation describing IDWSSD plans or activities; and
- agency descriptions, project proposals or descriptions, donor agency documentation or other official statements of WS&S sector operations, agreements, responsibilities or plans.

In many cases, IDWSSD activities will already have generated much of the documentation necessary to complete this step. Maximum use should be made of existing materials prepared to support decade planning in this regard.

Approximate Schedule and Resources

Assuming that the necessary documentation can be collected by in-country personnel, the project team will need four person days to review the documentation and prepare the purpose statement and project outline for review. Additional days should be allotted to this step to permit review of the project plan by project sponsors.

Outcomes/Products

The following products will be developed as a result of these activities:

- purpose statement and outline of project plan;
- specification of intended users and uses of the HRD plan; and
- proposed schedule and resource levels for preparing the HRD plan.

Step 2: Identify and Collect Background Materials

Purpose

The purpose is to collect, review, and synthesize relevant information on the country specific environment for IDWSSD activities in the WS&S sector. The assessment of background data at this stage in the project should be limited to gaining broad information that the team should be aware of in developing the HRD plan and on factors likely to facilitate or inhibit the HRD planning process.

Successful HRD planning is conducted only in recognition of specific political and cultural contexts within which HRD planning will take place. This step therefore contains two activities:

- review the major socio-political and demographic aspects of the country which are likely to have the most impact on WS&S operations and HRD planning now and over the decade; and

- prepare a brief background summary document for project team information purposes.

Procedures

Sources such as the Area Handbook,* and recent summaries of socio-political, demographic, and other relevant background data as well as sponsored sectoral studies (where they exist) should be reviewed to determine factors especially relevant to WS&S sector operations, such as:

- topography;
- demography;
- administrative/political jurisdictions and divisions, governmental process;
- constitutional, statutory, or regulatory authorities;
- planning cycle (5-year plans, etc.); and
- economic structure, industry configurations, labor force estimates.

A brief one or two page country/area summary should be prepared in the form of a fact sheet to which pertinent data can be added if necessary as the project progresses.

Data Needs

While some of these data will be available outside the country, in-country sources will need to be accessed particularly for specialized information such as labor force estimates. Much of the necessary information should be obtainable from introductory statements to IDWSSD documentation reviewed in Step 1.

Approximate Schedule and Resources

The time needed to complete this step will depend on the quantity of available data. At a minimum, two person days of effort are needed

*Series compiled by the Foreign Area Studies of the American University, Washington, D.C.

for team members to obtain and review background information and prepare the country background summary.

Outcomes/Products

This activity will produce a country background summary fact sheet for internal project team use. This document should be in such a form that additional relevant data may be added throughout the project.

Step 3: Identify Stakeholders and Data Sources

Purpose

It is essential in the backgrounding stage of this project that organizations, agencies, and key individuals be identified and contacted, and that a preliminary assessment be made of data sources relevant to occupational demand/supply estimation. During the background activities of Steps 1 and 2, the structure of the WS&S sector will begin to emerge. The twofold purpose of Step 3 is to ensure (1) that all major organizational or agency "stakeholders" in the sector are defined and (2) that all sources of available data are identified to support the HRD planning process.

Outline of Activities

Activities in this step will vary in scope, depending on the level (national, regional, local) and type of planning contemplated (long-term, short-term, project-specific). In all cases however, the tasks will be to:

- identify all agencies, groups and/or key decision-makers critical to the functioning of the WS&S sector and likely to affect or be affected by the planning process;
- determine (through review of secondary documentation or direct interviews) agency roles, and responsibilities in the WS&S sector, and HRD information needs;

- determine the mechanism by which continuing input to the HRD planning process may be derived as needed; and
- assess the scope and accessibility of available data.

While detailed procedures are contained in Steps 4 and 7 for detailed assessment of types and characteristics of available occupational demand/supply data, activities in this step are confined to general determinations of data availability to guide the conduct of more intensive analyses.

Procedures

Identification of stakeholders is accomplished through the following approaches conducted in-country by the project team:

- Reviewing the list of all agencies, organizations, communities and groups that were identified in Step 1 and 2. Such a list should include public agencies with authority, oversight or, other statutory or de facto responsibility for policy development or program administration in community development including special projects; planning; water supply installation operation or maintenance, energy environment or natural resources; health and sanitation; public works, labor; lands, housing or urban development; municipal or rural affairs; or education/training for WS&S sector occupations. Relevant special commissions, committees or consultant group or technical assistance providers in the public sector should also be included, as should donor agencies or their contractors if appropriate. In addition, private sector constituencies should be identified, such as unions, potential employers for skilled WS&S personnel, or companies offering substantial training programs.
- Identifying agencies or groups with which direct contact is necessary, as well as individual representatives from appropriate levels within the agency.
- Finalizing the list with project staff and knowledgeable individuals within the WS&S sector.

Information to be gained from stakeholders will either be obtained through secondary documentation or direct contact or a combination of both whichever is considered to be most cost-effective and useful in a given situation. At this point, the information sought will not be too

detailed but of a general nature to give the project team a feel for major trends, issues, and problems in agency functioning and in the supply of and demand for skilled labor in the sector and may include the following:

- Background information, e.g. agency structure and function, funding patterns, procedures and priorities, extent of communications within and across agencies, existing projects and future plans relative to WS&S sector activities, existing employment and education and training policies/procedures, extent of existing training efforts, education and training related problems, whether employment is rising, declining, or remaining relatively constant over recent years in the sector, concentrations of occupational employment in certain agencies, or seasonality to employment or unemployment patterns.
- Secondary data sources, documentation or special reports addressing current or projected employment patterns, insight into specific skills needs or education/training requirements.
- Primary data, (personal estimates of current and projected employment and corresponding education and training needs).

The initial assessment of data availability is conducted by means of sectoral agency checklists sent to selected stakeholder representatives. The checklist is included as Worksheet 1 in Appendix 1. Completed checklists can be obtained indirectly (e.g., by mail) or preferably filled out during interviews with project team members.

A forum for potential continued input from stakeholders should be considered so that original contacts are not necessarily lost. This can either be through periodic recontact during the project as the need arises, or through a more formal mechanism such as standing or ad hoc committees for review or advisory functions. Because the effective organization of HRD planning is likely to transcend the authority and resources of any one agency, the feasibility should be explored of assigning responsibility to a single coordinating agency for monitoring

stakeholder input. Such an agency should be within the public sector, and can be for example, a management institute, or a government entity with authority for the WS&S sector or the provision of education and training. Whatever institution is selected, it should have a direct link with the Decade's Overall National Action Committee where one exists or with an equivalent national coordinating mechanism. In addition to organizing and coordinating information to and from stakeholders, this agency should also serve as the coordinator and sponsor of a centralized public sector planning effort.

Data Needs

Types of information needed include:

- background statutory, organizational, and functional data on stakeholder agencies and their HRD policies and practices;
- names of individuals who can provide relevant information on involvement in the planning process;
- information on existing formal interagency or intersectoral linkages such as committee structures, agreements, or other mechanisms forming a basis for future coordination in the HRD planning process; and
- identification of specific data sources by agency and estimates of data availability by data type.

Worksheets 2 and 3 of Appendix J illustrate how the Stakeholder Identification process should be structured. Worksheet 2a is a list of exemplary stakeholder agencies in government and other central WS&S agencies and organizations, with brief descriptions of stakeholder roles in the sector. Worksheet 3 is a record for stakeholder contacts with the Project Team and should be completed where possible for all stakeholder agencies.

Approximate Schedule and Resources

Time needed and level of effort will vary depending on the number of agencies and organizations. A rough but fairly conservative guide is one professional person day per agency or group involved. The same amount of time, about 1 day per agency, will be needed for agency personnel to make documentation available and to meet with members of the project team.

Outcomes/Products

Among the important outcomes of this step will be the identification of the key agencies, organizations, and actors in the HRD planning process, their policies and procedures relative to employment, education, and training. Preliminary information can be gained on HRD needs within agencies, intersectoral linkages, and communications patterns and issues related to coordinated HRD planning, with some preliminary information for the project team as to factors facilitating or inhibiting information flows and future cooperation. A lead agency will be identified, and formal and informal mechanisms initiated for further contact.

Specific products from this step will include:

- a list of stakeholder agencies and roles in the WS&S sector (Worksheet 2);
- a list of individual representatives of stakeholder agencies and dates of contacts (Worksheet 3);
- relevant background documentation, organizational, functional and policy manuals or guidelines, agency reports, statutory authorities, HRD policy positions, preliminary information on HRD needs;
- a list of formal intersectoral or interagency coordination agreements, structures (committees, task forces), or other mechanisms for achieving coordinated HRD policy or procedures; and
- completed data availability checklists (Worksheet 1).

II. PROCEDURES FOR ESTIMATING DEMANDS

Steps 4-through 6 address the needs of the WS&S Sector to estimate current and future occupational demand and associated skills. Exhibit 6 summarizes the purpose, activities, data needs, approximate schedule and resources, and products of this component.

Step 4: Assess Sources and Types of Occupational Demand Data

Purpose

To evaluate in detail the sources of occupational demand data identified in Step 3, and to determine their reliability and comparability for use in estimating projected occupational demand by sector and subsector.

Outline of Activities

Important variables in the computation of demand/supply estimates in models of local labor markets were originally identified by the U.S. Department of Labor and have been adapted for occupational planning elsewhere (e.g., Mangum et al., 1974, 1979; OIS Handbook, 1981). These guidelines are based on the USDOL demand/supply model, and, for the purposes of estimating occupational demand, key definitions follow.

Occupational demand is defined as the number of job opportunities in a specific occupation for a discrete geographic area and time period. More simply, current occupational demand is the number of persons currently employed in an occupation, plus the number of vacancies existing in the occupation. Projected occupational demand is defined as the estimated number of persons employed in an occupation in a given target year. This number will consist of two adjustments to the number currently employed in the occupation: (1) an adjustment up or down

EXHIBIT 6

DEMAND ANALYSIS COMPONENT--STEPS 4 THROUGH 6

| Step | Purpose | Outline of Activities | Procedures | Data Needs | Approximate Schedule and Resources | Outcomes/Products |
|------|--|---|---|---|---|---|
| 4 | -- To evaluate in detail sources and types of occupational demand data, and determine basis for method for estimating projected demand by occupation | <ul style="list-style-type: none"> -- Obtain and review occupational demand data -- Assess data relative to methodology selection for estimating sectoral and subsectoral needs | <ul style="list-style-type: none"> -- Develop agency specific lists of occupations -- Review data on occupations by agency and determine characteristics of data by completing Worksheet 4 -- Complete comprehensive list of all occupations for all ministries/agencies in the sector | <ul style="list-style-type: none"> -- Agency occupational data as detailed in Worksheet 4 | <ul style="list-style-type: none"> -- 6-8 person days of project team time with equal matching time by agency per- | <ul style="list-style-type: none"> -- Completed data source worksheets for each ministry/agency -- List of references of ancillary data sources -- Comprehensive "master" list of sectoral occupations |
| 5 | -- To select and implement an appropriate method for determining sectoral job skill needs | <ul style="list-style-type: none"> -- Review alternative methods for estimating occupational demand -- Select appropriate method -- Implement method to determine current and projected occupational demand -- Obtain educational and training requirements by occupation | <ul style="list-style-type: none"> -- Establish base and target years -- Obtain estimates of current and projected occupational employment by subsector and occupation -- Estimate subsector and sector totals and staffing patterns -- Calculate average annual openings by occupation -- Obtain review of estimates and adjust accordingly | <ul style="list-style-type: none"> -- Information on agency or sector expansion/contraction -- Current and target year employment estimates -- labor force separations and replacement needs | <ul style="list-style-type: none"> -- 2 person weeks of project team time with equal matching time from agency personnel | <ul style="list-style-type: none"> -- Completed Worksheet 5 |

EXHIBIT 6 (CONTINUED)

DEMAND ANALYSIS COMPONENT--STEPS 4 THROUGH 6

| Step | Purpose | Outline of Activities | Procedures | Data Needs | Approximate Schedule and Resources | Outcomes/Products |
|------|------------------------------|--|--|---|------------------------------------|---|
| 6 | -- To prioritize occupations | -- Rank occupations by quantitative and qualitative criteria | <ul style="list-style-type: none"> -- Determine criteria -- Rank occupations -- Obtain review of rankings | <ul style="list-style-type: none"> -- Annual average job openings -- Estimates of training time -- Stakeholder estimates of criticality of occupations | -- 3 person days | -- Prioritized set or subset of occupations |

depending on industrial change (growth or decline respectively); and (2) an adjustment for estimated replacement demand, i.e. the estimated number of vacancies due to separations from the labor force, such as deaths, retirements, out-migrations or transfer to other occupations. Numbers currently employed will often be referred to as current manpower or existing strength of a ministry or agency. Projected numbers of employees may be referred to as manpower needs or needed strengths for a given ministry/agency and occupation.

In addition to needs for skilled labor to fill actual empty positions, there is another kind of "demand," i.e. for improved skills for the currently employed in an occupation through upgrading or retraining in some form of on-the-job or continuing education or training for employers. As opposed to occupational demand, which represents a need for new employees, the demand for skills development for existing employees represents the need for adequate in-service programs for the currently employed. Both of these categories of need will be addressed in Step 5 and 12 below.

Activities in step 4 will be:

- to obtain and review existing estimates of occupational demand;
- to assess various aspects of the data such as time periods, comparability across ministries/agencies, and reliability and validity in order to guide methodologies in next steps; and
- to construct a list of all occupations in the sector.

Procedures

Few developing (or developed) countries have adequate data bases on occupational employment statistics. Most however have at least rudimentary data on public sector employment though not necessarily appropriately aggregated or in a format that facilitates occupational demand

estimation. The major objective of this task is to find out the extent to which the various needed types of information are comparable across agencies and subsectors (e.g., urban, rural), in what format they are obtained and processed, and what if any major problems or barriers exist in obtaining and interpreting the data. The emphasis in this step is on determining sources of objective quantitative data on occupational demand.

The procedures are as follows:

- In coordination with the necessary stakeholder representation, develop a list of sectors/subsectors and occupations of interest within the WS&S Sector. Subsector detail may have to be identified broadly by general classifications such as urban or rural, or by subgovernmental unit or structure such as water planning, water production and delivery (plumbing, engineering, electrical), water distribution, water examination, administration and finance. Occupations should be grouped by broad category such as manager, professional, technician, supervisor, craftsman, operative, unskilled/volunteer. Occupations should, however, also be capable of being identified by specific job title, such as chemists, engineers, lab technicians plumbers, well drillers, etc., and definitions, job descriptions and skills requirements obtained where possible.
- Using the data source worksheets in Worksheet 4 as a guide, for each data category already determined to be available in the previous step (Worksheet 3), review and determine characteristics of each data source as follows:
 - Column 2 -- Put check in Column 2 if data are available and accessible. Stakeholders and individual agency staff will be of assistance in determining this. It may be that on closer examination of data sources, some data originally thought to be available in Step 3 are not readily accessible, or vice versa.
 - Column 3 -- Name of source (ministry or other agency) location, and the title of the data series.
 - Column 4 -- Format: Type of output i.e., unaggregated raw data, hardcopy, report, manual/automated.
 - Column 5 -- Age of the data, i.e., year published and year/s for which data are applicable, as well as frequency if a routine data series. If available, historical

time series data (e.g., for employment by occupation for previous years) should be noted and years identified for which data are available.

- Column 6 -- Extent of occupational detail (e.g., "broad" occupational titles such as professional/technical or "detailed" such as civil engineer or technician).
- Column 7 -- Extent of geographical (national, regional, local) detail.
- Column 8 -- Estimate of reliability (low, medium, high).*
- Column 9 -- Other comments as to problems with accessibility, use or interpretation of the data.

The major problems with data are likely to be:

- data not collected or available only in a form that is either too aggregated (e.g., only by major occupational category such as engineers, technicians) or too disaggregated to be useful;
- data are unreliable, that is different publications or documents estimating employment counts or characteristics provide differing estimates for the same agency; and
- occupational titles or classifications vary across agencies, or are inconsistent within agencies in different documents (e.g., the title "engineer" may include "sub-assistant" or "junior engineer", or the title "accountant" may be included among either professional or technical personnel).

Because the use of secondary data is preferable to gathering new primary data, additional sources such as special studies or reports should be investigated as should the possibility of special tabulations of census, taxes or other data if such tabulations can feasibly provide the required information on occupational demand.

Finally, qualitative data such as those in newspaper articles, or technical journals and the informed opinion of stakeholders should be identified. These sources should be used to identify trends for example

*Reliability is defined as the consistency across estimates the same measure. Entries in Column 8 should ideally reflect the degree to which multiple sources or publications provide consistent estimates of the relevant data item.

in occupational employment, occupational mobility, technological innovation, or the demand for skilled labor.

From the various occupational listings, a comprehensive list of occupations for the sector will be generated. In order to accommodate variations in titles across agencies, it will be necessary to include all separate titles in the list, and where the same title is defined differently by different agencies, both should be contained separately in the list with annotations indicating why they are different. This is important because education/training requirements may be different for the different occupations. For example, the title "engineer" in one agency may be used for either sanitary or civil engineers or both whereas another agency may break the title into its component subclassifications. An illustrative classificatory scheme, based on actual data from WS&S sector studies is included in Appendix 2.

To assist with the problem of occupational classification in a way that permits comparison across agencies, a scheme developed by Gonima (1983) and the Pan American Health Organization is suggested as an additional procedure. Agency functions are classified into six categories:

- operational
- commercial/sales/marketing;
- financial;
- personnel;
- administrative/support, and
- planning.

Four types of activities associated with these functions are: strategic (long term) planning, administrative management, operational management, and transactions/operations. The matrix, with its 24 cells is illustrated here.

AGENCY FUNCTIONS

| | | Operational | Commercial/Sales/ Marketing | Financial | Personnel | Administration/ Support | Planning |
|------------|------------------------------|-------------|--------------------------------|-----------|-----------|----------------------------|----------|
| ACTIVITIES | Strategic Planning | | | | | | |
| | Administrative Management | | | | | | |
| | Operational Management | | | | | | |
| | Transactions/ Operations | | | | | | |

Within each cell, occupations shown in Appendix 2 can be placed accordingly as a further way of organizing job positions by agency function, thereby facilitating designation of occupation types by agency. For example, an engineer may be basically an administrator in the lead office of an agency or be a field supervisor in charge of actual operations. The discrimination between these two types of function is not apparent in the title "engineer" and would not be detected in a simple listing of the number of engineers in an agency. The matrix however permits such discrimination.

To the extent that the functional approach illustrated here is useful in assisting agencies a) to be explicit about job classifications or b) to identify requisite job skills, or training requirements for jobs, it should be used.

Data Needs

The data needed for this step are outlined in Column 1 of the Data Source Worksheet for Occupational Demand in Worksheet 4.

Sources for these data will be the ministries/agencies themselves, and special studies, articles, and reports completed by outside agencies, consultants or universities.

Approximate Schedule and Resources

Time needed and level of effort will vary depending upon the extent of available data. It is estimated that between two to four professional person days will be required for each of the three categories of demand data. A minimum of two days will be necessary to determine if routine statistical data series exist and to identify qualitative sources where available. A maximum of four days will be needed to obtain details of available data series and to complete this assessment across all WS&S ministries/agencies.

Outcomes/Products

The results of this step will provide the basis for the decision as to whether to conduct the needs assessment on existing secondary data or on yet to be collected primary data. The availability and quality of existing data are key factors in making that decision, and the exploratory activities conducted during this step are intended to inform that judgement:

The products of this step are:

- an objective assessment of data availability concerning occupational demand, in the form of:
 - a completed Data Source (Worksheet 4) for each agency;
 - a list of ancillary, or qualitative data sources, where appropriate; and

- a comprehensive "master" list of occupations in all ministries/ agencies in the sector.

Step 5: Conduct Needs Assessment

Purpose

To select and implement an appropriate method for determining the current and projected job skills needs in the WS&S sector.

Outline of Activities

The assessment of needs for HRD services starts by focusing on the "demand" side and making an analysis of employment in the sector, both current and projected. Current occupational demand, as already defined, consists of those currently employed plus job vacancies in a given occupation at a given point in time. Projected occupational demand reflects the numeric change in job openings expected in an occupation due to growth or decline over a specified period plus the number of job openings anticipated as a result of replacement needs. This step involves choice and implementation of the best method for estimating occupational demand for job skills.

Activities in this step will be to:

- review alternative methods for estimating current and projected occupational demand and select the appropriate method;
- applying the selected method, develop estimates of current and projected demand by occupation; and
- obtain educational and training requirements by occupation.

Procedures

Future education and training needs are a function of future employment needs by occupations or future occupational demand and will require projections or forecasting. Any forecasting or projection process involves uncertainty, thus a major objective of this task is to

reduce to the minimum uncertainty as to future education and training needs by making occupational estimates as accurate as possible. In developed countries, with relatively stable economies, the occupational composition of the major public and private employing sectors in some cases remain fairly constant, permitting extrapolation of past levels of sectoral or occupational employment as the preferred method of estimation of future employment requirements. There are several different approaches using these techniques, the advantages and disadvantages of which are reviewed elsewhere (U.S. Department of Labor 1981; Kidd 1980; Lawrence and Cruze, 1981).

In developing countries where past occupational employment may be a less accurate predictor of future levels of employment and where historical time series data essential for extrapolation are incomplete or unavailable, more subjective estimates are often necessary. Whatever the method used, the intended outcome of this task is to develop reliable and valid estimates of current and future employment levels by occupation. The HRD planning team should include if possible one member familiar with estimating occupational employment so that the most appropriate approach is applied.

Two general approaches are available:

- using in-country data on estimates of existing and future or "needed" strengths by subsector as the basis for calculating occupational demand; and
- conducting primary surveys of agencies where existing data are inadequate or unavailable. Such surveys will require respondents to provide direct estimates of current strengths by occupation (numbers currently employed). For estimates of future needs, however, either respondents are asked for their own informed estimates of future strengths in their agencies, or indirect estimates can be calculated from existing and historical data through a variety of projection, or forecasting methodologies.

The state of the art in occupational projections in the U.S. relies on rather extensive data time series on both occupational employment and total employment for employing agencies and establishments. Such data are unlikely to be available in most developing countries, and project resources for the HRD team will limit the use of sophisticated projection efforts. Where data from special studies are readily available or data processing facilities and other resources permit and in particular where past occupational employment and other sector trends are relatively stable, the array of available projection and forecasting techniques should be considered. However, for the purposes of these guidelines, since all methods cannot be outlined here, it is assumed that in-country data will be used, and best estimates of existing and "needed" strengths are already available. The method presented here therefore is a generic approach that can be adapted to suit specific national or regional conditions.

Worksheet 5a illustrates the subsector-by-occupation matrix which is the intended outcome of this step. The matrix contains all occupations of interest (rows) and all subsectors of interest (columns). The cells of the matrix contain levels of current employment for the base year (usually the most recent year for which current employment statistics are available). Each cell, in addition to containing total employment (E) for a given occupation by subsector, will also contain the proportion (p) of employment in that occupation to total employment for that subsector (E_{TOT}). The proportion (p) represents the staffing pattern for a particular occupation within a subsector and can be used to compare occupations in terms of their importance (employment weights) for that subsector. Some projection techniques also use staffing

patterns to distribute projected total employment (column employment totals) across occupations for a given column (subsector). Columns 1 through 5 in Worksheet 5a contain subsector employment. More columns need to be added to the matrix if more than five subsectors are to be represented. Column 6 contains current (base year) total employment (ΣE) and total proportion (P) for a given occupation across all subsectors obtained by summing (E) and calculating the proportions (P) for Column 6 respectively. The total proportion (P) is now the staffing pattern for a given occupation for the sector as a whole and for later prioritization purposes provides an empirical estimate of relative importance by employment weight. Column 7 contains estimates of needed strength in the target year. Entries in this column are either obtained from agency data or are estimated independently by projection techniques. Estimates should reflect consideration of all sources of change (e.g., expansion needs due to growth or contraction due to decline as well as replacement needs due to deaths, retirements, and other replacement factors). Column 8 contains annual average openings (O) by occupation. $O = \frac{N}{Y}$ calculated for each occupation by:

- subtracting current employment estimates (Column 6) from estimates of needed strengths in the target year (Column 7) to provide total expansion needs (N) across the projection period; and
- dividing N by the number of years (Y) between the base year and the target year.

A foreshortened example of a completed Worksheet 5 is given below in illustration of the approach. Columns 4 and 5 are missing in this example, and columns 6, 7 and 8 are the same as in Worksheet 5.

| | (1) Water & Sewerage Authority | (2) Natural Resources Authority | (3) Ministry of Muni- pal Rural Affairs ... | (6) 1980 Base Year Total Employment By Occu- pation | (7) Esti- mated Strength 1985 | (8) Annual Aver- age Job Open- ings 1980- 85 |
|--------------------------|---|--|---|--|---|--|
| Engineers | 100 (.11) | 200 (.18) | 50 (.09) ... | 350 (.14) | 500 | 30 |
| Lab Technicians | 200 (.22) | 400 (.36) | 200 (.36) ... | 800 (.31) | 700 | -20 |
| Surveyors/ Draftsmen | 100 (.11) | 100 (.09) | 50 (.09) ... | 250 (.10) | 400 | 30 |
| Drillers | 200 (.22) | 200 (.18) | 100 (.18) ... | 500 (.20) | 700 | 40 |
| Maintenance | 300 (.33) | 200 (.18) | 150 (.27) ... | 650 (.25) | 1250 | 120 |
| Total All Occupations | 900 | 1100 | 550 ... | 2550 | 3550 | |

These fictitious data illustrate the derivations of proportions (p) in Columns 1-3, total proportions (P) in Column 6, total employment for all subsectors (column totals E_{TOT}), base year total employment by occupation (row totals (ΣE) in Column 6), needed strengths (N) in Column 7, and annual average job openings (O) in Column 8, calculated by $O = \frac{N}{Y}$ which for engineers is $\frac{N}{Y} = \frac{(500-350)}{5} = 30$.

Major problems in applying this approach are likely to be:

- Inconsistency in occupational titles across agencies: careful pre-screening of agency lists of occupations will be necessary to ensure applicability of titles to common occupations across all agencies--where differences exist, occupations should be listed separately.
- Obtaining reliable and valid estimates for Column 7: assuming agency data are to be accepted, data may be (1) unreliable in that different estimates exist from different sources or (2) of questionable validity, in that estimates are consistent but inflated, are generated more subjectively than objectively, or reflect inadequate attention to task management (for example, shortfalls in engineering occupations may lead to estimates of

expansion needed in that occupation, but may be more usefully handled by better utilization of existing technicians). Accurate estimates of needed strengths are the hub around which any manpower planning approach must revolve, and it is important that these data be the best available. Extensive review of these estimates by knowledgeable sector representatives and other experts is advisable to detect and resolve inconsistencies in these estimates.

- Consistency of time periods in agency estimates: data from different agencies may reflect different base or target years for current employment, or different seasons or periods within years, providing additional sources of error in comparing estimates across agencies and preparing aggregate sectoral estimates. Establishment of common base and target years may necessitate extrapolation of some agency data, but in any case all time periods for which estimates are provided should be consistent across agencies.

Once Worksheet 5 has been completed for all subsectors, it should be circulated among stakeholders for review and comment, and revised if necessary.

Data Needs

Because of the centrality of current and projected employment estimates by occupation to the HRD planning process, it is worth expending considerable effort to ensure that multiple data sources are tapped, and that whatever estimates are obtained be thoroughly reviewed with opportunity for corrections provided. Estimating future needs whether by "forecasting" the future or projecting mechanically from the past involves error, and the job of the HRD analyst is to understand sources of error and account for them where possible. Comparing the results of different processes for analyzing the same data provides a measure of reliability and extensive review of eventual estimates can reveal invalid results in time for corrections to be made. In addition, various factors affecting sector expansion or contraction and future occupational demand need to be recognized.

Data needed for this step are therefore:

- general information on sector expansion/contraction;
- current employment estimates by sector, subsector, and occupation;
- target year employment estimates by sector, subsector, and occupation;
- labor force separations and replacement needs by occupation; and
- detailed occupational listings with job descriptions by agency (obtained in Step 4).

Approximate Schedule and Resources

Time and level of effort will vary considerably depending upon the number of occupations, subsectors, quality of available data, and computation facilities. It is anticipated that at least two person weeks of effort will be needed to complete Worksheet 5 for all occupations. A similar amount of time from agency personnel is expected in interpreting and reviewing data. The HRD analyst should be the task leader for this step but can be assisted by others in data collection and analyses.

Outcomes/Products

The outcomes from this step will be estimates of annual average employment needs by occupation across the target period. When associated with specific job skills descriptions and training time required for each occupation, the data become meaningful in terms of annual training needs for the HRD delivery system. The major product from this step is a completed Worksheet 5 which contains:

- current employment by occupation and subsector as well as total sector employment by occupation;
- staffing patterns by subsector;
- projected employment by occupation for a specified target year; and
- average annual employment needs by occupation for each year during the target period.

Step 6: Determine Occupational Priorities

Purpose

Although the set of occupations is fairly small (37 separate and detailed occupational titles in Table 2 of Appendix 1), it will be useful to order them according to specific criteria of importance. Ranking occupations in order of priority will assist in directing resources to where they are most needed. The purpose of this step, therefore, is to translate occupational projections into specific priorities for training.

Outline of Activities

This step is intended to provide measures of relative importance to each occupation for which estimates were developed in Step 5. Priorities can be determined by consideration of four factors:

- relative occupational demand--the rank order of occupations by total projected demand;
- training time needed to achieve the necessary skills--number of months training required;
- perceived shortages of skilled labor supply by occupation; and
- perceived criticality of occupation to subsector functioning.

The first two criteria are quantitative estimates, the second two will require subjective input from stakeholders.

Procedures

- Rank order job openings from Column 8 of Worksheet 5 to obtain relative importance of occupations by annual average demand. The total proportions (P) can be used to identify a cutoff point (e.g., occupations which constitute less than a certain percentage of base year total employment for the sector may be excluded from further consideration).
- Obtain estimates of training time in months for acceptable skill levels in each occupation, if available.
- Weight the average number of job openings by number of months of training time, and rerank occupations by the weighted product.

- Obtain appropriate stakeholder review of the resultant final priority rank, with a request to indicate which occupations are either:
 - perceived as experiencing acute shortages of labor supply; or
 - perceived as particularly critical to the sector.
- Identify set of most important occupations according to the four criteria specified.

Data Needs

In addition to estimates of average annual job openings by occupation from Step 5, the following new data will be needed for this step:

- estimates of education/training time in months needed for acceptable skill levels in each occupation; and
- stakeholder estimates of shortages and importance of listed occupations.

Approximate Schedule and Resources

Three person days of effort will be needed to collect the necessary data and produce the priority rankings of occupations.

Outcomes/Products

Discriminating between relative importance of occupations in terms of their education and training needs will permit discretion in the direction of project resources to addressing occupational supply factors. Prioritizing occupations in this way provides a rationale for directing HRD efforts where they are most needed.

The product from this step is a set of prioritized occupations in order of relative importance for skills development.

III. PROCEDURES FOR ESTIMATING SUPPLY

Steps 7 through 10 address the assessment of the current and anticipated capacity of the education and training system to respond to WS&S needs identified in earlier steps. Exhibit 7 outlines the purpose, activities, procedures, data needs, approximate resources and products of this project component.

Step 7: Assess Sources and Types of "Supply" Data

Purpose

To identify existing or potential sources of information on the educational and training delivery system related to occupational supply for the priority occupations selected in Step 6.

Outline of Activities

Occupational supply is usually defined as the number of workers in a specific labor market that are available and qualified to fill jobs in an occupation. The following groups contribute to the supply of qualified people actively seeking employment in an occupation:

- completers and leavers from public or private educational/training institutions and programs;
- currently unemployed;
- number of individuals resulting from net migration;
- occupational transfers; and
- new entrants and reentrants to the labor force.

Although all these components of occupational supply are important in considering current or anticipated demand/supply imbalances, Steps 7-9 will concentrate on the education and training delivery system and particularly educational/training institutions and programs, since of all the components they are the most susceptible to planned intervention.

EXHIBIT 7

SUPPLY ANALYSIS COMPONENT--STEPS 7 THROUGH 10

| Step | Purpose | Outline of Activities | Procedures | Data Needs | Approximate Schedule and Resources | Outcomes/Products |
|------|--|---|--|--|------------------------------------|---|
| 7 | -- To identify sources of information on occupational supply | <ul style="list-style-type: none"> -- Define occupational supply for purposes of the project -- Link priority occupations to institutions and programs -- Identify relevant data sources | <ul style="list-style-type: none"> -- Develop inventories of institutions and program offerings -- Define the limits of occupational supply for the project -- Identify institutions and programs relevant to priority occupations -- Assess availability of data sources on occupational supply | <ul style="list-style-type: none"> -- Institutional or agency documentation linking occupations to specific educational or training programs -- Data on institutions and program offerings -- Estimates of availability of detailed data on occupational supply outputs and processes | -- 5 person days | -- List of institutions/programs |
| 8 | -- To specify criteria for assessing current education and training system | <ul style="list-style-type: none"> -- Develop effectiveness criteria -- Develop data collection plan | <ul style="list-style-type: none"> -- Review sources for types and availability of supply data -- Develop criteria and measures that can be assessed using available data -- Identify specific sources, schedules and formats for supply data collection | -- Outcomes of Task 7 | -- 3 person days | <ul style="list-style-type: none"> -- List of supply data elements to be collected -- List of evaluative questions -- Plan for occupational supply data collection |

EXHIBIT 7 (CONTINUED)

SUPPLY ANALYSIS COMPONENT--STEPS 7 THROUGH 10

| Step | Purpose | Outline of Activities | Procedures | Data Needs | Approximate Schedule and Resources | Outcomes/Products |
|------|---|--|---|----------------------------|--|---|
| 9 | -- To inventory delivery system for education and training system | -- Implement plan from Step 8 | <ul style="list-style-type: none"> -- Collect secondary data from central or institutional sources -- Collect qualitative data from employers and other individuals -- Tabulate and interpret data | -- Identified in Step 8 | -- 4-8 person days with equal matching time for agency personnel | <ul style="list-style-type: none"> -- Quantitative data tabulations on enrollments/completions by program for each institution -- Qualitative data on systems effectiveness by institution/agency/program |
| 10 | -- To estimate occupational supply | <ul style="list-style-type: none"> -- Aggregate institutional data from Step 9 -- Develop estimates of system supply | <ul style="list-style-type: none"> -- Aggregate estimates of occupational supply -- Prepare preliminary listing of supply for each occupation -- Review and finalize occupational supply estimates | -- Tabulations from Step 9 | -- 3 person days | -- Aggregate estimates of occupational supply by occupation |

In addition, for the purposes of these guidelines, occupational supply data include information on all relevant aspects of the education and training system, not just the products in the form of program graduates, but facilities, staff, equipment, and other essential components of the delivery process.

Activities in this step will be to:

- define occupational supply for project purposes;
- link priority occupations to specific education and training institutions and programs; and
- identify types of sources of data available on current and projected supply for the priority occupations, as well as data on organizational or functional factors in the delivery system that affect numbers or quality of program graduates.

Procedures

In order to focus the assessment of occupational supply data, the link needs to be made between the priority occupations and institutions and programs providing potential supply. The agency job descriptions obtained in Steps 4 and 5 will be useful here, and in some cases specific educational qualifications and requirements may be available with references to programs and institutions. In-country program inventories and descriptions by institution will be used to develop a list of institutions and program offerings for each of the priority occupations. This list will contain several duplications in both institutions and programs (since one program may train for more than one occupation). The list will however serve to limit the assessment of occupational supply to only those institutions and programs potentially providing skilled labor for critical occupations within the WS&S sector. It is the specification of this labor supply pool which constitutes the definition of occupational supply for project purposes. All potential

sources of institutional education and training should be nevertheless assessed as potential sources of supply, including the following:

- universities;
- specialized colleges and institutes (Public Administration, Statistics, Commercial, Polytechnic, etc.);
- teacher-training institutions;
- technical and subprofessional training establishments, including vocational training, corporations, centers, or trade schools;
- management, supervisor, and foreman training programs;
- apprentice training programs;
- agricultural schools;
- adult education programs;
- in-service (in-plant) training programs (government and private);
- professional/technical organizations, unions;
- office/clerical training facilities;
- specialized programs for military, and police personnel;
- university preparatory schools;
- secondary schools; and
- correspondence schools or overseas training sources.

For the programs identified above, the availability and sources of the following data categories should be ascertained:

- program title, program descriptions;
- certification, or competency testing activities;
- enrollees, completers, leavers;
- facilities/equipment;
- staff;

- financial resources; and
- location.

To the extent that they can realistically be related directly to priority occupations, data should also be sought from appropriate central sources on:

- characteristics of the unemployed;
 - number; and
 - skills;
- occupational mobility;
 - in-migration;
 - labor force;
 - entrants and reentrants; and
 - occupational transfers.

Data Needs

Two kinds of data are needed for this step:

- information on program offerings by institution (public/private) to determine universe of supply data relevant to priority occupations; and
- a determination of the availability and sources of specific data on occupational supply, such as:
 - program titles, descriptions of course content;
 - skills tests, competency testing or certification requirements;
 - number of enrollees by institution and program;
 - number of completers/leavers by institution and program;
 - Characteristics of completers/leavers (e.g., sex, number employed/unemployed, type of employment, wages/earnings);
 - employer feedback, follow-up data on completers;
 - facilities, labs, equipment descriptions;

- current staff characteristics (e.g., number, qualifications/training, salary/wages, time on the job, and WS&S experience); and
- program institutional budgets (funding sources and amounts).

Approximate Schedule and Resources

Resources for this task will of course depend on the size of the country and the extent of the occupational set of interest. Five professional person days are estimated as a minimum for the conduct of this step.

Outcomes/Products

Narrowing the estimation of occupational supply just to priority occupations in the WS&S sector permits optional targeting of planning resources. Finding out which institutions and programs serve priority occupations and what specific data are available on occupational supply will form the basis for evaluating current and future delivery of services and identify constraints to explicit demand/supply matching in subsequent steps.

Products from this step are:

- a list of institutions/programs providing education or training for priority occupations;
- an estimate on availability and specific sources of institutional and programmatic occupational supply information; and
- an estimate of availability of other relevant data on factors affecting occupational supply related to priority occupations.

Step 8: Determine Evaluative Criteria

Purpose

To decide, on the basis of availability of data identified in Step 7, specific criteria for determining the capacity of the current education and training system to respond to the needs of the WS&S sector.

Outline of Activities

Depending on what kinds of information are available on all sources of occupational supply, a methodology will be developed for use in steps 9 and 10 for assessing the effectiveness of existing HRD systems in providing the needed skills. Effectiveness criteria should be developed in coordination with education, WS&S, and agency personnel and should include measures of:

- availability of services--are education and training programs for priority occupations accessible?
- demand/supply--how does the number of educated/trained compare with demand now and in the future? and
- quality of services--how appropriate are the skill levels of those completing education/training programs?

Other questions of importance to WS&S decision-makers identified during stakeholder contacts in Step 3 should be included here. The quality of occupational supply data is critical to this step, and the team should ensure that criteria are developed that can adequately be assessed using available data, and that reflect stakeholder judgments of data quality.

Procedures

The following tasks are required to complete this step:

- Review all types of occupational supply data identified in step 7, and determine which data elements can be used to answer which major evaluative questions, including at least the three questions suggested above.
- Develop formal criteria by which existing data can be used to make objective determinations of effectiveness. Specific criteria will depend on data available for measurement of each criterion, as well as degree of consensus on validity of criteria for assessing the "success" of the education and training system in meeting its objectives. Examples of criteria, for the three factors introduced above, are the following:

Availability

- Programs are available in education and training institutions for each one of the priority occupations;
- such programs are adequately located (geographically) and in sufficient quantity to meet enrollee needs.

Demand/Supply

- Program graduates are working within occupations for which trained;
- employers are satisfied with numbers of available graduates;
- employees are satisfied with skills of available graduates.

Quality of Services

- Education/training program objectives are met with minimal cost per student;
 - programs are offered with adequate staff, resources and facilities;
 - competency testing ensures graduates complete the system with adequate competencies for successful employment;
 - programs adequately reflect employer skills needs.
- Develop a data collection plan for occupational supply data needed to complete demand/supply matching. This plan should specify locations and sources of the data, and in what format the data are to be collected. The plan should also indicate what qualitative sources (judgments of qualified observers of classes, program comparisons and opinions of informed graduates and others on facilities, equipment, and staff quality) will be used.

Data Needs

Supplied in Task 7.

Approximate Schedule and Resources

Three professional person days are allocated to this step, with three days for agency personnel to assist in development of evaluation criteria and in providing additional evaluative data sources.

Outcomes/Products

The outcome of this step will be a framework (based on available data) for the demand/supply matching and evaluative activities in Step 10.

The products from this step will be:

- a list of available and needed occupational supply data elements;
- a list of evaluative questions to be answered by available data elements; and
- a plan for occupational supply data collection.

Step 9: Inventory Delivery System

Purpose

To obtain the necessary data on the HRD delivery system to permit occupational demand/supply matching and evaluation of system effectiveness. The extent and scope of this inventory will depend upon the size of the occupational set or subset determined in Step 6.

Outline of Activities

This step consists of implementing the plan, developed in the previous step, for data collection from institutions and agencies supplying the WS&S sector with skilled labor. In addition, data should be obtained where possible from WS&S sector employers and other qualified observers on adequacy of education/training and relative competencies of recently employed program graduates.

Procedures

The institutional supply data will either be available from centrally located sources (national, regional) or from individual institutions. Where possible, the former should be used as data sources to conserve project resources. A sample of WS&S sector employers and other informed persons should be contacted for qualitative estimates of skills of

program graduates and adequacy of all aspects of the education/training system. Quantitative and qualitative data thus gathered should then be tabulated according to the step 8 plan.

Data Needs

As specified in Step 8.

Approximate Schedule and Resources

Depending on the extent of available data and the extent of dispersion of data sources, it is estimated that between four to eight professional person days be allocated to this task. Matching time in equal amounts from institutions or agencies will facilitate provision and interpretation of the data.

Outcomes/Products

Data from this task will be used as input to the demand supply matching process in Step 10. Specific products from this step will be raw program and institutional data on occupational supply for priority occupations to be tabulated as necessary in Step 10. At a minimum, quantitative data on enrollments and completions by program should be provided as well as qualitative WS&S agency estimates of skills training effectiveness of program graduates and adequacy of program staff, facilities, equipment and course or program content for sector employment productivity.

Step 10: Estimate Occupational Supply

Purpose

To take disaggregated data from Step 9 and prepare estimates of total supply by occupation across institutions and programs.

Outline of Activities

Estimation of occupational supply is imperfect at best and is much less developed as a technique of traditional manpower planning than occupational demand estimation. Nevertheless, supply estimates are necessary in order to complete even rudimentary demand/supply analyses. As indicated earlier, occupational supply is made up of several components (see Step 7: Outline of Activities) not all of which can be estimated because of lack of data. The stock of occupational supply--currently employed and entrants and reentrants into the labor force--is reasonably well defined. Data on new entrants, i.e. the output from educational and training programs, will usually be available, and in most cases these data will be the major contributor to estimating supply. Flows or rates of supply, however, such as movements between occupations or from outside the labor force (new entrants, reentrants, immigrants) are not so easily estimated, and in most cases will not be measurable within the constraints of this approach. Where the labor force is relatively stable for the WS&S sector, estimates of supply other than new entrants will usually not be necessary. Where there is instability, movement across national borders, or substantial reentry of older people back into the labor force, neglecting these sources of supply may lead to substantial errors in demand/ supply estimates.

Activities therefore in this step will be to:

- aggregate institutional and program estimates of supply across institutions; and
- develop quantitative estimates of occupational supply by occupation.

Procedures

The first task is to aggregate estimates of occupational supply from data gathered in earlier steps. Specific procedures for aggregation will depend on types of data collected but should (a) recognize all sources of supply for which data have been collected and (b) provide estimates of total supply from all sources in (a) for the base year and the target year and the annual average in between. In most cases, as already discussed, those who complete training/education programs will serve as the best basis for estimating occupational supply. If enrollments are used, they will lead to overestimates of supply, since not everyone who enrolls finishes. One way to proceed is to develop a supply index which relates placements to enrollments based on empirical data. Whichever method is used to determine the supply estimate, it should be annually averaged for each occupation over the target period.

These annual average aggregate estimates should then be listed by occupation and disseminated for stakeholder review. The list should then be adjusted where necessary to reflect stakeholder input.

Data Needs

Tabulations from Step 9.

Approximate Schedule and Resources

Three professional person days are provided for this step.

Outcomes/Products

A reviewed list of occupational supply by occupation will result from this step.

IV. SYNTHESIS OF DEMAND/SUPPLY INFORMATION AND HRD PLAN DEVELOPMENT

Steps 11 through 15 address the matching of demand and supply, the detection of imbalances, and the preparation of recommendations in the form of the HRD plan. Exhibit 8 summarizes each step in this final component by purpose, outline of activities, procedures, data needs, approximate schedule and resources, and outcomes/products.

Step 11: Matching of Demand/Supply

Purpose

To integrate and compare data on current and anticipated demand for priority occupations with available data on occupational supply in order to provide quantitative and qualitative assessments of education and training system effectiveness and to provide an empirical basis for recommended program development.

Outline of Activities

The numerical demand/supply analysis conducted during this step is intended to detect general imbalances in the labor market for priority occupations. For a number of reasons, mechanical comparisons of annual average demand with comparably estimated occupational supply from related education and training programs, while useful as quantitative measures of the demand/supply relationship, need to be supplemented by more qualitative interpretation of key factors that affect labor market behavior such as comparative wage structures or hiring patterns. Moreover, data on occupational supply are not limited just to numbers of students served, but include additional information as necessary on all relevant aspects of the HRD system of occupational supply. For example, supply of program graduates may numerically exceed the demand for a

EXHIBIT 8
PROGRAM IMPROVEMENT COMPONENT--STEPS 11 THROUGH 15

| Step | Purpose | Outline of Activities | Procedures | Data Needs | Approximate Schedule and Resources | Outcomes/Products |
|------|---|---|---|---|--|---|
| 11 | -- To integrate demand/supply data by occupation and provide quantitative and qualitative assessment of system effectiveness with recommendations for program development | -- Analysis of qualitative information on occupational supply -- Present quantitative supply data -- Development of recommendations | -- Summarize qualitative assessments with working paper -- Complete demand/supply worksheet | -- Qualitative information from Step 9 -- Estimates of occupational supply from Step 10 -- Demand estimates from Step 7 | -- 10 person days | -- Brief project working paper on system effectiveness -- Completed demand/supply worksheet |
| 12 | -- To determine where improved measurement of existing personnel or use of volunteers can alleviate identified shortages | -- Select occupations for which more analysis is indicated -- Make recommendations for appropriate internal HRD policy changes | -- Identify subset of occupations with imbalances or other reasons for special attention -- Obtain and evaluate existing sector or agency HRD policies -- Make recommendations for better utilization of existing resources | -- Priority occupations from Step 6 -- Demand/supply worksheets from Step 11 -- Internal HRD policies and procedures | -- 3 person days person days | -- Formal policy recommendations to WS&S sector management |
| 13 | -- Determine needs for new education and training programs | -- Identify needed competencies -- Define recommended program improvements for sector review | -- Develop competencies from job descriptions or other materials -- Review competencies with appropriate WS&S personnel and refine accordingly -- Specify location type and resource needs of recommended program change | -- Job descriptions from Step 4 -- Occupational competencies -- Characteristics of the delivery system from Step 9 -- Budgetary and resource information | -- 6 person days with up to 3 weeks of agency staff time | -- Recommendations for programmatic improvement -- Reviews of recommendations from WS&S sector personnel |

EXHIBIT 8 (CONTINUED)

PROGRAM IMPROVEMENT COMPONENT--STEPS 11 THROUGH 15

| Step | Purpose | Outline of Activities | Procedures | Data Needs | Approximate Schedule and Resources | Outcomes/Products |
|------|---|---|---|--|---|--------------------|
| 14 | -- To design procedures for evaluating recommended program improvements | <ul style="list-style-type: none"> -- Develop evaluative measures -- Define evaluative data -- Prepare evaluation plan | <ul style="list-style-type: none"> -- Develop evaluation questions -- Obtain review and consensus on important questions -- Specify data elements needed to answer questions -- Develop evaluation design and data collection and analysis plan | <ul style="list-style-type: none"> -- Amount of resources available for evaluation -- Evaluation needs and specific information needs of stakeholders -- Existing evaluative data for programs to determine new data needed | -- 3 person days and 3 matching days of agency staff time | -- Evaluation plan |
| 15 | -- To develop comprehensive HRD plan | <ul style="list-style-type: none"> -- Develop final recommendations -- Prepare HRD plan | <ul style="list-style-type: none"> -- Obtain agency reviews from Step 13 -- Incorporate programmatic recommendations with product of Step 14 -- Present recommendations with budgets and other implementation details | <ul style="list-style-type: none"> -- Reviews from Step 13 -- Evaluation plan from Step 14 | -- 5 person days | -- HRD plan |

given occupation, but the skill levels of the same graduates may be inappropriate. Recommendations would therefore be implied for existing programs in education or training institutions such as improved training for staff, new equipment or facilities, or testing and certification programs for program graduates. Thus the quantitative estimates, while useful as a guide, should in all cases be supplemented by qualitative analyses of informed opinions obtained in Step 9.

Activities in this step will consist of:

- analysis of qualitative information on occupational supply, including available information on the delivery system in all programs relevant to the priority occupations collected in Step 9;
- completion of Worksheet 6, Demand/Supply Worksheet using estimates of occupational supply derived in Step 10; and
- development of recommendations for program improvement or other necessary changes in the HRD delivery system.

Procedures

Qualitative information on the effectiveness of programs, staff, facilities, equipment, and the skills and abilities of program graduates should be reviewed by project staff and a brief working paper prepared summarizing the major findings. For each of the priority occupations, comparable occupational supply information will need to be reviewed, numerical data on enrollees, completers and leavers tabulated, and other information assessed to determine the basis for recommendations.

Worksheet 6, the Demand/Supply Worksheet should be completed as follows:

- Column 1 -- Enter priority occupation title.
- Column 2 -- Enter total current employment for the base year, from Column 6 of Worksheet 5.
- Column 3 -- Enter annual average job openings for target period, from Column 8 of Worksheet 5.

- Column 4 -- Enter program/s providing skilled labor for occupation, from Step 7.
- Column 5 -- Enter estimated current supply for each occupation from Step 10. The supply estimate for programs that "supply" more than one priority occupation should be prorated across priority occupations. Several methods can be used to allocate supply. The method recommended for this step is to compute the "relative placement share" for each occupation according to the procedures detailed in Appendix 3.
- Column 6 -- Enter estimates of annual average projected supply for the target period. These are calculated by obtaining estimates of the supply index for the target year, subtracting the base year supply index, and dividing by the number of years in the target period.

Data Needs

The only data available to complete this step will have already been identified and collected in Steps 7 and 9.

Approximate Schedule and Resources

Approximately 10 professional person days are allocated to this step, with 10 days of in-kind professional time from in-country advisers and analysts both from the WS&S and education and training sectors.

Outcomes/Products

This is an important step in which all the information previously sought on demand and supply for priority occupations is synthesized and the foundation for the HRD plan laid out. The result is documentation of the effectiveness of the existing HRD system with problems identified and areas for improvement suggested.

The products from this step will be the working paper on system effectiveness and the completed demand/supply worksheet.

Step 12: Specify Improvement in Utilization of Currently Employed Personnel

Purpose

To determine where shortages of skilled labor can be alleviated by improved management or training of employees or use of volunteers.

Outline of Activities

Underemployment or malemployment of trained personnel has been identified (Redekopp, 1981) as a major factor underlying migration of trained people from the WS&S sector in developing countries. For example, engineers may devote disproportionate amounts of time supervising field projects with foreman-level personnel inadequately performing the work of high level technicians. On the other hand, particularly in small scale rural projects, use of community or volunteer labor under effective supervision can offset otherwise critical labor shortages. Improved maintenance schedules can also reduce the need for repair personnel. In occupations identified in Step 11 where there are critical shortages of adequately trained people for jobs, further analysis may be needed on the structure of the occupations, their tasks, degree of supervision, incentives and available in-service training, to suggest ways in which existing human resources can be better utilized. Improved management of existing human resources is likely to be a very cost effective alternative to expensive start-up costs usually associated with new training facilities and programs.

Activities in this step will be to:

- select occupations for which further analysis is indicated; and
- review internal management, supervision, in-service training policies and procedures as well as opportunities for continuing education or training, and make recommendations for internal WS&S consideration and review.

Procedures

The procedures in this step will be to:

- identify those occupations for which demand/supply imbalances were evident in Step 10 or occupations where inadequacies are known to exist in WS&S policies or procedures relating to factors such as support services, supervision, or organization of and incentives to employees; and
- review agency or sector policy and practices with regard to employment within each occupation with assistance from appropriate WS&S personnel. To the extent that internal policies (with respect to recruitment, employment, salaries, appropriate distribution of responsibilities and provision of career development opportunities) can be pinpointed as causing skill shortages, and can be changed, these instances should be identified and recommendations for change developed. In particular policies and procedures should be examined relative to:
 - management, supervision, and support;
 - incentive structures, wages, salaries, and promotional opportunities;
 - continuing education--training opportunities;
 - transportation to and from work;
 - housing; and
 - community or volunteer participation or involvement.

Data Needs

Data needed for this step are:

- priority occupations from Step 6;
- demand/supply worksheets from Step 11; and
- information on internal policies relating to management, recruitment, incentives, support structures, and continuing education opportunities.

Approximate Schedule and Resources

Three professional person days are required for this step. Up to 10 days of professional time from WS&S in-country personnel will need to

be provided to assist in determining existing policies and in preparing feasible recommendations.

Outcomes/Products

Work performed in this step will provide guidance in the form of explicit recommendations for improved management of people already employed in the WS&S sector. This represents a cost-effective approach to combatting skill shortages in the sector by optimizing use of existing human resources, or by augmentation of the existing labor pool through use of community or volunteer assistance under competent supervision.

The product from this step will be formal policy recommendations for WS&S management.

Step 13: Describe Process for Program Development

Purpose

To specify needed competencies in short supply, and the process by which these needs can be met through new or improved education and training programs.

Outline of Activities

This step focuses on skills needs for which the only remedy is new or upgraded skills development programs. From analyses already conducted, certain occupations will have emerged from the priority set identified as having largely programmatic problems. For these occupations, required job skills may have changed with new technologies, and training programs may not have adapted accordingly. Or programs may not be accessible to all those who need the training, or current programs suffer from lack of adequate resources to provide effective certification

or testing of program graduates. In some cases, entirely new curricula or facilities will need to be designed and resources allocated accordingly. An objective of this step is therefore to prescribe whatever organizational or procedural improvements are needed in the HRD system to improve the delivery of services in priority needs areas. The model outlined earlier in Exhibit 2 should guide the development of recommendations. Inter-agency linkages should be considered, as should improving the system of occupational information flow of demand and supply data to provide the necessary empirical data base for future HRD planning.

Two activities therefore constitute this step:

- determining specific competencies required for selected occupations for which new or improved programs are judged as needed; and
- depending on whether the new or improved program being recommended is to be provided in-house in the agency, or by an education or training institution, indicating institutional or agency responsibility, and type, structure, content and estimated resources needed.

Procedures

Several methods exist for determining needed competencies, from complex job analyses to periodic surveys of employers. The following is the recommended method, although project teams should adapt their procedures to particular situations.

- From current or updated job descriptions, lists of competencies should be developed for each occupation selected. These competency lists will form the basis for curriculum design or improvement, and for competency testing at program conclusion. Competencies should be developed according to the following hierarchical taxonomy:

Occupation;
Task;
Activity; and
Competency

Worksheet 7a, the Occupational Competency Development Worksheet illustrates how competencies are defined for the occupation: WS&S Inspector (Densham and Carefoot, 1978). The resultant worksheets for each occupation should be reviewed by appropriate WS&S personnel to increase validity of stated competencies.

For each occupation and associated competencies, the recommended programmatic improvements should be defined. Although specific recommendations will vary in format and content, the following factors should be considered in their preparation:

- administrative responsibility for design and conduct and management of the program (supervision and support);
- assignment of program to type and level of institution or agency (formal/informal education, secondary/post-secondary);
- staff availability, qualifications and requirements;
- facilities and equipment available, required;
- instructional method, curriculum materials, media;
- curriculum design;
- certification, testing (available documentation on existing trade tests, certification or licensing requirements);
- funding sources, budgeting requirements; and
- contractual or overseas arrangements, if appropriate.

Data Needs

The following data are needed for completing this step:

- occupational competencies, to be organized as shown in Worksheet 7, from job descriptions obtained in Step 4;
- information on characteristics of the existing delivery system, obtained in Step 9; and
- budgetary and resource information needed to develop specific programmatic recommendations.

Approximate Schedule and Resources

It is recommended that members of the project team work closely with stakeholders and particularly representatives from the WS&S and

education/training sectors during this step. Occupational task analysis and competency development can be supervised by project staff, but should be conducted as much as possible by in-country WS&S personnel. Recommendations for programmatic innovations as they relate to education and training sector administration, staff, facilities utilization or curriculum design or materials should be developed in coordination with appropriate in-country education and training planners and professionals.

It is estimated that a minimum of six professional person days of effort be allocated to these activities with up to three additional person-weeks of in-country assistance from the two major sectors involved.

Outcomes/Products

Activities in this step form the basis for the comprehensive plan to be proposed in Step 15. Developing recommendations in coordination with both the WS&S and education and training sectors increases the probability that the recommendations will be feasible to implement and less likely to generate opposition.

The products of this step are a set of recommendations for program improvements to be prepared for administrative and policy review by public sector agencies and the results of those reviews in the form of reactions and suggestions from WS&S sector personnel.

Step 14: Prepare Evaluation Plans for Programmatic Improvements

Purpose

To include design procedures for evaluation of program improvements in the initial development of the HRD plan.

Outline of Activities

In order to facilitate future decision-making relative to the distribution of scarce education and training resources, the evaluation of programmatic interventions and the early provision of evaluative feedback to program administration is essential. Moreover, evaluation information needs should be considered during the design of new programs or changes in program content or delivery so that the necessary evaluative data on both treatment and control populations are defined and collected from inception of the intervention. Evaluation is all too often left until new programs are already installed and running with scant attention to the routine collection of the necessary evaluative data from the onset of the program. In short, it is too late to wait until an evaluation begins in the second or third year of new program operation to decide to collect data on program effectiveness. This step ensures that evaluation is included as a component of the HRD plan.

The activities in this step will therefore be to:

- develop consensus on measures of effectiveness of planned improvements in the HRD delivery system;
- indicate what evaluative data should be collected; and
- prepare an evaluation plan to be incorporated into the overall HRD plan in Step 15.

Procedures

Depending on resources exclusively available for evaluation, the design of the evaluation will need to focus on specific questions. Extent and complexity of the questions and the degree of evaluative rigor will be subject to the judgement of those sponsoring the evaluation. It should be determined whether the major focus should be on

effectiveness of the process of program implementation (better utilization of staff, facilities, updated curricula) or on outcomes (improved placement rates or job skills of program graduates). Once the focus is established through discussions between project staff and the relevant stakeholder agencies and evaluation information needs of both sectors are identified, the following procedures should be carried out:

- Develop a list of questions the evaluation will be expected to address. These can be shared with major stakeholders and augmented or revised as necessary. Items on this list should be ranked so that questions for the evaluation can be directed towards answering important questions first.
- For each question, indicate the data elements needed to provide answers (e.g., placement rates, cost per student, or staff/ student rates). Data elements should then be categorized into those already available and those requiring new collection.
- Prepare an evaluation plan which specifies the evaluation design, how the data are to be collected and analyzed, the format of the results, and schedule and resource requirements.

Data Needs

Data required for this step are:

- amount of resources (money, staff) available for evaluation;
- evaluation information needs related to program improvements; and
- existing process or outcome data on education and training programs to determine whether proposed evaluative data are already collected in the system or would involve new collection procedures.

Approximate Schedule and Resources

Three professional person-days should be allocated to this task, and up to three days of the time of representatives from WS&S and education/ training agencies.

Outcomes/Products

The evaluation plan is the product of this step and will be a direct input into the product of Step 15.

Step 15: Prepare a Comprehensive HRD Plan

Purpose

To provide a plan for the least costly and most effective ways to provide coordinated education and training in response to WS&S sector HRD needs.

Outline of Activities

This step combines the products of Steps 13 and 14 to produce a formal plan for implementation by either the lead agency identified in Step 1 or an agency or consortium specified in the plan. Activities in this step are to:

- develop final recommendations for HRD improvements; and
- incorporate these recommendations with the evaluation plan into a comprehensive planning document which provides specific implementation procedures and anticipated levels of resources needed to carry out the plan.

Procedures

A key concern in this step is determining what agency and what types of personnel should be involved in implementing the plan since the audience and principle decision-making entity should dictate the way the plan is constructed. Once this determination is made, the planning document should be organized and written accordingly. Specific procedures should include the following:

- On the basis of input from agency reviews of recommendations in Step 12, make the necessary revisions to recommendations and define the steps needed to accomplish each recommended option with constraints and potential barriers identified and solutions suggested.

- Including the evaluation plan from the previous step, prepare a document which:
 - summarizes the context for planning activities;
 - synthesizes results of the demand/supply analyses;
 - documents priority skill needs by occupation of the WS&S sector; and
 - presents the recommendations with resource requirements, personnel needed to implement them, anticipated barriers to completion, specific program outlines, curricula to be developed, facilities and equipment needed, instructional staff or staff training required, and planning schedule.

Data Needs

- The review comments on recommendations from Step 13.
- Evaluation plan from Step 14.

Approximate Schedule and Resources

Five person days are allocated to this task.

Outcomes/Products

The product from this step is a comprehensive plan for carrying out recommendations developed in Step 13.

REFERENCES

- Austin, J.H.
1980 Action Plan; Manpower Development Activities for Drinking Water and Sanitation Decade Planning. Government of Sri Lanka and Agency for International Development. The Maxima Corporation, Silver Spring, Maryland.
- Austin, J.H., Woolf, K. and Pinto-Costa, W.
1982 A proposed action plan for a national training program in the water sector for the Hashemite Kingdom of Jordan. WASH Field Report No. 34. U.S. Agency for International Development.
- Briscoe, J., Eng, E., Gearhart, R.A.
1982 Environmental Sanitation Master Plan for Training and Education in Tanzania. Water and Sanitation for Health Project, USAID, Washington, D.C.
- Cairncross, S. and Carruthers, I.
1980 Evaluation for Village Water Supply Planning. John Wiley & Sons. Chichester, England.
- Carefoot, N.F., Densham, J.K.
1978 Suggested steps in development of a national training delivery system (water and sanitation sector). WHO International Reference Center for Community Water Supply and Sanitation, The Netherlands. Third Draft.
- Connor, J.J. and Carson, W.M.
1982 Manpower Planning and Development: the developing world. International Human Resources Development Corporation. Boston, Massachusetts.
- Ginzberg, E.
1975 Realism in Educational Planning in LDCs. In Ramati, Y. (Ed). Economic growth in developing countries: material and human resources. Proceedings of the 7th Rehovot Conference. Praeger Publishers, New York, pp. 458-466.
- Gonima, A.
1983 El adiestramiento como función institucional. En Simposio Regional sobre Recursos Humanos para el Decenio Internacional del Agua Potable y del Saneamiento Ambiental. Pan American Health Organization, Washington, D.C., pp. 53-71.
- Interagency Task Force on Human Resources
1982 Development for the International Drinking Water Supply and Sanitation Decade: Basic Strategy Document. Adopted by the Task Force, Geneva.
- Kidd, C.V.
1980 Manpower Policies for the Use of Science and Technology in Development. Pergamon Policy Studies, New York.

- Lawrence, J.E.S. and Cruze, A.M.
1981 Procedures for Estimating Occupational Demand in Texas. Research Triangle Institute, North Carolina. December.
- Loken, R.D.
1969 Manpower Development in Africa. Frederick A. Praeger, New York.
- Mangum, G., Snedeker, D.
1974 Manpower Planning for Local Labor Markets. Olympus Publishing Company. Salt Lake City, Utah.
- Mangum, G., Morlock, J., Pines, M.W. and Snedeker D.
1979 Job Market Futurity: planning and managing local manpower programs. Olympus Publishing Company. Salt Lake City, Utah.
- Milburn, A.
1981 Manpower Development Programme for Community Water Supply in the Republic of Indonesia. WHO International Reference Center for Community Water Supply and Sanitation. The Netherlands.
- National Occupational Information Coordinating Committee
1980 Vocational Preparation and Occupations. Washington, D.C.
- Occupational Information System Handbook
1981 National Occupational Information Coordinating Committee, Washington, D.C.
- Report of the United Nations Water Conference
1977 Mar del Plata, 14-25 March, New York, United Nations 1977 (Document E/Conf. 70/29).
- U.S. Department of Labor
1979 Bureau of Labor Statistics. Occupational Employment Statistics Handbook. Washington, D.C.
- U.S. Department of Labor
1981 Employment and Training Administration. Selected Characteristics of occupations defined in the Dictionary of Occupational Titles. Washington, D.C.
- U.S. Department of Labor
1981 Employment and Training Administration. Occupational and employment projections for labor market areas: an analysis of alternative approaches (R&D Monograph, No. 80.) Washington, D.C.
- World Health Statistics
1976 Report 29, No. 10.
- World Health Organization
1982 Human Resources Development Handbook.

Appendix 1

WORKSHEETS 1 THROUGH 7

Worksheets for Use in Preparing the HRD Plan

A

WORKSHEET 1 (Step 3)

OCCUPATIONAL DEMAND/SUPPLY DATA AVAILABILITY CHECKLIST

Country _____

Ministry/Agency _____

Please indicate by checking in the appropriate column(s) whether the following information exists in your ministry/agency, and if so, in what form it is available for review by the project team.

| Data Type | Existence of Data | | Availability of Data | | | English Translation Available | Comments |
|--|-------------------|--------------------|----------------------|---|-------|-------------------------------|----------|
| | Has Data | Does Not Have Data | Copies Available | Data Are Available But Not In Copiable Form | Other | | |
| <u>Current Occupational Demand</u> | | | | | | | |
| -- Rosters of Persons by Occupation | | | | | | | |
| -- Sex by Occupation | | | | | | | |
| -- Expatriate/Indigenous Status by Occupation | | | | | | | |
| -- Temporary/Permanent/Trainee | | | | | | | |
| -- Duration of Employment | | | | | | | |
| -- Age by Occupation | | | | | | | |
| -- Job Vacancies | | | | | | | |
| -- Current Total Employment by Occupation | | | | | | | |
| -- Current Total Employment by Sector/Sub-sector | | | | | | | |
| <u>Projected Occupational Demand</u> | | | | | | | |
| -- Projected (Needed) Employment by Occupation | | | | | | | |
| -- Number of Turnovers | | | | | | | |
| -- Retirements | | | | | | | |
| -- Deaths | | | | | | | |
| -- Quits/Layoffs | | | | | | | |

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WORKSHEET 1 (CONTINUED)

OCCUPATIONAL DEMAND/SUPPLY DATA AVAILABILITY CHECKLIST

Country _____

Ministry/Agency _____

Please indicate by checking in the appropriate column(s) whether the following information exists in your ministry/agency, and if so, in what form it is available for review by the project team.

| Data Type | Existence of Data | | Availability of Data | | | English Translation Available | Comments |
|---|-------------------|--------------------|----------------------|---|-------|-------------------------------|----------|
| | Has Data | Does Not Have Data | Copies Available | Data Are Available But Not In Copiable Form | Other | | |
| -- Separation Rates | | | | | | | |
| -- Outmigration | | | | | | | |
| -- Transfers to Other Jobs | | | | | | | |
| -- Projected Total Employment by Occupation | | | | | | | |
| -- Projected Total Employment by Sector/Sub-sector | | | | | | | |
| <u>Occupational Characteristics</u> | | | | | | | |
| -- Standard Occupational Titles and Descriptions | | | | | | | |
| -- Earnings by Occupation | | | | | | | |
| -- Education and Training Requirements | | | | | | | |
| -- Entry Level | | | | | | | |
| -- In-Service | | | | | | | |
| -- Licenses, Accreditations Certifications Required | | | | | | | |
| -- Entry Level | | | | | | | |
| -- In-Service | | | | | | | |
| <u>Occupational Supply</u> | | | | | | | |
| -- Inventory of In-Service Education and Training Programs for Currently Employed | | | | | | | |

WORKSHEET 1 (CONTINUED)

OCCUPATIONAL DEMAND/SUPPLY DATA AVAILABILITY CHECKLIST

Country _____

Ministry/Agency _____

Please indicate by checking in the appropriate column(s) whether the following information exists in your ministry/agency, and if so, in what form it is available for review by the project team.

| Data Type | Existence of Data | | Availability of Data | | | English Translation Available | Comments |
|---|-------------------|--------------------|----------------------|---|-------|-------------------------------|----------|
| | Has Data | Does Not Have Data | Copies Available | Data Are Available But Not In Copiable Form | Other | | |
| -- Number of Currently Employed Personnel Educated/Trained in In-Service Programs | | | | | | | |
| -- Total | | | | | | | |
| -- By Program | | | | | | | |
| -- By Occupation | | | | | | | |
| -- Inventory of Education/Training Institutions Providing WS & S Sector Occupational Supply | | | | | | | |
| -- Public | | | | | | | |
| -- Private | | | | | | | |
| -- By Program | | | | | | | |
| -- By Program Content | | | | | | | |
| -- Current Enrollments | | | | | | | |
| -- By Institution | | | | | | | |
| -- By Program | | | | | | | |
| -- Institutional Follow-Up Information | | | | | | | |
| -- By Institution | | | | | | | |
| -- By Program | | | | | | | |
| -- Occupational Mobility (Transfers Between Occupations) | | | | | | | |
| -- Immigrants Labor Supply | | | | | | | |

AP

WORKSHEET 2 (Step 3)

ILLUSTRATIVE LIST OF STAKEHOLDER AGENCIES* IN HRD PLANNING FOR WS & S SECTOR

| Agency | Role |
|--|------|
| <u>Government</u> | |
| Agency 1 Agency 2 (etc.) | |
| <u>Donors or Other External Agencies</u> | |
| <u>Committees or Other Bodies</u> | |
| <u>Cooperatives</u> | |
| <u>Other (if appropriate)</u> | |

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WORKSHEET 2a (Step 3)

ILLUSTRATIVE LIST OF STAKEHOLDER AGENCIES* IN IIRD PLANNING FOR WS & S SECTOR

| Agency | Role |
|--|---|
| <u>Government</u> | |
| -- Ministry of Agriculture and Forests -- Rural Water Supply Division of | Rural water supply--mainly drilling deep tubewells or constructing piped inter-village systems for provision of drinking water supply to dry zone and other areas, also in-service training programmes for workers. |
| -- Irrigation Department | Agricultural water supply; Water Resources Data Bank. |
| -- Ministry of Health, Department of Health -- Environmental Sanitation Division | Rural water supply and sanitation of villages; also in-service training for workers. |
| -- Health Education Bureau | Health education activities and community participation. |
| -- Ministry of Construction, Housing Dept. -- Urban Water Supply and Sanitation Division | Urban water supply and sanitation for towns; prefeasibility studies and planning up to the construction stage. |
| -- Construction Corporation, Water and Sanitary Division | System construction for urban water supply projects (e.g., Reservoir Project); in-service training. |
| -- Ministry of Home and Religious Affairs, Department of General Affairs | Urban water supply and sanitation; administration of Township Development Committees. |
| -- Ministry of Cooperatives -- Industry and Cottage Industries Dept. | Development of mini-cement production units. |
| -- Ministry of Planning and Finance, Foreign Economic Relations Department, Planning Department, Budget Department | Coordination, monitoring and evaluation of project planning for IDWSSD and coordination through FERD of local financing and foreign aid. |
| -- Ministries of Industry (#s 1 and 2) | Manufacture of materials for IDWSSD (e.g., batch production of plastic pellets, production of water pipes, pumps and cement; feasibility studies.) |

*Stakeholders defined as agencies or organizations having direct interest in IDWSSD activities, and identified through in-country documentation.

WORKSHEET 2a (CONTINUED)

LIST OF STAKEHOLDER AGENCIES IN IIRD PLANNING FOR WS & S SECTOR

| Agency | Role |
|---|--|
| -- Ministry of Education | Education and training; preparation of hydrogeologic maps. |
| -- PII -- DIAVE, Government Technical Institutes | |
| -- Ministry of Information | Disseminating IDWSSD materials and information. |
| -- Ministry of Labor | National manpower policy. |
| <u>Donors or Other External Agencies</u> | |
| -- Asian Development Bank | Allocation of fiscal resources for projects (e.g., City Water Supply Scheme). |
| -- Australian Development Aid Bureau | Technical assistance and support for IDWSSD activities (e.g., village health statistics survey; dry zone tubewells). |
| -- Netherlands | Grant aid donor for rural water supply. |
| -- Japan | Funds, technical assistance and support to IDWSSD activities (e.g., urban water supply.) |
| -- USAID | Funds, technical assistance and support to IDWSSD activities (e.g., primary health care, training, etc., through the WASII project). |
| -- WIIIO | Technical assistance and support for IDWSSD activities (e.g., training of trainers for CIWS). |
| -- UNDP | Funds, technical assistance and support for IDWSSD activities (e.g., pre-investment studies for industrial projects, urban water supply, water resources exploration). |
| -- UNICEF | Funds, technical assistance and support for IDWSSD activities (e.g., Dry Zone drilling programme). |
| -- Federal Republic of Germany (GTZ) | Funds, technical assistance and support for IDWSSD activities (e.g., assisting UNICEF in dry zone drilling programme). |

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WORKSHEET 2a (CONTINUED)

LIST OF STAKEHOLDER AGENCIES IN IIRD PLANNING FOR WS & S SECTOR

| Agency | Role |
|---|---|
| -- India | Interest in industrial manufacturing assistance to IDWSSD activities. |
| -- Scandinavia | Interest in industrial manufacturing assistance to IDWSSD activities. |
| -- OPEC | Funds for construction of Reservoir. |
| -- World Bank | Urban Water Supply. |
| <u>Committees or Other Bodies</u> | |
| -- Interministerial Committee on Water Supplies | Coordinating policy and planning for all water supplies. |
| -- Technical Committee for IDWSSD | Coordinating IDWSSD activities. |
| <u>Cooperatives</u> | |
| -- Civil Engineers' Construction Cooperative | Professional resources for IDWSSD activities. |

WORKSHEET 3 (Step 3)
STAKEHOLDER CONTACT TABLE

| Agency | Representative(s) | Meetings Completed (Dates) |
|--------|-------------------|----------------------------|
|--------|-------------------|----------------------------|

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WORKSHEET 4 (Step 4)

DATA SOURCE WORKSHEET--OCCUPATIONAL DEMAND

| (1) Data Category/Element | (2) Availability Yes/No | (3) Source | (4) Format | (5) Year(s) | (6) Occupational Coverage | (7) Geographical Coverage | (8) Reliability | (9) Comments |
|---|----------------------------|------------|------------|-------------|------------------------------|------------------------------|-----------------|--------------|
| <u>Current Occupational Demand</u> | | | | | | | | |
| <u>Current Occupational Employment</u> | | | | | | | | |
| -- Rosters of Persons by Occupation | | | | | | | | |
| -- Sex by Occupation | | | | | | | | |
| -- Expatriate/Indigenous | | | | | | | | |
| -- Temporary/Permanent/Trainee | | | | | | | | |
| -- Length of Employment | | | | | | | | |
| -- Age by Occupation | | | | | | | | |
| -- Job Vacancies | | | | | | | | |
| -- Current Total Employment by Sector/Sub-sector | | | | | | | | |
| -- Current Total Employment by Occupation | | | | | | | | |
| <u>Projected Occupational Demand</u> | | | | | | | | |
| -- Projected Occupational Employment | | | | | | | | |
| -- Replacement Demand | | | | | | | | |
| -- Number of turnovers | | | | | | | | |
| -- Retirements | | | | | | | | |
| -- Deaths | | | | | | | | |
| -- Quits/layoffs | | | | | | | | |
| -- Separation Rates | | | | | | | | |
| -- Out-Migration | | | | | | | | |
| -- Transfers to Other Jobs | | | | | | | | |
| -- Projected Total Employment by Sector/Subsector | | | | | | | | |

WORKSHEET 4 (CONTINUED)

DATA SOURCE WORKSHEET--OCCUPATIONAL DEMAND

| (1) Data Category/Element | (2) Availability Yes/No | (3) Source | (4) Format | (5) Year(s) | (6) Occupational Coverage | (7) Geographical Coverage | (8) Reliability | (9) Comments |
|---|----------------------------|------------|------------|-------------|------------------------------|------------------------------|-----------------|--------------|
| -- Projected Total Employment by Occupation | | | | | | | | |
| <u>Occupational Characteristics</u> | | | | | | | | |
| -- Standard Occupational Titles and Descriptions | | | | | | | | |
| -- Earnings | | | | | | | | |
| -- Education and Training Requirements | | | | | | | | |
| -- Entry level | | | | | | | | |
| -- In-Service | | | | | | | | |
| -- Licenses, Accreditations, Certifications Required | | | | | | | | |
| -- Entry Level | | | | | | | | |
| -- In-Service | | | | | | | | |

WORKSHEET 5 (Step 5)

SUBSECTOR BY OCCUPATION MATRIX--BASE YEAR EMPLOYMENT AND PROJECTED ANNUAL AVERAGE OPENINGS BY OCCUPATION

| Occupation | Subsector* Base Year Employment | | | | | (6) Base Year Total Employment by Occupation | (7) Estimated Total Employment in Target Year | (8) Annual Strength in Job Openings |
|--------------------------------|---------------------------------|--------------|--------------|--------------|--------------|--|---|-------------------------------------|
| | (1) Agency A | (2) Agency B | (3) Agency C | (4) Agency D | (5) Agency E | | | |
| <u>Professional</u> | | | | | | | | |
| Engineers (Civil and Sanitary) | | | | | | | | |
| Engineers (Mechanical) | | | | | | | | |
| Engineers (Electrical) | | | | | | | | |
| Chemists/Bacteriologists | | | | | | | | |
| Hydrologists | | | | | | | | |
| Sanitary Inspectors | | | | | | | | |
| Training Officers | | | | | | | | |
| Administrative/financial | | | | | | | | |
| Other | | | | | | | | |
| <u>Technical</u> | | | | | | | | |
| Lab Technicians | | | | | | | | |
| Water Resources Technicians | | | | | | | | |
| Drafting/Surveying | | | | | | | | |
| Accounting/Bookkeeping | | | | | | | | |
| Engineering Design | | | | | | | | |
| Operations/Maintenance | | | | | | | | |
| Sanitarians | | | | | | | | |
| Training Staff | | | | | | | | |
| Others | | | | | | | | |
| <u>Supervisors</u> | | | | | | | | |
| Foreman | | | | | | | | |
| Others | | | | | | | | |

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WORKSHEET 5 (Step 5) CONTINUED

SUBSECTOR BY OCCUPATION MATRIX--BASE YEAR EMPLOYMENT AND PROJECTED ANNUAL AVERAGE OPENINGS BY OCCUPATION

| Occupation | <u>Subsector^A Base Year Employment</u> | | | | | (6) Base Year Total Employment by Occupa- tion | (7) Estimated Total Employment in Target Year | (8) Annual Strength in Job Openings |
|----------------------------------|---|--------------|--------------|--------------|--------------|--|---|---|
| | (1) Agency A | (2) Agency B | (3) Agency C | (4) Agency D | (5) Agency E | | | |
| <u>Craftsmen</u> | | | | | | | | |
| Plumbers/Pipefitters | | | | | | | | |
| Mechanics | | | | | | | | |
| Meter Repairers | | | | | | | | |
| Well Drillers | | | | | | | | |
| Pump Repairers | | | | | | | | |
| General Maintenance | | | | | | | | |
| Welders | | | | | | | | |
| Electricians | | | | | | | | |
| Others | | | | | | | | |
| <u>Operators</u> | | | | | | | | |
| Waterworks | | | | | | | | |
| Sewerage Works | | | | | | | | |
| Sanitary Aides | | | | | | | | |
| Drivers | | | | | | | | |
| Others | | | | | | | | |
| <u>Semi-Skilled/Unskilled</u> | | | | | | | | |
| Laborers | | | | | | | | |
| Guards/Watchmen | | | | | | | | |
| Others | | | | | | | | |
| Total Employment by Subsector | | | | | | | | |

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WORKSHEET 5a (Step 5)

SUBSECTOR BY OCCUPATION MATRIX--BASE YEAR EMPLOYMENT AND PROJECTED ANNUAL AVERAGE OPENINGS BY OCCUPATION

| Occupation | Subsector ^A Base Year Employment | | | | | (6) Base Year Total Employment by Occupation | (7) Estimated Total Employment in Target Year | (8) Annual Strength in Job Openings |
|--------------------------------|---|---------------------------------|---|---------------------|-------------|--|---|-------------------------------------|
| | (1) Water & Sewerage Authority | (2) Natural Resources Authority | (3) Ministry of Municipal Rural Affairs | (4) Health Activity | (5) Other | | | |
| <u>Professional</u> | | | | | | | | |
| Engineers (Civil and Sanitary) | $E_1 (p)^{**}$ | $E_2 (p_2)$ | $E_3 (p_3)$ | $E_4 (p_4)$ | $E_5 (p_5)$ | $\sum E (P)$ | | $U = \frac{N}{Y}$ |
| Engineers (Mechanical) | | | | | | | | |
| Engineers (Electrical) | | | | | | | | |
| Chemists/Bacteriologists | | | | | | | | |
| Hydrologists | | | | | | | | |
| Sanitary Inspectors | | | | | | | | |
| Training Officers | | | | | | | | |
| Administrative/Financial | | | | | | | | |
| Other | | | | | | | | |
| <u>Technical</u> | | | | | | | | |
| Lab Technicians | | | | | | | | |
| Water Resources Technicians | | | | | | | | |
| Drafting/Surveying | | | | | | | | |
| Accounting/Bookkeeping | | | | | | | | |
| Engineering Design | | | | | | | | |
| Operations/Maintenance | | | | | | | | |
| Sanitarians | | | | | | | | |
| Training Staff | | | | | | | | |
| Others | | | | | | | | |
| <u>Supervisors</u> | | | | | | | | |
| Foreman | | | | | | | | |
| Others | | | | | | | | |

^AThis illustration is subdivided by agencies--other functional subdivisions (such as urban/rural) may be necessary depending on the determination of subsector categorization in Step 4.

^{**}For explanations of these symbols see text in Step 5.

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WORKSHEET 5a (CONTINUED)

SUBSECTOR BY OCCUPATION MATRIX--BASE YEAR EMPLOYMENT AND PROJECTED ANNUAL AVERAGE OPENINGS BY OCCUPATION

| Occupation | Subsector* Base Year Employment | | | | | (6) Base Year Total Employment by Occupation | (7) Estimated Total Employment in Target Year | (8) Annual Strength in Job Openings |
|-------------------------------|---------------------------------|---------------------------------|---|---------------------|-----------|--|---|-------------------------------------|
| | (1) Water & Sewerage Authority | (2) Natural Resources Authority | (3) Ministry of Municipal Rural Affairs | (4) Health Activity | (5) Other | | | |
| <u>Craftsmen</u> | | | | | | | | |
| Plumbers/Pipefitters | | | | | | | | |
| Mechanics | | | | | | | | |
| Meter Repairers | | | | | | | | |
| Well Drillers | | | | | | | | |
| Pump Repairers | | | | | | | | |
| General Maintenance | | | | | | | | |
| Welders | | | | | | | | |
| Electricians | | | | | | | | |
| Others | | | | | | | | |
| <u>Operators</u> | | | | | | | | |
| Waterworks | | | | | | | | |
| Sewerage Works | | | | | | | | |
| Sanitary Aides | | | | | | | | |
| Drivers | | | | | | | | |
| Others | | | | | | | | |
| <u>Semi-Skilled/Unskilled</u> | | | | | | | | |
| Laborers | | | | | | | | |
| Guards/Watchmen | | | | | | | | |
| Others | | | | | | | | |
| Total Employment by Subsector | E ₁₀₁ (p=100%)** | | | | | | | |

*This illustration is subdivided by agencies--other functional subdivisions (such as urban/rural) may be necessary depending on the determination of subsector categorization in Step 4.

**For explanations of these symbols see text in Step 5.

WORKSHEET 6 (Step 11)

DEMAND/SUPPLY WORKSHEET

| (1) Occupation | (2) Sector Total Current Employment | (3) Annual Average Job Openings for Target Period | (4) Program(s) | (5) Current Supply (Base Year) | (6) Annual Average Supply for Target Period |
|----------------|--|---|----------------|-----------------------------------|---|
|----------------|--|---|----------------|-----------------------------------|---|

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WORKSHEET 7 (Step 13)

OCCUPATIONAL COMPETENCY DEVELOPMENT WORKSHEET

| Occupation | Task | Activities | Competencies |
|------------|------|------------|--------------|
|------------|------|------------|--------------|

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WORKSHEET 7a (Step 13)

OCCUPATIONAL COMPETENCY DEVELOPMENT WORKSHEET

| Occupation | Task | Activities | Competencies |
|------------|-------------------------------|--|--|
| Inspector | -- Mains and waste inspection | -- Inspection duties -- Dealing with installation defects -- Waste investigation -- Turning -- Using instruments for recording and measuring | -- Pressure and flow tests -- Hydrant Pressure Test (1) 7-day recorder (2) 24-hour recorder -- Fitting charts to pressure recorders and flow recorders -- Renewing charts on Multilee Recorder -- Kent meter waste detection |

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Appendix 2

ILLUSTRATIVE OCCUPATIONAL CLASSIFICATION

ILLUSTRATIVE OCCUPATIONAL CLASSIFICATION

OCCUPATION

Professional

Engineers (Civil and Sanitary)
Engineers (Mechanical)
Engineers (Electrical)
Chemists/Bacteriologists
Geologists/Hydrologists
Sanitary Inspectors
Training Officers
Administrative/Financial
Others

Technical

Lab Technicians
Water Resources Technicians
Drafting/Surveying
Accounting/Bookkeeping
Engineering Design
Operations/Maintenance
Sanitarians
Training Staff
Others

Supervisors

Foremen
Others

Tradesmen/Craftsmen

Plumbers/Pipefitters
Mechanics
Meter Repairers
Well Drillers
Pump Repairers
General Maintenance
Welders
Electricians
Others

Operators

Waterworks
Sewerage Works
Sanitary Aides
Drivers
Others

Semi-Skilled/Unskilled

Laborers
Guards/Watchmen
Others

Appendix 3

-- RELATIVE PLACEMENTS SHARE METHOD

RELATIVE PLACEMENTS SHARE METHOD FOR ALLOCATING OCCUPATIONAL
SUPPLY INDICES TO MORE THAN ONE OCCUPATION

Purpose

To allocate entrants from an education/training program or program cluster among the related priority occupations on the basis of the relative share of placements from a program into each related occupation. Relative placement share can be derived from a time series of follow-up placement data sufficient to permit identification of typical placement patterns, or estimated directly in the absence of follow-up data.

Procedural Steps

1. Identify education/training programs or clusters of such programs which are related to more than one occupation.
2. For each program or program cluster identified in Step 1, use follow-up data on placement to identify the related occupations in which - program completers (and leavers, if available) typically obtain employment.
3. For each program or program cluster determine the number of program completers placed in each related occupation.
4. Compute the "placement share" to each related occupation using the following formula:

$$\text{Placement Share} = \frac{\text{Number of program completers placed in occupation n}}{\text{Total number of program placements}}$$

An example is provided in Table 1. The figure in Column 1 for occupation A = .40 (or 40%). This is derived from the formula in Step 4 where:

$$\frac{100}{250} = .40$$

5. Allocate supply (as represented by the supply index for the program) among the related occupations using the following formula:

$$(\text{Placement Share}) \times (\text{Supply index}) = \text{Allocated Supply to Occupation n}$$

The figure in Column 3 of Table 1 for occupation A = .40. This is based on the Step 5 formula where $.40 \times 300 = 120$.

Table 1

Example of Use of Placement Share Method
To Allocate Occupational Supply

Example: Program or Program Cluster 1 is related to 3 occupational fields (A, B, and C).
Available supply (supply index) from program or program cluster 1 = 300.

| 1. Occupational Field | 2. Number of Graduates placed From Program or Program Cluster 1 | 3. Method of Calculation: Multiply Per Cent Figure in Column 2 Times Supply Index (300) | Placement Share |
|-----------------------|---|---|-----------------|
| Total | 250 | -- | 300 |
| A | 100 (40%) | .40 x 300 = | 120 |
| B | 100 (40%) | .40 x 300 = | 120 |
| C | 50 (20%) | .20 x 300 = | 60 |

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