WATER AND SANITATION FOR HEALTH PROJECT

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

WASH TECHNICAL REPORT NO. 20

JULY 1988

Prepared for
the Office of Health,
Bureau for Science and Technology,
U.S. Agency for International Development
WASH Activity No. 373

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Prepared for the Office of Health,
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PREFACE

Member states of the United Nations 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. One of the key requirements for achieving this goal is a substantial commitment to human resource development (HRD). Well-trained personnel are needed at all occupational levels if public monies are to be conserved and effective services are to be initiated and maintained in line with swiftly escalating demands and consumer expectations.

Developing country governments are faced with complex problems in HRD planning which include heightened competition for scarce resources, complex inter-ministerial jurisdictions, and a lack of adequate data for decision-making. In particular, the sector lacks theoretically based and field-tested approaches that can usefully assist those responsible for HRD planning in the field.

These guidelines are intended to assist those charged with HRD planning in an increasingly complicated world. In recognition of the difficulties faced by HRD planners, the purpose is to provide realistic assistance in the form of a workable, structured, and systematic approach to HRD planning that goes beyond preparation of a plan to the development of an improved capacity for planning and the linking of planning to the management of human resources. In particular, our methods differ from traditional "manpower" planning methods in several ways. They require attention to multiple labor market signals over time rather than just occupational employment projections and the capability for routine "scanning" of the occupational environment rather than reliance on periodic manpower studies. Accordingly, the expression "manpower planning" is not used except in general reference to earlier approaches, literature, and research. In addition, because HRD planning is far too important to be left just to HRD planners, emphasis is stressed on identification and involvement of all key stakeholders in the development of human resources.

Chapter 1 introduces the conceptual model and gives an overview of the proposed methodologies and their operational requirements, including the composition of the planning team. Chapters 2 through 5 present each of the four components which make up the method and give details of their separate procedural steps.

These guidelines are constructed to provide some structure for short-term consultant or technical assistance teams working in a sectoral HRD assessment or related projects. The realities of time and other resource constraints are acknowledged. To make the document more usable, therefore, Exhibits 5 through 8 (summaries of steps for all components) and accompanying worksheets in Appendix B can be separated from the text to provide an abbreviated package for use in the field.

The need to promote the capacity for longer term HRD planning within the water sectors in developing countries cannot be emphasized too strongly. Accordingly, it is hoped that the guidelines will eventually minimize the need for external consultants.

Chapter 1

INTRODUCTION

Half the population of the world (excluding China) lives in developing countries. Approximately 70 percent of the these people live in rural areas. In 1975, only 22 percent of the rural populations had access to reasonably safe water, and 15 percent to sanitary excreta disposal facilities. In contrast, 77 percent of the urban populations of developing countries 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 that national development policies and plans give priority to drinking water supplies and sanitary waste disposal and the decade 1981-1990 was designated as the International Drinking Water Supply and Sanitation Decade (IDWSSD). The goal was to provide safe water supplies and sanitation facilities for all by 1990. National Action Committees were formed in participating nations for policy and technical guidance. As a consequence, there is an emerging international consensus as to the critical needs of large segments of developing country populations for new technical assistance mechanisms and cooperation in the water and sanitation sector between donor agencies, national governments, and communities. It is the purpose of this document to address one aspect of such technical assistance, namely the human resource development planning component.

Successful implementation, maintenance, and expansion of water supply and sanitation (WS&S) programs in a developing country rely 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 is dependent on skilled work forces at all levels. Without effective measures to recruit, train, and successfully manage skilled labor to provide water supply and sanitation services, government policies and available resources can have little impact.

Despite escalating costs of water supply and sanitation service delivery, not enough systematic attention has been given to defining the process by which human resource development (HRD) needs are routinely assessed over time, and the necessary personnel recruited, trained, supported, and supervised.* For

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* The term "human resource development" in this context (HRD) means more than the education and/or training of people. HRD is defined as improving individual capacity for continued achievement of productive employment goals in ways that promote economic independence and are mutually beneficial to both employers and employees. HRD strategies include preparatory education and training, recruiting/hiring/promotion policies, supervision and management, continuing education and training, and occupational welfare. In this document, however, we are primarily concerned with education and training for employment in the water and health sectors.

example, the water resources of a country or a region are well understood to be valuable, and in need of adequate conservation, management, and development. No major investment is likely to be made concerning water supply without reference to basic data on water resources, water quality, and consumption patterns. Yet major decisions are routinely reached on both preparation and management of human resources without access to any equivalent data, for instance, on job skills requirements, occupational migration, or job vacancies. Human resources planning and management, however, are surely important, and the shortage of relevant occupational information may seriously retard efforts at sectoral development.

This is not to suggest that HRD planning for the water supply and sanitation sector has been ignored. Indeed, there is a growing literature on HRD planning in developing countries (e.g., Ginzberg, 1975; Loken, 1969; Kidd, 1980; Connor and Carson, 1982; Serageldin and Li, 1983; Psacharopoulos et al., 1983), and corresponding adaptations to WS&S sector needs (Gearhart et al., 1982; Milburn, 1981; Austin, 1980; Austin et al., 1982, 1984, and 1988; Cairncross et al., 1980; Carefoot and Densham, 1978; WHO, 1984; United Nations, 1987; Lawrence and Stevens, 1987).

Important contributions to HRD planning are made by these studies and others. Several issues however, 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. Developing country water agency staffing patterns show considerable variation in terms of ratios of both employees to population served, and of employment by occupation to total employment for the sector. In addition, the processes are not clearly understood by which water supply and sanitation personnel are (1) distributed throughout agencies; (2) drawn to private sector employment by higher wages/salaries; (3) replaced as they migrate to other locations in the country or abroad; (4) integrated with indigenous and auxiliary personnel working in the same sector; and (5) brought into the activities of local communities. HRD planning for the sector must take these factors into consideration in developing HRD plans.

These guidelines outline a systematic approach to assessing HRD needs and preparing training plans. The approach is consistent with HRD planning designs referred to 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 in which this approach might be used should have assigned an important role to WS&S activities, be actively committed to Decade goals, and be expected to have key ministry support and interagency collaboration in the pursuit of WS&S policy and programs. In addition, where data bases do not currently exist to support HRD planning, initiation and effective use of such data bases should be a major focus of those in the country who are responsible for HRD planning.

To give conceptual structure to the planning process, a general model of the HRD system is provided in the following section.

1.1 A General Model for a Human Resource Development System

The approach put forward in these guidelines is based on four assumptions:

- HRD planning is a continuous, not a "one-shot", process --that is, planning and management are interrelated;
- an effective HRD education and training delivery system should be responsive to shifts in the specific demands of labor markets at all levels;
- HRD planning can best be approached through systematically defining and understanding occupational supply and demand for the sector; and
- HRD planning necessitates a coordinated interagency approach, involving all the necessary stakeholders.*

The interchange between education/training and the workplace should be dominated by the need to realize improved productivity in the provision of products or services. Figure 1 outlines this relationship. Information on the demand for job skills must flow continually from the WS&S sector so that education and training programs can provide the necessary competencies for a skilled labor force. As new technologies create needs for new or changed occupational skills, appropriate information must be communicated to those responsible for curriculum design and achievement and competency testing so that skills taught are those needed in occupational settings. This information flow is crucial to successful HRD planning.

Effective HRD planning should involve all parties concerned and their separate individual and agency jurisdictions and prerogatives and should recognize the statutory, fiscal, and regulatory environments within 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. Figure 2 expands Figure 1 into 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.

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* "Stakeholders" are defined as key actors or representatives of agencies who have a significant stake in HRD planning for the WS&S sector; these may include agencies such as, for example, ministries of labor and civil services who oversee public sector personnel policies, but who are not usually thought of as WS&S agencies.

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

Figure 1

Education and Training for Improved Productivity

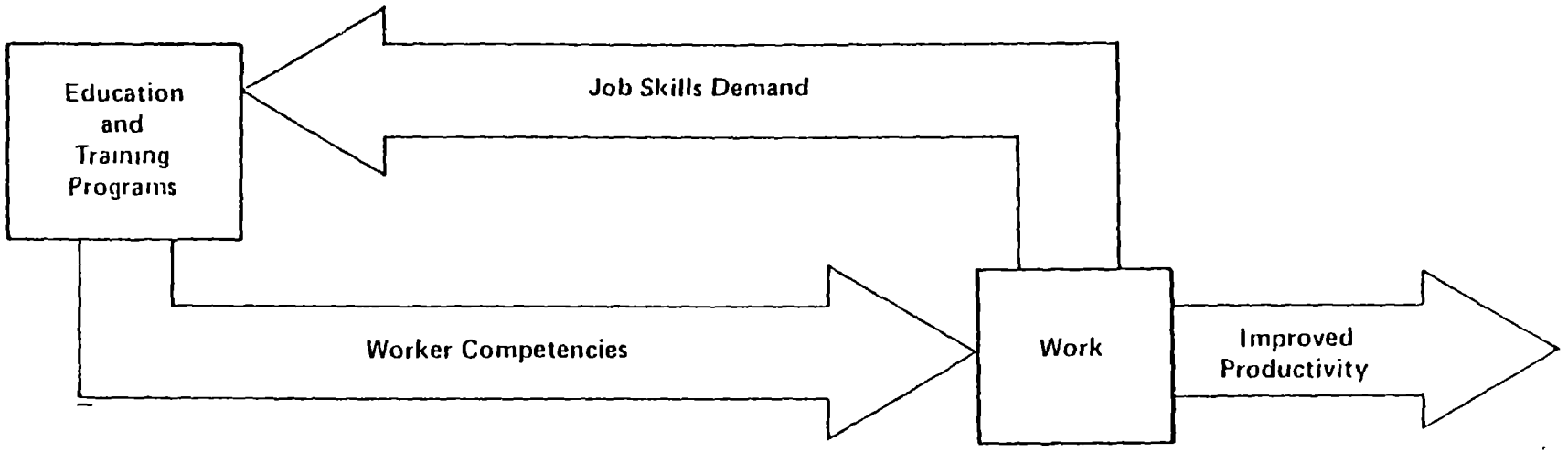
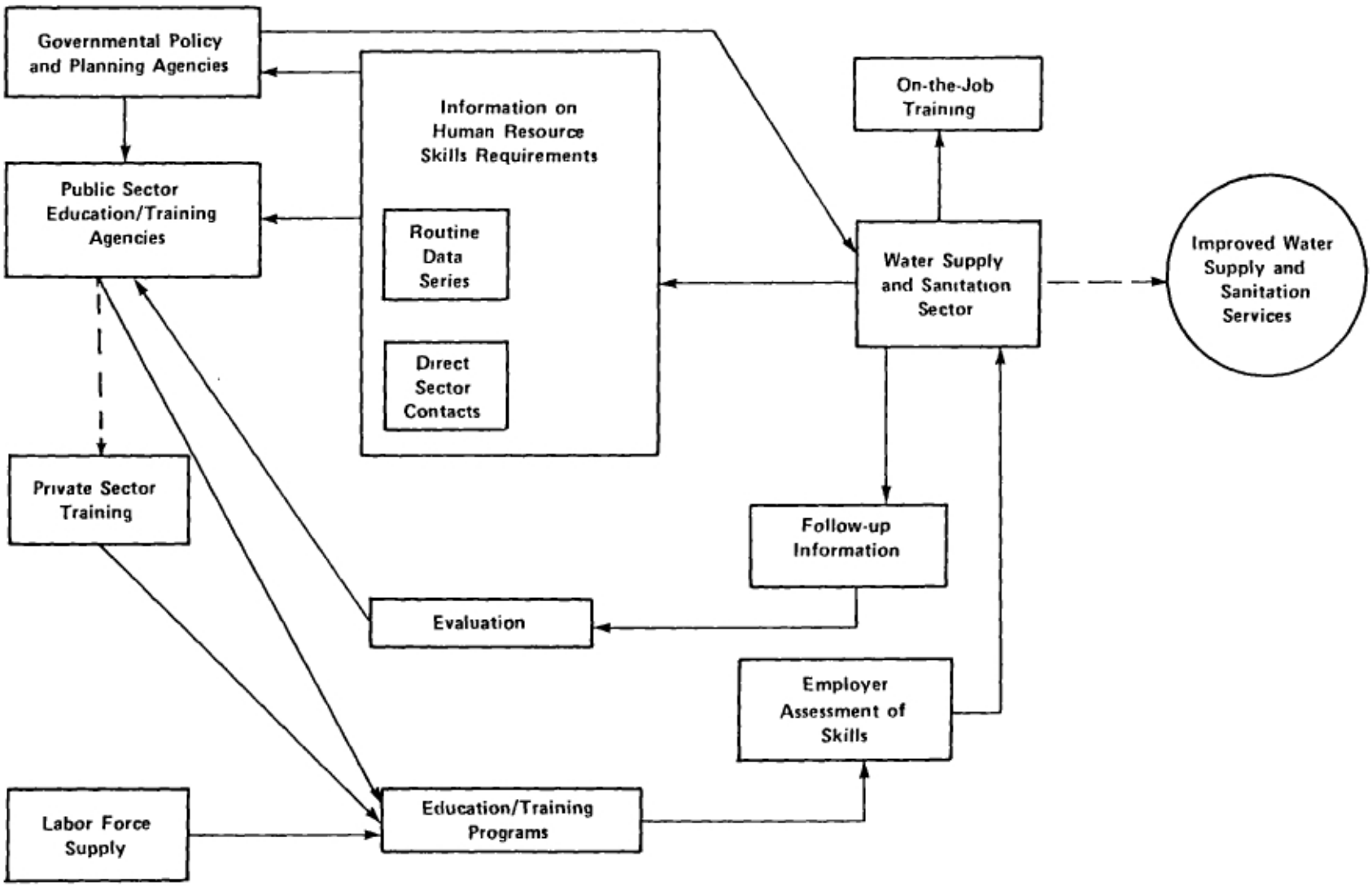


Figure 2

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



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.

It is this systematic "sensing" of occupational information from the WS&S occupational environment to HRD planners that is the key element of the approach. If it works well, this occupational information system can serve as a kind of institutional "radar", where skilled observers attend to specific signals from relevant labor markets and translate that information into data for management decisions. All elements of such a system are unlikely to be found in place in any country. Routine methods for scanning the occupational environment through periodic employment and skills surveys, for example, seldom exist. Statistical data series are often rudimentary at best. Inadequate information, imperfect linkages between agencies, and uncertainty concerning policy and resource allocation are more often the rule than the exception.

Yet HRD planning, to be successful, requires information which can be used by HRD planners. Where there is little formal organization or structure in the conduct of HRD planning, these guidelines should be useful in promoting the required interrelationships among the agencies. Where basic occupational information systems exist, the approach should assist in ensuring the provision of data into HRD policy and programmatic decision-making. The model therefore provides a conceptual foundation for a systematic approach to the education/training components of human resource development and is the central organizing principle around which these guidelines are structured. A summary of the approach follows.

1.2 Outline of the Approach

The basic structure of the planning 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 inter- or intra-ministerial 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 human resources required to meet skill needs and/or correct demand/supply imbalances in the water supply and sanitation sector; and

- preparing a plan for (a) meeting the short-term skills needs of the sector in a cost-effective and timely manner and (b) ensuring the long-term capability for responsive HRD planning in the future.

Figure 3 shows the interrelationships of these four components. The first component involves definition of the purpose and anticipated uses of the plan, 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, and determination of availability of the necessary data to conduct the demand and supply analyses. Some of the activities in this first component can be carried out before visiting the country by using secondary data sources such as IDWSSD position papers, recent sectoral and economic studies, and other relevant documentation.

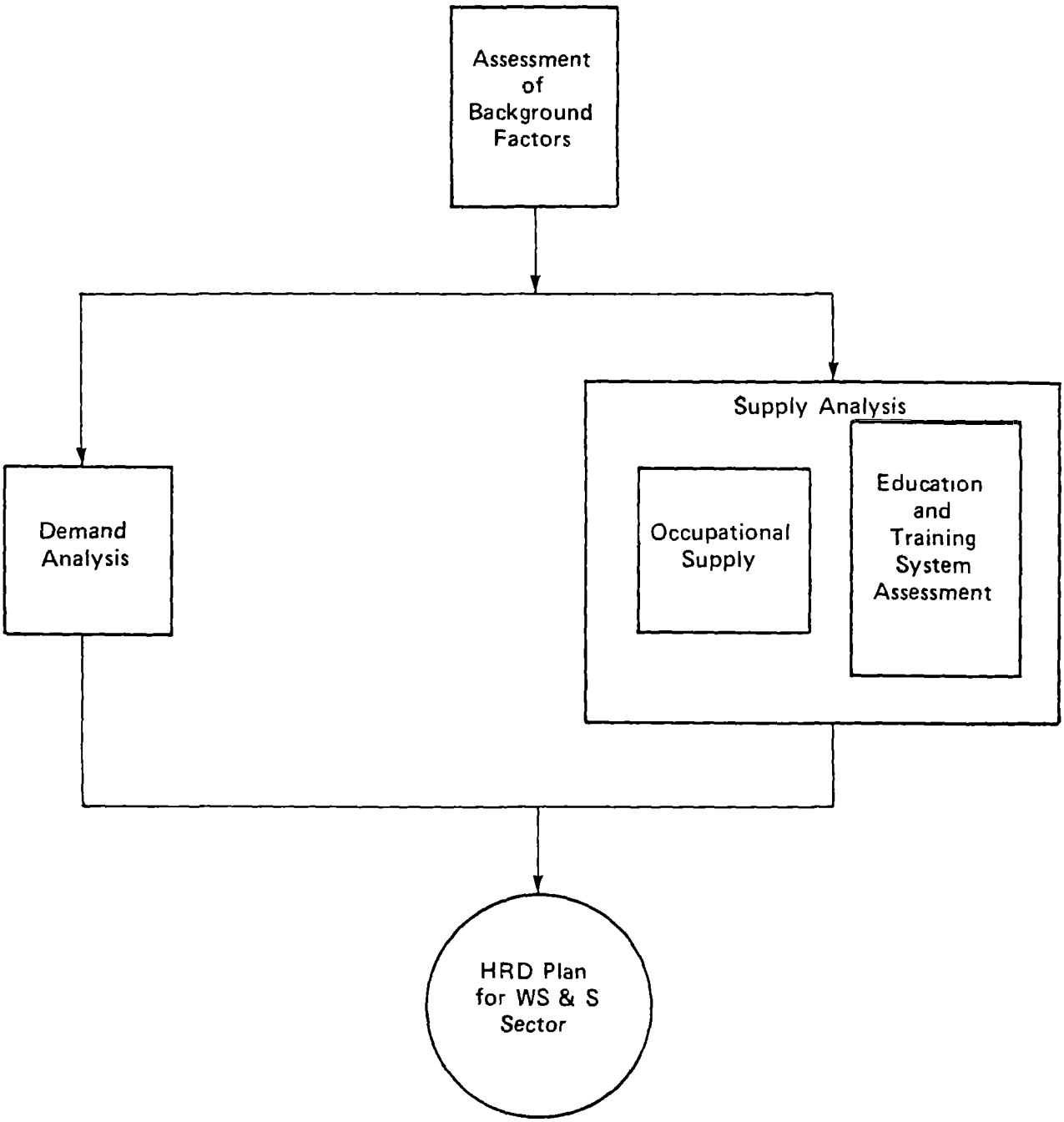
It is important however that the current and anticipated configuration of ministry and other key agency involvement in planning be well understood prior to the development of HRD plans. Part of the background factor assessment will therefore need to be done in country, particularly the final identification and meeting with representative stakeholders in sectoral HRD planning.

The second and third components deal with 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. Included in the guidelines 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 commonality 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 assessing available data, identifying and, where possible, reconciling interagency differences in classification and occupational statistics, and preparing tables showing current resources and estimated needs by sub-sector. Extensive review by stakeholders of agency job definitions, skill needs requirements, and current and projected demand will result 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 the occupations are to sector operations. Occupations so identified and ranked will serve as a guide in the analyses of occupational supply.

Figure 3

The Four Components of the HRD Planning Approach



The two sub-components in the determination of occupational supply estimation are (1) deriving numerical estimates of available skilled labor for identified occupational needs and (2) 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.

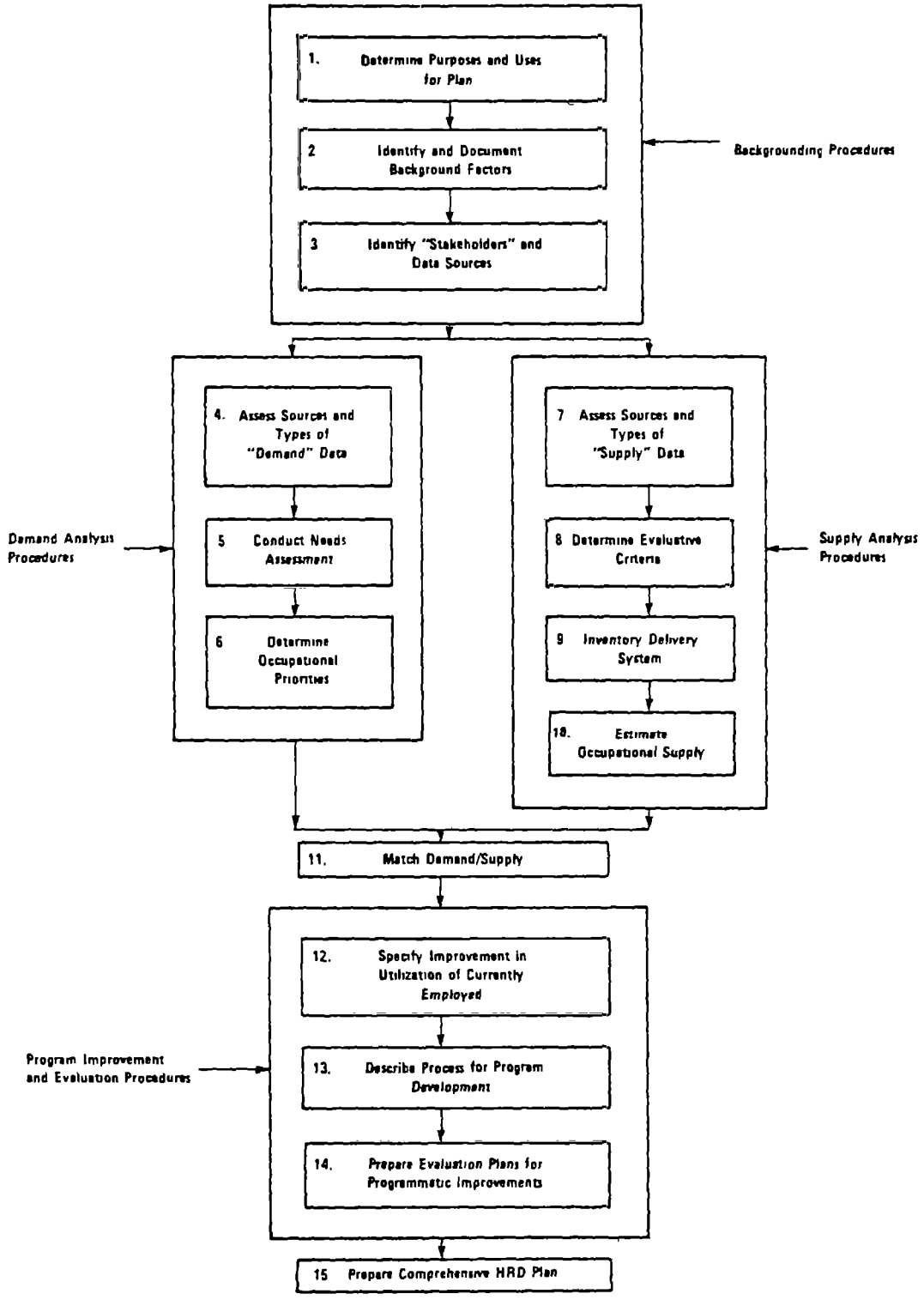
The final component consists of the preparation (with the involvement of in-country water sector managers) of a comprehensive HRD plan for institutional, programmatic, staff or other modifications which need to be made to redress imbalances. In addition, the plan will address the capacity of the sector to carry out effective HRD planning in the future and will focus on the occupational information system of the relevant agencies. If adequate occupational or personnel information systems are not in place, the plan should specify how such systems can be initiated.

The guidelines follow the above component structure in a series of fifteen steps as illustrated in Figure 4. Although the steps need not necessarily be conducted in sequential order, each step is comprised of a set of discrete activities which should be completed during the development of the HRD plan. Each step is presented in Chapter 2 according to the following outline:

- purpose
- outlines of activities
- procedures
- data needs
- approximate schedule and resources
- outcomes/products.

Figure 4

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



To assist in implementing this approach, a multidisciplinary consultant team is proposed to work with in-country personnel. This strategy can usefully initiate or facilitate the HRD planning process in such a way that it can quickly become independent of outside consultant services. Technical assistance, however, at the outset may prove beneficial especially when data systems or HRD planning activities are in the early stages of development. The composition of the team and its role in the planning process are detailed below.

1.3 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 requirements within a particular regional and national context. The collective skills and relevant experience of the 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.

Expertise in at least two different areas is required. One person should have a strong technical background, have a thorough knowledge of water supply and sanitation systems in developing countries, and be able to present the team's findings in technical terms relevant to water sector policy makers and planners. A second person should be experienced in designing and evaluating HRD systems in the developing world and in analyzing and developing specifications for training programs that will provide the skills needed in the WS&S sector.

The activities of these two professionals can be complemented by a third person with skills in assessing and/or initiating the local community development process--for example, in community health programs. Such a person can address those parts of the HRD plan which touch on community involvement, assist in gathering/interpreting local data, and ensure education/training program recommendations are oriented towards local needs. The multidisciplinary team should be able to assess the qualitative and quantitative dimensions of the WS&S sector and develop, with in-country sector personnel, 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;
- the administrative structure that facilitates or obstructs policy development and the implementation of ongoing or new initiatives; and
- both short- and long-term human resource requirements and the policies/strategies necessary to meet these requirements.

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. In addition, consideration should be given to training sessions for in-country counterparts following completion of 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 Figures 5 through 8 (in Chapters 2 through 5). 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 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. Approximate total number of professional person-days for the project team is estimated to be:

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

for a minimum total of 73 person-days.

1.4 Use of the Guidelines

It is suggested that the structure of the guidelines be followed and that all steps be considered during the process of developing the HRD plan. Not all steps need to be completed in all cases. Some planning activities may need to focus exclusively on occupational demand for example, (e.g., deriving sectoral employment figures for annual reports). In general, however, effective HRD planning will involve procedures in every one of the proposed steps.

A set of worksheets is included in Appendix A in blank form for use by the team (Worksheets 1 through 7). In cases where completed 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 completed worksheets) can be detached from the document and added to the step summaries (Figures 5 through 8) to provide a 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 refer to in the text for explanation of the procedure associated with that worksheet.

The guidelines also provide the basic material for a three- to five-day workshop in HRD Planning. This may be particularly appropriate where some technical assistance is needed, but where there is some reluctance to rely solely on outside consultants. In this, as in any other use of the guidelines, flexibility will be needed in adapting the document to specific situations and requirements. 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 be adapted by experienced professionals to the needs of a particular country or region.

Chapter 2

BACKGROUND PROCEDURES

Steps 1 through 3 assess the context of the HRD plan. This means, in practical terms, acquainting the team with the key issues, actors, and agendas surrounding the sectoral HRD planning process. The necessary background tasks will thus consist of:

- determining the purpose for developing the eventual HRD plan and the uses to which it will be put;
- identifying and documenting background factors with particular emphasis on available data sources; and
- specifying the major audiences, users, and uses for the plan.

These steps are not necessarily in any particular order, and the work can be usefully divided between team members to ensure adequate coverage in the time available. In addition, some tasks can be at least partly done before arrival in country, with information from existing documents such as prior studies or reports.

Figure 5 summarizes the purpose, activities, data needs, resources, and products for this step.

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

Purpose: To define the reasons for developing the HRD plan, to determine the users and uses for which the plan is to be designed, and to specify a work schedule for producing the plan within an approved period of time. Some countries, for example, may be interested only in short-term sectoral employment needs at a particular point in the planning cycle (e.g., preparation of an annual or five-year plan). The team will do a better job if it clearly understands the ultimate purpose of the HRD plan, as perceived by those sponsoring the planning effort.

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;

Figure 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.	-- 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.	-- 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	-- 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	-- 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	-- Review contextual factors affecting decade HRD planning in the WS&S sector	-- Develop fact sheet for major contextual factors	-- Information on context of IDWSSD activities	2 person days	-- Country/area summary fact sheet
3	-- Identify and document key sector ministries and agencies, and assess extent of available data.	-- 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.	-- 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	-- 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	-- 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

- 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.

Procedures: Broad sectoral plans for the country and regions or other appropriate geopolitical subdivisions will be obtained and reviewed along with IDWSSD plans. Descriptions of the involvement of relevant agencies 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 along with an outline of the proposed activity containing a schedule and required resources. In preparing the statement of purpose and the project outline, the following should be considered:

- immediate long-term HRD planning priorities;
- formal/non-formal education and training capabilities, programs, and resources;
- sectoral agency and interagency planning mechanisms;
- role of external support teams vs. in-country personnel; and
- HRD planning capacity, both sector-specific and government-wide.

Data Needs: Documentation required for this initial step will be as follows:

- background reports on general HRD, economic, or education/training issues of special relevance to HRD planning (introductory chapters of sector assessments by bi- or multilateral funding agencies, for example, are good sources of this kind of information);
- 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 and other 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 statement of purpose and project outline for review. Additional days should be allotted to this step to permit review of the plans by project sponsors.

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

- statement of purpose 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: To collect, review, and synthesize relevant information on the country-specific environment for Decade activities in the WS&S sector.

Outline of Activities: The assessment of background data at this stage in the project should be realistically limited to gaining broad information that the team needs to develop the HRD plan and that will improve the team's understanding of major factors relevant to identifying and meeting the HRD needs of the sector. 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 both short- and long-term; and
- prepare a brief background summary document for project team information purposes. This can also serve as an introductory chapter to any subsequent field report to the agency or agencies sponsoring the planning effort.

Procedures: Sources such as the Area Handbook* and recent summaries of socio-political, demographic, and other relevant background data as well as sector studies should be reviewed to determine factors especially relevant to WS&S sector operations. These factors might include:

- topography, demography, and urban/rural characteristics;
- relevant constitutional, statutory, or regulatory authorities, or planned initiatives relevant to the WS&S sector;
- the planning cycle (five-year plans, etc.); and
- economic structure, industry/commercial configurations, and 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 should be used, 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 for team members to obtain and review background information and prepare the country background summary.

Outcomes/Products: This activity will produce, at least, 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. If appropriate, the information can be summarized in written form in an introductory chapter to either a field project report or the eventual HRD plan.

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

Step 3: Identify Stakeholders and Data Sources

Purpose: It is essential in this early stage of the project that organizations, agencies, and key individuals be identified and contacted where appropriate. A preliminary assessment should also 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 two-fold purpose of Step 3 is thus 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. Stakeholders are defined as those agencies and/or individuals having a significant formal "stake" in the planning process and its outcomes. We include an illustrative listing of such agencies below under "Procedures", but the stakeholders are likely to vary considerably from country to country.

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 procedures are contained in Steps 4 and 7 for detailed assessment of types and characteristics of available occupational demand/supply data, activities in Step 3 are confined to general determinations of data availability to guide the conduct of more intensive analyses later.

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 Steps 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 development; or education/training for WS&S sector occupations. Relevant special commissions, committees, or consultant groups 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 agencies.

- Finalizing the list with project staff and knowledgeable individuals within the WS&S sector.

Stakeholder contacts can be a valuable two-way communication device. The planning team can provide stakeholders useful information on the purposes of, as well as limitations of, the planning effort. Correspondingly, the stakeholders offer the team the advantage of multiple perspectives on the sector and its HRD needs. Information from stakeholders will be obtained through either secondary documentation or direct contact or a combination of both. At this point, the information sought will not be too detailed but be of a general nature to give the project team a good sense of major trends, issues, and problems in agency performance and in the supply of and demand for skilled labor in the sector. Information sought 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 project 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 overseas and national/regional sources of education/training; whether employment is rising, declining, or relatively constant over recent years in the sector; concentrations of occupational employment in certain agencies; labor flows from public to private sector; and seasonality of employment or unemployment patterns

- Secondary data sources, documentation of 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 can be aided by means of sectoral agency checklists sent to selected stakeholder representatives. The checklist is included as Worksheet 1 in Appendix A. Completed checklists can be obtained indirectly (e.g., by mail) or preferably filled out during interviews with project team members. This checklist gives a good indication of the types of information, by major category and data elements, that are available. Experience in using Worksheet 1 suggests that many agencies may be able to fill out occupational demand information, but not occupational supply information for their agency. In any case, Worksheet 1 provides an objective and replicable way to classify the kinds of data available, permits others to share in the process as well as the results, and serves also usefully to illustrate some of the major gaps in available information.

Data Needs: Two types of data are needed for this step: information on stakeholder agencies that will help explain agency functions and identify individuals to contact and occupational information currently available in these agencies. Such data will 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.

In approaching the task of contacting and gaining information from stakeholders, Worksheets 2 and 3 of Appendix A can be helpful. Worksheet 2a is an example of 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. Worksheet 3 is particularly useful during preparation of appendices to trip reports by the field team.

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 one 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 tangible outcomes of this step will be the identification of the key agencies, organizations, and actors in the HRD planning process and their policies and procedures relative to employment, education, and training. Preliminary information can be gained on HRD needs within agencies, intersectoral linkages, and communication 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 and preliminary information on HRD needs;
- a list of formal intersectoral or interagency coordination agreements, structures (such as committees or task forces), or other mechanisms for achieving coordinated HRD policy or procedures; and
- completed data availability checklists (Worksheet 1).

Perhaps the most important outcome of this step will be intangible. The network set up between agencies and the project team, if carefully constructed, should provide invaluable assistance to the field activities. The interrelationships among the agencies evidenced from this step should also serve as a basis for more long-term HRD planning by in-country professionals once the project team has left.

Chapter 3

PROCEDURES FOR ESTIMATING DEMAND

In order to best utilize existing human resources, sector management must have the capability to access routinely the employment profile of the sector as a whole and its sub-sectors. In order to forecast requirements for future personnel, adequate time-series data will be needed for a number of variables such as employment by occupation and labor turnover. The team is unlikely to find such time-series data available in the necessary detail, in which case it will be important to indicate why these data systems are necessary for the future and to assist whenever possible in the improvement of agency capabilities in this direction.

This chapter shows in Steps 4 through 6 how current and future occupational demand and associated skills needs may be estimated for the sector. Figure 6 summarizes the purpose, activities, data needs, approximate schedule, resources, and products of this component of the approach.

Step 4: Assess Sources and Types of Occupational Demand Data

Purpose: (1) to evaluate the sources of occupational demand data identified in Step 3, (2) to document exactly what types of data they contain and for what time periods, and (3) to determine the reliability and comparability of data for use in estimating projected occupational demand by sector and sub-sector.

Outline of Activities: Important variables in the computation of demand/supply estimates in models of local labor markets have been identified by the U.S. Department of Labor (USDOL) and have since been adapted for occupational information system planning (U.S. Department of Labor, 1974; Mangum et al., 1974 and 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 accepted conventions in the job analysis literature (Lawrence, 1988).

Three levels of job-related information are germane to HRD planning, from the general to the more detailed:

- economic information relevant to the aspirations, conduct, management, compensation, or products of persons working;
- labor market information, concerned with long- and short-term characteristics or factors affecting the operations of discrete labor markets; and

Figure 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	-- Obtain and review occupational demand data -- Assess data relative to methodology selection for estimating sectoral and subsectoral needs	-- Develop agency specific lists of occupations -- Review data on occupations by agency and determine characteristics of data by completing Work sheet 4 -- Complete comprehensive list of all occupations for all ministries/agencies in the sector	-- Agency occupational data as detailed in Worksheet 4	-- 6-8 person days of project team time with equal matching time by agency per-	-- 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	-- Review alternative methods for estimating occupational demand -- Select appropriate method -- Implement method to determine current and projected occupational demand	-- 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	-- Information on agency or sector expansion/contraction -- Current and target year employment estimates -- Labor force separations and replacement needs	-- 2 person weeks of project team time with equal matching time from agency personnel	-- Completed Worksheet 5

Figure 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	-- Determine criteria -- Rank occupations -- Obtain review of rankings	-- Annual average job openings -- Estimates of training time -- Stakeholder estimates of criticality of occupations	-- 3 person days	-- Prioritized set or subset of occupations

- occupational information, or information pertaining to characteristics of occupations as they relate to actual jobs.

"Occupational information" is thus a subset of labor market information and is defined, in contrast to the larger economic intelligence system of which it is a part, as job-related information which can be associated directly with either single or aggregate occupations. Other distinctions are made between "occupation," a class or group of jobs with identical or related work activity dimensions across agencies; "job," a position or group of positions with identical or highly similar work activity dimensions; "position," an actual or potential set of work activities associated with a specific job at a particular agency; "work activities," physical, logical, cognitive, and other associated operations and processes performed in conformity with established goals by a person occupying a position; "task," a unit of work; and "element," the smallest sub-unit into which it is possible to divide work activities and tasks.

"Occupational demand" is defined as a 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 as defined regionally or sectorally. "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 depending on sectoral 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 entry-level skilled labor to fill actual empty positions, there is another kind of "demand", i.e., need 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. As opposed to occupational demand, which can be measured directly in numbers of job vacancies and which represents a need for new employees, the demand for skills development for existing employees is less easily measured, since it represents a less tangible need for adequate in-service programs for the currently employed. Both of these categories of need will be addressed in Step 5 and 12.

Outline of Activities: Activities in Step 4 are therefore:

- 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 relevant occupations in the sector.

Procedures: Most developing countries have some data bases on occupational employment statistics, with 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 sub-sectors (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 therefore on determining sources and types of objective quantitative data on occupational demand.

The procedures are as follows:

- With representatives of the various stakeholder agencies, develop a list of sectors/sub-sectors and occupations of interest within the WS&S sector. Sub-sector detail may have to be identified broadly by general classifications such as urban or rural or by sub-governmental unit or structure such as water planning, water production and delivery (plumbing, engineering, electrical), water distribution, water quality assessment or water agency administration, and finance. Occupations should be grouped by broad category such as manager, professional, technician, supervisor, craftsman, operator, unskilled/volunteer. Occupations should, however, also be capable of being identified by specific job title (such as chemist, engineer, lab technician, plumber, well driller, etc.) and definitions, and sample job descriptions and skills requirements obtained where possible.

- Using the data source worksheets (Worksheet 4) as a guide, for each data category already determined to be available in the previous step (Worksheet 1), 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, hard copy report, manual/automated.

Column 5 -- Age of 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 coverage (national, regional, or local).

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 too aggregated (e.g., only by major occupational category such as engineers, technicians);
- data are unreliable, that is, different publications or documents estimating employment counts or characteristics provide differing estimates for the same agency or there are severe discontinuities or differences in definitions in data series across time;
- 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 technician-level personnel.

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* "Reliability" is defined as the consistency across estimates of 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.

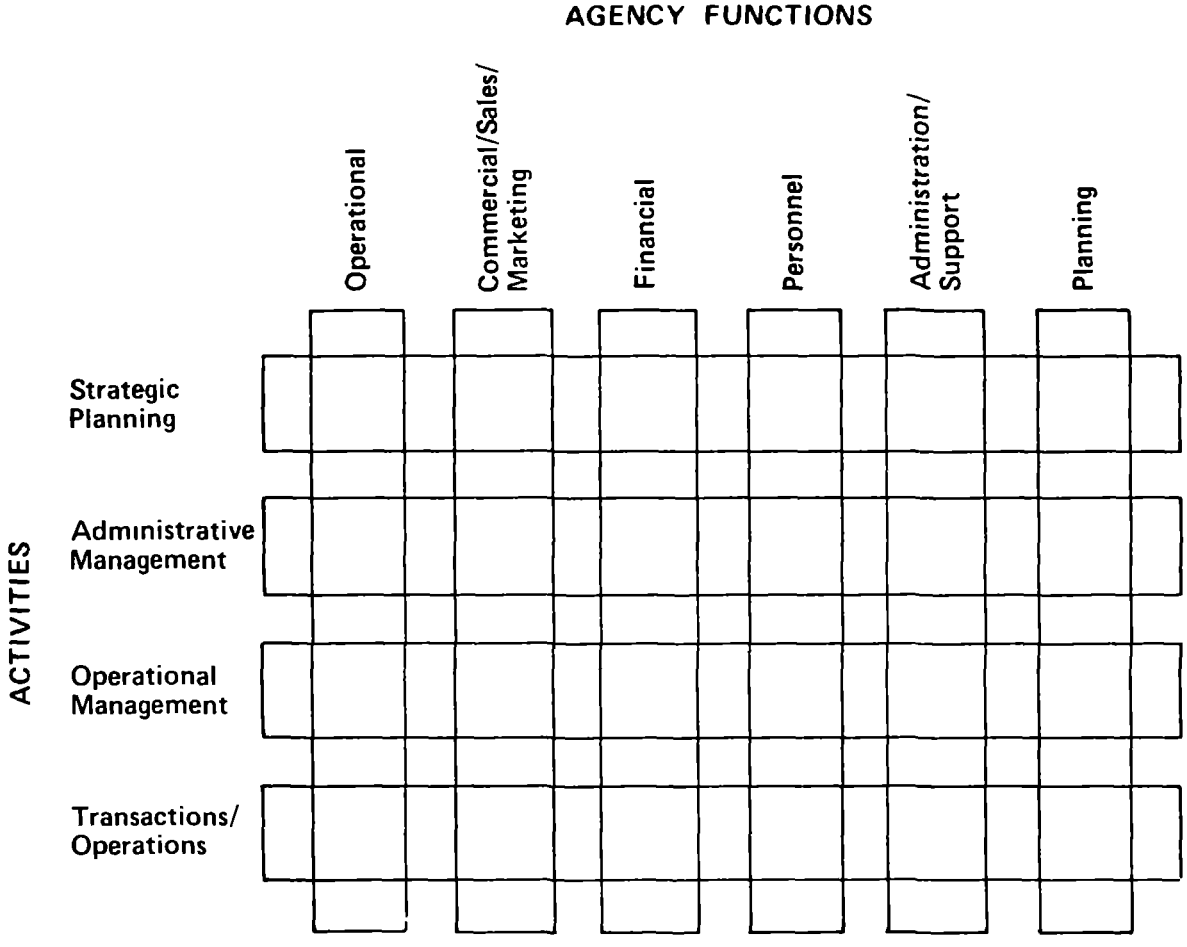
Because the use of secondary data is usually preferable to gathering new primary data, additional sources such as special studies or reports should be investigated, as should the possibility of special tabulations of census, tax or other data if such tabulations can feasibly provide the required information 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 discriminatingly to identify trends, for example, in occupational employment, occupational mobility, technological innovation, or the demand for skilled labor.

From the various occupational listings, a comprehensive list of occupations for sub-sectors and 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 sub-classifications. An illustrative classification scheme with a restricted set of "typical" occupations, based on actual data from WS&S sector studies, is included in Appendix B. These illustrative occupational titles are included in the worksheets on occupational demand (Worksheets 5 and 5a). Also contained in Appendix B are actual occupational titles from two major water sector agencies in Swaziland, the Water and Sewerage Board, which is responsible for urban water services, and the Water Resources Branch, responsible for water resources management and policy. 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.



Occupations can be placed within each cell as a further way of organizing job positions by agency function, thereby differentiating between occupational types within or across agencies. For example, an engineer may be basically an administrator in the lead office of an agency or be a field supervisor in care of actual operations. The discrimination between these two types of functions 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. If the skill requirements are radically different for field positions as compared with centralized administrative functions, then conceivably in-service training may be needed to facilitate transition from one position to the next.

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 or 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 six professional person-days will be required. 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 complete this assessment across all WS&S ministries or agencies.

Outcome/Products: The results of this step will provide the basis for the decision to base 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 judgment. The product of this step is an objective assessment of data availability concerning occupational demand, in the forms of:

- a completed Data Source Worksheet (Worksheet 4) for each major agency in the sector;
- 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 needs assessment starts by focusing on the "demand" side and making an analysis of employment in the sector, both current and projected. Current operational demand, as already defined, consists of those currently employed plus vacancies in a given occupation at a given 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; and
- apply the selected method and develop estimates of current and projected demand by occupation.

Procedures: Future education and training needs are a function of future employment needs by occupation (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 by making occupational estimates as accurate as possible. In developed countries, with relatively stable economies, the occupational composition of some major sectors remains fairly constant, permitting the use of past levels of sectoral or occupational employment as the preferred method of estimating future requirements. There are several different approaches using these techniques, the advantages and disadvantages of which are reviewed elsewhere (U.S. Department of Labor, 1981b; Kidd, 1980; Lawrence and Cruze, 1981; Goldstein, 1986).

In developing countries where past employment patterns may be a less accurate predictor of future employment and where time-series data essential for extrapolation are incomplete or unavailable, more subjective estimates are often necessary. The two major principles are (1) to derive some approximate unit of production, such as the number of people served relative to the number of water sector personnel providing services, and (2) to estimate future personnel requirements that, barring any significant discontinuities, are consistent with past occupational employment patterns. It is especially important that government agencies develop the capacity to maintain basic employment statistics by sector across time so that HRD needs can be assessed as a routine part of agency management.

Whatever the method used, the intended results of this task are reliable and valid estimates of current and future employment levels by occupation. The HRD planning team should include, if possible, one person familiar with estimating occupational employment so that the most appropriate method is used.

Two general approaches are available:

- using occupational employment projections already calculated either by other studies for "manpower" plans or for ministry or agency purposes; and

- preparing independent and new projections using anappropriate methodology, such as industry/occupational employment projection techniques, "expert" assessment (e.g., Delphi methods), separately or in combination.

The state of the art in occupational projections in the U.S. relies on rather extensive time-series data on both occupational employment and total employment for employing agencies and establishments (Goldstein, 1981 and 1986). Such data are unlikely to be available in most developing countries, and project resources for the HRD team are likely to limit the use of sophisticated projection efforts. Modified Delphi approaches, "stakeholder" evaluation of existing data, and informed assessments of objective projections by agency management may assist the HRD planner. Where data from special studies are readily available or data processing facilities and other resources permit, particularly where past occupational employment and other sector trends are relatively stable, the full 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 a matrix which is the intended outcome of this step. The matrix contains all occupations of interest (vertical axis) and all sub-sectors of interest (horizontal axis). 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 sub-sector, will also contain the proportion (p) of employment in that occupation to total employment for that sub-sector (E_{TOT}). The proportion (p) represents the staffing pattern for a particular occupation within a sub-sector and can be used to compare occupations in terms of their dominance (relative employment weights) for that sub-sector. Some projection techniques also use staffing patterns to distribute projected total employment (column employment totals) across occupations for a given column (sub-sector).

Columns 1 through 5 in Worksheet 5a contain sub-sector employment. More columns need to be added to the matrix if more than five sub-sectors are to be represented. Column 6 contains current (base year) total employment (ΣE) and total proportion (P) for a given occupation across all sub-sectors 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 ranking purposes provides an empirical estimate of relative dominance 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.

(0) = $\frac{N}{Y}$ 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 to illustrate 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 Rural Affairs ...	(6) 1990 Base Year Total Employment By Occupation	(7) Estimated Strength 1995	(8) Annual Average Job Openings 1990-95
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 (1.00)	1100 (1.00)	550 (1.00)	2550 (1.00)	3550	

These fictitious data illustrate the derivations of proportions (p) in Columns 1-3, total proportions (P) in Column 6, total employment for all sub-sectors (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 due to growth (O) in Column 8, calculated by

$$O = \frac{N}{Y} \text{ which for engineers is } N = \frac{(500-350)}{5} = 30.$$

It should be noted that Column 8 contains the average number of job openings due to growth (or decline), but makes no estimate of the additional number of job openings due to replacement (through death, retirement, migration, occupational transfer, or other reason for labor force or occupational separation). While net employment of engineers in 1995 in this example will be 500 (30 new engineers per year in each of the five years 1991-1995), some additional job openings will be generated through attrition, and these must be added to the estimate of job openings.

Agency employment due to growth/decline by occupation is estimated by linear or other forecasting methods, Delphi approaches, or some combination of both. Calculating job openings due to replacement ideally requires turnover data by occupation and by employee age to determine age-specific rates of separation by occupation. Separation rates by age are important because, for example, where older employees predominate in a given occupation at a particular time, the separation rate due to death or retirement should differ from the rate in other occupations in which employees are generally younger.

In general, however, occupational separation data by age of worker are not available, and estimates of labor turnover must be derived which can be applied across all occupations. Thus, for each of (Y) years in the above example, a replacement rate (R) should be applied to total employment by occupation for that year to estimate approximate total numbers of job openings due to replacement for that year. In the fictitious example above, therefore, assuming a 3.5 percent replacement rate annually, the 30 engineers needed each year from 1990 to 1995 should be augmented by R * E(Y-1) to account for replacements for those lost for various reasons to occupational attrition, as follows: in 1991, E(Y-1) = 350 and R = .035. Thus RP = (.035 * 350) = 12, and in 1991 through 1995 the growth (GR) and replacement (RP) needs are, respectively

1991		1992		1993		1994		1995	
GR	RP	GR	RP	GR	RP	GR	RP	GR	RP
30	12	30	13	30	14	30	15	30	16

Total annual average job openings therefore are represented by GR(Y) + RP(Y) or, for 1991, (30+12) = 42.

Finally, it will be necessary to review ratios of personnel to population served to pinpoint major staffing imbalances and to help guide agency human resource targets for the future. The WHO Handbook (1984) provides evidence of the large range in empirical ratios of waterworks staffing to populations served in the various countries studied, from one employee per 600 to 1800 persons served, depending on degree of technology and development. In particular, the denominator in the ratio may vary from the total population of the country to some approximation of the population actually served at the time of the estimate. Some illustrative cases follow:

COUNTRY	YEAR	RATIO
Pakistan	1971	1:700
	1978	1:950*
Kenya	1980	1:1800**
Swaziland	1987	1:728*
Brazil	1974	1:1000**

* Denominator is total population
** Denominator is population served

CITIES	YEAR	RATIO
Copenhagen	-	1:1350**
Hamburg	-	1:1550**
Madrid	-	1:2200**
Bordeaux	-	1:1750**
Wessex	-	1:1500**

* Denominator is total population
** Denominator is population served

The WHO Guidelines (1984) suggest that staffing levels for stable, well-developed waterworks systems approach the mark of 1:1600 population served (see also Gearhart et al., 1982). Care must be taken in comparing staffing pattern data from one country to another, because of differences in the ways occupations are classified, but broad comparisons can be useful. Appendix C provides illustrative staffing patterns from two African countries, the first an actual staffing pattern for the Swaziland water sector in 1987, and second a recommended staffing pattern for the Tanzania water sector in 1982. Both are at a general occupational level, and the methods of aggregation of individual occupations into categories may be dissimilar. These distributions, however, furnish some index of sectoral occupational staffing ratios and are included for purposes of general comparison.

In applying these general approaches to estimating occupational demand, some problems are likely to be encountered:

- 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 poor utilization of staff management. For example, shortfalls in engineering occupations may lead to estimates of expansion needed in that occupation, but may be better handled by more efficient use 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 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. Establishing common base and target years may require 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 sub-sectors, 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 and an opportunity provided for corrections. Estimating future needs, whether by "forecasting" the future or projecting mechanically from the past, involves error, and the job of the HRD planner is to understand the sources of error and account for them where possible. Comparing the results of different processes for analyzing the same data 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.

The HRD planner is also attempting to strengthen agency capability to perform these kinds of analyses routinely, so information sources and methods must be well documented.

Data needed for this step are therefore:

- general information on sector expansion/contraction, i.e., macroeconomic data on general economic and sectoral trends;
- current employment estimates by sector, sub-sector, and occupation:
- target year employment estimates by sector, sub-sector, and occupation;
- labor force separations and replacement needs by occupation; and
- detailed occupational listings with sample job descriptions by agency (from Step 4).

Approximate Schedule and Resources: Time and level of effort will vary considerably depending upon the number of occupations, sub-sectors, 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 planner 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 sub-sector as well as total sector employment by occupation;
- staffing patterns by sub-sector;
- 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 likely to be fairly small (see Appendix B), 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. Since time in country is limited for the HRD team, it will be necessary to select certain occupations for specific attention in the HRD plan (Step 15). In addition, ranking occupations will provide both a ranked list and a method for ranking, both of which can be useful for sector management in the future. The purpose of this step, therefore, is to translate occupational projections into specific priorities for management attention.

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 for four factors:

- relative occupational demand--the rank order of occupations by total projected demand;
- training time needed to achieve the necessary skills (longer-term training, in general, implies significant expenditure of public resources);

- perceived shortages of skilled labor supply by occupation; and
- perceived importance of the occupation to sub-sector functioning.

The first two criteria are quantitative estimates; the second two will require subjective responses from stakeholders.

Procedures: The following tasks are required in this step:

- 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 the number of months of training time. (Multiply the job openings by the number of months of training time.) Then re-rank the occupations by the weighted product.
- Obtain appropriate stakeholder review of the resultant final priority rank, with a request to indicate which occupations are either:
  - in acute shortage; or
  - particularly critical to the sector.
- Identify a 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 rank the occupations.

Outcome/Products: The product of this step is a set of ranked occupations in order of relative importance for skills development. Discriminating between relative importance of occupations in terms of their education and training needs will assist in making decisions on how to use project resources for priority occupations in the HRD plan. Ranking occupations in this way provides a rationale for directing HRD efforts where they are most needed.

Chapter 4

PROCEDURES FOR ESTIMATING SUPPLY

In this component, we are interested in both pre- and in-service skills acquisition of those working in the sector. Steps 7 through 10 assess the current and anticipated capacity of the education and training system to respond to WS&S needs identified in earlier steps. The approach is comparable to that used in estimating occupational demand. One begins by exploring and documenting the various data sources and ends by estimating occupational supply for the priority occupations defined in the previous component. Figure 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 education and training system related to occupational supply for the priority occupations selected in Step 6. The education and training "system" includes both pre- and in-service programs/courses, as well as overseas training where directly relevant to the WS&S sector.

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:

- those leaving public or private educational/training institutions and programs whether having completed the program or not;
- those currently unemployed;
- the number of individuals resulting from net migration;
- occupational transfers; and
- new entrants and re-entrants to the labor force.

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

Figure 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	-- Define occupational supply for purposes of the project -- Link priority occupations to institutions and programs -- Identify relevant data sources	-- 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	-- 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	-- Develop effectiveness criteria -- Develop data collection plan	-- 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	-- List of supply data elements to be collected -- List of evaluative questions -- Plan for occupational supply data collection

Figure 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	-- 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	-- Quantitative data tabulations on enrollments, completions by program for each institution -- Qualitative data on delivery systems effectiveness by institution/agency/program
10	-- To estimate occupational supply	-- Aggregate institutional data from Step 9 -- Develop estimates of system supply	-- 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, i.e., not just the products in the form of program graduates, but on 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 sources of data on current and projected supply for the priority occupations, as well as data on factors that affect the number and quality of program graduates.

Procedures: In order to assess occupational supply data in relation to need, the link needs to be made between the priority occupations and institutions and programs providing potential supply. Agency job descriptions will be useful here, and in some cases specific educational qualifications and requirements may be available with reference to programs and institutions.

In-country program inventories and descriptions by institutions 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 provide training for more than one occupation. The list will serve, however, to limit the assessment of occupational supply to those institutions and programs providing potentially skilled labor for critical occupations within the WS&S sector. It is the specification of this "priority" labor supply pool which constitutes the definition of occupational supply for project purposes. Nevertheless, all potential sources of institutional education and training should be assessed as potential sources of supply, including:

- universities;
- specialized colleges and institutes (public administration, statistics, commercial, polytechnic, etc.);
- teacher training institutions;
- technical and sub-professional training establishments, including vocational training, corporations, or trade schools;
- management, supervisory, and foreman training programs;

- apprentice training programs;
- adult education programs;
- in-service (in-plant) training programs (government and private);
- professional/technical organizations, unions;
- office/clerical training facilities;
- 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 should be ascertained:

- program title and program descriptions;
- certification or competency testing activities;
- enrollees, graduates, school leavers;
- facilities/equipment;
- staff;
- financial resources; and
- location.

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

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

Data Needs: Two kinds of data are needed for this step:

- information on program offerings by the institution (public/private) to determine the supply data relevant to priority occupations; and
- a determination of the availability and sources of specific data on occupational supply, such as:
  - program titles and descriptions of course content
  - skills tests, competency testing, or certification requirements
  - number of enrollees by institution and program
  - number of graduates/leavers by institution and program
  - characteristics of graduates/leavers (e.g., sex, number employed/unemployed, type of employment, wages/earnings)
  - employer feedback, follow-up data on graduates
  - facilities, labs, equipment descriptions
  - current staff characteristics (e.g., number, qualifications/training, salary/wages, time on the job, and WS&S experience)
  - 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 size of the occupational force of interest. Five professional person-days are estimated as a minimum for this step.

Outcomes/Products: Narrowing the estimation of occupational supply just to priority occupations in the WS&S sector permits optimal use of planning resources. Finding out which institutions and training 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 contraints 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 capability 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 other relevant 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?
- 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 be assessed using available data and that reflect stakeholder judgments of data quality.

Procedures: The following tasks are required to complete this step:

- Review the 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 the validity of criteria for asserting 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 well located (i.e., good access by a likely audience of students) and in sufficient quantity to meet enrollee needs.

  Demand/Supply:

  - Program graduates are working within occupations for which they were trained.
  - Employers are satisfied with the number of available graduates.
  - Employees are satisfied with the 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 program well prepared for successful employment.
  - Program content adequately reflects employer skills needs.

- Develop a data collection plan for occupational supply data to complete demand/supply matching. This plan should specify locations, sources, and format of the data to be collected. The plan should also indicate what qualitative sources will be used (judgments of

qualified observers of classes, program comparisons, and opinions of informed graduates and others on facilities, equipment, and staff quality).

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 to provide 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 the adequacy of education and training programs and relative competencies of recently employed program graduates.

Procedures: Some of the institutional supply data will be available from centrally located sources (national, regional) or from individual institutions and will consist of prior studies or reports prepared from existing data. There is no substitute for hard work in this task, however, and every effort should be made to seek both quantitative and qualitative data from as many sources as possible on program effectiveness. WS&S sector employers and other informed persons should be contacted for their estimates of skills of program

graduates and adequacy of all aspects of the education/training system. Staff and management of the relevant education and training institutions should be asked for their assessments of the relationship between skill/knowledge taught in relation to work requirements and their opinions sought regarding needed program directions or improvements. Finally, the team should meet with some recent program enrollees and WS&S employees in the priority occupations to elicit their points of view. Where available, written descriptions of institutional programs should be obtained, as should any existing tabulations of course enrollment and completions or institutional follow-up studies. In case of in-service training, agencies may keep their own records of employees attending institutional courses, both in-country and overseas.

Data Needs: As specified in Step 8.

Approximate Schedule and Resources: Depending on the extent of available data and how far data sources are dispersed, it is estimated that from four to eight professional person-days should be allocated to this task.

Outcomes/Products: Specific products from this step will be:

- raw program and institutional data on occupational supply for the priority occupations (to be aggregated in Step 10);
- interview notes from faculty, students, etc.;
- quantitative data on enrollment and completions by program;
- qualitative data on effectiveness of education and training, including adequacy of staff, facilities, and course content.

Step 10: Estimate Occupational Supply

Purpose: To take disaggregated data from Step 9 and prepare estimates of total supply by occupation for priority occupations in 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--those currently employed and entrants and re-entrants 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 data for estimating supply. Flows or rates of supply, however, such as movements between occupations or from outside the labor force (new entrants, re-entrants, immigrants) are not so easily estimated and in most cases will not be measurable within the constraints of the approach used in these guidelines. 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 re-entry 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 enrollments to placements based on empirical data. Thus, for a specific time period, ratios of enrollments to placements can be calculated for programs or program users. These ratios applied to program enrollments at some future time can serve as supply "indices" for the program. Whichever method is used to determine the supply estimate, it should be averaged every year 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 list of occupational supply estimates by occupation will result from this step.

Chapter 5

SYNTHESIS OF DEMAND/SUPPLY INFORMATION AND HRD PLAN DEVELOPMENT

The last stage of this approach is the most important and constitutes an analysis of activities needed to meet the requirements of HRD planning. In particular, the team must address short- and long-term needs of the sector, with attention to the capacity of sector agencies to strengthen their own capabilities for routinely determining these needs as they change over time.

Steps 11 through 15 therefore address the matching of demand and supply, the detection of imbalances, and the preparation of recommendations in the form of the HRD plan. Figure 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 for Priority Occupations

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 the effectiveness of education and training 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 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 to the number 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 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 and quantitative information in occupational supply, including available information on the delivery system in all programs relevant to the priority occupations collected in Step 9;

Figure 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

Figure 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	-- Develop evaluative measures -- Define evaluative data -- Prepare evaluation plan	-- 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	-- 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	-- Develop final recommendations -- Prepare HRD plan	-- Obtain agency reviews from Step 13 -- Incorporate programmatic recommendations with product of Step 14 -- Present recommendations with budgets and other implementation details	-- Reviews from Step 13 -- Evaluation plan from Step 14	-- 5 person days	-- HRD plan

- 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 the program, 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. This can serve as a chapter in the final report of the project. For each of the priority occupations, comparable occupational supply information will need to be reviewed; numerical data on enrollees, graduates, and leavers tabulated; and other information assessed to determine the basis for recommendations. Additional sources, such as World Bank sector assessments or macroeconomic analyses of labor supply and demand, can be helpful in determining supply/demand relationships in selected occupations.

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

Column 1 -- Enter priority 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 programs 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 divided 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 procedure detailed in Appendix D.

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 professional time from in-country advisors and analysts both from the WS&S and education and training sectors.

Outcome/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 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 the effectiveness of education and training 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 utilization of employees or use of volunteers in the community.

Outline of Activities: Underemployment or mal-employment of trained personnel has been identified 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. In some countries there is a steady drain of skilled employees from the public sector to higher paying jobs in the private sector. There are several potential reasons for this, among which are:

- economic incentives: compensation and benefits are often superior in the private sector;
- job dissatisfaction: trained and experienced professional or technical persons may be stifled by bureaucratic constraints and lack of opportunity in the public sector.

Limits on public budgets and restrictions on the number of budgeted (or approved) positions reduce the freedom of agency managers to respond to staffing needs by hiring new people. 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 therefore 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 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
- review agency or sector policies and practices with regard to employment within each occupation. 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 such issues as:
  - employee management, supervision, and support;
  - written job descriptions, their currency, and relevance to performance reviews;
  - incentive structures, wages, salaries, and promotional opportunities;
  - continuing education--training opportunities;
  - role of expatriate advisors, if appropriate;
  - 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 be needed to assist in determining existing policies and in preparing feasible recommendations.

Outcome/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 will lead to a cost-effective approach to combating 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 voluntary assistance under competent supervision. It will be particularly important to ensure that recommended actions will not only address critical short-term needs, such as need for immediate expatriate or consultant assistance, but also longer-term management issues, such as the quality of personnel information systems and the provision of adequate data for effective HRD planning and management.

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

Step 13: Describe Process for Program Development

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

Outline of Activities: In contrast to the previous step which addressed those problems for which solutions can be found in agency management policy and procedures, 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 requiring new approaches in either pre-service or in-service education or training. Programs may not be accessible to all those who need the training, or current programs may 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. In other cases, linkages will need to be set up between WS&S agency management and donor agencies who fund the programs or courses or education/training institution staff who conduct them. 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 areas. The model outlined earlier in Figure 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, a list of competencies should be developed for each occupation selected. Agency methods for updating job descriptions should be reviewed and procedures established if necessary for obtaining the requisite data to determine current job competencies. 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 hierarchy: occupation, task, activity, and competency.

Worksheet 7A, the Occupational Competency Development Worksheet, illustrates how competencies are defined for one occupation: WS&S Inspector (Carefoot and Densham, 1978). The resultant worksheets for each occupation should be reviewed by appropriate WS&S personnel to verify the 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, conduct, and management of the program;
- 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 and required;
- instructional method, curriculum materials, and media;
- curriculum design;
- certification or testing (available documentation on existing trade tests, certification, or licensing requirements);
- funding sources, donor interest/involvement, budgeting requirements; and
- contractual or overseas institutional 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 administration, staff, facilities utilization, or curriculum design--should be developed in coordination with appropriate in-country education and training 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 implemented.

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 (e.g., hiring of expatriates, design and implementation of a new personnel information system). This step recognizes the importance of explicit methods to assess the effectiveness of any recommended new approaches as they are implemented.

Outline of Activities: To facilitate future decision-making about the distribution of scarce education and training resources, the evaluation of programmatic interventions and early provision of evaluative feedback to program administrators are 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 evaluation data are defined and collected from the inception of the intervention. Evaluation design is all too often left until new programs are 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. The extent and complexity of the questions and the degree of evaluative rigor will be subject to the judgment 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, or equipment or on outcomes (improved productivity or management practices). Once the focus is established thorough discussions between project staff and other relevant stakeholders, 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 the resources for the evaluation can be directed towards answering important questions first.

- For each question, indicate the data elements needed to provide answers. 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 program improvements 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.

Outcome/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: This final step represents the synthesis of conclusions from all previous steps and subsequent preparation of a blueprint for human resource development in the WS&S sector for the future. The purpose of this step is thus to provide a plan for the least costly and most effective ways to meet both immediate and longer-term WS&S sector HRD needs.

Outline of Activities: Several factors will affect the preparation of the HRD plan. There will be some short-term human resource needs, such as acute shortages of trained personnel in already established agency positions which will have to be addressed immediately through aggressive hiring, short-term in-service training, or some form of expatriate or consultant assistance. Other needs may include longer-term activities such as approval of additional established positions, which may require bureaucratic clearances from outside ministries, and more extended training plans. There may be a need for some

occupational surveys to be conducted in priority occupations both to update job descriptions for hiring or performance review purposes and to develop more accurate competency specifications for training.

In addition to addressing these direct HRD needs, it will also be important to consider the processes by which WS&S agencies themselves are able to identify shifts in HRD priorities in the future. For WS&S management to anticipate and respond effectively to the changing requirements of the workplace, adequate occupational information must be maintained on employment and training characteristics of those currently employed in the sector. The data elements in Worksheet 1 illustrate the kinds of information required for human resource development planning. If such information systems can usefully and cost-effectively be improved, they will contribute to the capacity of the sector to conduct its own HRD planning. Recommendations to improve HRD planning capacity should be included in the HRD plan.

Finally, a mechanism and schedule for implementing the plan with associated resource requirements (e.g., levels of effort, equipment needs) should be included. The probability of implementation of recommended activities will be significantly increased if those who are to carry out the plan are involved in its development and if the recommendations are practical and perceived as effectively solving agency problems. Thus it is essential that the stakeholder network established in Step 3 be incorporated into the process of plan development and that enough time be allowed for thorough in-house review and adjustment of the plan before it is finalized. Activities in this step, therefore, 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 principal 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 and, where appropriate, with direct stakeholder input. Specific procedures should include the following:

- On the basis of input from agency reviews of recommendations in Step 12, revise the recommendations and define the steps needed to accomplish each recommended option with constraints and potential barriers identified and solutions suggested. Additional recommendations concerning the sectoral planning capacity should be made as appropriate, and resources specified such as HRD data systems, micro-computers, software, as well as routine data analysis procedures for periodic reporting to sector management.

- Including the evaluation plan from the previous step, prepare a document which can serve as a field report of the HRD planning team to:

  - summarize the context for planning activities, including such factors as national (multi-sectoral) analyses and plans, macroeconomic trends in employment and labor force characteristics, and WS&S sector priorities for HRD policy;

  - document priority skill needs by occupation of the WS&S sector; and

  - present the recommendations with resource requirements, personnel needed to implement them, anticipated barriers to completion, specific program outlines, institutional responsibilities, anticipated donor involvement where appropriate, 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, a plan which is presented within the context of field team activities and of overall HRD policy in the WS&S sector.

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APPENDIX A

WORKSHEETS 1 THROUGH 7

Worksheets for Use in Preparing the HRD Plan

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: Has Data	Existence of Data: Does Not Have Data	Availability of Data: Copies Available	Availability of Data: Data Are Available But Not In Copiable Form	Availability of Data: Other	English Translation Available	Comments
Current Occupational Demand							
-- 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/Subsector							
Projected Occupational Demand							
-- Projected (Needed) Employment by Occupation							
-- Number of Turnovers							
-- Retirements							
-- Deaths							
-- Quits/Layoffs							

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.

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

	Existence of Data		Availability of Data				
Data Type	Has Data	Does Not Have Data	Copies Available	Data Are Available But Not In Copiable Form	Other	English Translation Available	Comments
-- 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							

WORKSHEET 2 (Step 3)

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

Agency	Role
Government	
Agency 1	
Agency 2 (etc)	
Donors or Other External Agencies	
Committees or Other Bodies	
Cooperatives	
Other (if appropriate)	

WORKSHEET 2a (Step 3)

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

Agency	Role
Government	
-- Ministry of Agriculture and Forests -- Rural Water Supply Division	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 HRD PLANNING FOR WS & S SECTOR

Agency	Role
-- Ministry of Education	Education and training; preparation of hydrogeologic maps.
-- RTI -- DTAVE, Government Technical Institutes	
-- Ministry of Information	Disseminating IDWSSD materials and information.
-- Ministry of Labor	National manpower policy.
Donors or Other External Agencies	
-- 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 WASH project).
-- WHO	Technical assistance and support for IDWSSD activities (e.g., training of trainers for CHWS.
-- 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)

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.
Committees or Other Bodies	
-- Interministerial Committee on Water Supplies	Coordinating policy and planning for all water supplies.
-- Technical Committee for IDWSSD	Coordinating IDWSSD activities.
Cooperatives	
-- Civil Engineers' Construction Cooperative	Professional resources for IDWSSD activities.

WORKSHEET 3 (Step 3)

STAKEHOLDER CONTACT TABLE

Agency	Representative(s)	Meetings Completed (Dates)

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

WORKSHEET 5 (Step 5) CONTINUED

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

Occupation	Subsector* Base Year Employment (1) Agency A	(2) Agency B	(3) Agency C	(4) Agency D	(5) Agency E	(6) Base Year Total Employment by Occupation	(7) Estimated Total Employment in Target Year	(8) Annual Strength in Job Openings
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								
Total Employment by Subsector								

WORKSHEET 5a (Step 5)

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

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

*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 5a (CONTINUED)

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

Occupation	Subsector* Base Year Employment (1) Water & Sewerage Authority	(2) Natural Resources Authority	(3) Ministry of Municipal Rural Affairs	(4) Health Activity	(5) Other	(6) Base Year Total Employment by Occupation	(7) Estimated Total Employment in Target Year	(8) Annual Strength in Job Openings
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								
Total Employment by Subsector	E_{TOT} (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

WORKSHEET 7 (Step 13)

OCCUPATIONAL COMPETENCY DEVELOPMENT WORKSHEET

Occupation	Task	Activities	Competencies

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

APPENDIX B

Illustrative Occupational Classifications

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

OCCUPATIONAL GROUPS AND COMPONENT OCCUPATIONS

FOR THE SWAZILAND WATER RESOURCES BRANCH 1987

PROFESSIONAL
Director
Senior Water Engineer
Asst Director
Financial Controllers/Accountants
Surveyor
Training Officer
Engineer
Chemist
Data Processing Officer
Personnel Officer
Clerk of Works
Transport Officer
Cadet Engineer

TECHNICAL
Instrument Mechanic
Draughtsmen
Inspector of Works
Lab Technician/Technologist
Technical Electrician
Building/Workshop Foreman
Survey/or Technician
Technician
Static Plant Mechanic
Panel Beater/Spray Painter
W/Works Supervisors
Water Sewage Work Supervisor
Lab Asst

ARTESAN
Motor Vehicle Mechanic
Carpenter
Electrician/Technician
Plumber
Builder
Welder
Survey/or Assistant
Drivers/Operators
Steel Fixer
Pointers
Trainee Electrician
Drainlayer/Pipefitter
Painter
Meter Reader
Technical Assistant
Water/Sewer Attendant
Bricklayer (untested)
Tyre Repairer
Pump Attendant

ADMIN/CLERICAL
Personal Secretary
Storekeeper
Mechanical Storekeeper
Asst Accounts Officer
Asst Acountant
Accounts Officer
Billing Officer
Clerical Officer
Progress Control Clerk
Shorthand Typists
Storeman
Junior Clerical Officer
Induna
Timekeeper
Groundsman
Security Guard
General Asst
Telephonist
Night Watchman/Gateman
Cleaner
Messenger

LABOURERS
Labourers

OTHER
Other/ungraded occupations

Source: Lawrence and Stevens 1987

OCCUPATIONAL GROUPS AND COMPONENT OCCUPATIONS

FOR THE SWAZILAND WATER AND SEWERAGE BOARD 1987

PROFESSIONAL
Senior Water Engineer
Water Resources Engineer
Hydrologist
Water Control Officer
Dam Supervisor
Chemist
Trainee Hydrologist
Trainee Meteorologist
River Biologist
Meteorologist

TECHNICAL
Hydrology Technician
Trainee Hydrology Technician
Trainee Technician
Hydrology Assts
Met Assistants
Water Bailiffs
Dam Operators
Water Guards
Construction Foreman
Lab Assts
Lab Tech
Data Processing Technicians

ARTISANS
Drivers

ADMINISTRATIVE/CLERICAL
Typist
Accounts Clerk
Junior Clerical Officer

LABOURERS
Labourers

Source: Lawrence and Stevens 1987

APPENDIX C

Illustrative Occupational Staff Patterns

SWAZILAND WATER SECTOR
STAFFING PATTERNS BY BROAD OCCUPATIONAL CATEGORY 1987

AGENCY/SECTOR	OCCUPATIONAL GROUP	1987	PROP
Rural Water Supply Board	ENGINEERS	4	0.03
	OTHER PROF., TECH., & SKILLED	94	0.59
	ACCOUNTANTS & ADM/SUPPORT	28	0.18
	LABOURERS	32	0.20
	TOTAL EMPLOYMENT	158	1.00
Water Resources Board	ENGINEERS	3	0.06
	OTHER PROF., TECH., & SKILLED	24	0.46
	ACCOUNTANTS & ADM/SUPPORT	10	0.19
	LABOURERS	15	0.29
	TOTAL EMPLOYMENT	52	1.00
Water and Sewerage Board	ENGINEERS	6	0.01
	OTHER PROF., TECH., & SKILLED	286	0.39
	ACCOUNTANTS & ADM/SUPPORT	109	0.15
	LABOURERS	329	0.45
	TOTAL EMPLOYMENT	730	1.00
SECTOR TOTALS	ENGINEERS	13	0.01
	OTHER PROF., TECH., & SKILLED	404	0.43
	ACCOUNTANTS & ADM/SUPPORT	147	0.16
	LABOURERS	376	0.40
	TOTAL EMPLOYMENT	940	1.00

Source: Lawrence and Stevens 1987

RECOMMENDED STAFFING PATTERNS FOR THE TANZANIA WATER SECTOR

OCCUPATIONAL CATEGORY	PROPORTION
Engineers	.04
Technicians	.14
Skilled Labor	.28
Administrative/Accounting	.22
Unskilled Labor	.32
Total	1.00

Source: Gearhart et al 1982

APPENDIX D

Relative Placements Share Method

APPENDIX D

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.

Procedures

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 1 above, use follow-up data on placement to identify the related occupations in which program graduates (and leavers, if available) typically obtain employment.

3. For each program or program cluster determine from follow-up data the number of program graduates placed in each related occupation.

4. Compute the "placement share" to each related occupation using the following formula:

$$\text{Placement Share} \quad \frac{\text{Number of program graduates placement in occupation n}}{\text{Total number of program placements}}$$

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

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

5. Allocated supply (as represented from the supply index* for the program) among the related occupations using the following formula:

(Placement Share) x (Supply index) = Allocated Supply to Occupation n

The figure in Column 4 of Table 1 for occupation A = 120. This is based on the Step 5 formula where
Placement Share x Supply Index is (.40) x 300 = 120.

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* Obtained by determining the ratio of placements to enrollment by program as defined in Step 10.

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)	4. 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