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ENVIRONMENTAL HEALTH PROJECT

WASH Reprint: Field Report No. 402

Environmental Guidelines for PVOs and NGOs: Potable Water and Sanitation Projects

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William Hogrewe
Eugene Brantly

November 1992

Prepared for the USAID Mission to Dominican Republic
under WASH Task No. 383

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WASH and EHP

With the launching of the United Nations International Drinking Water Supply and Sanitation Decade in 1979, the United States Agency for International Development (USAID) decided to augment and streamline its technical assistance capability in water and sanitation and, in 1980, funded the Water and Sanitation for Health Project (WASH). The funding mechanism was a multiyear, multimillion-dollar contract, secured through competitive bidding. The first WASH contract was awarded to a consortium of organizations headed by Camp Dresser & McKee International Inc. (CDM), an international consulting firm specializing in environmental engineering services. Through two other bid proceedings, CDM continued as the prime contractor through 1994.

Working under the direction of USAID's Bureau for Global Programs, Field Support and Research, Office of Health and Nutrition, the WASH Project provided technical assistance to USAID missions and bureaus, other U.S. agencies (such as the Peace Corps), host governments, and nongovernmental organizations. WASH technical assistance was multidisciplinary, drawing on experts in environmental health, training, finance, epidemiology, anthropology, institutional development, engineering, community organization, environmental management, pollution control, and other specialties.

At the end of December 1994, the WASH Project closed its doors. Work formerly carried out by WASH is now subsumed within the broader Environmental Health Project (EHP), inaugurated in April 1994. The new project provides technical assistance to address a wide range of health problems brought about by environmental pollution and the negative effects of development. These are not restricted to the water-and-sanitation-related diseases of concern to WASH but include tropical diseases, respiratory diseases caused and aggravated by ambient and indoor air pollution, and a range of worsening health problems attributable to industrial and chemical wastes and pesticide residues.

WASH reports and publications continue to be available through the Environmental Health Project. Direct all requests to the Environmental Health Project, 1611 North Kent Street, Suite 300, Arlington, Virginia 22209-2111, U.S.A. Telephone (703) 247-8730. Facsimile (703) 243-9004. Internet EHP@ACCESS.DIGEX.COM.

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WASH Field Report No. 402

ENVIRONMENTAL GUIDELINES FOR PVOs AND NGOs: POTABLE WATER AND SANITATION PROJECTS

Prepared for the USAID Mission to Dominican Republic
under WASH Task No. 383

by

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William Hogrewe
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November 1992

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Foreword

These guidelines were originally developed by the Water and Sanitation for Health Project in 1992 for the USAID Mission to the Dominican Republic for use by Private Voluntary Organizations (PVOs) and Non-Governmental Organizations (NGOs) applying for grants from USAID's PVO Co-Financing Project. The USAID/Dominican Republic Selection Committee uses these guidelines, together with other guidance for applicants, as a framework for evaluating grant proposals that involve water supply and sanitation activities.

Although oriented to the Dominican Republic, these guidelines are applicable to any developing country situation where issues of public health, natural resources, and environmental quality are of concern. The guidelines provide a framework that will help planners in any development organization ensure that their water and sanitation projects are environmentally sound. Therefore, WASH requested and received USAID/Dominican Republic permission to make the document available to the general public as a WASH Field Report.

The development of the guidelines was a formidable task, involving the WASH team as well as a number of people from the Mission and USAID's countepart, ENTRENA S.A., (a Dominican training services organization). The text underwent several revisions before final acceptance. The WASH team, which included Alan Wyatt, William Hogrewe and Eugene Brantly, drafted the main document. There was substantial input and guidance from various personnel from USAID, including Richard Mangrich, Paul Struharik, Larry Laird, Francis Conway, and from ENTRENA, Bolivar Pou and Robert Crowley.

J. Ellis Turner, Director
Water and Sanitation for Health Project
June 1993

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Acknowledgment

This final version of *Environmental Guidelines for PVOs and NGOs: Potable Water and Sanitation Projects* represents the efforts of a number of people in addition to the principal authors. Mr. Andy Karp, who provided technical assistance during a field test of the draft guidelines, made a number of valuable contributions to the text and format of the guidelines, especially in Section 4, Synthesis and Grant Proposal Preparation, and technical terminology throughout the document, in both the English and Spanish versions. Significant input also was provided by Ms. Karen Menczer, AID/LAC/DR/E. Finally, both USAID/Santo Domingo and ENTRENA staff offered comments and suggestions for shaping this final version of the guidelines.

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1. About These Guidelines

1.1 Purpose

Private Voluntary Organizations (PVOs) and Non-Governmental Organizations (NGOs) often wish to build water supply and sanitation projects to increase the coverage of services and improve the quality of life in the communities that they serve. The U.S. Agency for International Development (USAID) recognizes the value of these activities and the unique abilities of PVOs and NGOs to make such projects work. PVO and NGO groups are particularly good at applying appropriate technology, working with community members to plan and manage their systems, and providing training and follow-up activities to ensure project success. The USAID Mission to the Dominican Republic has established the PVO Co-Financing Project to support the efforts of PVOs and NGOs that wish to sponsor small to medium-scale water supply and sanitation projects. The Co-Financing Project also supports other types of activities, including natural resource management, which are addressed in other guidance documents.

Water supply and sanitation projects are intended to accomplish significant environmental improvements. These positive environmental impacts may include any or all of the following:

- elimination of excreta from the community environment;
- improvement in environmental health and hygiene;
- provision of an opportunity to educate people about environmental concerns.

This document does not deal with ways to optimize and maximize these benefits, because to do so would involve creating a design manual and would greatly expand the size and scope of the document. Nonetheless, the reader is encouraged to consider these positive impacts and to design projects which will maximize them.

Without careful planning, water supply and sanitation projects may have negative effects on public health, environmental quality, and natural resources. Some unintended consequences of water supply and sanitation projects include the depletion of local water resources, bacteriological or chemical contamination of aquifers and surface water, increases in vector-borne disease, increases in water-related disease, soil erosion and siltation, and destruction of flora, fauna, and natural habitats, to name a few. These negative impacts may arise from poor project design, careless construction practices, incorrect use of the facilities, and faulty operations and maintenance procedures.

USAID recognizes that the principal objective of most water supply and sanitation projects is to provide services to underserved communities. Designing a project to avoid or minimize potential negative effects on public health and the environment may increase its expense, and thereby reduce the size of the project and the extent of new coverage provided. Nevertheless, it is important to design projects that are environmentally sound and sustainable. The potential costs of a poorly designed project in terms of illness and harm to the environment far outweigh the additional expense required to design, construct, and maintain the project properly. USAID is required by United States law to ensure that all projects it funds are environmentally sound. USAID believes that designing environmentally sound water supply and sanitation projects is also in the best long-term interest of the communities served by such projects, and of the Dominican Republic.

This document provides guidelines to PVOs and NGOs for developing water supply and sanitation projects that are environmentally sound. The document is not a technical design manual; it does not describe how to address all of the technical, financial, social, institutional, and public health concerns that must be addressed to deliver clean potable water, or ensure safe, effective disposal of human excreta. These subjects are addressed in other manuals focused on project design and engineering. Rather, this document describes the steps PVOs and NGOs should take to identify, study, and address the potential negative impacts that water supply and sanitation projects may have on public health and the environment. Another area not specifically discussed in this document is the discovery of items or sites of archaeological importance during construction of the project. Should such findings occur, a mechanism must be in place to notify the proper authorities.

The document does not provide a simple "checklist" of steps that applicants must take to qualify for grants under the Co-Financing Project. Rather, the document outlines a process for conducting an environmental evaluation of proposed projects. Applicants must implement this process thoughtfully and thoroughly to ensure that the projects they propose are environmentally sound and sustainable.

Applicants should be aware that they are accountable for effects that their projects have on environmental quality. If these guidelines should fail to foresee a potential negative environmental impact, the applicant is not relieved of their responsibility to mitigate the negative impacts.

1.2 Technical Scope

This manual is targeted at several types of rural and urban water supply systems. The document assumes that PVO and NGO groups will conduct projects in rural communities and under-served neighborhoods in peri-urban areas. The types of technologies for which these guidelines were prepared include:

Water Supply

- small diameter wells with hand pumps
- spring-fed gravity feed water distribution systems
- more complex water systems including well or surface water source pump, storage tank and distribution to standposts, individual yard taps or connections
- extensions of existing urban water lines into unserved or under-served peri-urban zones

Sanitation

- individual latrines (VIP, composting, pour-flush)
- community latrines
- small scale septic systems
- extensions of existing urban water-borne sewage lines
- water-borne sewage with disposal to surface waters

Large scale projects including surface water impoundments, water and sewerage treatment works are not considered.

This document presents information at a level of detail appropriate to project managers and trained technical professionals. PVOs and NGOs will require the services of trained engineers, environmental scientists, and social scientists to implement these guidelines and design environmentally sound water supply and sanitation projects. Significant resources and technical assistance may be required for the PVO or NGO to succeed in collecting and evaluating the data that are required to support the project design process.

1.3 Relationship to the Grant Application and Review Process

The process for project development, application, review of proposals, and grant decisions under the USAID PVO Co-Financing Project involves activities by the PVO/NGO group, USAID, and ENTRENA, the private contractor providing technical assistance to PVOs/NGOs. The following paragraphs describe how these guidelines relate to the grant application and review process. The applicant should refer to other documents from USAID for a more complete description of the application requirements and review procedures.

1. The PVO/NGO develops the Basic Project Design, and prepares a Concept Paper describing it to USAID and ENTRENA.

2. USAID and ENTRENA review the Concept Paper to determine if it matches the Eligibility Criteria for the Co-Financing Project.

3. If the Basic Design meets the Eligibility Criteria, and if the USAID Environmental Officer concludes that the Basic Design may have unintended negative impacts on public health or the environment, USAID will provide these **Environmental Guidelines** to the PVO/NGO. In addition, USAID will make some technical assistance available to the PVO/NGO group to help them follow these guidelines.

4. Following these **Environmental Guidelines**, the PVO/NGO group identifies potential public health and environmental problems associated with its proposed project, conducts detailed data collection and analyses, and designs appropriate measures to avoid, minimize, or mitigate potential negative impacts of the project. These measures are incorporated into a Detailed Project Design, which is presented to USAID in the Grant Proposal. The precise format for the Grant Proposal is provided by USAID and ENTRENA, on a case by case basis. General guidance concerning the environmental issues that should be addressed in the Grant Proposal is given in these **Environmental Guidelines**.

5. USAID and ENTRENA review the Grant Proposal and evaluate it according to the established Evaluation Criteria.

1.4 How to Use These Guidelines

STEP 1: Get Oriented to the Guidelines.

Use Section 1 - About the Guidelines to understand the purpose, scope, intended users, and structure.

STEP 2: Learn About Environmental Problems and Environmental Design

Use Section 2 - A Framework for Environmentally Sound Design to understand general principles to be followed in project design and the key environmental problems that may be caused by small and medium-sized water supply and sanitation projects.

STEP 3: Identify Important Problems, Study and Address Them

Use Section 3 - Detailed Guidelines to understand (a) the problems that are most likely for a specific type of project and setting; (b) the types of data that will be needed to study the problem; and (c) the steps that must be taken to evaluate data and identify measures that will address the problems. An Annex to the Guidelines includes a list of **References**, which may be useful as additional guidance for project designers.

STEP 4 : Synthesize Results and Prepare a Grant Proposal

Use Section 4 - Synthesis and Grant Proposal Preparation to understand what information USAID will look for in the Grant Proposal to demonstrate that these guidelines have been followed and the project design is environmentally sound and sustainable.

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2. Framework for Environmentally Sound Design

2.1 Basic Principles for the Development of Environmentally Sound Projects

There are nine principles which must guide the design of environmentally sound water and sanitation projects:

1. **Water Supply and Sanitation projects can lead to unintended or ignored negative impacts on public health, environmental quality, and natural resources if not done correctly.** This document provides guidelines on how to avoid, minimize and mitigate these impacts.

2. **The impacts, and measures taken to reduce them, will be very different in rural as compared to urban areas.** The increased population density in urban areas aggravates potential environmental problems and makes what would be a negligible environmental problem, a major one.

3. **Impacts arise from decisions and actions taken at different stages of a project: design, construction, system use, and operations and maintenance.** Development of environmentally sound projects must consider potential impacts from all of these phases.

4. **Community involvement is an essential part of project design, as well as implementation.** Projects with strong community involvement will be more environmentally sound. Communities can provide information that is critical to the design of a successful project and can help minimize environmental impacts through proper use and maintenance of the system.

5. **Community commitment to addressing negative environmental impacts is critical to the success of an environmentally sound project.** Including measures to avoid or minimize potential negative impacts of a project to public health and the environment may reduce the extent of services that will be provided or alter the nature of the facilities to be built. These measures sometimes conflict with community objectives or desires. It is important that these issues be discussed openly and that the community understand the need for a genuine commitment to avoiding

negative impacts because of the potential harm to their health and the environmental conditions in which they live.

6. **Training for individual users, operators and community system managers is essential to the success of an environmentally sound project.** While designers may make every effort to develop good designs, improper use (or non-use) of the system and poor operations and maintenance can result in major environmental problems. Many of these problems can be avoided with strong training programs. PVO/NGO groups are often well experienced and ideally situated to provide such training.

7. **PVO/NGO groups and communities should conduct monitoring and follow up** to ensure that the system is being used and maintained correctly, and to ensure that environmental impacts are kept to a minimum. A clear monitoring plan should be developed at the project design stage.

8. **Efforts in water supply and sanitation should be closely linked to each other and to project efforts in solid waste and drainage.** Recognition of these linkages, and designs which take into account these linkages will have the most positive impact on the environment and public health. Projects which ignore these connections will have negative impact on the environment.

9. **The severity of potential environmental impacts must be weighed against the cost of measures to avoid them.** Options must be analyzed on both financial and environmental grounds.

2.2 Environmental Evaluation and the Project Design Processs

These **Environmental Guidelines** describe the process for conducting an environmental evaluation of water supply and sanitation projects. The environmental evaluation is only one part of the project design process. The basic steps of the project design process are outlined briefly below and illustrated in the diagram on the following page. The steps of the process that constitute the environmental evaluation are described in italics below and are shown in grey shaded boxes in the diagram.

Define Objectives and Identify Project Setting. The first step is for the PVO/NGO to work with the community to define what objectives the project is intended to meet and to determine where the project will be located. The objectives should address the type and extent of services to be provided, desired improvements in public health, health education, and community responsibility for system operation and maintenance.

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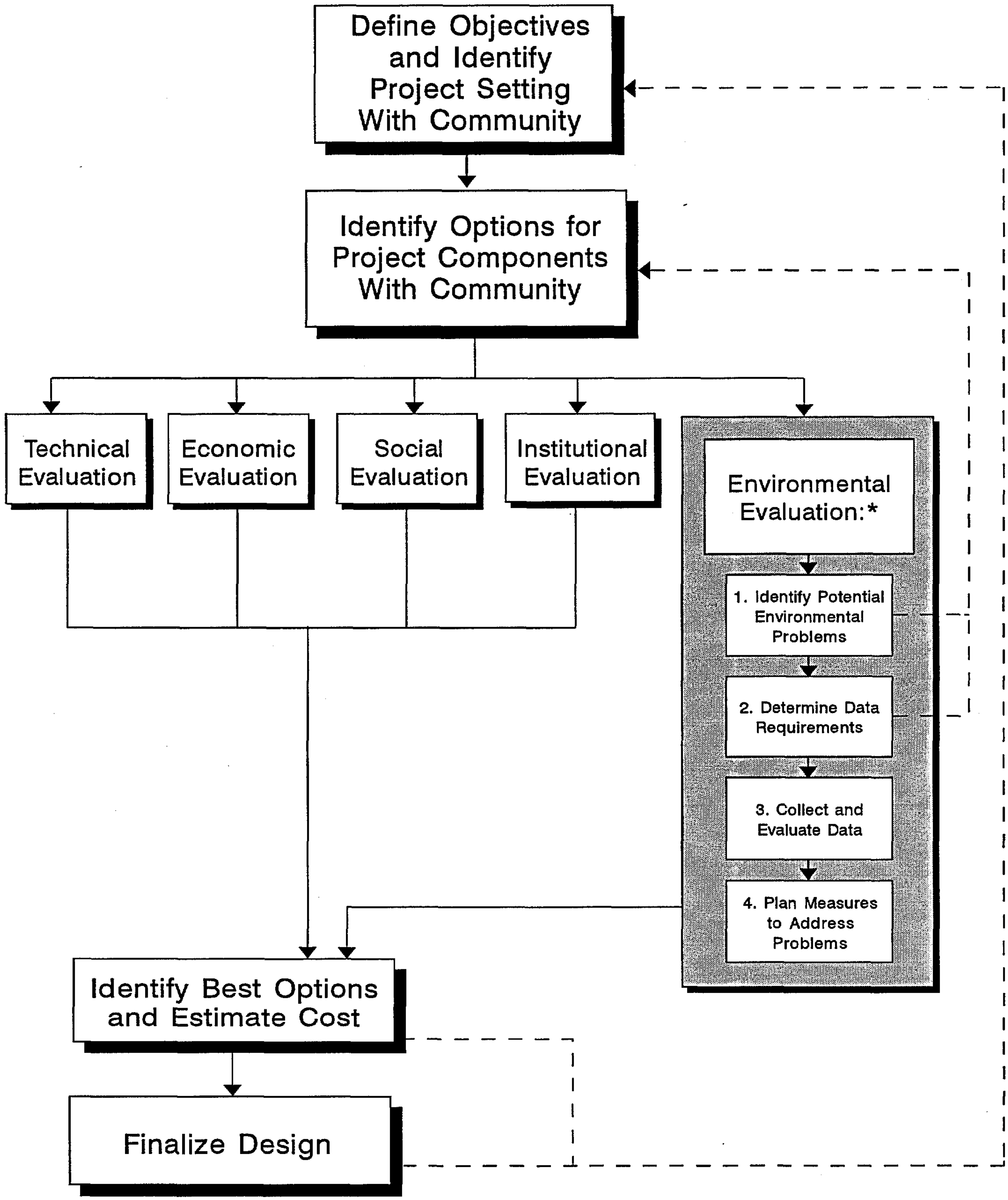
Process of Environmentally Sound Design



These guidelines address steps identified in the shaded box.

* The Environmental Evaluation consists of the four steps listed below this heading.

Identify Options for Project Components. Next, the PVO/NGO works with the community to identify, in general terms, the types of facilities that will provide the desired services in a manner appropriate to the physical, social, and economic conditions of the community. Appropriate options should be identified for each "component" of the system. The components of a water supply system include the water source, storage facilities, the distribution system, and possibly treatment facilities. The components of a sanitation system include facilities for excreta collection, transmission, treatment, and disposal or reuse.

Environmental Evaluation:

1. **Identify Potential Environmental Problems.** The first step of the environmental evaluation is to identify potential "environmental problems," which include unintended negative impacts to public health, environmental quality, and natural resources. Each type of option identified in the preceding step may cause environmental problems; the PVO/NGO should identify the potential problems associated with each option.

2. **Determine Data Requirements.** The PVO/NGO will need certain types of data and other information to understand the nature and extent of the environmental problems that may result from its project, and to design measures to avoid, minimize, and mitigate such problems. The second step of the environmental evaluation is to determine what types of data will be required to complete the environmental evaluation.

3. **Collect and Evaluate Data.** The next step of the environmental evaluation is to collect and evaluate each type of data needed. This step may require substantial time and effort.

4. **Plan Measures to Address Problems.** The final step of the environmental evaluation is to plan specific measures that will be incorporated into the project design to avoid, minimize, or mitigate the project's potential negative impacts on public health, environmental quality, and natural resources. Such measures will include decisions regarding where projects will be located, specific types of equipment and facility design, construction practices, operation and maintenance procedures, and training for system users.

Identify Best Options and Estimate Cost. In this step, the PVO/NGO must integrate the results of the environmental evaluation with the results from the technical, economic, social, and institutional evaluations. The results of each evaluation are taken into account to identify the best option for each component of the water supply or sanitation project.

After identifying the best option for each component, together with the specific measures that will be included to address potential environmental problems, the cost of the full project can be estimated.

Finalize Design. Estimating project costs and considering together all components of the project may cause the PVO/NGO to reconsider certain aspects of the project. After reaching final decisions on each component of the project, including specific measures to address potential environmental problems and monitoring and evaluation of costs, the last step of the process is to prepare a document describing the final Detailed Project Design.

2.3 Key Environmental Problems in Water and Sanitation Projects

Below is a list of important environmental problems that may be associated with water supply and sanitation projects:

Water Supply

1. depletion of fresh water resources (surface and ground water);
2. chemical degradation of the quality of potable water sources (surface and ground water);
3. creation of stagnant (standing) water;
4. degradation of terrestrial, aquatic, and coastal habitats.

Sanitation

1. contamination of surface water, ground water, soil, and food by excreta (chemicals and pathogens);
2. degradation of stream, lake, estuarine and marine water quality and degradation of terrestrial habitats;

Linkages

It is important to recognize that these problems are linked together. For example, depletion of fresh water resources is a problem in itself (with its own impacts and causes), but it is also one of several causes of chemical degradation of fresh water quality. More precisely, reduced stream flow can cause a given loading of pollutants to produce a greater impact on water quality. At normal flows these pollutants could be diluted or assimilated, but not at reduced flows. There are other causes of chemical degradation of fresh water quality, such as runoff from wasted or excess water, or improper disposal of excreta or solid waste. The other prime example is the general link between sanitation and water supply. Poor excreta disposal leads to contamination of water supplies in the community or elsewhere, which can lead to direct health impacts, or require more sophisticated water treatment or development of alternative supplies. The matrices present these linkages as they occur.

It is also important to recognize that water supply and sanitation projects realize their full potential when they are implemented as part of a comprehensive program that also includes improvements to solid waste management and surface drainage. Following ares some of the ways in which the potential problems associated with water supply and sanitation projects are related to each other, and to solid waste management and drainage.

Surface Drainage is a necessary component of an environmentally sound **Water Supply** project. Adequate drainage must be designed at the water source, storage facilities, and distribution points to avoid creating standing water.

Surface Drainage is a necessary component of an environmentally sound **Sanitation** project. Improper drainage can cause latrines to flood, hamper the operation of soakaway and leach fields, cause septic tanks to overflow, and overload water-borne sanitation systems.

Solid Waste management is an important part of maintaining a **Water Supply** project. Solid waste may clog soak-away pits and drainage channels designed to drain off excess water, resulting in standing water and possibly contamination of drinking water sources. The solid waste also contaminates the standing water. Standing water may drain into nearby latrines.

Solid Waste management is an important part of maintaining a **Sanitation** project. If solid waste is disposed of in the sanitation system, it can clog the system and impede its performance.

Inadequate **Sanitation** may cause contamination of **Water Supplies** as well as standing water with human excreta.

An adequate **Water Supply** must be provided for water-borne **Sanitation** systems, and appropriate disposal of sullage must be provided for non-water-borne systems.

Summary of Environmental Problems

Two tables are included on the next two pages which summarize the environmental problems associated with water supply and sanitation projects. These tables describe potential environmental problems in the following terms:

- **Impacts** are consequences which occur because of the problem, including direct immediate impacts and more indirect or secondary impacts. These include impacts on public health, environmental quality, and natural resources, as well as on other human activity.

- **Causes** are factors which produce or contribute to the problem. Some causes are immediate direct causes and others are root causes, somewhat removed in time and space from the problem itself.

- **Measures** to avoid, minimize, or mitigate the problem are actions which can be taken to address the problem. They can include siting decisions, physical facilities designed in environmentally responsible ways, training programs, monitoring and other actions.

This approach was adapted from a draft version of the Analytical Framework for Urban Environmental Problems, a policy paper under preparation by the World Bank (See References).

Environmental Problems in Water Supply Projects

Problems	Possible Impacts	Possible Causes	Possible Measures
1. Depletion of fresh water resources (surface and ground water quantity)	- Destruction of the natural resource - Destruction of aquatic life - Loss of economic productivity - Loss of recreation areas - Land subsidence - Increased cost of water supplies in the future or down gradient locations	- Underestimation of water demand - Over-pumping of water resources - Lack of information on resource yields - Waste and leakage of potable water - Poor water pricing policies and practices, leading to excessive use, wastage and leakage	- Designs based on effective water demand - Determination of sustainable water yields - Regulation or rationing of pumping or water use where necessary, with ongoing monitoring. - Waste/leakage control programs - User/operator training - Realistic pricing schemes - Where necessary, development of alternative, more costly water supply sources
2. Chemical degradation of the quality of potable water sources (surface and ground water)	- Poor quality surface and ground water - More severe pollution in surface water sources due to reduced stream flow - Salt water intrusion - Use of poorer quality water, with associated health impacts, or increased water treatment costs in the future or down gradient locations	- Depletion of surface and groundwater resources caused by: underestimation of water demand; over-pumping of water resources; waste and leakage of potable water; poor water pricing policies and practices, leading to excessive use, wastage and leakage; alteration of groundwater flow - Runoff/drainage from improper solid waste/ excreta/excess water disposal	- Designs based on effective water demand - Regulation or rationing of ground water pumping or surface water withdrawals where necessary, with ongoing monitoring - Integration of water/sanitation/solid waste and drainage project components - User/operator training - Waste/leakage control programs - Realistic pricing schemes - Development of alternative water supply sources
3. Creation of stagnant (standing) water	- Increased in vector-borne diseases - Contamination of standing water with fecal matter, solid waste, etc, leading to health impacts - Soil erosion/siltation	- Lack of, or inadequately designed drainage systems - Leakage from pipes/wastage from taps - Lack of proper solid waste/excreta disposal - Lack of user/operator concern for stagnant water	- Include provision of proper drainage systems in all water supply projects - Waste/leakage control programs - Integration of water/sanitation/solid waste and drainage project components - Health and hygiene education
4. Degradation of terrestrial, aquatic, and costal habitats	- Alteration of ecosystem structure & function and loss of biodiversity - Loss of economic productivity - Loss of aesthetics - Loss of recreation areas - Soil erosion/siltation	- Improper siting of facilities (within wetlands or other sensitive habitats, etc) - Poor construction practice - Leakage/wastage from pipes and taps - Increased population density/agricultural activity because of new water system	- Proper siting of facilities - Regional planning and design linked to ecosystem capacity to tolerate interventions - Careful construction practice - Waste/leakage control programs - Proper drainage systems

Environmental Problems in Sanitation Projects

Problems	Possible Impacts	Possible Causes	Possible Measures
1. Contamination of surface water, ground water, soil, and food by excreta, chemicals and pathogens	- Increased disease transmission associated with excreta (diarrheal, parasitic, etc.) - malnutrition caused by above diseases - high infant mortality - reduced economic productivity - Poor quality surface and ground water - Health impacts associated with use of chemically contaminated water - Increased cost of down-gradient water treatment for domestic and industrial uses	- Failure to use sanitation facilities - Disposal of excreta or wastewater directly on land or into surface water without adequate treatment - Improper siting of sanitation facilities - Inadequate protection of ground water - Improper operation of sanitation facilities - Failure of sanitation facilities due to lack of maintenance - Improper use of wastewater in food production	- Hygiene education - Proper selection, design, and monitoring of sanitation facilities - Proper siting of sanitation facilities with respect to water supplies - Protection of water supplies - Design of facilities with consideration for operation and maintenance - Training in operation and maintenance
2. Degradation of stream, lake, estuarine and marine water quality and degradation of terrestrial habitats	- Health impacts associated with contact with contaminated water - Fish or shellfish contamination - Eutrophication - Alteration of ecosystem structure & function and loss of biodiversity - Reduced economic productivity - Loss of aesthetics - Loss of tourism - Soil erosion and siltation	- Failure to use sanitation facilities - Disposal of excreta or wastewater directly into sensitive areas without adequate treatment - Improper operation of sanitation facilities - Failure of sanitation facilities due to lack of maintenance - Improper siting of facilities (within wetlands or other sensitive habitats, etc) - Poor construction practice	- Hygiene education - Proper selection and design of sanitation facilities - Proper siting of sanitation facilities with respect to surface water resources and sensitive habitats - Design of facilities with consideration for operation and maintenance - Training in operation and maintenance - Regional planning and design linked to ecosystem capacity to tolerate interventions - Careful construction practice

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3. Detailed Guidelines

3.1 Introduction

With information on the full range of potential environmental impacts as background, the project designer can determine which are the most important ones to focus on for the project being undertaken. Once the most likely problems are identified, the designer must collect data and plan measures to address the problems.

The matrices on the next two pages indicate which of the potential environmental impacts outlined above should be of most concern for different types of water systems in rural or urban settings. Project designers should consult these tables and determine the priority issues for their case. They should then turn to the corresponding Sections in these detailed guidelines for more information on the nature of the problem, the different types of causes, data collection requirements, as well as analyses to be performed and actions which can be taken to avoid, minimize or mitigate these risks.

To the extent applicable, PVOs and NGOs must assume responsibility for complying with the established regulations by the Dominican Republic water/sanitation government authorities (INAPA, INDRHI, CAASD, CORAASAN, municipalities) as well for getting the corresponding authorizations for their projects.

Likelihood of Potential Environmental Problems in Water Supply Projects				
Environmental Problem	**1.Depletion of fresh water resources**	**2.Chemical degradation of fresh water quality**	**3.Creation of stagnant (standing) water**	**4.Degradation of terrestrial, aquatic, and coastal habitats**
Rural Setting				
Small diameter wells with hand pumps	**VERY LOW**	**VERY LOW**	**HIGH**	**MODERATE**
Spring fed gravity feed water distribution systems	**MODERATE TO HIGH ***	**MODERATE**	**HIGH**	**MODERATE**
More complex systems including well or surface water source, infiltration gallery, pump, storage and distribution	**MODERATE**	**MODERATE**	**HIGH**	**HIGH**
Urban Setting				
Spring-fed gravity feed water distribution systems	**LOW**	**MODERATE**	**HIGH**	**HIGH**
More complex systems including well or surface water source, pump, storage and distribution	**HIGH**	**HIGH**	**HIGH**	**HIGH**
Extensions to existing urban water lines into unserved or under-served peri-urban zones	**HIGH**	**HIGH**	**HIGH**	**HIGH**
Corresponding Detailed Guidelines Section	See 3.2	See 3.3	See 3.4	See 3.5

* Springs, once capped, may have a downstream affect not otherwise obvious.

NOTE: The fact that a particular problem is considered to have a very low or low likelihood of occurring in a specific setting does not excuse the PVO/NGO from the responsibility of mitigating that problem if it does occur.

Likelihood of Potential Environmental Problems in Sanitation Projects		
Environmental Problem	**1.Contamination of water, soil and food by excreta**	**2. Degradation of environmental water quality and terrestrial habitats**
Rural Setting		
Individual latrines (VIP, composting, pour-flush)	MODERATE	LOW
Community latrines	HIGH	LOW
Small scale septic systems and soakaways	MODERATE	LOW
Urban Setting		
Individual latrines (VIP, composting, pour-flush)	HIGH	LOW
Community latrines	HIGH	MODERATE
Small scale septic systems and soakaways	HIGH	HIGH
Extensions to existing urban water-borne sewerage lines	MODERATE	HIGH
Water borne sewage with disposal to surface waters	HIGH	HIGH
Corresponding Detailed Guidelines Section	See 3.6	See 3.7

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Water Supply

3.2 Depletion of Fresh Water Resources (Surface and Groundwater Quantity)

Key Locations	Impacts	Causes	Measures
Urban and larger piped systems in rural areas	- Degradation of the resource - Destruction of aquatic life - Loss of economic productivity - Loss of recreation areas - Land subsidence - Increased cost of water supplies in the future or down gradient locations - Use of poorer quality water, with associated health impacts, or increased water treatment costs in the future or down gradient locations	- Underestimation of water demand - Over-pumping of water resources - Lack of information on resource yields - Waste and leakage of potable water - Poor water pricing policies and practices, leading to excessive use, wastage and leakage	- Designs based on effective water demand - Determination of sustainable water yields - Regulation or rationing of pumping or water use where necessary, with ongoing monitoring. - Waste/leakage control programs - User/operator training - Realistic pricing schemes - When necessary, development of alternative, more costly water supply sources

3.2.1 Nature of the Problem

Problem: Fresh water sources, including groundwater and surface water, can be depleted due to use in excess of planned uses or source yields.

Impacts: Depletion of these resources leads to many types of impacts. Depletion of surface water sources destroys the resource itself, damages aquatic life, reduces economic productivity, diminishes downstream use, and reduces recreational possibilities. Exhaustion of groundwater can lead to land subsidence, altered groundwater flow in other locations, and loss of economic productivity. Both these situations increase the cost of new

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water supply systems in the future or in other locations. In addition, these impacts lead to poorer water quality, health impacts, and elevated costs of potable water supplies in downstream or down gradient locations.

Discussion of Causes: In general this problem is caused when water extraction from the source exceeds the safe yield of the surface or groundwater resource. This excessive extraction can take place for many reasons. First of all the designers must collect information on the safe yield of the resource. Such information should be available from the Instituto de Recursos Hidraulicos. If not well tests on nearby wells or stream flow measurements should be undertaken. The amount of water that is currently being extracted (or will be extracted) from the resource for other purposes must be taken into account in determining a safe yield for the project.

Next, information on realistic water demand must be collected. In many cases designers use rules of thumb for consumption per capita and an assumed population growth rate. These "guestimates" often do not properly take into account wastage or leakage which can inflate water extraction needs. Nor do they account for how people will react to a new more convenient (cleaner) water source with its specific price. If the water source is close in proximity and the price is relatively low in comparison to the previous system, then consumption may be high. Conversely if the cost is high and alternative sources are available then consumption may be less.

If designers have underestimated demand, the withdrawal can exceed the planned extraction and result in resource depletion, especially after several years of use. If demand is overestimated the cost of the facilities will be higher than necessary. Thus a careful demand projection is important.

3.2.2 Summary of Data Needed

- safe yield of the water resource at the location under consideration
- current (before project) water sources and preferences, consumption volume, time spent collecting water, and price paid
- actual water use in similar projects conducted in the past

- current and projected population
- institutional and agricultural water needs
- data on typical water leakage rates in other existing water schemes

3.2.3 Summary of Actions Needed

Design Phase:

- Prepare realistic projections of population and water demand.
- Carefully compare realistic demand projections to water resource safe yield and develop alternative sources if demand exceeds supply.
- When investigating stream uses, check flows downstream for potential affects of intervention.

Construction Phase:

- Ensure proper installation of all pipelines, taps, etc. to minimize leaks.

Use and O&M Phase:

- Monitor total water extraction, water use.
- Conduct programs to control waste and leakage.

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3.3 Chemical Degradation of the Quality of Potable Water Sources (Surface and Groundwater)

Key Locations	Impacts	Causes	Measures
Urban and Rural	- Poor quality surface and ground water - More severe pollution in surface water due to reduced stream flow - Alteration of groundwater flow - Salt water intrusion - Use of poorer quality water, with associated health impacts, or increased water treatment costs in the future or down gradient locations	- Depletion of surface and ground water caused by: underestimation of water demand; over-pumping of water resources; waste and leakage of potable water; poor water pricing policies and practices, leading to excessive use, wastage and leakage - Runoff/drainage from improper solid waste/ excreta/excess water disposal	- Designs based on effective water demand - Regulation or rationing of ground water pumping or surface water withdrawals where necessary, with ongoing monitoring. - Integration of water/ sanitation/solid waste and drainage project components - User/operator training - Waste/leakage control programs - Realistic pricing schemes - Development of alternative water supply sources

3.3.1 Nature of the Problem

Problem: The chemical and physical quality of potable water resources, including groundwater and surface water, can be degraded because of excessive use, or excess runoff of wasted potable water polluted with silt, garbage and other contaminants.

Impacts: Streams can become more polluted due to "normal" contaminant loadings being less diluted in reduced flows. Groundwater flow can be altered and aquifers in coastal or island areas can be subject to salt water intrusion. Both of these situations can cause health impacts or higher water treatment costs in down-stream or down-gradient locations.

Discussion of Causes: Chemical pollution of potable water resources takes place for two types of reasons: 1) resource depletion (or excessive use) or 2) contamination of these resources by wastewater or runoff.

The causes, data requirements, analyses, and actions required are essentially identical to those presented in Section 3.2, and will not be repeated in detail here. The reader should review that section if it has not been done already. The main point made there is that demand must be carefully estimated and compared to safe yield of the surface water source or aquifer. Aquifers in coastal or island areas which are pumped beyond their sustainable yield can be subject to salt water intrusion. Data on the occurrence of this process should be collected and assessed to determine the maximum safe yield.

Water which runs off from water taps, leaking pipes, or overflowing storage tanks can pick up contaminants and pollute water resources into which they drain. The project designers should collect data on current behaviors for solid waste and excreta disposal. Project components should be designed to ensure that these materials do not contaminate water. Properly designed drainage systems which exclude these products are called for in any water project.

3.3.2 Summary of Data Needed

- safe yield of the water resource at the location under consideration
- current (before project) water sources and preferences, consumption volume, time spent collecting water, and price paid
- actual water use in similar projects conducted in the past
- current and projected population
- institutional and agricultural water needs
- data on typical water leakage rates in other existing water schemes
- occurrence of salt water intrusion in nearby or similar areas
- behaviors on solid waste and excreta disposal
- baseline data for water quality (biological, chemical, and physical), current/projected upstream demands for surface water

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3.3.3 Summary of Actions Needed

Design Phase:

- Prepare realistic projections of population and water demand.
- Carefully compare realistic demand projections to water resource safe yield and develop alternative sources if demand exceeds supply.
- Make plan for proper drainage, solid waste and excreta disposal systems.
- Design training/education programs on water use, hygiene education and environment.

Construction Phase:

- Ensure proper installation of all pipelines, taps etc to minimize leaks.
- Ensure proper construction of drainage and waste disposal systems to ensure effectiveness.

Use and O&M Phase:

- Monitor total water extraction, water use.
- Conduct programs to control waste and leakage.
- Monitor runoff and waste disposal practices.
- Monitor water quality changes and water levels in wells.
- Maintain records of water quality monitoring data and incorporate data into national data bases.

3.4 Creation of Stagnant (Standing) Water

Key Locations	Impacts	Causes	Measures
Rural and Urban	- Increase in vector-borne diseases - Contamination of standing water with fecal matter, solid waste, etc, leading to health impacts - Soil erosion/ siltation	- Lack of, or inadequately designed drainage systems - Leakage from pipes/ wastage from taps - Lack of proper solid waste/excreta disposal - Lack of user/operator concern for stagnant water	- Include provision of proper drainage systems in all water supply projects - Waste/leakage control programs - Integration of water/sanitation/ solid waste and drainage project components - Health and hygiene education

3.4.1 Nature of the Problem

Problem: The use of potable water supply systems can lead to pools of stagnant water near water taps, water pipes and storage tanks. This problem is exacerbated by improper or ineffective excreta and solid waste disposal practices.

Impacts: The pools of stagnant water lead to numerous impacts. They form an excellent breeding place for vectors (mosquitos, etc). They can also increase transmission of water related diseases, especially when the wet spots are clogged or contaminated with solid waste or excreta. Wasted water which is not properly drained leads to soil erosion and increased siltation in receiving waters.

Discussion of Causes: This problem results from a number of items. First there is a lack of or poorly designed ineffective drainage systems for water spilled from taps. Designers should collect data on soils, slope, rainfall, water flow rates etc, to design proper drainage systems to avoid the problem altogether. In areas where the water table is high, clay soils are present, or population or tap density are high the problem is more severe and proper drainage is critical. The type of drainage system needed can vary from simple, small soak-away pit to large, sophisticated drainage system depending on these factors. Other causes include poor drainage around pipes, causing overflow water to collect and stagnate. Proper pipe bedding and construction is required to prevent this, as well as leakage control programs.

3.4.2 Summary of Data Needed

- soil type
- slope and topography
- depth to water table
- rainfall patterns
- waste flow at taps
- behaviors on solid waste and excreta disposal

3.4.3 Summary of Actions Needed

Design Phase:

- Design drainage system to handle excess flow given circumstances, including population density, and specific component of system (source, storage, distribution, point of use).
- Make plan for proper solid waste and excreta disposal systems.
- Design training/education programs on water use, hygiene education and environment.

Construction Phase:

- Ensure good quality materials (such as uniformly-sized gravel).
- Supervise construction to ensure effective drainage.

Use and O&M Phase:

- Conduct maintenance to ensure periodic checking and cleaning of soak-away pits or other drainage facilities.
- Conduct training for water users on water use, health and water-related disease issues; relationship to solid waste and sanitation programs.
- Community-based inspectors perform monitoring function.
- Conduct programs to control waste and leakage.

3.5 Degradation of Terrestrial, Aquatic, and Coastal Habitats

Key Locations	Impacts	Causes	Measures
Rural and Urban	- Alteration of ecosystem structure and function and loss of biodiversity - Loss of economic productivity - Loss of aesthetics - Loss of recreation areas - Soil erosion/siltation	- Improper siting of facilities (within wetlands, and other sensitive habitats, etc) - Increased population density/agricultural activity because of new water system - Poor construction practice - Leakage/wastage from pipes and taps	- Proper siting of facilities - Regional planning and design linked to ecosystem capacity to tolerate interventions - Careful construction practice - Waste/leakage control programs - Proper drainage systems

3.5.1 Nature of the Problem

Problem: Terrestrial habitats near to facilities can be damaged during the construction or use of potable water systems.

Impacts: Numerous impacts on ecosystems are possible. Construction of facilities in sensitive areas (wetlands, estuaries, etc) can destroy flora or fauna or their habitats, leading to loss of biodiversity, reduction of economic productivity and loss of aesthetics and recreation areas. Soil erosion is the principle impact on land from potable water systems, brought on by either poor construction practice, pipe leakage, or lack of drainage of excess water at taps. This soil erosion leads to siltation in receiving waters, as well as a loss inf economic productivity. If installation of improved water supply leads to increased local population or increased livestock raising, this extra burden can cause numerous impacts on local natural resources, including forests, grasslands and soils. When using surface sources, the project can dry up flows downstream causing loss of habitat, wetlands and wildlife.

Discussion of Causes: Both flora and fauna can be impacted by installation of facilities at ecologically sensitive locations. Project designers will need to collect data on locations of any endangered species and determine if the project area lies in such a sensitive zone. Particular attention should be placed on wetlands and estuaries. Efforts should be made to avoid locating facilities in these areas.

Soil erosion can develop in the construction phase of a project if workers or supervisors are unaware of proper practice to avoid or minimize this problem. The project team should collect and assess local data on soil types and slopes and determine the potential for significant erosion. As water is used, soil erosion can take place if excess water from leaking pipes or taps is not properly drained. Soil data will need to be assessed to compute proper drainage in pipe trenches, and around water taps. These engineering features must be designed to minimize soil erosion.

In-migration to an area or increases in livestock raising may occur as a result of installing a new water project. This will be impossible for a PVO to influence. Nonetheless the PVO group should be aware of this potential impacts, and encourage regional planning officials to consider this issue in general regional development planning.

3.5.2 Summary of Data Needed

- location of habitats of endangered species near the project zone
- location of any wetlands or other ecologically sensitive sites in the project area
- soil types and slopes
- flows in terms of demand and supply

3.5.3 Summary of Actions Needed

<u>Design Phase:</u>

- Conduct careful siting of all facilities (small dams, intakes, pump houses, tanks, distribution lines, taps etc.).
- Avoid highly sloped or ecologically sensitive areas.
- Consider the capacity of local ecosystems to tolerate the implementation of the project.

Construction:

- Ensure careful construction practice especially concerning trenches and other excavations, through training and monitoring.
- Use silt screens, hay bales, or other mechanisms to prevent sedimentation in wetlands or water bodies.
- Use riprap as needed to prevent scouring.
- Revegetate slopes that have been cleared during construction. Do not remove erosion control structures until vegetation is reestablished.

O&M Phase:

- Develop training to community members and system caretakers to minimize leakage and water wastage.
- Monitor conditions around taps or pipelines for soil erosion.

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Sanitation

3.6 Contamination of Surface Water, Groundwater, Soil, and Food by Excreta (Chemicals and Pathogens)

Key Locations	Impacts	Causes	Measures
Rural and Urban	- Increased disease transmission associated with excreta (diarrheal, parasitic, etc.) - Malnutrition caused by above diseases - High infant mortality - Reduced economic productivity - Poor quality surface and ground water - Health impacts associated with use of chemically contaminated water - Increased cost of water treatment for domestic and industrial uses	- Failure to use sanitation facilities - Disposal of excreta or wastewater directly on land or into surface water without adequate treatment - Improper siting of sanitation facilities - Inadequate protection of ground and surface water sources - Improper operation of sanitation facilities - Failure of sanitation facilities due to lack of maintenance - Improper use of wastewater in food production	- Hygiene education - Proper selection, design, and monitoring of sanitation facilities - Proper siting of sanitation facilities with respect to water supplies - Protection of water supplies - Design of facilities with consideration for operation and maintenance - Training in operation and maintenance

3.6.1 Nature of the Problem

Problem: Water, soil, and food can become contaminated with the pathogenic organisms associated with human excreta.

The chemical water quality of fresh water resources, ground water and surface water, can be degraded by the introduction of human excreta or the byproducts of the decomposition of wastes. Nitrate contamination is especially common.

Impacts: Contamination of soil and water with excreta can result in increased transmission of the diseases associated with poor sanitation. These diseases include diarrheal diseases, dysenteries, enteric fevers, enteric viruses, worm infections, and some insect related diseases. Malnutrition, increased infant mortality, and a decrease in productivity may result from these diseases. Undesirable chemical constituents in water can lead to adverse health effects if consumed. Increased treatment costs may also result if the water is treated for domestic or industrial use. These impacts may be present in both urban and rural areas. Impact in peri-urban areas may be greater because of increased population densities and the frequent lack of facilities.

Discussion of Causes: If sanitation facilities are not used, either because of inappropriate design or lack of hygiene education, contamination with excreta can result from defecation in open areas or in drainage ditches. Information on the hygiene behaviors of the potential users is needed to design facilities that will be used.

Contamination with excreta can also occur if facilities are inappropriately chosen or not designed for site conditions, or user preference. Details about site conditions, water availability, population density, pathogens, and land availability are needed for proper design so that facilities will perform as desired and will be used as expected by the residents.

Inadequate protection of ground water sources (springs or wells) can result in contamination due to surface water inflow. Siting of latrines, soakaways, or leach fields upgradient of water sources also increases the probability of contamination. Site topography data is needed to assist in the proper location of facilities.

Improper reuse of wastewater can result in contamination of food products. Evaluation of the need for irrigation water should be included in the data gathering process. Wastewater may be reused by residents even if it is not the intent of the original design.

Properly designed facilities can also result in contamination if they are not operated correctly or adequately maintained. The level of expertise within the community for operation and maintenance should be determined so that appropriate training can be included in the design.

3.6.2 Summary of Data Needed

- hygiene behavior of users
- population density
- land availability
- institutional and community capabilities to build, operate, and maintain the facilities
- willingness of users to pay initial and operating costs of various levels of service
- depth to ground water
- soil type
- water availability
- construction costs
- existing infrastructure
- site topography
- ground water hydrology
- baseline data for water quality (biological, chemical, and physical)

3.6.3 Summary of Actions Needed

<u>Design Phase</u>

- Analyze users' willingness to pay so that level of service can be selected.
- Incorporate user preferences, institutional capabilities, site conditions, etc. into design.
- Provide for training in hygiene education, operation, and maintenance.
- Obtain baseline data for water quality.

<u>Construction</u>

- Measures should be taken (such as training and monitoring) to ensure the use of adequate quality materials and quality of work.

<u>Use and O&M</u>

- Asure necessary funding for O&M.
- Provide periodic training.
- Periodic testing of water supplies for fecal contamination and other water quality parameters.

- Maintain records of water quality monitoring data and incorporate data into national data bases.
- PVOs/NGOs are responsible for ensuring that local users/operators have enough understanding of how the water/sanitation system works.

3.7 Degradation of Stream, Lake, Estuarine, and Marine Water Quality and Degradation of Terrestrial Habitats

Key Locations	Impacts	Causes	Measures
Mainly Urban	- Health impacts associated with contact with contaminated water - Fish or shellfish contamination - Eutrophication - Alteration of ecosystem structure & function and loss of biodiversity - Reduced economic productivity - Loss of aesthetics - Loss of tourism - Soil erosion/siltation	- Failure to use sanitation facilities - Disposal of excreta or wastewater directly into sensitive areas without adequate treatment - Improper operation of sanitation facilities - Failure of sanitation facilities due to lack of maintenance - Improper siting of facilities (within wetlands or other sensitive habitats, etc) - Poor construction practice	- Hygiene education - Proper selection and design of sanitation facilities - Proper siting of sanitation facilities with respect to surface water resources and sensitive habitats - Design of facilities with consideration for operation and maintenance - Training in operation and maintenance - Regional planning and design linked to ecosystem capacity to tolerate interventions - Careful construction practice

3.7.1 Nature of the Problem

Problem: Streams, lakes, estuaries, marine, and terrestrial environments can be polluted with organic, nutrients, and solids. Adverse impacts can also result from site selection and construction activities.

Impacts: Adverse health impacts may result from recreational use of polluted waters.

Fish or shellfish can be contaminated with pathogenic organisms which may decrease their economic value and alter ecosystem structure and function.

Pollution of receiving waters may result in eutrophication or other changes in the environment that may in turn cause undesirable changes in the flora or fauna. These changes may affect economic productivity.

A general loss of aesthetics due to the odors and appearances associated with polluted waters is possible. Economic loss can result from a decrease in tourism.

Urban areas are more likely to impact water bodies due to the high concentrations of people. In rural areas, pollutant loadings are more likely to be within the assimilative capacity of receiving waters, thus having a smaller impact.

When disposed of on land, the organic, nutrients, and solids in human waste and water-borne sewage can alter terrestrial habitats. Urban impacts will tend to be more extensive due to large quantities of wastes and scarcity of land.

Numerous impacts on ecosystems are possible. Construction of facilities in sensitive areas (wetlands, estuaries, etc) can destroy flora or fauna or their habitats, leading to loss of biodiversity, reduction of economic productivity and loss of aesthetics and recreation areas. Soil erosion is the principle impact on land from project construction brought on by poor construction practice. This soil erosion leads to siltation in receiving waters, as well as a loss of economic productivity.

Discussion of Causes: If sanitation facilities are not used, either because of inappropriate design or lack of hygiene education, contamination with excreta or decomposition byproducts can result from defecation in open areas or in drainage ditches. Information on the hygiene behaviors of the potential users is needed to design facilities that will be used.

Contamination with excreta can also occur if facilities are inappropriately chosen or designed for site conditions, location with respect to water, assimilative capacity of receiving waters, types of pathogens likely to be present, or user preference. Details about site conditions, topography, water availability, population density, pathogens, and land availability are needed for proper design so that facilities will perform as desired and will be used as expected by the residents.

Improper reuse of wastewater can result in contamination of receiving waters. Evaluation of the need for irrigation water should be included in the data gathering process. Wastewater may be reused by residents even if it is not the intent of the original design.

Properly designed facilities can also result in contamination if they are not operated correctly or adequately maintained. The level of expertise within the community for operation and maintenance should be determined so that appropriate training can be included in the design.

Land can be contaminated if wastewater, septic tank sludge, or raw wastes are disposed of improperly by land application. Information on site conditions should be incorporated into the design.

Both flora and fauna can be impacted by installation of facilities at ecologically sensitive locations. Project designers will need to collect data on locations of any endangered species and determine if the project area lies in such a sensitive zone. Particular attention should be placed on wetlands and estuaries. Efforts should be made to avoid locating facilities in these areas.

Soil erosion can develop in the construction phase of a project if workers or supervisors are unaware of proper practice to avoid or minimize this problem. The project team should collect and assess local data on soil types and slopes and determine the potential for significant erosion.

3.7.2 Summary of Data Needed

- hygiene behaviors of users
- population density
- land availability
- institutional capabilities to build, operate, and maintain the facilities
- willingness of users to pay initial and operating costs of various levels of service

- depth to ground water
- soil types and slopes
- water availability
- construction costs
- existing infrastructure
- site topography
- level of expertise available within the community to build, operate, and maintain the facilities
- flow rates in streams (seasonal differences)
- existing water quality in receiving waters
- survey of aquatic plants and animals including commercial fisheries
- location of habitats of endangered species near the project zone
- location of any wetlands or other ecologically sensitive sites in the project area
- assessment of tourism

3.7.3 Summary of Actions Needed

Design Phase

- Analyze users' willingness to pay so that level of service can be selected.
- Incorporate user preferences, institutional capabilities, site conditions, etc. into design.
- Provide for training in hygiene education, operation, and maintenance.
- Conduct careful siting of all facilities to avoid highly sloped or ecologically sensitive areas.
- Consider the capacity of local ecosystems to tolerate the implementation of the project.

Construction

- Ensure careful construction practice especially concerning trenches and other excavations, through training and monitoring.
- Use silt screens, hay bales, or other mechanisms to prevent sedimentation in wetlands or water bodies.
- Use riprap as needed to prevent scouring.
- Revegetate slopes that have been cleared during construction. Do not remove erosion control structures until vegetation is reestablished.

Use and O&M

- Assure necessary funding for O&M.
- Provide periodic training.
- Periodically evaluate of affected ecosystems using habitat surveys.

4. Synthesis and Grant Proposal Preparation

This Section provides guidance on how the project designers can integrate the investigations and analyses of potential environmental problems and present the results of the environmental evaluation in a Grant Proposal.

Section 4.1 provides a series of questions which project sponsors should ask themselves, while they study the potential environmental problems. However, the questions are intended only to help the NGO prepare for Section 4.2 and need not be submitted as part of the Grant Proposal. USAID will evaluate relevant sections of the proposal to determine whether the applicant has implemented the guidelines and addressed these issues.

Section 4.2 presents a format that the project designer should use to document steps taken to address each potential environmental problem associated with the project. These summary sheets should be included as an annex to the Grant Proposal.

4.1 Project Application of Principles for Environmentally Sound Projects

A. Are adequate design parameters being used in agreement with national standards?

B. What are the project's potential negative impacts on public health and natural resources? How, and to what extent, are these avoided, minimized or mitigated ?

C. How does the specific project setting determine the nature of the potential impacts and corresponding measures?

D. How has the project considered public health and environment during the design, construction, operations and maintenance phases?

E. How will the community be involved in the conception, design, construction and on-going implementation and monitoring of the project? What skills or local resources will be put to use in this process?

F. What training is planned in the project? Who will conduct these activities, how, and with what funds?

G. What monitoring is planned in the project? Who will conduct these activities, how, and with what funds?

H. How does the project account for the linkages between water supply, sanitation, solid waste and drainage?

I. How have financial considerations influenced the environmental design in this project?

J. How will this project ensure sustainability (economic and ecological)?

4.2 Presentation of Potential Environmental Impacts in the Grant Proposal

Within the body of the Grant Proposal, a brief discussion of the project's environmental impact should be included in the section on Environmental Feasibility. (The word "project" is used to refer to everything covered by the Grant Proposal. Thus, for example, it may include the sum total of the work proposed by a PVO/NGO in a large number of rural communities, if the Grant Proposal would cover all of this work.) This discussion should consist of a general overview, and should refer to more detailed information in the Annex on Environmental Protection.

The project designers must prepare an Annex on Environmental Protection to their Grant Proposal, and this annex must contain the summary information indicated in items I, II, and III below.

The format of the annex may vary somewhat according to the size and nature of the project, but should always include certain important information. As an example of the variation in size and nature of potential projects, in late 1992, one NGO was requesting financing for a single community which consisted of a peri-urban neighborhood of the City of Santo Domingo, with 43,000 inhabitants, while other NGOs were requesting financing for projects which could serve between 5 and 15 rural communities per year. Clearly, the proposal to serve a single peri-urban neighborhood requires information aimed at that specific neighborhood. However, the rural projects should include information applying to typical communities, as well as information for any specific community which does not conform to the conditions of such typical communities.

In order to avoid repetition of virtually the same information for several communities, the following format is suggested. In this format, special conditions related to environmental impact, which may apply to only a specific community within a project which will serve many communities, are considered in Section III.

<u>Suggested Annex to Each Project Proposal: Environmental Protection</u>

I Summary of the Project's Environmental Impact

Note: This summary should be very concise, perhaps two to four pages, and should apply to all of the communities for which the NGO is requesting funding via this grant proposal. It should include the following sub-sections:

A. Overall summary (one to three pages - brief response to questions in section 4.1)

B. Positive environmental impact (very brief - less than one page)

C. Summary of the control of potential negative environmental impacts

D. Conditions in communities which vary from the project norm

Note: This sub-section should consist of a brief explanation of how one or more of the communities might vary from the typical project community in relation to its potential environmental impact. If there are no communities which do not conform, then it should be briefly stated that this is the case.

II Institutional Environmental Protection Policy

Note 1: This section should present the generalized policies of the PVO/NGO in relation to potential environmental impacts. It should describe conditions related to potential negative environmental impacts in typical communities to be served by the project and should include all of the information referred to in items 1 through 6 below.

Note 2: This section will be the same for each Grant proposal submitted by the PVO/NGO until such time as the PVO/NGO should decide to modify its policies. Taking this into account, it should indicate the date of the current revision, and it should indicate the changes that have been made since the previous revision.

III Discussion of Potential Environmental Problems for Specific Communities

Note 1: For each community (or typical community) included in the proposed project, and for each possible environmental problem within that community that may result from project interventions, all of the information referred to in items 1 through 6 below should be included in the annex.

Note 2: If a potential problem listed in section 2.3 of these Guidelines either does not apply or could not in fact take place because of factors which are independent of any actions by the proposed project, it will be sufficient to briefly explain the situation, without necessarily responding to all of the six items listed below, that would otherwise have to be discussed.

Note 3: It often will be convenient to cross reference information in other parts of the Grant Proposal instead of repeating the information in the Environmental Protection Annex.

Note 4: The problems presented in this annex will typically be the same problems described in the tables in Section 2.3 of these guidelines. However, the PVO/NGO is responsible to include any other problems which may be anticipated for the project. Furthermore, the PVO/NGO must use its judgement as to whether or not it may be best to subdivide the basic problems into sub-problems for purposes of this annex. This judgement should be based on what will best assure that the project will avoid, minimize, and mitigate all potential negative environmental impacts.

<u>Items to be Included in the Discussion of Potential Environmental Impacts in Sections II and III Above:</u>

1. The Problem:

- problem definition
- relevance and importance of the problem in this project

2. Data Collection and Analyses Performed:

- categories of data collected, or to be collected, including when it will be collected
- analyses

3. Measures Adopted to Avoid, Minimize and Mitigate the Problem:

   - design phase
   - construction phase
   - use/operation and maintenance phase

4. Training to Be Conducted:

   - training topics and approach
   - trainers, technical resources, and facilities to be used
   - source of funds for ongoing training

5. Monitoring and Follow-up:

   - monitoring to be performed, by whom and how
   - indicators of environmental conditions or impacts to be used
   - source of funds and technical skills for ongoing monitoring

6. Summary of Roles and Responsibilities of Different Parties:

   - community
   - PVO/NGO
   - any other organizations

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* These references should be obtained by the users of these guidelines.

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