

**TRAINING MANUAL FOR IMPLEMENTING  
THE COMMUNITY ENVIRONMENTAL  
ACTION PLAN (CEAP)**

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## FOREWORD

The Community Environmental Action Plan (CEAP) methodology was developed by the Project in Development and the Environment (PRIDE) of Chemonics International, Inc. PRIDE first conducted CEAP in Central America supported with funds from the Initiative for the Environment in the Americas of the U.S. Agency for International Development (USAID) through its Regional Environmental Program for Central America (PROARCA). A Washington-based private voluntary organization (PVO) is to implement CEAP in 18 Central American communities. The project will likely continue to receive strong support from the national environmental commissions of the region and the Federation of Municipalities in Central America (FEMICA).

Field tests proving the effectiveness of CEAP methodology were carried out in Puerto Barrios, Guatemala, and Usulután, El Salvador; and PRIDE expresses its gratitude to those communities.

In addition to the team of specialists who participated in CEAP, the project benefited from numerous consultations with Stuart Sessions, Lane Krahl, and Paul Markowitz. Among PRIDE personnel, Toben Galvin and Rebecca Rasch, in particular, prepared the Appendix on Low-Cost Environmental Technologies in this manual.

Ron Carlson, Lawrence Odle, and Roberto Morales of USAID/G-CAP/RHUDO/CA supervised the establishment of CEAP.

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<b>INTRODUCTION</b>
<b>GENERAL INFORMATION</b>

The Community Environmental Action Plan (CEAP) is a user-friendly methodology directed at strengthening the capacity of local governments and community-based organizations (CBOs) to manage environmental programs for improving the quality of life in their community. The CEAP has a highly participatory nature which brings together municipalities, CBOs, environmental ministries, the private sector and individuals traditionally not included in the development process. CEAP is based on a process called Comparative Risk Assessment (CRA) and a combination of rapid evaluation methods that have been used successfully in various parts of the world. It has been designed to be carried out in medium and small communities with populations of between 5,000 and 80,000 inhabitants.

CEAP has the following main objectives:

- Strengthen the capacity of municipal governments to manage local resources
- Increase the participation of municipalities and CBOs in the decision-making process regarding pollution and environmental programs
- Identify and rank environmental problems at the local community level
- Expose communities to low-cost alternative technologies for reducing their environmental problems
- Develop cost-effective strategies that can be implemented at the local community level to mitigate identified environmental problems
- Develop action plans in terms of institutional responsibility and available resources enabling municipalities and CBOs to have more opportunities in identifying national and international sources of funding
- Incorporate minority groups that are not traditionally included in the development process
- Increase partnerships and self help approaches in the solution of environmental problems
- Improve the quality of life in communities where the project is carried out.

#### **DISSEMINATING CEAP METHODOLOGY**

CEAP is a municipal-based project that can be implemented in partnerships with community groups. The best formula for disseminating CEAP methodology is training, and the contents of this manual may be used for training at the regional, national, or community level.

Such training can be directed at:

- Municipal governments
- CBOs and nongovernmental organizations (NGOs)
- Citizens' groups involved in environmental pollution

Organizations and members of the community, once trained in CEAP methodology, can become the trainers of new groups that wish to apply CEAP methodology. Inter-institutional or inter-community coordination can also be established in a particular region or country, creating a system of paired or sister communities. Utilizing that formula, several municipalities and/or communities in which CEAP has been carried out could serve as coordinating entities to provide training for other municipalities and/or communities wishing to conduct this type of program.

### **POSSIBLE FINANCING MECHANISMS**

When CEAP is an outgrowth of a community's own initiative, its own members should pursue support for implementing the project. Groups interested in implementing CEAP should explore possible sources of financing and consult with international financing agencies and local institutions. In addition, many CEAP costs may be met through voluntary community efforts.

Other expenses of implementing CEAP may include paying a member of the community to act as project coordinator (an option that could serve to expedite implementation) and/or contracting with a CBO to serve as a CEAP coordinating entity.

In relation to logistics and direct expenses, CEAP may need to consider the cost of such activities as training, workshop preparation, surveys, reproduction of CEAP-related materials, purchase and/or rental of office equipment, paper and supplies, photocopies, telephone expenses, postage, transportation, translations, and preparation of publications.

### **HOW TO USE THIS MANUAL**

This manual has been developed in modules, which include a series of annexes that offer suggestions, practical ideas, and examples useful in implementing CEAP. The manual design allows communities to apply the methodology through self-help, i.e., with little intervention from agencies external to the community. Ideally, a copy of this manual will be provided to the organization responsible for implementing CEAP in each community.

The manual includes six modules as described below:

**Module I: Initiating CEAP; First Community Workshop.** The objective of this module is to describe how CEAP can be initiated. Module I also presents information on preparing the First Community Workshop, as well as a series of guides for preparing CEAP workshops and training for the CEAP Advisory Committee (ACCEAP) and other members of the community.

**Module II: Preparing Initial Information.** This module describes how information can be collected for implementing CEAP, and preparing the Basic Community Profile. In addition, this module explains how to prepare a preliminary list of environmental problems.

**Module III: Community Survey and Mapping.** This module is designed to guide the collection of additional information for CEAP through a community survey. A CEAP community survey is designed to solicit the opinion of those groups or individuals who have not been able to participate in the process of implementing CEAP. This module also describes the development of community maps designed to depict areas where the most severe pollution problems occur.

**Module IV: Ranking Priority Risks; Second Community Workshop.** This module describes the process of setting priorities among environmental pollution problems to rank the more critical problems which merit priority action. This module also includes information on preparing and conducting the Second Community Workshop.

**Module V: Environmental Pollution Strategies; Third Community Workshop.** This module includes information for the identification of the *anatomy* of environmental pollution problems and the objectives and goals of the community, both necessary steps in formulating strategies to resolve environmental pollution problems. This module also includes information on preparing and conducting the Third Community Workshop.

**Module VI: Action Plans; Fourth Community Workshop.** This module guides the identification of priority action plans that have the highest feasibility of being implemented, considering available resources and institutional capacities. This module also includes information on preparing and conducting the Fourth Community Workshop.

**Appendix: Low-Cost Environmental Technologies.** The appendix includes a list of alternative and low-cost technologies for addressing wastewater and solid waste problems. The document is designed to serve as a tool for local governments and community-based organizations searching for solutions attainable with limited financial resources. The document describes 50 innovative environmental projects and technologies.

## CEAP SCHEDULE

CEAP has been designed to be conducted over four and a half months. The schedule for tasks and activities are displayed in the following chart:

Tasks	Month 1	Month 2	Month 3	Month 4	Month 5	
<b>Module I: CEAP initial steps</b>						
Steering committee initial activities						
<i>First Community Workshop</i>						
ACCEAP initial tasks						
<b>Module II: Gathering of information</b>						
Preparing list of environmental problems						
Planning CEAP tasks						
Collecting information from local institutions						
Collecting infor. from community members						
Preparing Community Profile						
<b>Module III: Survey and mapping</b>						
Planning survey and mapping						
Conducting survey and preparing maps						
Processing results of the survey						
<b>Module IV: Ranking of envir. problems</b>						
Preliminary ACCEAP ranking						
<i>Second Community Workshop</i>						
<b>Module V: Pollution strategies</b>						
Preparing anatomy matrices						
<i>Third Community Workshop</i>						
<b>Module VI: Action planning</b>						
Preparing matrices for action plans						
Review of low-cost technologies						
<i>Fourth Community Workshop</i>						

## OBJECTIVES AND CONTENTS

The objectives of this Module are to describe initiating CEAP in a community and conducting the First Community Workshop. Module I contains:

- Where can CEAP be carried out?
- CEAP Steering Committee
- “Green” problems and “brown” problems
- Initial steps
- Holding the first community meetings
- Involving the community
- Preparing the First Community Workshop
- Explaining CEAP to the community
- Ratifying community commitment
- Selecting the CEAP Advisory Committee (ACCEAP)
- Establishing responsibility for future ACCEAP actions
- ACCEAP training
- Making CEAP efficient
- Summary of CEAP tasks
- Time frame for initial CEAP activities
- Annexes



## GENERAL INSTRUCTIONS

**WHERE CAN CEAP BE CARRIED OUT?**

There is no fixed rule to apply in determining which communities can successfully implement CEAP. Ensuring the support and participation of municipal governments, CBOs, and local public and private institutions is essential, however. A participating community needs to perceive environmental pollution problems as among its main concerns; that these problems are increasing and therefore difficult for local authorities and the community to manage or control; that the municipal government is a community-unifying element; and that CBOs have achieved an acceptable level of community organization.

*Annex 1A includes a series of criteria for use in determining which communities can successfully implement CEAP.*

*Environmental pollution problems typically arise when a community's population increases rapidly while environmental services remain insufficient or inadequate. Poor solid waste and wastewater management can trigger watershed, soil, and groundwater contamination and air pollution.*

**CEAP STEERING COMMITTEE**

To initiate CEAP, a community should form a steering committee. This committee can be initiated by individuals in the community who feel the need to strengthen their community's environmental pollution programs and who envision CEAP as a tool to achieve this purpose.

Due to the participatory and self-help nature of the project, the CEAP steering committee can be composed of any combination of the groups listed below:

- Representatives of one or more municipal governments
- Members of one or more CBOs, NGOs, or church groups
- Community leaders
- Experts in environmental problems
- School and university teachers and professors
- Prominent members of private sector institutions (bankers, businessmen)
- Personnel from key public agencies
- Members of national and regional organizations concerned with the implementation of environmental pollution control and prevention programs
- Minority groups and those traditionally not included in the decision-making process of development programs
- International development agencies, such as USAID, the World Bank (WB), the Japan Inter-Cooperation Agency (JICA), the Canadian International Development Agency (CIDA), and the German Development Bank (GTZ)

CEAP may also be launched as an initiative of several municipal governments in a region or groups of CBOs.

*Participation is the process by which the members of a community are able to influence, share, control, and take responsibility for initiatives related to the development and programming of community resources. The process of self-help refers to the capacity of communities to carry out a task without, or with very little, intervention by individuals or institutions who are not a part of the community.*

The initial CEAP Steering Committee need not be permanent, since formulation of a permanent Advisory Committee (ACCEAP) occurs later in the CEAP process. ACCEAP may include none, some, or all of the members of the steering committee.

### **"GREEN" PROBLEMS AND "BROWN" PROBLEMS**

Environmental problems may be separated into "green" and "brown" issues (and sometimes "blue"). Green issues include deforestation, erosion, and loss of biodiversity. "Brown" problems include air pollution--from fixed or mobile sources--and soil, watershed, and groundwater contamination resulting from poor management of wastewater, solid waste, and pesticides. CEAP is a methodology directed toward "brown" issues.

### **INITIAL STEPS**

CEAP has several key initial steps that need to be taken at an early stage of the project. These steps include:

- Visiting municipal authorities

- Establishing a dialogue with the local community through visits and informal meetings
- Obtaining a commitment of support from local and community institutions
- Involving the community in implementing CEAP
- Preparing and conducting the First Community Workshop

*Annex 1B may be used to describe and explain the concept of CEAP.*

### **HOLDING THE FIRST COMMUNITY MEETINGS**

The efforts of the CEAP Steering Committee during the early phase of the project should be directed toward gaining the support of key sectorial groups of the community. Members of the Steering Committee should visit local authorities and groups to communicate their intention to implement the project. It is essential that municipal authorities be involved in the process and offer their support and willingness to participate to the Steering Committee. It is also essential that the project become a municipal initiative and that municipal authorities obtain the support of CBOs and other private-sector groups.

During these first visits and meetings, the CEAP Steering Committee should:

- Explain the project concept and its principal objectives and benefits
- Determine if there is an interest in the community for implementing CEAP
- Determine the range of support from local authorities and CBOs in implementing CEAP

- Describe the role of the Steering Committee
  - Request a letter to demonstrate the interest of the municipality and/or CBOs in implementing CEAP. The letter should attempt to document the availability of funding and/or human and logistical resources that are available to support CEAP.
- Annex 1C includes a sample letter of commitment that may be prepared by a municipality or a CBO during the early stages of CEAP. This letter can be used to show community members that CEAP enjoys support from key institutions.*
- Do all group members share the same opinion regarding the problem being discussed?
  - What benefits of CEAP could be attractive to this group?
  - How can the members of this group be motivated to participate in CEAP?
  - How can this group contribute to implementation of CEAP?
  - Do apparently irreconcilable differences make it impossible to include this group with others already participating in CEAP? If so, how could coordination among the different groups be achieved?

## INVOLVING THE COMMUNITY

Sometimes securing strong community participation and support may be difficult. Different community institutions and groups can perceive environmental problems in different ways. For example, a problem related to the collection of trash may be seen differently by persons who live in different neighborhoods. Residents of a neighborhood where solid waste is frequently collected may have a different perception of the problem than that held by people who live where solid waste is never or infrequently collected. The Steering Committee must be prepared to respond to the needs and perceptions of various social groups to get a consensus among different sectors. To increase the possibility of good participation, the Steering Committee should ask itself the following questions pertaining to the various sectors and groups it will contact:

- What are the objectives and goals of this group?

## PREPARING THE FIRST COMMUNITY WORKSHOP

Having contacted key members and sectors of the community who agree to implement CEAP in the community, the Steering Committee should prepare the First Community Workshop. This workshop has the following objectives:

- To explain the key principles of CEAP methodology
- To ratify the community's commitment to implement CEAP
- To elect an Advisory Committee responsible for implementing CEAP
- To establish responsibility for future CEAP actions

*Annex 1D includes a sample letter for convening the First Community Workshop; Annex 1E is a sample agenda for such a Workshop; Annex 1F offers a list of necessary materials for holding CEAP Workshops; Annex 1G contains a proposed evaluation for a CEAP Workshop; and Annex 2 includes material related to facilitating CEAP Workshops.*

## **EXPLAINING CEAP TO THE COMMUNITY**

A key characteristic of CEAP is that it can be a tool for addressing technical and social issues while identifying and seeking solutions to environmental pollution problems. During the First Workshop, community organizers should describe CEAP as a mechanism that serves to strengthen environmental programs, to identify pollution problems that most severely affect the community, and to develop strategies and action plans directed at resolution of those problems. They should also emphasize the participatory nature of CEAP, which allows the systematic integration and participation of various local interest groups and creates a forum to discuss the community's environmental pollution problems. This First Workshop may last one to two days.

*Organizers may use the material contained in Annex 3 of this module to explain CEAP to the community.*

## **RATIFYING COMMUNITY COMMITMENT**

Commitments established by the municipal authorities and CBOs for implementation of CEAP need to be ratified during the First Community Workshop. These commitments, written on large display sheets of paper, should be visible for all participants during the First Community Workshop. The objective is

to clarify specific commitments made by the municipal government, the community, and the other public and private institutions participating in the project. The Steering Committee can take advantage of this opportunity and ask for a ratification of these commitments.

## **SELECTING THE CEAP ADVISORY COMMITTEE (ACCEAP)**

The CEAP Advisory Committee (ACCEAP) is to be formed during the First Community Workshop. In some cases, it may be possible to simply ratify members of the Steering Committee or to add or subtract members from the Steering Committee. It is recommended that the ACCEAP not exceed ten members.

Selection of ACCEAP members can be accomplished by nominations or volunteering—in which one or various individuals are nominated or volunteer to serve as members of ACCEAP—or by ballot, in which participants in the First Community Workshop vote for certain participants.

*ACCEAP is a committee of citizens charged with managing CEAP activities. This committee must be composed of municipal and other public institutional authorities, members of CBOs, the private sector, university professors, experts and technical personnel, as well as community and religious leaders. Ideally, ACCEAP should represent various interest groups, particularly those groups often excluded from the decision-making process in development programs.*

It is possible, during this First Workshop, to nominate individuals in the community who are not in attendance at the Workshop. In such cases, on the strength of the Workshop nomination, the members of the recently

formed ACCEAP will have to verify if the person nominated is willing to serve on ACCEAP. It is recommended that ACCEAP be organized as a permanent body to remain after CEAP has been completed. Such an ongoing committee can constitute a vital element in terms of controlling community environmental pollution.

### **ESTABLISHING RESPONSIBILITY FOR FUTURE ACCEAP ACTIONS**

Participants in the First Community Workshop need to define the tasks and responsibilities of ACCEAP members. It must be clearly established that those persons who become members of ACCEAP will contribute a certain amount of time to participate in meetings, carry out various tasks, and generally support implementation of CEAP.

Tasks of the Advisory Committee include:

- Familiarizing themselves with the CEAP process
- Obtaining a letter from the municipal government supporting the formation of the Advisory Committee
- Collecting, reviewing, and analyzing information on community environmental pollution problems
- Soliciting public opinion on local environmental pollution problems
- Preparing and analyzing a CEAP survey and corresponding community maps
- Preparing a preliminary ranking of local environmental pollution problems
- Promoting and attending preliminary CEAP meetings

- Preparing and conducting the CEAP Workshops
- Providing public information related to environmental pollution
- Preparing informative materials for all community members
- Coordinating the preparation of information and announcements on CEAP activities for the media
- Educating members of the community on CEAP and its progress in reducing environmental pollution

To achieve greater effectiveness, it is recommended that ACCEAP, once constituted, divide itself into two groups. One will concentrate on the informative aspects of the project, public education, preparation and conduct of the Workshops, and collection of information. The other group will concentrate on review and analysis of information, analysis of technical matters, conversion of information from technical jargon to a language more easily understood by the community, and technical assistance during the process of identifying and ranking environmental pollution problems.

### **ACCEAP TRAINING**

ACCEAP training during the early stage of the project is essential. ACCEAP members need to function as a coordinated body having substantial knowledge about the CEAP method and approach. Only through training is it possible to achieve this purpose and successfully implement CEAP. ACCEAP training may be carried out by technical personnel versed in the process, personnel of municipal governments, members of CBOs, and individuals of other communities where CEAP has been implemented.

*Although basic training should be provided during an early stage of the project, training of ACCEAP members needs to continue throughout all phases of implementing the project. Before initiating each module of this manual, participants need to review and discuss key issues.*

*Annex 3 of this module includes the key elements of CEAP and may be used as support material in ACCEAP training sessions.*

### MAKING CEAP EFFICIENT

For CEAP to be implemented effectively, the municipal government needs to bestow a certain degree of official status on ACCEAP. That can be achieved in various ways. A municipal government might draft a letter of support or issue an identification card recognizing ACCEAP as a committee constituted to carry out the CEAP project and plan actions related to community environmental pollution problems.

A municipality might provide space in the municipal building for the use of ACCEAP. Such an act would demonstrate to the community that ACCEAP is perceived as an entity that enjoys the support of local authorities.

*Annex 1H includes a sample letter of commitment and an identification document that a municipal government could use to recognize and support the formation of ACCEAP.*

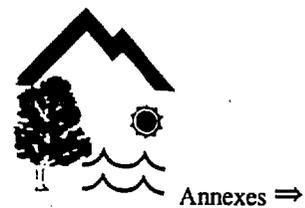
### SUMMARY OF CEAP TASKS

The following tasks are key to successful implementation of CEAP:

- Identification of the most pressing community pollution problems
- Information and data collection
- Preparation of community surveys and mapping
- Preparation of a Basic Community Profile
- Ranking of the most severe community pollution problems
- Identification of the anatomy of ranked environmental pollution problems
- Development of the most effective environmental strategies
- Development of the most feasible community action plans

**TIME FRAME FOR INITIAL CEAP ACTIVITIES**

ACTIVITY	DURATION No. Weeks
<p><b>Activities for the Steering Committee</b></p> <ul style="list-style-type: none"> <li>• Visit local authorities</li> <li>• Establish dialogue with local communities</li> <li>• Establish a commitment of support from local authorities and the community</li> <li>• Prepare the First Community Workshop</li> </ul>	3
<p><b>First Community Workshop</b></p> <ul style="list-style-type: none"> <li>• Send letter of invitation and agenda</li> <li>• Prepare First Workshop</li> <li>• Conduct First Workshop</li> <li>• Explain CEAP methodology</li> <li>• Ratify the community commitment to implement CEAP</li> <li>• Elect ACCEAP</li> <li>• Establish the responsibilities of ACCEAP</li> </ul>	2
<p><b>ACCEAP Responsibilities</b></p> <ul style="list-style-type: none"> <li>• Receive CEAP training</li> <li>• Obtain official status from the municipal government</li> </ul>	2
<p><b>Total Duration of this Module</b>  <b>5 weeks</b>                      (Some activities overlap.)</p>	





## ANNEXES: MODULE I

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The following annexes are designed to support the activities described in Module I. They include materials that can be used to initiate CEAP and to prepare and conduct the First Community Workshop. This section contains:

- Annex 1A: List of criteria to determine if CEAP can be implemented in a community.
- Annex 1B: CEAP general information that can be distributed during the initial meetings or when information on CEAP is requested.
- Annex 1C: Sample of a letter of commitment to be signed by institutions or individuals to ratify support for implementation of CEAP.
- Annex 1D: Sample of a letter of invitation to the First Community Workshop.
- Annex 1E: Sample of an agenda for the First Community Workshop.
- Annex 1F: Workshop action list.
- Annex 1G: Proposed evaluation form for CEAP Workshops.
- Annex 1H: Sample of a letter to make ACCEAP "official."
- Annex 2: Trainer's Handbook for Facilitators of CEAP Workshops.
- Annex 3: CEAP Trainee Handbook that provides written and graphic material to facilitate the training of ACCEAP members, participants in the First Community Workshop, and other groups or individuals who desire to familiarize themselves with CEAP methodology.

## CRITERIA TO DETERMINE IF CEAP CAN BE IMPLEMENTED IN A COMMUNITY

*This form can be used to determine if CEAP is feasible for implementation in a specific community. It is recommended that at least 12 of the 15 questions included on this form be answered in the positive to implement CEAP successfully.*

	YES	NO
• Is there a municipal agency interested in resolving environmental pollution problems?	—	—
• Is there a municipal government with good leadership which enjoys the respect of the community?	—	—
• Is there a municipal government that supports the development of community-based organizations and wants to undertake programs to be implemented in a participatory manner involving broad sectors of the population?	—	—
• Is there a political structure that allows the municipal government to work with community-based organizations?	—	—
• Is there one or more community-based organizations presently interested in resolving environmental pollution problems?	—	—
• Does the municipal government and community have similar concerns in relation to environmental pollution programs?	—	—
• Is there a municipal agency that can give assistance and support to environmental contamination programs?	—	—
• Is there strong leadership among community-based organizations to provide assistance and support to environmental pollution programs?	—	—
• Does the community have pollution problems related to natural resources considered most important by the nation and/or the region?	—	—
• Does the community depend on the natural resource-base for their subsistence and perceive such resources dwindling as the result of pollution problems?	—	—
• Has the community experienced rapid changes which threaten natural resources as the result of an increase in pollution problems?	—	—

- Can resolving environmental problems also improve the economy, health, and sustainable development of the community? \_\_\_ \_\_\_
  
- Can the community's problems be resolved substantially with low-cost interventions? \_\_\_ \_\_\_
  
- Can the community and/or municipal government serve as the nuclei for other communities and/or municipal governments with similar environmental problems in the region? \_\_\_ \_\_\_
  
- Can the community and/or municipal government support the efforts being made at the regional level to improve environmental resources? \_\_\_ \_\_\_

Number of positive responses: \_\_\_\_\_

## CEAP GENERAL INFORMATION

### WHAT IS CEAP?

The Community Environmental Action Plan (CEAP) is a participatory, municipal-based, self-help project. It offers a series of tools designed to:

- Strengthen the capacity of municipal governments to manage local resources
- Increase the participation of municipalities and CBOs in the decision-making process regarding pollution and environmental programs
- Identify and rank environmental problems at the local community level
- Expose communities to low-cost alternative technologies for reducing their environmental problems
- Develop cost-effective strategies that can be implemented at the local community level to mitigate the identified environmental problems
- Develop implementation plans in terms of institutional responsibility and available resources enabling municipalities and CBOs to have more opportunities to identify national and international sources of funding
- Incorporate marginal groups that are not traditionally present in the development process
- Increase partnerships and self-help approaches in the solution of environmental problems
- Improve the quality of life in communities where the project is conducted

CEAP is based on a process called Comparative Risk Analysis (CRA) and on a combination of rapid evaluation methods used successfully in various parts of the world. At the present time, CEAP is being carried out in two communities in Central America under the auspices of the U.S. Agency for International Development (USAID), and a Washington, D.C.-based private voluntary organization (PVO) is to implement CEAP in 18 other Central American communities.

### WHO CAN IMPLEMENT CEAP?

CEAP can be implemented by a Steering Committee operating at the community level whose members feel the necessity of improving their pollution and environmental programs. CEAP can be promoted by municipal governments, community-based organizations, religious institutions, members of the private sector and the academic sector, as well as by international finance agencies working in collaboration with the public and private authorities of the community.

## **WHAT BENEFITS MAY BE OBTAINED FROM CEAP?**

CEAP is expected to generate the following benefits:

- Assistance to community-based organizations and municipal governments in the development of environmental strategies to deal with the priority pollution problems which affect the community
- The development of action plans which may help the community identify national and international sources of financing
- Assistance in organizing participation at the community level, increasing the ability of the community to manage itself and its resources
- Assistance in incorporating sectors of the population not traditionally involved in the decision-making process regarding development
- Assistance in integrating the efforts of the municipal government, community-based organizations, and other key economic and social sectors in relation to environmental pollution and natural resource problems

## SAMPLE COMMITMENT LETTER

Dear Mr(s).\_\_:

We are pleased to inform you that our\_\_\_\_ (*institution or group*) is interested in participating in the Community Environmental Action Plan (CEAP), a project designed to identify, rank, and provide strategies and action plans for solving environmental pollution problems in the community.

Our collaboration will be directed at the following actions:	YES	NO
• Support the preparation of the various meetings CEAP will conduct	___	___
• Support the preparation of the community survey that will be conducted	___	___
• Provide space for the various community workshops to be conducted	___	___
• Assist with expenses required by the implementation of CEAP	___	___
• Provide assistance in conducting the Workshops	___	___
• Provide technical assistance through our personnel	___	___
• Other areas of collaboration (specify)	___	___

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Please be informed that our contact person is Mr(s).\_\_\_\_, whose direct telephone number is \_\_\_\_.

Sincerely yours,

## SAMPLE LETTER OF INVITATION TO THE FIRST COMMUNITY WORKSHOP

It is a pleasure for me to inform you that our community is now implementing the Community Environmental Action Plan (CEAP). CEAP is a project sponsored by \_\_\_ and its principal objectives are directed at the consolidation of environmental programs, identifying and establishing priorities among environmental pollution problems, and identifying strategies and a limited number of actions of high priority that can be accomplished by the community relative to our resources and institutional capacity.

The benefits that will be obtained from CEAP include assistance in bringing together the efforts of the municipal government, community-based organizations, and other key economic and social sectors in relation to pollution problems and increasing the opportunities of these sectors to access local, national, and international funds through the development of feasible action plans.

As a part of the CEAP working agenda, an informative and consultative Workshop is being held at \_\_\_ on \_\_\_ at \_\_\_ a.m. I am pleased to invite you to attend (as a representative of your institution). The Workshop is being organized by the CEAP Steering Committee whose objective is to promote and initiate the implementation of CEAP in our community.

Your participation in this Workshop is of great importance, as it will allow your point of view (or that of your institution) to be incorporated in the process of planning for CEAP.

For any additional information you may require and to confirm your participation or that of a delegate representing you, please contact Mr(s). \_\_\_, who is in charge of the Workshop, at \_\_\_.

I take this opportunity to express my appreciation for your support.

Yours very truly,

Annex: Agenda of the Workshop

## SAMPLE AGENDA FOR THE FIRST COMMUNITY WORKSHOP

**Workshop Objectives:** *Initiate CEAP in the community, using material included in Annexes 2 and 3 of this Module.*

- 8:00—8:30 Registration of participants
- 8:30—8:45 Opening of the event. Two persons will conduct the opening. They may be authorities from the municipality or other public institutions, members of a CBO, or key individuals of the community, such as a community leader or well-known pollution control expert.
- 8:45—9:00 Explanation and approval of the agenda
- 9:00—9:15 Warm up
- TOPIC I:** *Formally explain CEAP to the community*
- 9:15—10:15 Plenary session
- 10:15—10:30 Recess and coffee**
- 10:30—11:30 Plenary session
- 11:30—12:30 Question and answer session
- 12:30—2:00 Lunch**
- TOPIC II:** *Ratify the commitment of the community to implement CEAP. The commitments that have been made by the institutions and the community during the initial visits of the Steering Committee should be prominently displayed and visible to all participants in the Workshop.*
- 2:00—3:30 Plenary session
- 3:30—3:45 Recess and coffee**
- TOPIC III:** *Selection of the Advisory Committee. Elect an Advisory Committee to be responsible for implementing CEAP*
- 3:45—4:45 Plenary session

- TOPIC IV:**                    *Establish the responsibilities of the Advisory Committee. Establish the responsibilities of the Advisory Committee for future CEAP actions. Future commitments of the new ACCEAP need to be documented and displayed prominently for all participants to see.*
- 4:45—5:45                    Plenary session
- 5:45—6:00                    Evaluation of the day
- 6:00                            **Closing**

## WORKSHOP ACTION LIST

The following list can be used when preparing CEAP Workshops:

- Objectives
- Agenda (content, time, procedures, speakers, facilitator, moderators)
- Date of the event
- Place, room(s), climate control, light, arrangement and type of furniture, size, ventilation, distracting elements, accessibility, comfort, service for drinks and lunches
- Cost estimates
- Participants—selection criteria, consolidation of the final list
- Invitations, drafting, signing, sending (accompanied by objectives and agenda), confirmation of the participants

Materials that may be used in the Workshop:

- Pencils (for all participants)
- Folders or files (for all participants)
- Blank paper (for all participants)
- Name tag (for all participants)
- Markers for transparencies
- Markers for the chalkboard
- Poster markers
- Poster boards
- Blank overhead sheets
- Masking tape

Support materials to be prepared /or distributed

- Overlays
- Reproductions of the supporting documents (tables, evaluation, etc.)
- Supporting material written on poster board
- Attendance registry sheet (should include name, institution, address, and telephone)

Equipment that may be used in the workshop sessions

- Overhead projector
- Projection screen
- Easel
- Chalkboard

(Check equipment and outlets in the conference room.)

**Workshop logistics:**

- Coordinate coffee and drinks to be served during coffee breaks (if available)
- Coordinate lunch service (if available)
- Arrange working tables in the room in the shape of a "U" (*see Annex 2, Part II of this Module for the Workshop "Warm up"*)
- Provide drinking water for all participants

## PROPOSED EVALUATION FORM FOR CEAP WORKSHOPS

1. How did you view the workshop dynamics (timing and activities)?

Good \_\_\_

Fair \_\_\_

Poor \_\_\_

2. How did you view the leadership of the Workshop?

Good \_\_\_

Fair \_\_\_

Poor \_\_\_

3. Do you think this Workshop could have been improved?

Yes \_\_\_

No \_\_\_

If your response to this question is positive, please indicate how the Workshop could be improved (facilitation, language, hour, place, etc.)

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## SAMPLE LETTER TO MAKE ACCEAP OFFICIAL

I am pleased to inform you that on\_\_\_\_\_, 19\_\_, key municipal staff and community members attended a Community Environmental Action Plan (CEAP) Workshop. During this Workshop, participants formed an Advisory Committee for CEAP (ACCEAP).

The principal objective of the Advisory Committee is to initiate the implementation of CEAP whose principal goals include:

- Consolidating the environmental programs of the community related to pollution problems
- Identifying and ranking environmental pollution problems which severely affect the community
- Developing environmental strategies that can be carried out effectively to reduce the largest number of pollution problems and risks
- Selecting a small number of high priority actions (action plans) in the area of environmental pollution that have a distinct possibility of being implemented in terms of available resources and institutional responsibilities
- Improving the quality of life of the community

The Advisory Committee for CEAP is composed of the following members:

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The CEAP Advisory Committee enjoys the support and approval of this Municipality.

Yours truly

## SAMPLE IDENTIFICATION CARD FOR USE BY A MUNICIPALITY TO MAKE ACCEAP OFFICIAL

*A municipality can issue an identification card (ID) to ACCEAP members, something like this sample. The purpose of the ID is to give public notice of municipal support for ACCEAP. The front and back of the ID are shown here.*

(front)

I.D. Card No. 001	Municipality of <u>Name of the Community</u>
Name: <u>Name of the Bearer</u>	PHOTO
Identification No. <u>Certificate 001</u>	
Position: <u>Member of ACCEAP</u>	
 <u>Signature of the Bearer</u>	
 <u>Signature of the Municipal Official</u>	 SEAL

(back)

The municipality certifies that the bearer of this identification card is a member of the Advisory Committee for the Community Environmental Action Plan, ACCEAP, which has the full support of this municipality to undertake activities necessary under the plan presented for the implementation of the CEAP project.

Seal of the Mayor's Office

Place and Date

## **ANNEX 2 - MODULE 1**

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### **TRAINER'S HANDBOOK FOR FACILITATORS OF CEAP WORKSHOPS**

This annex contains suggestions to the facilitator for conducting CEAP workshops. It covers the following material:

#### **Part I Workshop Preparation**

- What is a workshop?
- Who attends a workshop?
- The role of the facilitator
- The workshop "warm-up"
- Ascertaining participants expectations
- Building on the experience of the participants
- Brief rules of procedures for workshops

#### **Part II The Workshop "Warm-Up"**

- Presentation of the participants
- Firming up of communications (Alternative 1)
- Making lines of communications tangible (Alternative 2)
- Launching the game
- Concluding the exercise
- Amplified version of the exercise

## SUGGESTIONS TO THE FACILITATOR FOR CONDUCTING CEAP WORKSHOPS

*This document contains a series of suggestions to use in CEAP community workshops. It may be viewed as a "bank of ideas" that can be used to facilitate CEAP workshops. The text presents a series of procedures and "games" designed to increase the effectiveness of the workshops.*

### **PART I: WORKSHOP PREPARATION**

#### **What is a Workshop?**

*A workshop is a time and place where a group of people are brought together to exchange and discuss their knowledge, experience, and ideas with regard to a specific subject for the purpose of arriving at common conclusions to make recommendations about that subject to the institutions or group that called the participants together for that purpose.*

Generally, a workshop is called by a group of citizens, a government, nongovernmental organizations, or private-sector institution for the purpose of discussing a specific subject, formulating policy or strategies, or defining solutions to a problem or set of problems. The objective of the workshop is to receive ideas from the participants regarding the best way to meet a responsibility. Ideas are then firmed up in a series of **conclusions** upon which the participants agree or in a set of **recommendations** or concrete suggestions to the workshop organizers. The workshop may also simply **brainstorm**, that is, conclude with a set of loose opinions or ideas expressed by participants that workshop organizers will have to put in order and evaluate later.

The group, institution, or organization that calls the workshop may or may not be part of the same community as the participants. The organizer, for example, might be an outside institution that offers international cooperation and has an interest in identifying where and how technical assistance and funding are most needed. Or the workshop may be organized by the mayor's office to identify policies and programs for solid waste management. Participants in a workshop may or may not belong to the same community, but they must possess an interest in or experience with a common subject.

#### **Who Attends a Workshop?**

*Participants are generally individuals whose knowledge, interests, personal experience, activities, or responsibilities place them in a position to contribute to a better understanding of a specific situation or problem.*

People invited to workshops may bring different aspects of knowledge regarding the subject to be discussed. For example, such knowledge may be academic, as in the case of a university professor or a specialist in sources of water pollution. Or it may be knowledge held by farmers or businessmen involved in activities in which they use such contaminating agents as pesticides or chemical fertilizers. Or the participants may be the victims of such contamination, housewives, for example, or persons who care for children, or the children themselves. Because of their responsibilities, public employees may be in a position to contribute to the discussion, or they may have a special interest

in the results. An example would be the staff members of institutions responsible for the quality of community drinking water or the personnel of health institutions.

Management groups and members of the organization or institution which organized the workshop often attend, either participating directly or limiting themselves to the collection of ideas, conclusions, and recommendations.

The diverse backgrounds of participants and the presence of people whose knowledge of the subject derives from distinct sources allow the workshop topic to be examined from different points of view and establish an environment in which different forms of knowledge and thought with regard to a common subject can be debated.

A person's **authority**, the validity of his/her opinions on the subject, does not depend on the source of the knowledge, but on its **quality**, including such factors as knowledge of the arguments upon which the different opinions are based, the time that a person has dedicated to the problem or been in contact with it, etc.

**Authority** to offer a valid opinion on a subject does not imply possession of the whole truth or even knowing the answer to all possible questions. On the contrary, authority may also be expressed in the ability to ask the right questions with regard to a problem without resolving it.

### **The Role of the Facilitator<sup>1</sup>**

*The role of the facilitator is to bring to light what is on the minds of the participants. The role of the facilitator, therefore, consists of motivating participants to share their knowledge, together building a new understanding in the form of conclusions and recommendations and creating an environment in which such an experience can germinate and flourish.*

The facilitator is to encourage participants to express their opinions and share their ideas to give rise to "an environment conducive to learning" that invites open, tranquil communication and allows discussion in positive, constructive terms.

The facilitator must provide certain elements during a workshop:

- He/she must offer the more "timid" or "reserved" participants the assurance that their opinions are valuable and deserve to be heard, and he/she must help the more active and enthusiastic participants to understand that, while their contributions are important, they must also give others the opportunity to participate.
- He/she must orient the workshop so that each of the participants can recognize how much he/she has to contribute to the discussion.

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<sup>1</sup>In this Manual, the term facilitator refers to the person conducting the workshop, and the term moderator to a person working with small groups.

- He/she must be attentive to agreements and disagreements, to relationships and contradictions, to concordance and incoherence created during the workshop so that, from a few loose ideas, the pieces of a disarranged jigsaw puzzle, a recognizable image, one that makes sense, may finally emerge.

Those who attend a workshop not only expect to contribute their own knowledge and experience but, in general, to acquire new knowledge or give new dimension to their own understanding.

### **The Workshop "Warm-Up"**

*Those who attend a workshop are often acquainted with each other, precisely because they share an interest in the same subject or are involved in the same activities. Sometimes, however, they are meeting for the first time. The personal relationships that develop among participants, including the facilitator, allow the workshop to become a dynamic entity, with its own life and creative capacity. It happens, little by little, no matter how long the workshop lasts. The physical and temporal space in which it is developing can transform itself from an empty stage to a vibrant space filled with memories and meanings, even if those of only the preceding minutes. The principal function of the initiation rites, the "warm-up," is to create the ties and allow such meanings to emerge.*

When Part II of the Trainer's Handbook speaks of warm-up during CEAP workshops, it suggests a game of constructing spider webs or nets. One of the objectives is to have the participants call each other by their first names. That tends to establish relationships between actual, individual human beings, instead of institutional interactions, during the entire workshop. It is especially important for the facilitator to be able to address each participant by name. That allows him/her to personalize the relationship in both directions. It is also important, from the beginning, for the facilitator to encourage participants to address him/her by name or nickname in such a way as to make communication more comfortable.

### **Ascertaining Participants' Expectations**

*In a short workshop, it is not always easy to pick up on the expectations of each and every one of the participants because of time limitations. If possible, however, it is useful at the beginning of the workshop to identify at least ten collective expectations and write them out on an easel or chalkboard. This approach is useful to establish if the objectives of the workshop organizers coincide with the objectives of the participants. If something emerges totally alien to the workshop objective, it is good to point out, at the outset, that those expectations fall outside the framework of the workshop and are therefore unattainable. Such a list also allows an evaluation, at the end of the workshop, of whether it was possible to satisfy the expectations of the participants or not.*

The facilitator may ask the participants, randomly, as they raise their hands to offer their contributions, what type of expectations they have in terms of the workshop. That allows the facilitator to assess the level of information of those in attendance with regard to the workshop objectives and the effectiveness of those who organize the workshop. Should a significant number of the participants be totally out of focus with respect to the objectives of the workshop, depending on the characteristics of each workshop and each specific process, the facilitator must decide, consulting with the organizers of the workshop if possible, whether, under the circumstances, it is

necessary or possible to vary the objectives of the workshop to bring them into line with the expectations of the participants. If this is not possible, the facilitator must recap the process which has led to holding the workshop and explain in detail the objectives of the event and help participants readjust their expectations to those of the organizers. It is impossible to give precise rules regarding when to opt for one alternative or the other. The decision depends on the participants and on the judgment of the organizers and the facilitator.

### **Building on the Experience of the Participants**

*Through initiation games or dynamics to present participants and identify their expectations, the facilitator may gather some of the "personal history" of each person attending the workshop. To define the workshop as a place for building knowledge together and the facilitator as the person who guides the process, the facilitator needs to stimulate and orient contributions so that they address the workshop objectives. That allows the participants to include themselves in the process, justify their participation, and, most important, internalize the process, make it their own and understand the workshop as a tool for attaining their own objectives.*

Each person attending the workshop has a unique and specific "life history." When a workshop is not merely an isolated incident but part of a larger process, as in the case of CEAP workshops, the principal interest of the organizers is not for the participants merely to attend and contribute to the workshop but for them to become involved in the development of the CEAP process. Respect for the "personal histories" of the participants and their individuality, therefore, becomes essential. The intention of the organizers and the facilitator is to place a tool in the hands of the people, a technology and methodology to allow them and their community to more easily attain the objectives of **their own process**. If participants feel "manipulated" into the service of processes with which they do not identify, the results will be artificial and forced. The outcome will be totally different if they know they are building new understandings in terms of their own processes.

### **Brief Rules of Procedures for Workshops**

The following simple rules should be kept in mind during the workshops:

- Only one person should talk at a time. Everyone must have a turn to talk. The facilitator will recognize the participants in order.
- Respect must be shown for the opinion and integrity of each of the participants. The discussion must center on the contents of the topic, not on the person.
- Listening must be with an open mind. There must be a willingness to change opinion.
- Speaking and listening must be done as individuals, not as a representative of a group of individuals.
- Comments must be brief and on the subject.

- When necessary, a consensus must be sought after ten minutes of discussing any subject. If consensus cannot be attained, the proposal must be left aside and considered again, later.
- Participants who take part in a debate must be prepared to support their points of view.
- Those who feel that the workshop is not working should inform the facilitator with regard to the problems they perceive.

## **PART II: THE WORKSHOP "WARM-UP"**

The following activities may be used as a menu of alternatives to be utilized during CEAP workshops. They may be introduced in the "warm up" phase which appears on the agendas of CEAP workshops. The objective of this activity is to break the ice between the participants and allow them to visualize the complexity of the environmental problems that affect their communities.

The first step is to invite the participants to organize themselves in a big circle, either seated at tables which should have been previously arranged in a circle or a "U," or standing in an open space. It is important that there be no second or third rows, that one person is not behind another, and that they are all on the same level so that each one of those in one half of the circle has a clear view of those in the other half. This game can be employed when the number of participants is not less than 10 or 12 and not more than 30.

- **Presentation of the Participants**

This game is for the participants to introduce themselves, with the first person saying his first name (no last names or further information). The second then repeats the name of the first and says his own name. The third person repeats the name of the first, then the name of the second person and then his own name, and so on, successively, until the last, who, before saying his own name will have to repeat the names of all the others from memory. This game, in addition to being amusing, allows the participants to know each other by their first names. That facilitates and personalizes their communication. (The participants may be allowed to jot down the names of those present, but they have to say the names EXCLUSIVELY FROM MEMORY.) At the end of this game, the facilitator will repeat all names from memory.

- **Firming up Lines of Communication (Alternative 1)**

Each of the participants is invited, without moving from his place, to select a speaking partner from the other side of the circle, not from the same side, with whom he/she will later hold a conversation. Once the speakers have been paired off, they are to stretch an imaginary thread between them, a line on which they are going to "transmit" their communication. The participants must be encouraged to "visualize" the imaginary thread and assure themselves that each thread is stretched tight. Should the number of participants not be even, the facilitator may enter the game to form a pair with the remaining participant, or that participant can be assigned the role of "observer" or "commentator" on the development of the game. In that case, when the game is over the "observer" must be the first to comment on what happened, the behavior of each pair during the communication, etc. The facilitator must keep in mind that it is very important to be

sure that each participant has a duly identified partner and make whatever adjustments are necessary.

- **Making the Lines of Communication Tangible (Alternative 2)**

The preceding game can be played with a variation. Instead of imaginary "threads" between each pair of interlocutors, a ball of twine or colored yarn and some scissors can be used to stretch real lines between the interlocutors. After connecting the pairs there would be a real, tangible network or spider web occupying the center of the circle of participants.

- **Launching the Game**

At a signal from the facilitator, each and every one of the participants will begin to talk simultaneously and in a loud voice, with enough volume to achieve communication. All the simultaneous conversations will sound like an enormous, unintelligible noise for anyone who observes the exercise from outside but, between the paired interlocutors, if they concentrate well and pay attention to the lips and gestures of their partner, they can achieve good communication. Each pair may talk about any subject they choose.

One or two minutes later, at a signal from the facilitator, the conversations will be halted. Then each of the participants will tell who it was that he/she talked with and on what subject, and his/her interlocutor will confirm or complement what was said. Both members of the pair must comment on the difficulties, or advantages, they had in achieving good communication. If someone comes into the area during the realization of the game without knowing what was going on, he/she may be asked what his/her reaction was, finding everybody talking or shouting at the same time.

- **Concluding the Exercise**

After the exercise is completed and each of the pairs has recounted its experience, the facilitator encourages the group to reflect on the capacity of human beings to "tune in" exclusively on the frequency that interests them, in this case the communication between pairs, converting all other conversations to "noise." The facilitator should show the advantages and dangers of this human skill. The spider web created by the game illustrates the enormous complexity of the problems and the danger of becoming hopelessly lost, particularly those who venture in without clear objectives. In terms of CEAP, it may be said that CEAP is a "reductionist" methodology that allows the analysis of a large number of environmental problems, discarding "unnecessary noise," and concentrating on those problems capable of producing the greatest risks to the community. (Communities are often afflicted with an infinite number of environmental problems that, because of their dimensions and magnitude, are very difficult to deal with on limited resources and budgets.) The exercise demonstrates that it is possible to tune out "noise" and tune in on the frequency of interest. CEAP may serve as a tool to analyze a large number of environmental problems and choose or "tune in" on those few that inflict the greatest risks on the communities.

- **Amplified Version of the Exercise**

Depending upon the type of community involved, this amplified version of the exercise or game may be appropriate. The purpose is to introduce a series of elements that allow the examination of innumerable environmental pollution problems. In this version, each participant represents an element (the sun, the clouds, the plants, the water, the animals, the human beings, scavengers, mushrooms, and other decomposition organisms, etc.) and lines are stretched between each participant and the others with which he/she thinks or knows his/her element has a relationship or interaction. On stretching each thread, the participants must identify and discuss why they are making that connection. For example, on stretching a thread between the participant "rain," and the participant "plants," each must explain how they are linked. It is not important for the explanations to be scientific at this point, unless there is some monumental mistake the facilitator or other participants are in a position to clarify.

The participants can assume roles corresponding to the "actors" that play a role in different environmental problems, the rivers, for example, the air, the landscape, the soil, and other elements of the environment, on the one hand, and automobiles, factories, residential neighborhoods, pesticides, commerce, and such human activities, on the other. The lines of communication, preferably real lines, which tie one element to the others, are then reorganized, as a web or network of great complexity. Then the "messages" that travel along the lines will be identified. Between the factory and the atmosphere flows smoke, particulates, and noise. Between the residential neighborhoods and the soil flow solid waste and wastewater. It is also possible to use this exercise to visualize the incidence of such problems as overpopulation, consumerism, poverty, etc.

It is important to point out that, while there was only one thread between the components of each pair at the beginning of the game, in the following steps there will be many, connecting each element with the others which make up the ecosystems where environmental problems are found. That network and the one before are mere EXAMPLES of the true complexity of our environment and the complexity of the interactions that result in environmental problems. The more complex and complicated the network becomes the more realistic, but it will never be possible to reproduce the real network of interactions in all its subtlety and complexity.

## **ANNEX 3 - MODULE I**

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### **CEAP TRAINEE HANDBOOK**

This annex presents written and graphic material to facilitate the training of ACCEAP members as well as other groups or individuals who desire to familiarize themselves with the CEAP methodology. It covers the following material:

What is CEAP methodology?

How is the CEAP process implemented:

#### **Risk Assessment**

- Preparation of a preliminary list of pollution problems
- Collection of information and analysis of the problems
- Preparation of the Basic Community Profile
- Assessing and ranking risk pollution problems

#### **Risk Management**

- Establishing the community's objectives and goals
- Identifying a preliminary list of strategies
- Developing action plans

#### **Transparencies**

## CEAP TRAINEE HANDBOOK

*This handbook contains information that may be used to train ACCEAP members, First Community Workshop participants, and other groups and individuals interested in learning the CEAP methodology. All or part of the material may be copied and distributed during ACCEAP training sessions.*

### What Is CEAP Methodology?

CEAP is based on a process called Comparative Risk Analysis (CRA) and a combination of rapid assessment methods that have been used successfully in various parts of the world. CEAP is a methodology designed to identify and rank the most pressing pollution problems and develop environmental strategies and action plans feasible for implementation. Basically, this process has been designed to work with the so-called "brown" environmental problems, those related, for example, to the pollution caused by wastewater and solid waste contamination or industrial and vehicular emissions. ("Green" environmental problems, those related to forests, deforestation and biodiversity are only considered indirectly.)

### How Is the CEAP Process Implemented?

In CEAP, "risk" is understood as the actual and potential damages caused to human health, the quality of life and the ecosystems by activities identified as polluting.

In terms of community participation, CEAP has various stages, which are developed in the six modules contained in the Manual for the Implementation of CEAP. In general terms, CEAP has two basic stages: the evaluation of risks and the management of risks. Risk evaluation is divided into two steps: risk assessment and risk management.

- **Risk Assessment:** During the risk assessment stage, participants determine and assess significant problems and risks of a particular geographic area and then rank them and judge their severity. This phase include the following steps:
  - *Preparation of a preliminary list of pollution problems.* From a pre-prepared list of 10 to 15 problems, ACCEAP members select 5 or 7 that occur with the greatest frequency and severity in the local area in accordance with the criteria of the First Community Workshop. This preliminary list will serve as a basis for the collection of information (*make a transparency and/or provide copies of Annex 1 of Module II*).
  - *Collection of information and analysis of the problems.* ACCEAP collects the information available on the problems on the preliminary list. If no data or technical information is available, the Committee consults with experts, technicians, and authorities in the community to find out their opinion with regard to the problems, or they may obtain information through informal community meetings (*make a transparency and/or provide copies of Annex 4 of Module II*). If data is still insufficient, the committee can conduct a survey and prepare community risks maps (*make a transparency and/or provide copies of Annexes 1, 2 and 3 of Module III*).

*Note: In some cases, difficulties arise in obtaining information about identified problems. CEAP is based on the analysis of available scientific data, complemented by the judgment of experts who will built their criteria on identified information.*

- *Preparation of the Basic Community Profile.* The Advisory Committee prepares a Basic Community Profile from the collected information. The profile should include general information about the community, location, patterns of settlement, administrative divisions, topography, hydrology, ecosystems, population, production activities, pollution problems, and environmental institutional framework. *(make a transparency and/or provide copies of Annex 5 of Module II).* The profile should also include maps developed by ACCEAP and information from the community survey (if conducted).
  
- *Assessing and ranking risk pollution problems.* To make this evaluation, ACCEAP should assess the pollution problems in accordance with their effects on human health, the quality of life, and the integrity of ecosystems. This assessment should result in a preliminary ranking that will be discussed during the Second Community Workshop, during which the ranking will be validated and/or modified. Once the committee has evaluated risks, it can rank problems in accordance with their severity, allowing the selection of a maximum of three priority problems for the community in accordance with the conclusions reached in the Second Community Workshop *(make a transparency and/or provide copies of Annexes 1, 2, 3, and 4 of Module IV).*
  
- *Identifying the "anatomy" of the ranked problems.* During this phase of CEAP, the ACCEAP develops the *anatomy* or most visible effects and risks of the environmental problems. For this purpose, the committee can use a set of matrices *(make a transparency and/or provide copies of Annex 1 of Module V)* which include:
  - Types of damage (to health, quality of life, and ecosystems)
  - Path by which these damages occur
  - Types of contaminants
  - Sources of contamination
  - Population and geographic area affected
  - Causes

For example, in the case of wastewater pollution, the most common **types of damage** include gastrointestinal disorders, respiratory and skin diseases, watershed pollution, losses in tourism, and other problems related to the quality of life such as increases in bad odors or in health costs. The **paths by which these damages occur** include direct contact with wastewater and consumption of contaminated water or food. Generally **types of contaminants** include such pathogens as viruses from fecal material and such toxic substances as

hydrocarbons from petroleum derivatives. (In addition, rivers, lakes, and seas may be altered or degraded, increasing the biological demand for oxygen.) Homes and industries are the principal **sources** of wastewater. The **cause** could be the lack, or deterioration, of a functioning sewage network, insufficient collection, and lack of sewage treatment.

- **Risk Management:** The second stage of CEAP is an attempt to identify the most feasible strategies to resolve priority pollution problems and convert those strategies into action plans. The following steps are taken:
  - *Establishing the community's objectives and goals.* Establishing the community's objectives and goals is performed prior to identifying environmental strategies. During this step, ACCEAP should document the community's perception of itself and how it envisions development in future years if the more severe pollution problems are reduced or eliminated (*make a transparency and/or provide copies of Annex 2 of Module V*).
  - *Identifying a preliminary list of strategies.* The most feasible strategies to resolve pollution problems are identified. Identification of strategies must begin with a review of the critical points of the *anatomy* of ranked problems followed by a review of each problem. As many as six strategies can be listed, two for each priority problem. This stage of CEAP involves three steps:
    - A list of programs and concepts describing a series of initiatives that can resolve the pollution problems must be developed during this stage. These initiatives include low-cost technologies and methods, public education, community action, legislation and monitoring, cost recovery schemes, privatization and taxes, and incentives related to pollution prevention (*make a transparency and/or provide copies of Annex 3 of Module V*).
    - A set of questions directed at facilitating the development of environmental strategies must be formulated during this stage. During the Third Community Workshop participants should work in groups organized around the identified environmental problems (*make a transparency and/or provide copies of Annexes 4 and 5 of Module V*).
    - A set of preestablished criteria should be used to assess which of the identified strategies is more feasible for implementation. Such criteria include effectiveness in the reduction of risks; cost, cost-effectiveness, technologies, local institutional resources and technical capacity; previous experiences in the development of similar strategies; and equity (*make a transparency and/or provide copies of Annex 1 of Module VI*).
  - *Development of action plans.* Action plans are developed in terms of their viability for implementation based on available national and international resources. These action plans must define the following:
    - What? Refers to the type of actions that must be taken to respond to the strategies that have been defined

- o Who? Refers to the actors (individuals, CBOs, public or private, local or national institutions) responsible for carrying out the proposed priority actions
- o How? Refers to the processes or methods to be followed to implement the proposed actions
- o When? Refers to the implementation of the proposed actions over time
- o How much? Refers to the possible sources of funding from local, national, regional, and international organizations and agencies

To develop these action plans, a series of matrices and forms can be used (*make a transparency and/or provide copies of Annexes 2, 3, and 4 of Module VI*). Action plans should include:

- o Initial actions (actions to be undertaken in less than a year)
- o Short-term actions (actions lasting from one to three years)
- o Medium-term actions (actions lasting three to six years)
- o Areas of possible problems
- o National institutions capable of supporting implementation of the action plans
- o Possible funding sources
- o Legislative necessities

## TRANSPARENCIES

The following pages may be reproduced as overhead transparencies for purposes of the ACCEAP training process. They can be reproduced in conjunction with other transparencies suggested in this CEAP Trainee Handbook.

## **CEAP METHODOLOGY BASED ON:**

- **COMPARATIVE RISK ANALYSIS (CRA)**
- **RAPID MEANS OF EVALUATION**

## **DESIGNED FOR:**

- **"BROWN" OR ENVIRONMENTAL POLLUTION PROBLEMS**

## **CEAP PHASES**

- **RISK EVALUATION**
- **RISK MANAGEMENT**

## **RISK EVALUATION**

- **PRELIMINARY LIST OF POLLUTION PROBLEMS**
- **COLLECTION AND ANALYSIS OF INFORMATION**
- **BASIC COMMUNITY PROFILE**
- **RANKING**
- **"ANATOMY"**

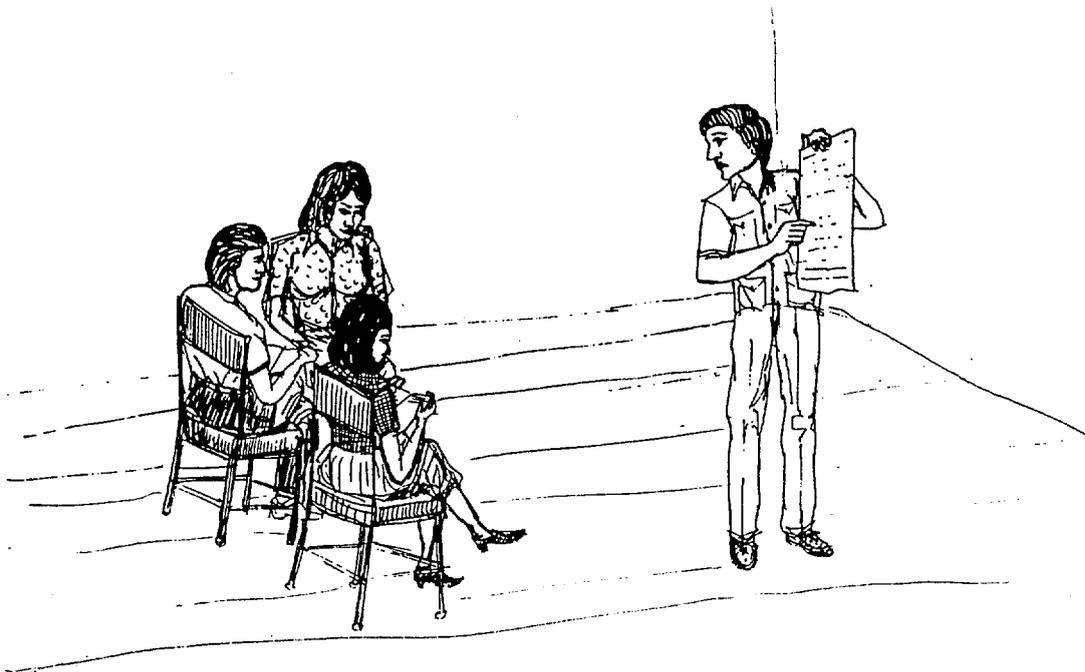
## **RISK MANAGEMENT**

- **IDENTIFICATION OF STRATEGIES**
- **EVALUATION AND SELECTION OF STRATEGIES**
- **ACTION PLANS**

## OBJECTIVES AND CONTENTS

The objective of this Module is to aid the CEAP Advisory Committee in establishing a list of the environmental pollution problems that affect the community most severely. Based on this list, a community can then collect information necessary for implementing the CEAP. This Module contains:

- Information on CEAP methodology
- Preparing a list of environmental pollution problems
- Information collection approach
- First steps in collecting information
- Informing the public about collecting information
- Information collecting activities
- Establishing a geographic area
- Visits to public and private institutions
- Small community meetings
- Community survey and mapping
- Preparing the Basic Community Profile
- Time frame for information-gathering activities
- Annexes



## GENERAL INSTRUCTIONS

**INFORMATION ON CEAP  
METHODOLOGY**

Collection of information is critical to CEAP development. CEAP methodology is based on a process called *comparative risk analysis (CRA)*, and collection of information is necessary to the development of this process.

*The CEAP methodology is based on a process called comparative risk assessment (CRA) and on a combination of rapid evaluation methods used successfully in various regions of the world. It is possible to establish the priorities of problems related to environmental pollution by means of this methodology.*

Comparative risk studies can make use of quantitative and qualitative data and information to analyze the severity of risks and determine priority ranking of pollution problems. The flexibility of CEAP methodology allows data and information to be complemented with the judgment of professionals from the public and private sectors and of the community in general.

*Within the CEAP methodology, priorities are set by establishing the risk presented by a particular pollution problem. These priorities, once set, are then associated with strategies and action plans formulated by the community. For these tasks, data is required.*

**PREPARING A LIST OF ENVIRONMENTAL POLLUTION PROBLEMS**

Before undertaking the collection of information, a community needs to establish a list of pollution problems to make the collection of information more efficient and to avoid requesting unnecessary information.

ACCEAP will be responsible for preparing a preliminary list of pollution problems. The list needs to be prepared with clear terminology that can be understood easily by the community. This list should become part of the materials to be discussed during the Second Community Workshop.

The list should avoid areas of overlap as much as possible. For example, if a community's air pollution problem is lead, air contamination and lead should not appear as two different problems. Similarly, when discussing a list with the community, ACCEAP should caution residents wishing to add problems that additions must not be similar in nature. For example, if a list includes problems of wastewater and solid wastes, additions such as "lack of drainage or latrines" or "interruptions in trash collection services" should not be included.

*Annex 1 includes a list of environmental pollution problems that may be used during the phase prior to the collection of information.*

## INFORMATION COLLECTION APPROACH

Two types of information may be used as a basis for comparative risk analysis. The first includes reports, studies, and publications prepared by public and private institutions, universities, CBOs, and experts on the subject. The second type has to do with how the community perceives such problems. In relation to CEAP, the process is based on a combination of the two types and because of its highly participatory nature, the portion arising from consultation with the community has high significance.

*Many times quantitative data can be scarce. CEAP considers judgment an important part of comparative risk analysis, however, such judgment should be structured around identified scientific data and information.*

## FIRST STEPS IN COLLECTING INFORMATION

Collection of information is one of the principal responsibilities of ACCEAP. The first step in collecting information consists of organizing the Advisory Committee. For that purpose, the following tasks must be undertaken:

- Prepare a list of tasks to be accomplished
- Identify possible sources for the collection of information
- Establish areas of responsibility among Committee members in accordance with individual expertise and time availability
- Prepare a schedule that shows the individual responsibilities of each Advisory Committee member and the time frames for completion of actions
- Inform the public with regard to the collection of information

*For the process of collecting information, as well as for the process of analyzing information, it is recommended that the members of ACCEAP be divided into small groups of two or three members.*

*Annex 2 includes a sample schedule for use by CEAP to organize the collection of information.*

## INFORMING THE PUBLIC ABOUT COLLECTING INFORMATION

For collection of information to be carried out in an effective manner, the community must be duly informed. ACCEAP must therefore prepare a series of informative notices, letters, or brochures to call the public's attention to the fact that CEAP is being carried out in the community. It is important to involve the local media, civic organizations, religious institutions, professors at local teaching centers, as well as leaders and prominent members of the community to properly inform the community. Informative notices, letters, or brochures prepared by ACCEAP, may be sent to the press, institutions, and key individuals in the community. In addition, the public can be informed via posters and other notices prepared on large pieces of paper utilizing marking pens. Such posters should be displayed in visible sites in municipalities, public and private buildings, and community-based organizations.

*Annex 3 includes a basic text that may be used for informative notices, letters, and brochures to be prepared by ACCEAP to involve the population in the process of information gathering.*

## **INFORMATION COLLECTING ACTIVITIES**

It is recommended that the collection of information for CEAP be carried out through a combined process by which:

- Visits are made to key public and private institutions
- A geographic area of interest is defined
- A series of small community meetings are promoted

The type of information to be collected should include general information about the community, the most visible pollution problems it faces, the impacts those problems have on health, ecosystems, and the economy. The information that should be gathered is based on the list of problems identified and those established in the Basic Community Profile.

## **ESTABLISHING A GEOGRAPHIC AREA**

A priority in collecting information is establishing the geographic area to be studied. This is of particular importance, since typically neighboring communities share similar pollution problems, and a close relationship can exist between these communities. For example, the quality of water of a river that is used as a source of drinking water by one community may be affected by the solid wastes and sewage discharged upriver by another community or communities. Air quality problems are not

usually confined to geographic boundaries. If the most severe problem in a community wishing to implement CEAP is caused by the behavior of neighboring communities, there are two options to be considered. Despite the cause of the problem being other communities, its effects can be considered solely as part of the community's problems. The second approach would implement CEAP in conjunction with the communities that are contributing to the problem.

## **VISITS TO PUBLIC AND PRIVATE INSTITUTIONS**

Members of ACCEAP, with the assistance of the community, must identify the public and private institutions that may serve as key sources of information. The following usually constitute important sources of information with regard to general community data and environmental pollution problems:

- The municipal government of the community and other neighboring municipalities
- Public and private institutions (agencies involved with the environment, public health, agriculture, commerce, water resources and the collection of statistics)
- Regional organizations and/or authorities
- National and foreign NGOs
- Community-based organizations
- Local or neighboring research centers
- Articles in newspapers, magazines, and specialized publications
- Libraries

- Key individuals with expertise and knowledge of the community's pollution problems

Efforts should be made not only to obtain publications and other types of material from institutions during the data collection process but also to interview key personnel of the institutions. Open-ended questions should be used to allow the person being interviewed to offer opinions in response to the questions.

### SMALL COMMUNITY MEETINGS

It is possible that small-group meetings, including community-based groups, churches, and community leaders can be organized, at which ACCEAP could conduct joint interviews. Such group interviews may be one to two hours long. The protocol includes:

- Objective of the meetings
- Presentations of the participants
- Brief explanation of CEAP
- Interview of the participants

The interview of the participants must be conducted in an informal manner and the information collected may be in the form of anecdotes.

*Annex 4 includes a sample questionnaire for use in community group meetings for information-collecting activities.*

### COMMUNITY SURVEY AND MAPPING

When available information is insufficient, ACCEAP might decide to undertake a community survey to solicit information regarding specific pollution problems or the impact of such problems on health, quality of life, and ecosystems. (See Module III)

In addition, preparation of a map may assist not only in determining areas where information should be sought but also as a visual aid to explain the results of the information process. (See Module III)

The community survey and the process of preparing a map can be of invaluable assistance in preparing the Basic Community Profile and, later, in setting priorities among environmental pollution problems (Module IV).

### PREPARING THE BASIC COMMUNITY PROFILE

Collected information will need to be organized and analyzed in drafting the Basic Community Profile. The Profile will form part of the materials to be discussed during the Second Community Workshop. (See Module IV)

*Annexes 5 and 6 include, respectively, the Basic Community Profile and a series of summary tables designed to facilitate the task of information gathering.*

ACCEAP should meet periodically during preparation of the Basic Community Profile. Information gathered must be processed during the ongoing information-collecting process, and once the process is under way, information may accumulate rapidly.

**TIME FRAME FOR INFORMATION-GATHERING ACTIVITIES**

ACTIVITY	DURATION No. Weeks
<p><b>Prepare a list of environmental problems</b>                      •Prepare the list that will be the basis for collection of information</p>	1
<p><b>First steps in collection of information</b>                      •Prepare a list of things to do                      •Identify possible sources for collection of information                      •Establish areas of responsibility among members of ACCEAP                      •Prepare a schedule of activities                      •Inform the public with respect to collection of information</p>	1
<p><b>Information gathering among groups</b>                      Make visits to key public and private institutions</p>	3
<p><b>Information gathering among community members</b>                      •Promote a series of community group meetings. This material will be introduced in the Second Community Workshop</p>	2
<p><b>Prepare a Basic Community Profile</b>                      •Hold periodic meetings to process the information that continues to be collected</p>	2
<p><b>Total Duration of this Module</b>  <b>5 Weeks</b>                      (Some activities overlap.)</p>	



Annexes ⇒



## **ANNEXES: MODULE II**

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The following annexes are designed to support the activities described in this Module. The section contains:

- Annex 1: Sample list of environmental pollution problems
- Annex 2: Sample schedule for collecting information
- Annex 3: Sample notes and letters to public and private institutions on collecting information
- Annex 4: Sample questionnaire for collecting information at community group meetings
- Annex 5: Basic Community Profile
- Annex 6: Summary tables

## SAMPLE LIST OF ENVIRONMENTAL POLLUTION PROBLEMS

*The first part of this document includes a list of the most common pollution problems and a description of such problems. This list of problems may be considered in the gathering of information and preparation of the Basic Community Profile. The final part of this document includes an expanded list. Both may serve as models for members of ACCEAP in the process of preparing a list of environmental pollution problems.*

<b>SHORT LIST OF ENVIRONMENTAL POLLUTION PROBLEMS</b>	
1.	Air pollution
2.	Lead contamination
3.	Contaminated water supply (in the distribution system)
4.	Sewage or wastewater
5.	Solid wastes
6.	Pesticides

### **1. Air Pollution (indoor and outdoor)**

Outdoor air pollution may be caused by vehicular emissions, industrial installations, electric power generation, and dust generated by construction, burning of solid wastes, and agricultural lands. In many developing countries, indoor air pollution is caused primarily by burning wood for home cooking and heating. Common air contaminants include particulates, sulfur oxides, nitrogen oxides, ozone, carbon monoxide, organic toxins, and heavy metals. Air pollution can impact human health, the economy, quality of life, and ecosystems. It can cause or exacerbate health problems, particularly respiratory problems. It can impose economic costs by damaging and soiling structures and clothing and by reducing tourism. It can impact the quality of life by reducing visibility and producing disagreeable odors. Air pollution may also damage or destroy ecosystems, particularly terrestrial ecosystems close to points of emission.

### **2. Lead Contamination**

Lead is a contaminant whose principal sources are industry, gasoline, leaded paints, the solder in food tins, and the use of lead pipes and lead solder in drinking water supply systems. Ingesting food or water contaminated with lead or inhaling airborne lead can cause mental retardation in children, mortality in infants, high blood pressure in adults, and acute neurotoxicity.

### 3. Contaminated Drinking Water (in the distribution system)

This problem area is primarily concerned with the contamination of water delivered by water distribution systems. Although contaminated drinking water is closely related to many other pollution problems, it is considered a separate problem because solutions can include treatment of the drinking water, public education, and switching to alternative sources, as well as controlling the pollution affecting the source of drinking water. In addition, the water treatment and distribution systems themselves can be sources of contamination, as is the case with disinfectant byproducts, cross-contamination with sewer systems, and leaching of metals from distribution pipes. Contaminated water is usually associated with the presence of pathogens, metals, organic toxins, pesticides, salinity, suspended solids, and disinfectant byproducts. The most obvious health problems associated with contaminated drinking water are waterborne diseases (gastrointestinal illnesses, parasites, dysentery, typhoid, cholera, etc.). Long-term problems, however, can be caused by the presence of some chemical contaminants. The cost of correcting problems or acquiring alternate sources of water supply can cause a severe drain on a country's economy. The economy can also be impacted if contaminated drinking water causes a reduction in tourism. Even if it does not directly affect health, the bad taste and odor of contaminated drinking water can have a negative effect on the quality of life.

### 4. Wastewater

This problem area includes wastewater from municipal and industrial sewers and treatment plants as well as on-site treatment systems such as septic tanks and pit latrines. Often, industrial and municipal wastewater is collected, treated, and discharged through a common system. Some industries, however, may pretreat wastewater before discharging it to municipal sewers, or they may have their own collection and treatment systems with independent discharges. Contaminants commonly associated with wastewater are increased biological oxygen demand (BOD), nutrients, pathogens, and suspended solids. Many toxic substances are often found in industrial sewage. Improper wastewater collection, treatment, and disposal can impact public health, the economy, quality of life, and aquatic ecosystems. Health impacts, including diarrhea, cholera, and typhoid, are most common when sewage pollutes sources of drinking water; however, wastewater can impact health via consumption of fish caught in polluted water or consumption of fruits and vegetables irrigated with contaminated water. Economic damages are often associated with the contamination of drinking water or surface water, particularly if the surface water is used for fishing or recreation. In terms of the quality of life, the most common negative effect of wastewater is its odor. Wastewater, when it contaminates surface water, may change or destroy aquatic ecosystems through sedimentation, the reduction of dissolved oxygen, eutrophication, and the introduction of toxic substances.

### 5. Solid Wastes

Solid waste problems include the collection, treatment, and disposal of hazardous and nonhazardous wastes generated by homes, businesses, industries, commercial establishments, and offices. Nonhazardous wastes include food, paper, plastic, metal, glass, the rubble from construction, and nontoxic wastes from industrial processes. Hazardous wastes, on the other hand, are toxic, corrosive, or explosive. The more dangerous wastes are often generated by industry; however, homes, commerce, offices, and health institutions may also produce significant quantities of

hazardous wastes. Solid wastes that are collected may be disposed of in formal or informal open dumps, burning pits, sanitary landfills, or incinerators. Solid wastes not collected may be burned on site or left to accumulate and decompose along streets, in vacant lots, in drainages, or in bodies of water (rivers, lakes, and the sea). Solid wastes can contaminate surface water through direct disposal and runoff, and they can contaminate groundwater via leaching. Solid wastes may also contaminate the air with gases released during decomposition and with smoke and associated pollutants from open burning. Pollutants associated with solid wastes include disease-carrying vectors, pathogens, particulate matter, BOD, methane gas, infectious wastes, and chemicals (industrial chemicals, pesticides, paints, cleaning agents, used chemical containers, etc.). Solid wastes may affect public health directly through contact with pathogens, toxic substances, or disease vectors, particularly if human scavenging is common. Solid wastes may also affect public health indirectly through contamination of water and air. Odors, trash piled in the streets, and litter scattered by the wind from disposal sites can affect quality of life, as can the reduction in visibility caused by open burning. Aquatic ecosystems may be damaged by solid wastes, if they pollute surface water. Solid wastes can cause a reduction of natural areas and impact terrestrial ecosystems, when green areas are chosen indiscriminately as disposal sites.

## 6. Pesticides

Pesticides include insecticides, herbicides, fungicides, rodenticides, etc. The environmental risks associated with pesticides originate primarily where they are applied, but damage may also occur when they are mixed, loaded, stored, transported, or discarded. Some of the more dangerous pesticides include methyl parathion, paraquat, phoxim, terbufos, and diazinon. Organochlorine pesticides (DDT, for example) can be a problem, even if they have been banned, because their residues persist for many years after use. Pesticides affect public health as well as ecosystems. Many pesticides represent a threat to human health, not only through direct contact during handling and use, but also through indirect exposure when food and water supplies are contaminated. Ecosystems are also impacted directly and indirectly. Direct impacts occur when pesticides are applied to nontarget species in the vicinity of use. Indirect impacts are associated with the accumulation of toxic components in ecosystems, causing bioaccumulation in the food chain, changes in ecosystem composition and structure, and development of resistance in targeted pests.

<b>EXPANDED LIST OF ENVIRONMENTAL POLLUTION PROBLEMS</b>	
1.	Air pollution (indoor)
2.	Air pollution (outdoor)
3.	Contamination of the drinking water
4.	Contamination of the surface waters
5.	Contamination of groundwater
6.	Contamination of soil
7.	Sewage
8.	Solid wastes
9.	Management of dangerous substances
10.	Pesticides
11.	Lead
12.	Chemical accidents
13.	Noise
14.	Production and processing of foods

## SAMPLE NOTES AND LETTERS TO PUBLIC AND PRIVATE INSTITUTIONS ON COLLECTING INFORMATION

The Advisory Committee to the Community Environmental Action Plan (ACCEAP), was approved at a meeting held \_\_\_\_\_. The principal goal of this activity is to determine the most severe pollution problems in our community and, in response to those problems, establish the most appropriate strategies and actions to improve the environmental conditions of the community. Attached is a copy of a letter from the municipality with regard to the membership of the Advisory Committee.

A series of community meetings will be held during this activity. Information will be collected from various institutions, public, private, and community-based. An information survey will also be conducted among different sectors of the community.

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Other options:

As part of this information collection, we request the contribution of your firm to \_\_\_\_\_.

As part of this information collection, we request that you attend a meeting at \_\_\_\_\_.

As part of this information collection, we request that you allow us to post information about the project in your facility located at \_\_\_\_\_.

To support this overall activity, we are requesting financial contributions to assist in carrying out activities related to the project.

To promote public awareness of the activity, we request that your communications media assist us in disseminating information related to the project.

On behalf of ACCEAP, we appreciate your support in this extremely worthwhile effort.

## SAMPLE QUESTIONNAIRE FOR COLLECTING INFORMATION AT COMMUNITY GROUP MEETINGS

- Discuss the history of environmental pollution problems in your community.
- Explain whether environmental pollution problems in your community are improving or getting worse.
- Explain if environmental pollution problems in your community have any relationship to health problems in the community. And if so, which ones?
- Discuss where the most obvious environmental pollution problems in your community may be seen or where the most serious problems are located.
- Explain if customs or habits in your community have changed as the result of environmental pollution.
- Explain if environmental pollution problems have had any economic impact on your community or on your own well-being.

*Note: Requesting information of the community through the use of this form is extremely important, particularly if CEAP decides not to undertake the community survey. It is helpful to utilize maps of the community during these meetings and to mark on the maps areas presenting the greatest environmental pollution problems or the population exposed to such risks. (See Annex 3).*

## BASIC COMMUNITY PROFILE

NAME OF THE COMMUNITY

NAME OF THE MUNICIPALITY OR DISTRICT

NAME OF THE STATE, PROVINCE, OR DEPARTMENT

NAME OF THE COUNTRY

1. **Brief history of the community.** Outline major historical events associated with environmental pollution. Describe any event that has taken place in the past or that is going to take place in the near future that may cause environmental pollution.
2. **General data.** Describe the following and indicate if they are a source of or affected by environmental contamination. (Add to the list if you believe something is missing.)
  - a) Location and boundaries (limits)
  - b) Geographical extension
  - c) Important topographical features (volcanoes, mountains, bluffs)
  - d) Important water resources (sources of potable water)
  - e) Urban areas, ecosystems, forest cover, flora and fauna, protected areas
3. **Population and social data.** Describe the following and indicate if they are a source of or affected by environmental contamination. (Add to the list if you believe something is missing.)
  - a) Urban and rural population
  - b) Spatial configuration (patterns of settlement: large urban nucleus/isolated villages)
  - c) Population by ethnic groups (if it is necessary to make such a distinction)
  - d) Population by gender and age (age pyramid)
  - e) Population growth, migration, and immigration
4. **Principal productive activities.** Describe the following and indicate if they are a source of or affected by environmental contamination. (Add to the list if you believe something is missing.)
  - a) Large, medium, and small industries
  - b) Informal (not registered) industries and manufacturing activities
  - c) Agricultural industries and agricultural activities
  - d) Services and commerce (transportation, electric power, banking, etc.)
  - e) Fishing
  - f) Mining
  - g) Others
5. **Health-related information.** Describe the following and indicate if they are a source of or affected by environmental contamination. (Add to the list if you believe something is missing.)

- a) Life expectancy
- b) Morbidity and mortality (infant and general population)
- c) Incidence of the following diseases:
  - Diarrhea
  - Gastrointestinal diseases
  - Parasite diseases
  - Vector diseases
  - Respiratory diseases
  - Cancer
  - Skin diseases
  - Poisoning by pesticides and other chemicals
  - Others

6. **Pollution problems.** The problems listed in this section are only examples. The problems to be included in the Basic Community Profile will depend upon those identified as the most severe pollution problems. Describe problems related to:

- a) **Pesticides.** Describe the use of pesticides in homes. Describe how pesticides are used in urban areas by public institutions. Indicate whether pesticide residues are found in foods. Estimate the number of workers and persons from surrounding areas affected by the misuse or excessive use of pesticides. Estimate the number of persons affected indirectly (contamination of food, fish in the rivers) by the excessive use or misuse of pesticides. Determine the incidence of pesticide poisoning by direct application, aerial fumigation, misuse of containers for the storage of water or foods, or the inappropriate disposal of pesticide wastes. Determine what areas of the community are most affected. List the diseases in the community which may be related to the misuse or excessive use of pesticides.
- b) **Drinking water (in the distribution system).** Describe how drinking water is supplied to the majority of homes in the community. Identify the number of persons and/or neighborhoods that have access to potable water from the distribution system, have access to a communal water supply, purchase water from a vendor, or have no access to potable water. Describe the quality of the source of water (including the possible pollution of surface water and groundwater). Describe the quality of water after treatment (if any), when it enters the distribution system. Determine what areas of the community are most affected by the lack of distribution of drinking water or deficiencies in the service. List possible illnesses in the community related to contaminated drinking water or deficiencies in the service.
- c) **Wastewater.** State the number of persons and/or neighborhoods that do and do not have access to a sewage service or to septic tanks. Determine the number of neighborhoods that have open sewers. Describe the most common methods for the treatment and disposal of wastewater. Describe any type of treatment of industrial wastewater. Describe where treatment units, if any, are located in relation to homes, watersheds, and groundwater. Describe any bad odor produced by inadequate sewage disposal. Identify and describe contamination of surface water and

groundwater originating from wastewater discharges outside of the community. Describe which lakes, rivers, seas, and aquifers are most affected. Determine what areas of the community are most affected by the lack of or deficient wastewater management. List possible illnesses in the community related to a lack of sewer service or deficiencies in wastewater management.

- d) **Solid wastes.** Indicate the number of persons and/or neighborhoods with and without access to solid waste collection services. Estimate the amount of solid waste generated in your community. Estimate the amount of solid waste that is not collected. Identify and describe existing sanitary landfills and open dumps. Describe common practices in disposing of uncollected wastes (in the streets, on vacant lots, in rivers, etc.). State whether there is a recycling program and describe the role of "trash entrepreneurs or scavengers." Describe whether surface water and groundwater are in danger of being contaminated as the result of runoff and leaching from inadequate solid wastes disposal. Determine what areas of the community are most affected by a lack of solid waste removal service or deficiencies in the service. List possible illnesses in the community related to the lack of or deficiencies in solid waste collection and disposal.
- e) **Air pollution.** Describe how air pollution affects the community. Determine the number of vehicles and type of gasoline being utilized in the community (leaded or unleaded). Describe the effects of vehicle emissions on air pollution. Identify where industries are located and their impact on air pollution. Explain any burning of fields and trash which affects air quality. Identify other substances (paints) used in the community which may be sources of air pollution. Indicate the number of households which cook or heat with wood. Describe the types of stoves most commonly used. Describe the frequency of use in building construction of asbestos and other materials which may omit dangerous particles or gases. Determine what areas of the community are most affected. List the possible illnesses related to air pollution in the community.

7. **Institutional framework.** Describe:

- a) Local government administration
- b) Public and private-sector institutions related to environmental pollution
- c) Community-based organizations (CBOs) and nongovernmental organizations (NGOs) that work on aspects of environmental pollution
- d) Projects, programs, initiatives, and incentives that have an impact on environmental pollution
- e) Laws and regulations related to environmental pollution
- f) Mechanisms for public participation
- g) Others

**8. Basic Community Profile annexes (to be assembled by the ACCEAP):**

- Maps of the country, department, or province and of the community
- Maps of high-risk areas, if they have been prepared
- List of contacts
- Bibliography

## SUMMARY TABLES

*These tables may be used as support material in preparing the Basic Community Profile and can help in presenting information collected in the community. The tables should be prepared to reflect the specific characteristics of each community based on information collected.*

NUMBER OF INHABITANTS			
Year	TOTAL	URBAN	RURAL
1950			
1960			
1970			
1990			
1995			
OTHER POPULATION INFORMATION			
DATA	TOTAL (%)	URBAN (%)	RURAL (%)
Annual growth			
Migration			
Immigration			
Population density			
HEALTH INFORMATION			
ITEM	COMMUNITY	URBAN	RURAL
Life expectancy			
Infant morbidity			
Infant mortality			

TYPE OF ECONOMIC ACTIVITY		
Information on fixed sources of pollution	No. of persons working	Population affected
Large industries		
Medium industries		
Small industries		
Informal industries		
Agricultural industries		
<b>Information on mobile sources of pollution</b>	<b>Totals</b>	
No. of cars, trucks, and other vehicles		
Percentage of car increase per year		
<b>Others</b>		
People cooking with wood fuel		
People affected by burning fields		
People affected by lead		
People affected by asbestos		
<b>Health-related information<sup>1</sup></b>		
People with respiratory illness		
People affected by toxicity		
People with lung cancer		
People with eye irritation		
People with skin irritation and diseases		
Others		

<sup>1</sup>If possible, correlate information with illnesses caused as a result of air pollution.

INFORMATION ON DRINKING WATER CONTAMINATION		
TYPE	URBAN	RURAL
Access to home water distribution system (%)		
Access to communal water supply (%)		
People who buy drinking water (%)		
Others		
<b>Health-related information<sup>2</sup></b>	<b>Totals</b>	
People with diarrhea		
People with cholera		
People with parasites		
People affected by toxicity		
People with dermatologic illnesses		
Others		

<sup>2</sup>If possible, correlate information with illnesses caused as a result of drinking water contamination.

INFORMATION ON WASTEWATER		
TYPE	URBAN	RURAL
Access to sewers (%)		
Septic tank (%)		
No septic tank (%)		
Open sewage drainage ditches (%)		
Sewage drains in streets (%)		
Others		
<b>Health-related information<sup>3</sup></b>	<b>Totals</b>	
People with diarrhea		
People with cholera		
People with parasites		
People affected by toxicity		
People with dermatologic illnesses		
Others		

<sup>3</sup>If possible, correlate information with illnesses caused as a result of water contamination.

INFORMATION ON SOLID WASTES		
TYPE	URBAN	RURAL
Frequent trash collection (%)		
No trash collection service (%)		
Treated dumps (how many?)		
Informal dumps (how many?)		
Recycling program (answer yes or no)		
Number of scavengers		
Others		
<b>Health-related information<sup>4</sup></b>	<b>Totals</b>	
People with diarrhea		
People with cholera		
People with typhoid		
People with respiratory illnesses		
People with vector diseases		
Others		

<sup>4</sup>If possible, correlate information with illnesses caused as a result of solid waste contamination.

INFORMATION ON PESTICIDE CONTAMINATION		
TYPE	URBAN	RURAL
No. of affected workers		
No of people affected		
USE <sup>5</sup>	YES	NO
Parathion		
Foxim		
Terfubos		
Diazinon		
DDT		
Health-related information <sup>6</sup>	Totals	
People who have been poisoned		
People with cancer		
People with reproduction problems		
People with dermatologic illnesses		
Others (vomiting, headaches, eye irritation, fainting)		

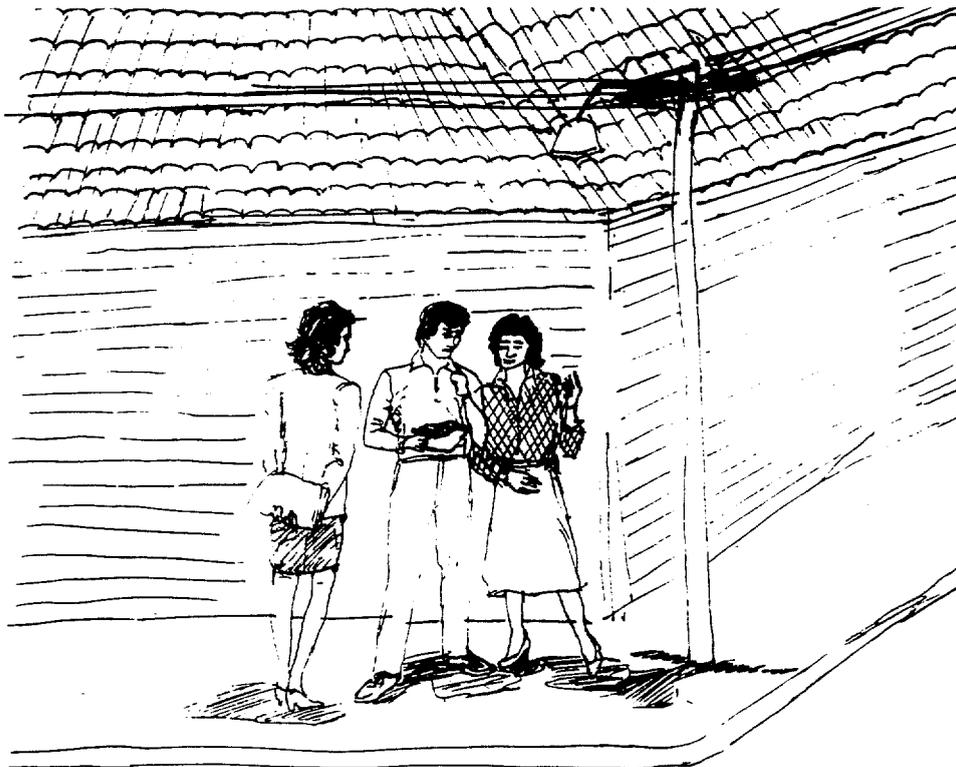
<sup>5</sup>Please indicate yes or no.

<sup>6</sup>If possible, correlate information with illnesses caused as a result of pesticide contamination.

## OBJECTIVES AND CONTENTS

The objective of this Module is to conduct a community survey and prepare maps depicting high-risk areas for pollution problems in the community. Module III, which is designed to be implemented in close coordination with Module II, contains:

- Objectives of the survey
- Configuration of the survey
- Information for risk analysis
- Mapping pollution problems
- Information on risk management: where we are and where we are going
- Preparing the survey
- Survey results
- Time frame for community survey and mapping activities
- Annexes



## GENERAL INSTRUCTIONS

**OBJECTIVES OF THE SURVEY**

The community survey has the following objectives:

- To allow the gathering of information on subjects about which the community has limited scientific or written information. This information will encompass environmental pollution problems that the community perceives as being of high risk.
- To allow the soliciting of public opinion from special groups (ethnic, low-income) or individuals who live in isolated villages and whose opinions have not been incorporated into the process of preparing the CEAP project. Such categories include those groups that are greatly affected by pollution problems.
- To allow the soliciting of information from public and private organizations, key members of the community, and community groups that have not been incorporated into the CEAP process. This category includes members of the community who have expertise and are highly qualified in matters of pollution.
- To allow the inclusion of key elements related to risk management.

*Annexes 1 and 2 include information pertinent to preparing and conducting a community survey.*

**CONFIGURATION OF THE SURVEY**

The survey included in this module comprises components to be considered during CEAP phases related to risk analysis and management. These two stages are essential to the process of implementing CEAP and can be summarized as follows:

- During the analysis phase, environmental pollution problems are compared with each other to determine which cause greater risk to human health, ecosystems, and quality of life. During this stage, attention centers on the more serious problems, which are then ranked in order of severity.
- During the risk management phase, the most appropriate strategies and those which have the greatest possibility of being carried out are identified. These strategies are compared with each other to determine which can reduce risks most effectively. During this phase, attention is centered on those initiatives that are most cost effective and, in terms of the economic, technical, institutional, legal, and political aspects of the communities where they are being considered, have the greatest possibility of actually being carried out.

*The community survey is composed of two parts: analysis and risk management. The CEAP offers responses to two basic questions: What are the most serious pollution problems being faced by the community? What can be done about those problems? The two questions are closely interrelated and form the basis of the community survey.*

### INFORMATION FOR RISK ANALYSIS

The first part of the survey is designed to collect information on the most severe pollution problems, information that is essential to the following phases of CEAP. Considering the following requirements is among the first stages of survey preparation:

- Determining what problems require urgent information
- Determining what parts of the community are most affected by such problems
- Determining what populations must be sampled

This stage must be developed in conjunction with the corresponding mapping stage included in this Module.

### MAPPING POLLUTION PROBLEMS

If considered necessary, the ACCEAP will prepare maps depicting locations of high-risk areas. Mapping, or the insertion of basic information on existing community maps, constitutes an important stage in the process of determining which risks affect the community most critically. Mapping can serve as a tool in the data collection process by facilitating the definition of high-risk pollution areas. Mapping also serves as an essential visual aid when conducting CEAP workshops by

showing workshop participants which areas and populations are exposed to the highest risks.

*Annex 3 includes sample maps displaying high-risk areas for wastewater and solid wastes. These maps are accompanied by instructions.*

### INFORMATION ON RISK MANAGEMENT: WHERE WE ARE AND WHERE WE ARE GOING

The community survey considers *where we are and where we are going* and attempts to respond to the following questions:

- Where are we today as a community?
- Which of the pollution problems we face are the most severe?
- Where are we going, if something is not done to change the present situation?
- What must be done to improve future conditions?
- What is the ideal vision for the future community in terms of a pollution free environment?
- How can the community implement changes?
- What resources does the community have to effect such changes?
- How can local public and private institutions support the ideal vision of the community?

**PREPARING THE SURVEY**

A survey should be prepared in response to the risk analysis and risk management phases of CEAP. The action plan should determine how such a survey can be carried out and what community resources can be used to conduct it. To prepare the survey, ACCEAP will need to first prepare a small action plan with the following elements:

- Groups and members of the community who will serve as the target of the survey
- Organizations, civic groups, academic groups, and scholars who will be able to assist in conducting the survey
- Organizations, civic groups, academic groups, and scholars who will be able to assist in analysis of survey results

*It is suggested that the sample survey number be limited to 300 to 500 respondents.*

*Annex 1 of this module includes a model questionnaire form for carrying out the community survey.*

**SURVEY RESULTS**

Risk analysis of the survey needs to be incorporated with results obtained during data collection and should be discussed during the Second Community Workshop.

Survey results related to risk management should be discussed during the Third Community Workshop. (See Module V.)

**TIME FRAME FOR COMMUNITY SURVEY AND MAPPING ACTIVITIES**

ACTIVITY	DURATION No. Weeks
<b>Preparing an action plan for carrying out the survey</b> •Determine what groups the survey targets and who can cooperate in carrying it out •Determine how the analysis of the results will be carried out •Making on-site visits •Preparing the maps	1
Conducting the survey and preparing the community mapping process	3
Analyzing survey results and incorporating them into the CEAP process	3
<b>Total Duration of this Module</b> <b>5 Weeks</b> (Some activities overlap.)	





## **ANNEXES: MODULE III**

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The following annexes are designed to support the activities described in Module III. This section contains:

- Annex 1: Sample form for the community survey
- Annex 2: Sample process for conducting a survey
- Annex 3: Sample community map depicting high-risk areas. This annex is accompanied by instructions.

# SAMPLE FORM FOR COMMUNITY SURVEY<sup>1</sup>

## 1. INFORMATION FOR RISK EVALUATION

### ENVIRONMENTAL PROBLEMS INFORMATION<sup>2</sup>

**A. How many people are in your family?**

2 ( )      3 ( )      4 ( )      5 ( )      6 ( )      7 ( )

**B. Is your home connected to a sewer system?**

Yes ( )      No ( )

**C. Where does your sewer drain?**

River ( )      Ditch ( )      Other ( )

**D. How much trash does your home produce per day?**

4 Pounds ( )      6 Pounds ( )      8 Pounds ( )

**E. What sort of trash is produced most in your home?**

Glass ( )      Metal ( )      Plastic ( )      Organic ( )

**F. How do you dispose of your trash?**

River ( )      Burn it ( )      Bury it ( )      Open Trash Dump ( )      Paid Trash Service ( )

<sup>1</sup>The first part of this survey, information for risk evaluation, can be carried out independently from the second part of the survey, risk management information. The ACCEAP, using already collected information, can determine: a) that only the first part of this survey will be carried out; b) that only the second part of this survey will be carried out; or c) that both parts will be carried out.

<sup>2</sup>In the initial part of this survey, questions are included that refer only to wastewater and solid wastes. If information in other areas merits attention, those areas can be developed in a similar manner.

1. INFORMATION FOR RISK EVALUATION, continued

1. Do you believe that the community is threatened by pollution problems?

- Yes No I am not sure

2. If your response to the above question is positive, which three of the problems listed below do you believe to be the most severe?

- a. Air pollution
b. Lead contamination
c. Contamination of the drinking water (in the distribution system)
d. Sewage system
e. Solid wastes
f. Pesticides
g. Other sources of water contamination
h. Other(s):

3. Rank the three problems you have chosen and check which risk you believe to be the most severe for your community

Problem 1: Problem 2: Problem 3:

- Risk to health Risk of decreased quality of life Risk of contaminated natural resources

4. For the three most severe problems (those you marked with "1," "2," and "3"), please explain why you consider them the most critical.

a.
b.
c.

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1. INFORMATION FOR RISK EVALUATION, continued

5. Of the problems mentioned as the most severe, indicate whether they are improving or deteriorating.

- Problem 1 [ ] Improving [ ] Getting worse [ ] Not sure
Problem 2 [ ] Improving [ ] Getting worse [ ] Not sure
Problem 3 [ ] Improving [ ] Getting worse [ ] Not sure

6. What place or places in your community is/are most affected by the pollution problems you have identified?

Four horizontal lines for handwritten answers.

7. Which factors, of those indicated below, contribute the most to causing environmental pollution problems?

- Problem 1, Problem 2, Problem 3 columns with factors a-i: Community dwellers, Markets, Industries and tanneries, Agriculture, Mining, Fishery industries, Upriver dwellers, Downriver dwellers, Others.

8. Have you been directly affected by environmental pollution problems?

- [ ] Yes [ ] No [ ] I am not sure

9. How are you affected by these problems? Specify in relation to your health or that of your family, the environment around you, your family income, habits and customs, and/or your sense of community.

Four horizontal lines for handwritten answers.

Handwritten number 75

**2. INFORMATION FOR RISK MANAGEMENT**

10. Do you think some of the problems identified could be improved? Say how.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

11. From the factors listed below, tell which you think could best solve your community's pollution problems.

- a.  Using better technology (use of improved septic tanks and low-cost sewage treatment solutions)
- b.  Having the municipal government and other influential sectors participate in the solution of the problems
- c.  Creating new and better laws and having them more strictly enforced
- d.  Educating residents not to create unnecessary pollution
- e.  Improving services (trash collection, provision of a sewage system, etc.)
- f.  Requiring business and industry to participate in the solution of the problems
- g.  Others \_\_\_\_\_

12. If the problems you chose as most severe could be solved, describe how you would visualize or want your community to be in the next ten years. Say what type of services you would want available in your community.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

13. Check which you think is most important to your community

- Improving public health
- Improving the local economy
- Improving the quality of life (recreation, etc.)
- Reducing contamination of natural resources
- Improving public understanding of pollution problems
- I am not sure

14. Would you like to participate more actively in solving pollution problems in your community?

- Yes                       No                       I am not sure

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**2. INFORMATION FOR RISK MANAGEMENT, continued**

15. If you choose not to participate more actively in solving pollution problems in your community, say why.

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16. If you would like to participate more actively, say how.

- Participate in environmental education programs
- Participate as a volunteer
- Others \_\_\_\_\_

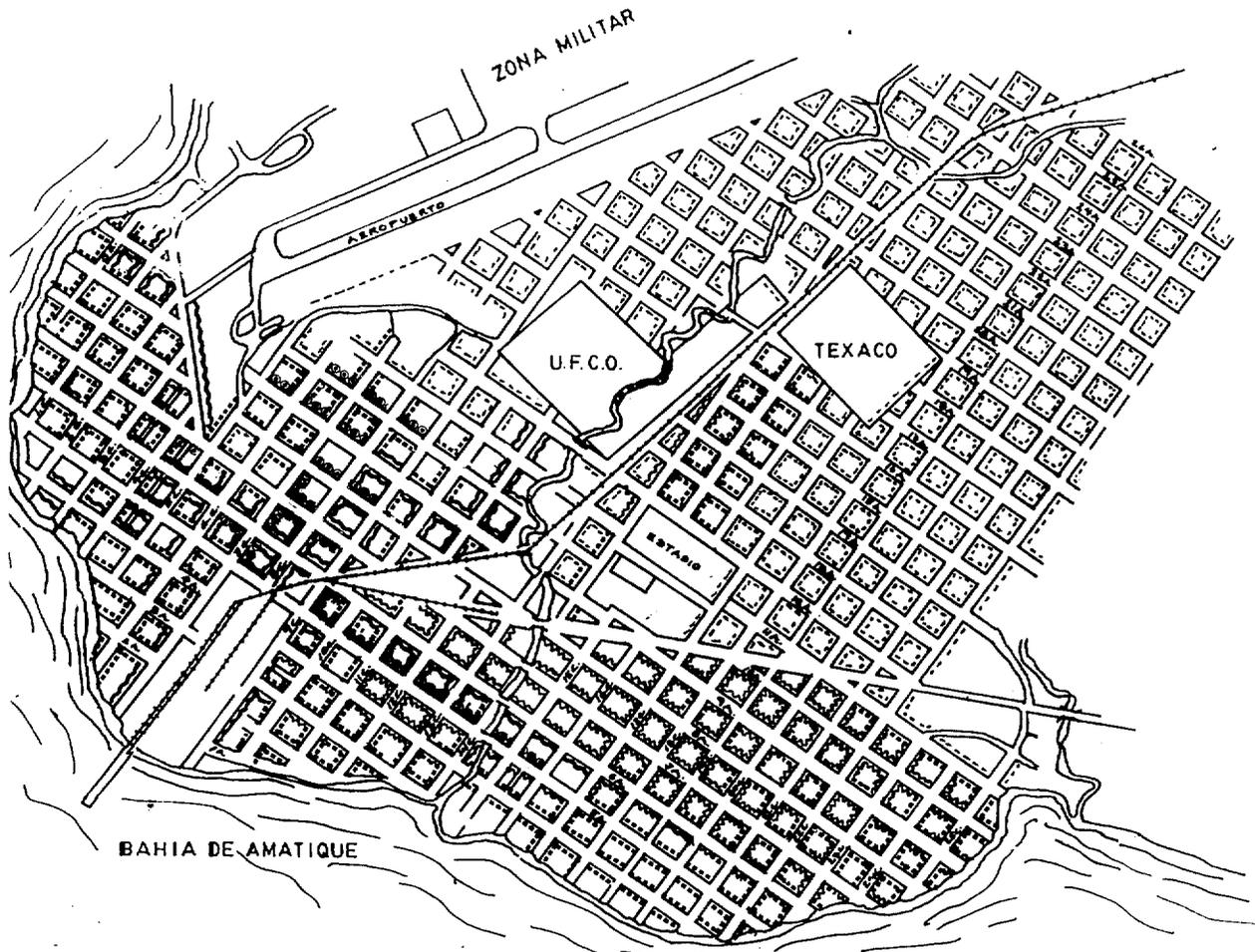
## EXAMPLE OF A PROCESS FOR CONDUCTING A SURVEY

### THE PROCESS CARRIED OUT IN CONDUCTING A SURVEY IN PUERTO BARRIOS, IZABAL, GUATEMALA

*The ACCEAP in Puerto Barrios faced the necessity of collecting information related to risks to human health, ecosystems, and the quality of life caused by contamination from wastewater and solid wastes and, because of the limited information available on the two subjects, decided to conduct a community survey. That survey was carried out with the support of high school seniors from the Domingo Juarros School of Business Science, the Miguel Angel Asturias College of Computer Science, and the Justo Rufino Barrios high school. In conjunction with the community survey, ACCEAP developed a series of maps depicting high-risk areas, particularly in relation to wastewater and solid wastes.*

*The Advisory Committee sought information from a sample of 559 completed surveys. That sample represents almost 0.84% of the total population of the municipality, which had a total of 66,689 inhabitants according to 1995 data. The survey sample was random in geographic areas identified as high risk during the mapping phase. Included were 339 residents from both sides of the Escondido River in Puerto Barrios, a highly polluted river which divides the city. Another 20 persons interviewed lived in the El Rastro and Estrecho neighborhoods, an area of the city with no adequate collection of solid waste and no sewage system. Finally, another 200 inhabitants were interviewed in the neighborhoods of El Pueblito and Quebrada Seca and the BANVI and San Agustín subdivisions in the village of Santo Tomás de Castilla. ACCEAP tabulated the surveys, analyzed the data, and recorded the information in the Basic Community Profile.*

# SAMPLE COMMUNITY MAP SHOWING HIGH RISK AREAS<sup>3</sup>



### High-Risk Wastewater Zones

Symbols:

- ..... Ditch
- ~~~~~ Open drainage
- ~~~~~ Sewer pipes

<sup>3</sup>Map of Puerto Barrios, Izabal, Guatemala, prepared by the community ACCEAP in June 1996.

## INSTRUCTIONS FOR PRODUCING COMMUNITY MAPS

*Mapping can be used as a tool to estimate the extent of the population exposed to a particular risk. Mapping may serve as an aid in the information collection process and as a resource for CEAP workshops, allowing the graphic depiction of populated areas at high risk to be displayed to workshop participants.*

**In preparing maps, the following steps may be helpful:**

Try to use maps of the community produced by a public or private institution or by individual cartographers contracted by ACCEAP in conjunction with information gathered by the Advisory Committee. The procedure is to locate the areas which represent greater risks in terms of the impact on human health, quality of life, and ecosystems. For this purpose, maps need to be prepared at an appropriate scale to display the collected information. Areas of risk need to be shown on the map using clear nomenclature or symbols for each problem. Before constructing the map, make on-site visits or observations in the community. It is advisable to include high-risk areas when planning the community survey, and it is important to consider the number of inhabitants and the severity of the problem identified in each risk area when choosing which zones are to be mapped.

One map should be prepared for each pollution problem, but various problems can be combined on a single risk map, so long as the presentation is clear.

### **Air Pollution**

Locate on the map the major traffic arteries and areas of greatest motor vehicle congestion. These areas will be the greatest sources of air pollution from vehicles. Industries, agroindustries, and businesses that have air emissions must be mapped, as well as areas where trash, fields, or brushwood are burned. This data, combined with information on population concentrations, can be used to indicate the areas of greatest risk.

### **Drinking Water (in the distribution system)**

For drinking water, lists of users of the service (public or private) or maps of the water distribution system, if available, should be used to locate service areas. Also identify the rivers, lakes, springs, or aquifers that are sources of drinking water. ACCEAP should collect information on the quality of the water at the source. Chlorination and treatment plants, if any, must be located and their effectiveness verified. The condition of the distribution pipes should be assessed to identify possible areas where infiltration into the system may contaminate drinking water. The mapping of drinking water services must indicate community residents who have access to potable water and show the points where the quality of the water is altered, either at the source or in the distribution network.

### **Wastewater**

In the case of wastewater, a sewer system map, if there is one, should be used. The map should be compared with a map of the community to identify areas which do not have access to the system.

When there is no sewer system map available, ACCEAP should contact municipal authorities or the company that provides sewer services to provide an approximate map of the system. Field observation can identify areas where wastewater surfaces. These areas will pose serious risks to health and quality of life via direct contact, contamination of drinking water and food, proliferation of disease vectors, and bad odors. It is important to identify rivers, lakes, lagoons, and other bodies of water that are the recipients of untreated wastewater, as they can constitute risk areas as well.

### **Solid Wastes**

Neighborhoods and homes that have trash collection services, whether provided by private companies or the municipality, should be located on the community map. Field observations can be used to locate clandestine or illegal dump sites on the map, as well as areas authorized by the municipality for the disposal of wastes. Depicting the neighborhoods or homes which have no collection services and the locations of formal and informal disposal sites will make it possible to identify those areas of the community which may have greater health problems associated with solid wastes or quality-of-life problems arising from bad odors, open-air trash burning, and water contamination.

### **Pesticides**

Locate on the map any facilities in the community where pesticides are formulated, packaged, and stored, as well as any centers for pesticide distribution and sale, transportation routes, principal areas of use (agroindustrial, agriculture, livestock, or domestic use), and manners of use (surface or aerial applications). Disposal sites for pesticide packaging and waste materials and areas where mixing and application equipment is washed should be located on the map. A cultivated area or a packaging plant close to inhabited areas will be of greater risk than those distant from residential areas. A plant which contaminates a river that serves as a source of potable water, even far from any inhabitants, constitutes an element of high risk to the community.

## OBJECTIVES AND CONTENTS

The objective of this Module is to introduce the CEAP process for ranking environmental pollution problems and to establish the means for making this process participatory. The process should include multisectorial representatives from all economic and social segments of the community. Review and validation of the ranking process will be carried out during the Second Community Workshop. Module IV contains:

- Key elements of the ranking process
- Comparative assessment of environmental pollution problems
- Effects on human health
- Reduction in the quality of life
- Effects on the ecosystem
- ACCEAP and the ranking process
- Conducting the ranking process
- Preparing the Second Community Workshop
- Key elements of a successful workshop
- Participants in the Second Community Workshop
- Time frame for priority-setting activities
- Annexes



## GENERAL INSTRUCTIONS

**KEY ELEMENTS OF THE RANKING PROCESS**

A community may be affected by an endless number of environmental problems. The seriousness of this situation is exacerbated in the case where only limited funds exist to resolve all the problems affecting the community. In such cases, CEAP can become a valuable tool. Based on CRA principles, it allows identity and ranking of problems that most seriously affect the community in terms of impacts on human health, quality of life, and ecosystems.

*Establishing priorities among pollution problems is no more than selecting an order of severity among them to determine which are considered the most important and therefore merit priority action. The selection of only two or three problems as priorities does not imply that other problems do not exist or that they are not important. It simply means that the problems selected are those that most urgently require solution and offer optimal opportunity.*

**COMPARATIVE ASSESSMENT OF ENVIRONMENTAL POLLUTION PROBLEMS**

Environmental pollution problems can be ranked on the basis of relative risks, the most serious being those that cause the most severe risks.

*The term "risk" is used in this manual to include all the actual and potential damages that may be caused by a pollution problem.*

The different damages caused by pollution may be interrelated. For example, illnesses produced by contamination not only are injurious to human health but reduce the quality of life as well, by imposing preventative and remedial treatment costs and loss of economic productivity. In a similar manner, some pollution problems may have negative effects on aquatic ecosystems and also cause economic losses from less tourism, as well as from degraded fishing. Utilizing CEAP methodology, these three types of damages are evaluated independently. The focus of CEAP is to judge risks that may be presented by pollution problems in relation to a series of pre-established criteria that allow the assignment of numerical points, which attempt to reflect the magnitude of such risks.

**EFFECTS ON HUMAN HEALTH**

This category includes diseases and injuries caused by exposure to environmental contaminants. Some of the health effects that may be caused by pollution are cancer, gastrointestinal diseases, birth and development defects and harmful effects on such organs as the liver, kidneys, and lungs. These effects may range from slight and temporary to chronic, disabling, and even fatal.

## REDUCTION IN THE QUALITY OF LIFE

Pollution can cause a series of broader effects on the well-being of individuals and society in general. Such effects can be economic in nature and may be measurable. The reduction of the fishing catch in polluted areas, the cost of treatment of polluted waters, or the reduction in productivity of the local economy when a segment of the work force happens to be affected by diseases associated with pollution can be quantifiably measured. Other effects, on the quality of life, may be intangible and unmeasurable, bad odors and the effect of a reduction in visibility attributable to air pollution are difficult to quantify.

## EFFECTS ON THE ECOSYSTEM

Effects on the ecosystem include the death of individual organisms, disturbance of the processes which regulate the interactions between species (reproduction and predatory relationships), and the alteration of factors which control key activities within the ecosystem (the food chain and the climate). The severity of damages may be measured by changes which occur in the structure and function of the system as a whole.

## ACCEAP AND THE RANKING PROCESS

The ranking of environmental pollution problems may be carried out by ACCEAP in two or three meetings of its members.

It is important to emphasize that during the initial stages of the project, members of ACCEAP should receive training on how to

*It is important for members of ACCEAP to have completed the Basic Community Profile, described in Module II of this Manual, before undertaking the ranking process.*

*Criteria set forth as part of a matrix format designed for the ranking of pollution problems do not constitute a coercive element. If one or more problems receive a low score during the process of establishing priorities, that score may be a subject for discussion during the Second Community Workshop. In spite of having received a low ranking, a problem may be considered to be the most important by the community, and vice versa.*

rank environmental problems. Such training will make it possible for ACCEAP members to implement the ranking process with the highest chance of success.

*Annex 1 includes a series of procedures and formats for use in the ranking process. Annex 2 includes a matrix form for use in assigning points during that process. Annex 3 includes a model matrix form that may be used to compare the results obtained from the ranking process by ACCEAP and by workshop participants; and Annex 4 includes a matrix form that may be used to consolidate the results of this process.*

The ranking process, after being conducted by the members of ACCEAP on the basis of data collected during preparation of the Basic Community Profile, must be fully discussed with members of the community for modification or validation during the Second Community Workshop.

## CONDUCTING THE RANKING PROCESS

The following steps must be carried out during the ranking process:

- The material prepared for conducting the ranking process must be fully

explained during the ACCEAP training session in the early stages of CEAP.

- All the members of ACCEAP who participate in the ranking process must have copies of *Annexes 1, 2, 3, and 4 of this Module*.
- The members of ACCEAP must elect a moderator to conduct the ranking session meetings.
- At the beginning of the meeting, the moderator will introduce the ranking process and the materials to be used. In spite of the ACCEAP members having received prior training, it is appropriate at this point to review the ranking process with them.
- Comparative risk analysis should be conducted problem by problem, analyzing one problem at a time. The formula provided for the purpose in *Annex 1 of this Module* must be utilized on each matrix form.
- The moderator will conduct discussions seeking to attain consensus on each of the criteria enumerated on the matrix form (health, quality of life, ecological, tendency to grow).
- After the first problem is analyzed, the second will be addressed, until all the problems identified have been assigned a priority or ranking. The total number of points for each problem must be summed on the matrix prepared for this purpose.
- After the risk analysis has been carried out for all the problems, a matrix form must be prepared which consolidates the results of the priority-setting session in accordance with *Annex 3 of this Module*.

## PREPARING THE SECOND COMMUNITY WORKSHOP

The process of ranking the identified problems and the modification and/or validation of those priorities by the community are among the most critical tasks of CEAP. During the preparation and implementation of the Second Community Workshop, the following procedure should be followed:

- The members of ACCEAP will select a facilitator, who may be a member of the Committee. The facilitator needs to be quite familiar with the ranking process and with the contents of the Basic Community Profile.
- The facilitator must briefly explain:
  - The list of environmental pollution problems (*see Annex 1 in Module II*)<sup>1</sup>
  - The Basic Community Profile (*see Annex 5 in Module II*)
  - The ranking process (*see Annex 1 in Module IV*)
  - Conclusions reached by ACCEAP in relation to that process.

If available, community maps prepared by ACCEAP should be displayed.

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<sup>1</sup>To the extent possible, the introduction of the Basic Community Profile and list of pollution problems should be informative in nature. An extensive debate on the material should not be encouraged, since the Profile is meant to be perceived as a tool in support of the classification of problems.

- Although the facilitator conducts discussions, ACCEAP subject experts should participate in the introduction of subjects in which they have expertise.
- The materials to be utilized in the workshop (*Annexes 1, 2, 3 and 4*) must be provided to each participant. Key materials should also be copied on poster boards to make them visible to all the participants.
- The facilitator must explain the ranking process and the manner in which priorities are set.
- Participants in the plenary session will then conduct a practice ranking exercise.
- After the exercise is concluded, the plenary session will be divided into working groups. ACCEAP members will be distributed equally among the groups to lead and facilitate the priority-setting process. The workshop facilitator should try to assign to each group persons knowledgeable of the subject under discussion. For example, if three representatives from the health sector attend, it is a good idea to distribute them among the groups.
- Each group must select a moderator to undertake the ranking of the problems. The moderator must relate the problems included in the Basic Community Profile with the criteria established for setting priorities.
- The moderator must formulate a series of questions related to the risks described in the Basic Community Profile and relate them to the ranking criteria. For example, the moderator must ask questions that relate critical risks caused by open dumps with data about the quantity and type of solid waste, indicators of morbidity and mortality, and severity of the impact on human health. For these purposes, he/she must use *Annexes 1 and 2 of this Module*.
- The moderator of each working group must promote discussion among the participants to establish consensus on the ranking of each of the problems under discussion. An average of 30 to 45 minutes should be anticipated for the discussion of each problem before the assignment of points.
- When each group has finished ranking all the problems, the plenary session of the workshop will be convened and each group will present its results.
- Results attained in the ranking by ACCEAP and by the workshop groups should be displayed on the matrix form in *Annex 3 of this Module*. It would be appropriate to have prepared, ahead of time, a similar matrix form on easel paper so that posting the results can be observed by all participants in the workshop.
- If the results of the working groups do not coincide, the workshop facilitator should conduct discussion of each problem for a short period of time (ten minutes) leading towards consensus. This discussion should include the pros and cons for which the problems were classified in the manner indicated on the easel sheets. The facilitator should concentrate the discussion on those points that differ and allow the groups in disagreement to explain the judgments, reasoning, and arguments which led them to assign the points.

The moderator must pose such questions as *What is your opinion based on? What is the basis of the points you gave?*

- If the results of the working groups and the members of ACCEAP do not coincide, the workshop facilitator should include that discrepancy in the foregoing discussion.
- If at the end of an hour, with approximately ten minutes given to each question, no consensus has been reached, the workshop facilitator may suggest a vote as a means of reaching consensus. The vote must include participants and ACCEAP members.
- After consensus has been reached, the facilitator must post the results on the matrix form included in *Annex 4 of this Module*. The final list of ranked problems can be presented on easel paper in the manner shown in *Annex 4 of this Module*.

*In addition to Annexes 1, 2, 3, and 4 in this Module, Annexes 1F, 1G, and 2 of Module 1 of this Manual can also be used in conducting the Second Community Workshop.*

## KEY ELEMENTS OF A SUCCESSFUL WORKSHOP

The following elements should assist in preparing and conducting the Second Community Workshop:

- Knowledge of the subject. ACCEAP members and the facilitator should be capable of communicating to the public the general principles of the ranking process of pollution problems

and the contents of the Basic Community Profile.

- Transparency. All the participants must have a clear realization of the objective of the ranking process and understand the general principles of the assessment system used.
- Clarity. To avoid confusion, the agreements, consensus, and disputes that take place during the workshop must be written on large sheets of paper that can be seen by all participants.
- Documentation. Detailed minutes must be taken of the more important discussions during the workshop. Such notes must explain precisely what happened during the process of modification and/or validation of the ranking. These minutes must include all points of agreement and disagreement as well as all data, criteria, values, and questions that were a part of workshop discussions. **(The taking of minutes is recommended for all CEAP workshops.)**
- Impartiality. The assessment process must be inclusive and must offer the opportunity of accepting new proposals from any participants at the workshop. It must leave the majority of participants enthusiastic about the results.

## PARTICIPANTS IN THE SECOND COMMUNITY WORKSHOP

The Second Community Workshop must be designed to bring together representatives from the largest number of economic and social sectors for the purpose of discussing in an open forum the conclusions reached by ACCEAP. The members of ACCEAP must

invite persons from the largest possible number of economic and social sectors of the community to this workshop. Representatives of the public and private sectors, members of nongovernmental organizations and religious entities, academics, professors, researchers, and members of the community who have an interest and/or experience in the subject of environmental pollution should be encouraged to participate.

*To provide continuity in terms of participants at the different CEAP workshops, it is essential for the ACCEAP to issue invitations to those who participated at earlier workshops, as well as to other persons.*

**TIME FRAME FOR ACTIVITIES  
RELATED TO PRIORITY-SETTING**

ACTIVITY	DURATION No. Weeks
<p><b>Setting priorities among environmental pollution problems</b> Preparing the ranking process for environmental pollution problems based on the information collected and the list of problems.</p>	1
<p><b>Second Community Workshop</b></p> <ul style="list-style-type: none"> <li>• Send letters of invitation to the workshop, including the agenda</li> <li>• Prepare for the Second Community Workshop</li> <li>• Convene the workshop</li> <li>• Undertake ranking</li> </ul>	2
<p><b>Total Duration of the Module: 3 Weeks</b></p>	



Annexes ⇒



## **ANNEXES: MODULE IV**

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The following annexes are designed to support the activities described in Module IV. This section contains:

- Annex 1: CEAP Process for Ranking Environmental Pollution Problems
- Annex 2: Matrix Form for Assigning Points in the Ranking Process
- Annex 3: Matrix Form for Comparing Results
- Annex 4: Matrix Form for Consolidating Results of the Ranking Process
- Annex 5: Sample Letter of Invitation to the Second Community Workshop
- Annex 6: Sample Agenda for the Second Community Workshop

## CEAP PROCESS FOR RANKING ENVIRONMENTAL POLLUTION PROBLEMS

*ACCEAP may utilize the following criteria to conduct the ranking process for establishing priorities among the identified problems of environmental pollution. The objective of ranking the environmental pollution problems is to judge and compare the severity of the risks caused by environmental pollution in terms of impacts on public health, quality of life, and ecosystems. For the ranking of environmental problems, a relative scoring system was prepared. Individual scores for the intensity and scope of each problem were assigned for impacts to human health, quality of life, and ecosystems as well as a score for the trend of the problem.*

### Point Scale

Each pollution problem should be evaluated with respect to each of the criteria and assessed points as set forth in this Annex. The assigned points should reflect the degree to which each of the problems correlates to the predetermined criteria. For CEAP, a problem with a higher assigned point value is considered a greater risk than a problem assessed a lower point value.

After the problems have been evaluated with respect to the criteria, the points will be summed to produce a total value for each problem. It is assumed that the three damaging effects of pollution (on health, the quality of life, and ecosystems) are equally important. For effects related to the quality of life, however, it is possible to reach a very high point value (see the criteria). The value assigned must therefore be weighted to reduce the quality-of-life impact on the points.

CEAP point values have been limited in the following manner:

- a) Effects on health (6 points maximum possible)
- b) Quality of life (12 points maximum possible)
- c) Ecological effects (5 points maximum possible)
- d) Behavior (1 point maximum possible)

For the evaluation, the points should be combined, utilizing the following formula:

$\text{Total points for a pollution problem} = \text{Health points} + \frac{1}{2}(\text{Quality of life points}) + \text{Ecosystem points} + \text{Trend points}$
---

### Evaluation of the Behavior or Trend of the Problems

Problems are compared in the CEAP ranking process on the basis of the extension of risk caused by the effect or level of each problem at the present time. It is considered important, however, to include a judgment with regard to how severe the problem is becoming, i.e., whether the problem has a tendency to improve with time or to deteriorate. For that reason, criteria of problem behavior or trend has been included.

## Registration of the Points

A table similar to that shown in Annex 2 of this Module should be used for each of the considered problems.

<b>CRITERIA FOR RANKING ENVIRONMENTAL POLLUTION PROBLEMS</b>	
<b>Criteria</b>	<ul style="list-style-type: none"> <li>■ For the assessment of risks to human health:               <ul style="list-style-type: none"> <li>Number of persons affected</li> <li>Severity of impact on persons affected</li> </ul> </li>   <li>■ For the assessment of risks with regard to the quality of life:               <ul style="list-style-type: none"> <li>Loss that affects economic activities as a result of damage to natural resources</li> <li>Loss of recreation and tourism activities</li> <li>Expenditures for prevention/remediation<sup>2</sup></li> <li>Expenditures related to aspects of health<sup>3</sup></li> <li>Decision on whether a solution to the problem is a necessity or simply a convenience</li> <li>Aesthetic damages and other adverse situations<sup>4</sup></li> </ul> </li>   <li>■ For the assessment of risks with regard to ecosystems:               <ul style="list-style-type: none"> <li>Area affected</li> <li>Intensity of impact on the area affected</li> <li>Importance or unique nature of the ecosystems affected</li> </ul> </li>   <li>■ For the assessment of the trend over time:               <ul style="list-style-type: none"> <li>The situation is getting worse</li> <li>The situation is not changing</li> <li>The situation is getting better</li> </ul> </li> </ul>

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<sup>2</sup>Prevention expenses refer to expenditures that institutions may assume to mitigate the problem. Remediation expenses refer to expenditures the population incurs to correct or alleviate the problem. For example, expenses undertaken by the agencies responsible for water treatment to chlorinate water for consumption because of its deficient quality is a prevention expense. Expenditures a community incurs to purchase water to drink to prevent diarrhea-type diseases, however, is a remediation expense.

<sup>3</sup>Relative to health care and the loss of labor productivity.

<sup>4</sup>This includes the sensation produced by cloudy drinking water, bad odors, and open-air, unregulated dumps.

*Notice: A community may decide that it does not necessarily have to evaluate its problems in relation to the criteria suggested here (human health, quality of life, and effect on ecology). In that case, it may want to simply utilize only two of the criteria to evaluate all the problems. It is worth noting, however, that the trend of the problems must always be considered, even if only two of the criteria are used.*

### Effects on human health

- Number of persons affected
  - 3 Half the population or less
  - 2 10 to 50% of the population
  - 1 1 to 10% of the population
  - 0 Less than 1% of the population
  
- Severity of impact on persons affected
  - 3 High probability of severe health effects (death, cancer, serious birth defects, etc.)
  - 2 Low probability of severe health effects and or moderate probability of chronic illnesses (asthma, hypertension, etc.)
  - 1 Light, temporary, and reversible health effects
  - 0 Minimal effect

### Effects on quality of life

- Losses that affect economic activities as a result of damage to natural resources
  - 2 Clear and substantial losses
  - 1 Uncertain or lesser losses
  - 0 Insignificant losses
  
- Losses of recreation and tourism activities
  - 2 Clear and substantial losses
  - 1 Uncertain or lesser losses
  - 0 Insignificant losses
  
- Expenditures for prevention/remediation
  - 2 Clear and substantial losses
  - 1 Uncertain or lesser losses
  - 0 Insignificant losses
  
- Expenditures related to aspects of health
  - 2 Clear and substantial losses
  - 1 Uncertain or lesser losses
  - 0 Insignificant losses

<b>Effects on quality of life (continued)</b>	
<ul style="list-style-type: none"> <li>■ Decide whether the solution to the problem is a necessity or simply a convenience. Decide whether the problem affects:                             <ul style="list-style-type: none"> <li>2 Half the population or more</li> <li>1 10 to 50% of the population</li> <li>0 Less than 10% of the population</li> </ul> </li>   <li>■ Aesthetic damages and other adverse situations. Decide whether the problem affects:                             <ul style="list-style-type: none"> <li>2 Half the population or more</li> <li>1 10 to 50% of the population</li> <li>0 Less than 10% of the population</li> </ul> </li> </ul>	
<b>Ecological losses</b>	
<ul style="list-style-type: none"> <li>■ Area of the ecosystems affected                             <ul style="list-style-type: none"> <li>2 Half or more of the area of terrestrial or aquatic ecosystems</li> <li>1 10 to 50% of the area, whether of terrestrial or aquatic ecosystems</li> <li>0 Less than 10% of the area of both types of ecosystems</li> </ul> </li>   <li>■ Intensity of ecological impact on the area affected                             <ul style="list-style-type: none"> <li>2 Certain and severe damage to the ecosystems affected, resulting in a change of the ecological nature of the area. It will probably require several decades for the area affected to recover.</li> <li>1 Uncertain or moderate ecological damage to the area affected, but without resulting in a complete change. It will probably require 5 to 20 years for the area affected to recover, if the contamination is halted.</li> <li>0 Little or no ecological damage to the area affected.</li> </ul> </li>   <li>■ Importance or unique nature of the ecosystems affected                             <ul style="list-style-type: none"> <li>1 The problem affects an especially important ecosystem or one unique at the municipal level.</li> <li>0 No particularly important ecosystem is affected.</li> </ul> </li> </ul>	
<b>Behavior or trend over time</b>	
<ul style="list-style-type: none"> <li>+1 The situation is getting worse</li> <li>-0 The situation is not changing</li> <li>-1 The situation is getting better</li> </ul>	

## MATRIX FORM FOR ASSIGNING POINTS IN THE RANKING PROCESS

<b>TABLE FOR USE IN CALCULATING POINTS ATTRIBUTED TO EACH ENVIRONMENTAL PROBLEM</b>		
<b>Problem:</b>		
<b>Effects category</b>	<b>Criteria</b>	<b>Points</b>
<b>Health</b>	Number of persons affected	
	Severity	
	<b>SUBTOTAL</b>	
<b>Quality of life</b>	Losses that affect economic activities	
	Losses that affect recreation and tourism activities	
	Expenditures related to prevention/remediation	
	Expenditures related to aspects of health	
	Whether the solution of the problem is a necessity or a convenience	
	Aesthetic damages and other adverse conditions	
	<b>SUBTOTAL</b>	
<b>Ecosystems</b>	Area of the ecosystems affected	
	Intensity of the impact on ecosystems	
	Importance or unique nature of the ecosystems affected	
	<b>SUBTOTAL</b>	
<b>Trend</b>		
<b>TOTAL POINTS</b>		

*Note that as with the formula included in Annex 1 of this Module, the subtotal of factors related to quality-of-life effects must be divided by two.*





## SAMPLE LETTER OF INVITATION TO THE SECOND COMMUNITY WORKSHOP

I take great pleasure in informing you that a Community Environmental Action Plan (CEAP) project is being carried out in our community at the present time. CEAP is a project sponsored by \_\_\_\_\_, and its principal objectives are designed to consolidate environmental programs, identify and rank environmental pollution problems, identify strategies and a small number of high-priority actions that can be carried out considering our access to resources and institutional capacity.

The benefits that can be obtained through CEAP include assistance in bringing together the efforts of municipal governments, community-based organizations, and other key economic and social sectors in relation to environmental pollution problems and natural resources, and to aid those sectors in obtaining access to national as well as international financial sources through formulation of feasible action plans.

A part of the CEAP working agenda is the holding of a consultative workshop, which will take place at \_\_\_\_\_ on \_\_\_\_\_ at \_\_\_\_\_ a.m., to which I take great pleasure in inviting you to represent your organization. The workshop is being organized by the CEAP Advisory Committee, which has been created to implement this project. For this workshop, the Committee has undertaken a series of preliminary tasks regarding the identification of pollution problems and their assessment in order of severity, subjects that will be discussed at some length during the event.

Your participation in this workshop is of vital importance, since it will allow your point of view (or that of your institution) to be incorporated into the CEAP preparation process.

For any additional information that you may require and to confirm your participation or that of another representative, please communicate with Mr./Ms. \_\_\_\_\_, who is in charge of the workshop, at telephone no. \_\_\_\_\_.

I appreciate your support of this important effort.

Very sincerely yours,

Annex: Workshop Agenda

## SAMPLE AGENDA FOR THE SECOND COMMUNITY WORKSHOP

**Workshop Objectives:** *To identify and establish priorities among the most severe environmental pollution problems*

- 8:00-8:30 a.m. Registration of participants
- 8:00-8:45 Opening of the event. Two persons will convene the event: One can be an authority from the municipality or some other local institution, and the other will be one of the members of ACCEAP or another organization involved in implementing CEAP.
- 8:45-9:00 Presentation of the participants and their expectations. Explanation and approval of the agenda.
- 9:00-9:15 Warm-up
- 9:30-9:45 Background information on the CEAP Process  
The First Community Workshop  
ACCEAP
- 9:45-10:00 Recess
- TOPIC I:** *Setting priorities among pollution problems: The objective of this session is to familiarize participants with the ranking process and with the materials and documents used in the process. These materials include a list of the identified problems, the Basic Community Profile, and materials prepared for the ranking process (Annexes 1, 2, 3, and 4).*
- 10:00-10:15 Plenary session
- *Explanation of the objectives of this session*
  - *Distribution of materials*
- Questions and answers with regard to the materials*
- 10:15-1:00 **Work in groups.** During this session, participants will undertake the ranking of one of the problems considered. Then, in working groups, they will conduct the ranking of the remaining problems. Participants must give themselves an opportunity, during the session, to consider any pollution problem they consider critical which is not included on the list. The summary matrix form (Annex 4) will be distributed during the session to display the results of the ranking process carried out by CEAP.

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*Questions and answers with regard to the materials*

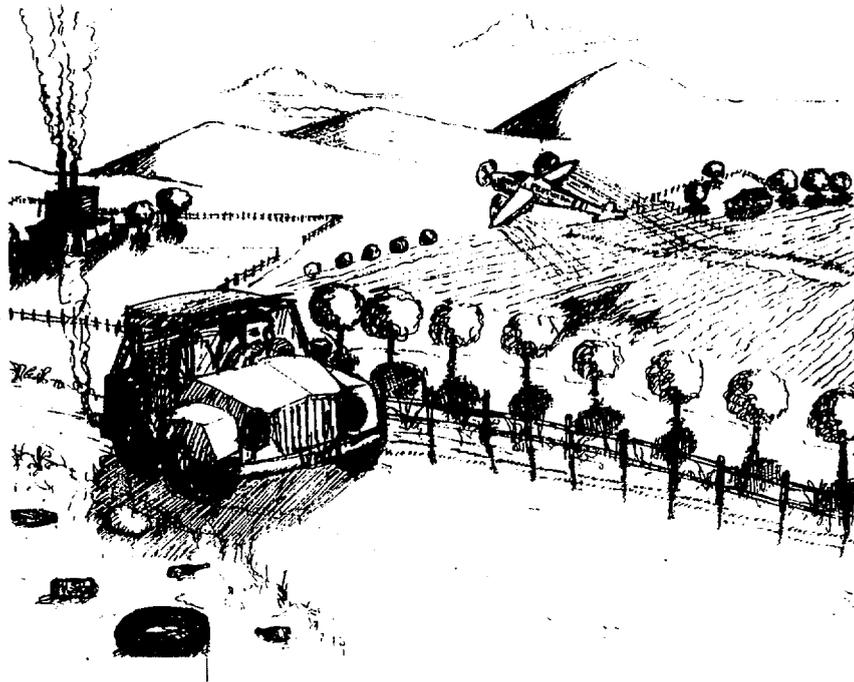
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- |                  |   |
|------------------|---|
| <b>1:00-2:15</b> | <b>Lunch</b>  |
| 2:15-3:00        | Plenary presentation of group work<br>Definition of the (two or three) priority pollution problems of the community |
| <b>3:00-3:15</b> | <b>Recess and coffee</b>  |
| 3:15-4:00        | Evaluation and closure  |
| <b>6:00</b>      | <b>ACCEAP meeting to discuss workshop results</b>   |

## OBJECTIVES AND CONTENTS

The objective of this Module is to formulate environmental strategies. To achieve this objective, it is necessary to identify the *anatomy* of the environmental pollution problems and establish the objectives and goals of the communities. These activities are the principal accomplishments of the Third Community Workshop. Module V contains:

- Environmental pollution strategies
- Identifying the *anatomy* of the problems
- Creating matrices for identifying the *anatomy* of the problems
- Establishing the objectives and goals of the community
- Formulating environmental strategies
- Third Community Workshop
- Participants in the Third Community Workshop
- Time frame for activities related to formulating strategies
- Annexes



## GENERAL INSTRUCTIONS

ENVIRONMENTAL POLLUTION  
STRATEGIES

After a community has identified its environmental problems, it must decide how to respond to the most critical ones. CEAP, following the CRA method, establishes a process that allows for formulation of the most appropriate strategies, which are those with the best possibility of being implemented. Before formulating strategies, CEAP identifies the *anatomy* of the environmental pollution problems, as defined in this Module and determines the community's objectives and goals.

IDENTIFYING THE ANATOMY OF THE  
PROBLEMS

Strategies established during this CEAP stage should focus on elements of the problems that present the greatest risks to the community. This crucial stage for CEAP identifies the most critical areas of pollution problems already ranked and develops strategies and specific actions that allow for effective application of available resources and funds. During this stage, the principal pollution problems already identified must be *dissected*.<sup>1</sup> In CEAP, this process is called the identification of the *anatomy* of environmental pollution problems.

<sup>1</sup> The dictionary definition of dissect is "to divide into parts or open an organism up for study or analysis."

*Knowing the anatomy of the problems allows for proper selection of strategies and after deciding which aspects of pollution problems are the most important, a community can target strategies for those key elements.*

CREATING MATRICES FOR  
IDENTIFYING THE ANATOMY OF  
THE PROBLEMS

As a part of the CEAP process, a form that contains the following columns (left to right) must be prepared for each of the pollution problems:

- Types of damage
- Path by which such damage occurs
- Contaminants
- Sources or origin of the contaminants
- Who is affected and where does it occur?
- Causes

The *anatomy* of the problems functions in the following manner: For example, the problem of wastewater (excreta) is extremely complex. Typically, the **types of damage** occasioned by wastewater have an impact on human health, ecosystems, quality of life, and the economy. If it is decided, during this process, that the greatest effect is its impact on health, **the paths by which such damage occurs** may involve the contamination of drinking water, crop irrigation, or food preparation using

contaminated water. **Contaminants** involved may be pathogens, sediments, or toxic substances, among others. The **sources** of contamination are related to human excreta or to wastes from industrial or agricultural wastewater systems. The questions **Who is affected and where does it occur?** refer to the population most exposed to the contaminating sources. The **causes** are related to inadequate collection and poor treatment provided for wastewater.

ACCEAP will be responsible for preparing these matrix forms. Identification of the *anatomy* of environmental pollution problems must be carried out during the Third Community Workshop.

*Identifying the **anatomy** of environmental pollution problems is accomplished prior to identifying strategies and focuses on dissecting pollution problems into sub-components to facilitate identification of appropriate strategies and action plans.*

*Annex 1 includes a series of matrix forms related to wastewater, solid waste, drinking water (water in the distribution system), pesticides, and air pollution that may be used to identify the **anatomy** of pollution problems. The guidelines which accompany the Annex provide a detailed explanation of how such forms may be used.*

### **ESTABLISHING THE OBJECTIVES AND GOALS OF THE COMMUNITY**

It is important for the community to have a clear understanding of its objectives and goals to facilitate identification of strategies directed at the resolution of pollution problems. Such objectives and goals need to include the community's perception of itself and how it

envisions its future development should the more severe pollution problems be reduced or eliminated.

ACCEAP should:

- Prepare a list of innovative programs related to the subject
- Inform participants at the Third Community Workshop about results of the community survey (Module III), if such a survey was conducted

Establishment of goals and objectives of the community will be accomplished during the Third Community Workshop. This workshop will serve as a preamble to identification of environmental pollution strategies. The facilitator will record *brainstorming ideas* on large sheets of paper that can be seen by everyone present, as ideas are being generated by the participants. The goals and objectives can serve as a reference while the strategies related to environmental pollution are being formulated.

*Establishment of the community's goals and objectives is accomplished prior to identification of strategies, which is the central theme of this Module. After strategies are formulated, the facilitator will compare those strategies with the objectives and goals established during the workshop and with those emanating from the community survey, if such a survey was implemented. This does not mean that the goals and objectives must necessarily be readjusted, if they do not coincide. The purpose of the comparison is to establish areas of commonality that may result from the different CEAP steps.*

*For the purpose of initiating the brainstorming session, Annex 2 includes a series of questions for use during the session on community goals and objectives.*

## FORMULATING ENVIRONMENTAL STRATEGIES

Since CEAP is designed to provide solutions to the most severe pollution problems affecting the community and to meet the community's environmental objectives and goals, the formulation of environmental strategies is one of its most critical activities. At this stage in the CEAP process, the transition is made from analysis of risk to risk management. The following questions must be answered at this point:

- Where should action be taken?
- How should action be taken?
- What should be done?

*Formulation of strategies will be carried out on the basis of the problems identified, determination of the **anatomy** of the problems, and identification of the community's goals and objectives.*

Development of strategies will be carried out during the Third Community Workshop. To facilitate the process, ACCEAP must:

- Prepare a list of innovative programs and concepts related to risk reduction
- Prepare a list of questions to motivate the weighing of strategies

*Annex 3 includes a list of sample programs that may be carried out to reduce risks. Annex 4 includes a list of sample questions for use in formulating strategies. Annex 5 includes examples of strategies related to wastewater and solid waste.*

## THIRD COMMUNITY WORKSHOP

The members of ACCEAP are responsible for preparing and conducting the Third Community Workshop. This workshop proceeds in the following manner:

- Explanation of workshop objectives
- Presentation and explanation of the use of matrix forms to identify the *anatomy* of pollution problems
- Identification of the *anatomy* of pollution problems
- Establishment of the community's goals and objectives
- Presentation and explanation of the list of programs that may be carried out to reduce risks
- Presentation of the list of questions to motivate the weighing of strategies
- Selection of strategies

*The strategies selected during the Third Community Workshop do not necessarily have to be definitive. There will be an opportunity for strategies selected during the workshop to be evaluated on the basis of a series of criteria and modified, if necessary, during the Fourth Community Workshop.*

The Third Community Workshop will be conducted in one day. A facilitator will moderate workshop discussions carried out in plenary as well as small group sessions.

*Annex 6 includes a sample letter of invitation to the Third Community Workshop, and Annex 7 presents a sample agenda for the workshop. Consulting Annexes 1F, 1G, and 2 of Module I of this Manual is also recommended.*

**PARTICIPANTS IN THE THIRD COMMUNITY WORKSHOP**

One of the most important aspects of the risk management phase brings the perception and values of the community to bear on formulating strategies oriented at resolving the most severe environmental pollution problems. ACCEAP must make an exhaustive effort during this workshop to bring together representatives of the greatest possible number of social and economic sectors of the population.

**TIME FRAME FOR ACTIVITIES RELATED TO FORMULATING STRATEGIES**

ACTIVITY	DURATION OF EACH ACTIVITY No. Weeks
Preparation of the matrices of the <i>anatomy</i> and other Workshop documents (list of programs and concepts)	2
<b>Third Community Workshop</b> <ul style="list-style-type: none"> <li>•Send a letter of invitation to the Workshop, along with the agenda</li> <li>•Make other preparations for the Third Community Workshop</li> <li>•Conduct the Workshop</li> <li>•Identify the <i>anatomy</i> of problems</li> <li>•Establish community goals and objectives</li> <li>•Formulate strategies</li> </ul>	2
<b>Total Duration of the Module: 3 Weeks (Some activities overlap.)</b>	



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## **ANNEXES: MODULE V**

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The following annexes are designed to support the activities described in this Module. These annexes include material designed to identify the *anatomy* of environmental pollution problems, and the strategies to deal with them, as well as materials designed for preparing and conducting the Third Community Workshop. This section contains:

- Annex 1: Materials for identifying the *anatomy* of environmental pollution problems.
  - Annex 1A: Sample matrix form for wastewater problems
  - Annex 1B: Sample matrix form for solid waste problems
  - Annex 1C: Sample matrix form for drinking water problems
  - Annex 1D: Sample matrix form for air pollution problems
  - Annex 1E: Sample matrix form for pesticide problems
  - Annex 1F: Guidelines for using sample matrix forms
  - Annex 1G: Sample matrix form completed by a community
- Annex 2: Suggested questions for identifying community goals and objectives
- Annex 3: Proposed programs and concepts for use in formulating strategies related to environmental pollution problems
- Annex 4: Suggested questions for formulating strategies related to environmental pollution problems
- Annex 5: Sample wastewater and solid waste strategies developed by a community
- Annex 6: Sample letter of invitation to the Third Community Workshop
- Annex 7: Sample agenda for the Third Community Workshop

## MATERIALS FOR IDENTIFYING THE ANATOMY OF ENVIRONMENTAL POLLUTION PROBLEMS

*The matrix forms included in this Annex may be used to carry out identification of the anatomy of pollution problems. Participants in the Third Community Workshop will be instructed to draw a circle around the effects that they consider the most critical in relation to the problem being considered. Participants will be instructed to read the following forms and circle the most critical problems, starting at the left side of the form and moving to the right.*

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**ANATOMY OF PROBLEMS RELATED TO WASTEWATER**

Types of damage (1)	Path by which damage occurs (2)	Contaminants (3)	Sources (4)	Who is affected and where does it occur? (5)	Causes (6)
<p><b>Health</b></p> <ul style="list-style-type: none"> <li>• Diarrhea, cholera, or typhoid</li> <li>• Toxicity</li> <li>• Diseases transmitted by vectors</li> </ul> <p><b>Ecosystems</b></p> <ul style="list-style-type: none"> <li>• Dead fish</li> <li>• Negative changes in aquatic ecosystems</li> </ul> <p><b>Quality of life and the economy</b></p> <ul style="list-style-type: none"> <li>• Aesthetic damages, including bad odors</li> <li>• Reduction in the fishing catch</li> <li>• Decrease in tourism</li> <li>• Increase in health and potable water treatment costs</li> </ul>	<p><b>Drinking water from surface or subterranean sources contaminated by wastewater</b></p> <p><b>Consumption of food contaminated by wastewater</b></p> <p><b>Consumption of contaminated fish</b> bred in water contaminated by wastewater</p> <p><b>Direct contact with contaminated water</b> by bathing, washing clothes, work, or recreation</p> <p><b>Breeding of disease vectors</b> in stagnant wastewater</p> <p><b>Odors</b> coming from wastewater drainage systems, sewage treatment plants, or lack of same</p> <p><b>Nutrients accumulated</b> in lakes or reefs</p> <p><b>Reduction of oxygen dissolved</b> in surface waters</p> <p><b>Toxic contamination</b> of surface waters</p> <p><b>Solid suspensions</b> occluding reproduction areas and reducing the penetration of light in surface waters</p>	<p><b>Pathogens</b></p> <p><b>Nutrients</b></p> <p><b>Heavy metals</b></p> <p><b>Toxic substances</b></p> <p><b>Organic wastes</b></p> <p><b>Suspended solids</b></p> <p><b>Fats and oils</b></p> <p><b>Detergents</b></p>	<p>Rural and urban homes</p> <p><b>Industries</b></p> <p><b>Agroindustries</b></p> <ul style="list-style-type: none"> <li>• Coffee</li> <li>• Sugar cane</li> <li>• Food</li> <li>• Fish farming</li> </ul> <p><b>Open drainage system</b></p> <p><b>Drainage system spills</b></p> <p><b>Sewage treatment plants</b></p>	<p><b>General population</b></p> <p><b>Population of urban centers</b></p> <p><b>Residents who live in the area of treatment plants</b></p> <p><b>Residents who live in the peri-urban areas</b></p> <p><b>Infant population</b></p> <p><b>Persons without access to a drainage system</b></p> <p><b>Fishermen</b></p> <p><b>Tourists</b></p> <p><b>Specific rivers, lakes, and reefs</b></p>	<p>Lack of drainage systems or hook-ups</p> <p>Lack of plants for wastewater treatment</p> <p>Lack of treatment of wastewater resulting from industrial and agricultural processes</p> <p>Poor maintenance of drainage or wastewater treatment systems</p> <p>Improper sanitary practices at the community level</p> <p>Lack of a potable water distribution system or maintenance of such system</p> <p>Lack of legislation or standards for the control of wastewater</p> <p>Insufficient compliance with existing legislation</p>

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<b>ANATOMY OF PROBLEMS RELATED TO SOLID WASTE</b>					
<b>Types of damage</b>	<b>Path by which damage occurs</b>	<b>Contaminants</b>	<b>Sources</b>	<b>Who is affected and where does it occur?</b>	<b>Causes</b>
<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>	<b>(5)</b>	<b>(6)</b>
<b>Health</b> <ul style="list-style-type: none"> <li>• Diarrhea, cholera, or typhoid</li> <li>• Toxicity</li> <li>• Respiratory diseases or diseases transmitted by vectors</li> </ul>	<b>Drinking water from surface or subterranean sources contaminated by solid waste</b>	<b>Pathogens</b>	<b>Uncollected solid waste</b>	<b>General population</b>	Lack of economic and management capacity of local governments to provide solid waste collection services
<ul style="list-style-type: none"> <li>• Consumption of food contaminated by waters contaminated by solid waste</li> <li>• Consumption of contaminated fish bred in waters contaminated by solid waste</li> </ul>	<b>Consumption of food contaminated by waters contaminated by solid waste</b>	<b>Nutrients</b>	<b>Illegal trash dumps in streets, roads, and ditches</b>	<b>Population in urban centers</b>	Poor management or insufficient capacity of trash dumps
<b>Ecosystems</b> <ul style="list-style-type: none"> <li>• Dead fish</li> <li>• Negative changes in ecosystems</li> </ul>	<b>Breathing smoke generated by trash fires</b>	<b>Heavy metals</b>	<b>Legal trash dumps</b>	<b>Residents who live where trash collection is inadequate</b>	Poor location of trash dumps
<b>Quality of life and the economy</b> <ul style="list-style-type: none"> <li>• Aesthetic damages, including the accumulation of trash in the streets, open dumps, reduction in visibility, and bad odors</li> <li>• Reduction in the fishing catch</li> <li>• Decrease in tourism</li> <li>• Increase in health and potable water treatment costs due to contamination by solid waste</li> </ul>	<b>Direct contact with uncollected trash or open-air dumps</b>	<b>Toxic substances</b>	<b>Trash burning in the open</b>	<b>Residents who live in the area of legal and illegal trash dumps</b>	Lack of practices to minimize solid waste such as recycling and improvements in packaging and industrial containers
	<b>Breeding of disease vectors in solid waste</b>	<b>Organic wastes</b>	<b>Homes</b>	<b>Residents who live in peri-urban areas</b>	Lack of regulations to oblige hospitals and industry to separate hazardous wastes from nonhazardous wastes
	<b>Odors coming from poorly handled solid waste</b>	<b>Suspended solids</b>	<b>Stores</b>	<b>Residents who live outside cities, in isolated areas where trash service does not exist or is limited</b>	Lack of legislation or standards for the control of solid waste
	<b>Nutrients accumulated in lakes or reefs</b>	<b>Oil and grease</b>	<b>Offices</b>	<b>Trash collectors</b>	Insufficient compliance with existing legislation
	<b>Reduction of oxygen dissolved in surface waters</b>		<b>Restaurants</b>	<b>Residents who live near trash dumps</b>	
	<b>Toxic contamination of surface waters</b>		<b>Markets</b>	<b>Tourists</b>	
			<b>Industries</b>	<b>Specific rivers, lakes, and reefs</b>	
			<b>Agroindustries</b>		
			<b>Hospitals</b>		
			<b>Construction works</b>		

<b>ANATOMY OF PROBLEMS RELATED TO DRINKING WATER</b>					
<b>Types of damage</b>	<b>Path by which damage occurs</b>	<b>Contaminants</b>	<b>Sources</b>	<b>Who is affected and where does it occur?</b>	<b>Causes</b>
(1)	(2)	(3)	(4)	(5)	(6)
<b>Health</b> <ul style="list-style-type: none"> <li>• Diarrhea, cholera, or typhoid</li> <li>• Diseases transmitted by parasites</li> <li>• Toxicity</li> <li>• Dermatology problems</li> </ul> <b>Ecosystems<sup>2</sup></b> <ul style="list-style-type: none"> <li>• None</li> </ul> <b>Quality of life and the economy</b> <ul style="list-style-type: none"> <li>• Expenses related to the treatment of potable water</li> <li>• Costs related to obtaining cleaner water sources (water for sale by trucks, bottled water, boiled water, well water)</li> <li>• Other adverse situations (bad taste, bad odor, turbidity, difficulty in utilizing it for personal and domestic uses)</li> <li>• Health costs</li> <li>• Decrease in tourism</li> </ul>	<b>Drinking water or preparing food with contaminated water</b>  <b>Using contaminated water for bathing, washing clothes, and cleaning the home</b>	<b>Pathogens, bacteria, viruses, and parasites</b>  <b>Heavy metals</b>  <b>Organic toxins</b>  <b>Suspended solids</b>  <b>Salinity</b>  <b>Insecticides</b>	<b>Contaminated at the source:</b> <ul style="list-style-type: none"> <li>• Surface waters</li> <li>• Groundwater</li> <li>• Well water</li> <li>• Upriver</li> <li>• In the community</li> </ul> <b>Contaminated during the treatment process (chlorination)</b>  <b>Contaminated at the tap or in the distribution system</b> <ul style="list-style-type: none"> <li>• Inadequate plumbing (old, broken, inadequate materials)</li> <li>• In the distribution system</li> <li>• Contamination by metals as the result of corrosion</li> <li>• In water transport trucks</li> </ul> <b>Contaminated during home storage</b>	<b>People without access to potable water</b>  <b>Population sector not connected to water distribution system</b>  <b>People who buy water in barrels</b>  <b>People who draw water from untreated wells</b>   <b>Geographic areas:</b> <ul style="list-style-type: none"> <li>• Urban areas</li> <li>• Rural areas</li> <li>• Marginal areas</li> </ul>	Little protection of the quality of sources of potable water  Lack of adequate treatment (chlorination)  Lack of an adequate distribution system  Poor maintenance of distribution system  Inappropriate storage practices for water

<sup>2</sup>There are no apparent damages to ecological systems associated with potable water distribution systems.

<b>ANATOMY OF PROBLEMS RELATED TO AIR POLLUTION</b>					
<b>Types of damage</b> <b>(1)</b>	<b>Path by which damage occurs</b> <b>(2)</b>	<b>Contaminants</b> <b>(3)</b>	<b>Sources</b> <b>(4)</b>	<b>Who is affected and where does it occur?</b> <b>(5)</b>	<b>Causes</b> <b>(6)</b>
<p><b>Health</b></p> <ul style="list-style-type: none"> <li>● Respiratory diseases</li> <li>● Toxicity</li> <li>● Lung cancers and other types of cancer</li> <li>● Eye and skin irritation</li> </ul> <p><b>Ecosystems</b></p> <ul style="list-style-type: none"> <li>● Damage to vegetation</li> <li>● Negative changes in aquatic ecosystems</li> </ul> <p><b>Quality of life and the economy</b></p> <ul style="list-style-type: none"> <li>● Aesthetic damages, including reduction in visibility and bad odors</li> <li>● Material damages</li> <li>● Decrease in tourism</li> <li>● Increase in health costs</li> <li>● Clothing and buildings soiled and damaged</li> </ul>	<p><b>Breathing polluted air</b></p> <ul style="list-style-type: none"> <li>● In the streets</li> <li>● Close to industrial smoke sites</li> <li>● Inside homes</li> <li>● In the countryside</li> </ul> <p><b>Contamination of various elements with the air acting as the carrier of the contamination</b></p> <ul style="list-style-type: none"> <li>● Contamination of the water</li> <li>● Contamination of the soil and crops</li> <li>● Contamination of exposed foods (in market places and sold by street vendors)</li> </ul>	<p><b>Solid particles in suspension, including smoke</b></p> <p><b>Sulfur oxide</b></p> <p><b>Nitrous oxide</b></p> <p><b>Ozone</b></p> <p><b>Carbon oxides</b></p> <p><b>Hydrocarbons</b></p> <p><b>Organic toxins</b></p> <p><b>Heavy metals</b></p> <p><b>Methane</b></p>	<p><b>Industries</b></p> <p><b>Plants for the processing of agricultural products</b></p> <p><b>Power plants</b></p> <p><b>Vehicles</b></p> <ul style="list-style-type: none"> <li>● Gasoline</li> <li>● Diesel</li> </ul> <p><b>Construction sites</b></p> <p><b>Open burning of:</b></p> <ul style="list-style-type: none"> <li>● Solid waste</li> <li>● Vegetation</li> <li>● Agricultural fields</li> </ul> <p><b>Domestic smoke cooking with wood or coal</b></p>	<p><b>General population</b></p> <p><b>Population of urban centers</b></p> <p><b>Residents who live in industrial areas</b></p> <p><b>Infant and aged population and others who have respiratory problems (e.g. individuals who suffer from asthma)</b></p> <p><b>Women and children who spend long periods indoors exposed to smoke in the home</b></p> <p><b>Tourists</b></p> <p><b>Specific ecosystems</b></p>	<p>Lack of control programs to monitor the maintenance of vehicles</p> <p>Lack of good traffic planning</p> <p>Use of inappropriate fuels in vehicles, electric power plants, and for food preparation</p> <p>Lack of chimneys or ventilated kitchens in homes</p> <p>Lack of legislation and standards for emission control</p> <p>Lack of monitoring</p> <p>Inadequate compliance with existing legislation</p>

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<b>ANATOMY OF PROBLEMS RELATED TO CONTAMINATION BY PESTICIDES</b>					
<b>Types of Damage</b>	<b>Path by which damage occurs</b>	<b>Contaminants</b>	<b>Sources</b>	<b>Who is affected and where does it occur?</b>	<b>Causes</b>
(1)	(2)	(3)	(4)	(5)	(6)
<p><b>Health</b></p> <ul style="list-style-type: none"> <li>● Poisoning, including skin irritations, vomiting, headache, fainting, and death</li> <li>● Chronic diseases, including reproductive problems and cancer</li> </ul> <p><b>Ecosystems</b></p> <ul style="list-style-type: none"> <li>● Poisoning, including dead fish</li> <li>● Chronic toxicity, including negative changes in ecosystems from bioaccumulation</li> </ul> <p><b>Quality of life and the economy</b></p> <ul style="list-style-type: none"> <li>● Reduction in the fishing catch</li> <li>● Increase in health costs</li> </ul>	<p><b>Exposure to large doses of pesticides for a short period of time</b></p> <ul style="list-style-type: none"> <li>● Direct contact of workers or ecosystems during the mixing and application of pesticides</li> <li>● Direct contact of workers or family members with stored pesticides</li> <li>● Indirect contact from re-use of pesticide containers</li> <li>● Washing of application equipment, or waste disposal in a river or ditch</li> <li>● Direct contact of the population during disease-vector control programs</li> </ul> <p><b>Exposure to lesser doses of pesticides for long periods of time</b></p> <ul style="list-style-type: none"> <li>● Continual exposure of workers</li> <li>● Continual exposure of agricultural communities, either via the air or the water</li> <li>● Pesticide residues in food</li> <li>● Consumption of fish originating in waters contaminated by pesticides</li> <li>● Continual exposure of ecosystems in agricultural areas.</li> </ul>	<p><b>Insecticides</b></p> <p><b>Herbicides</b></p> <p><b>Fungicides</b></p> <p><b>Rodenticides</b></p> <p><b>Fumigants</b></p> <p><b>Others</b></p>	<p><b>Due to agricultural use</b></p> <ul style="list-style-type: none"> <li>● Harvesting domestically consumed foods: corn, beans, rice, etc.</li> <li>● Harvesting traditional exports: coffee, sugar cane, citrus fruits, bananas and cotton</li> <li>● Harvesting non-traditional exports</li> </ul> <p><b>Due to urban use</b></p> <ul style="list-style-type: none"> <li>● Control of disease vectors, including mosquitoes</li> </ul> <p><b>Related to aquatic use</b></p> <ul style="list-style-type: none"> <li>● Control of aquatic weeds</li> <li>● Fishing</li> </ul> <p><b>Manufacturing the product</b></p>	<p><b>Agricultural workers</b> who mix, transport, and apply pesticides</p> <p><b>Public Health Service workers</b> who mix, transport, and apply pesticides</p> <p><b>Workers</b> who work in factories that produce pesticides</p> <p><b>Residents</b> who live near agricultural areas</p> <p><b>Residents</b> who live in areas where disease-vector control programs are being carried out</p> <p><b>Residents</b> who live in areas close to factories where pesticides are manufactured</p>	<p>Excessive use of pesticides</p> <p>Lack of protective equipment and practices in the use of pesticides</p> <p>Poor conditions for transportation, storage, and mixing of pesticides</p> <p>Poor handling of waste materials contaminated with pesticides</p> <p>Lack of regulations and controls on their use</p> <p>Inadequate compliance with existing regulations</p> <p>Lack of education and information on the part of those who work with or handle pesticides</p> <p>Illegal use of pesticides that have been prohibited</p>

## GUIDELINES FOR USING SAMPLE MATRIX FORMS

*Each of the environmental pollution problems identified needs to have a matrix form prepared to identify the anatomy of the problem.*

### THE COLUMNS OF EACH MATRIX FORM

The matrix forms to be prepared by ACCEAP, such as those in *Annexes 1A-1E and 1G*, should display the *anatomy* of the problems in columns in the following manner (reading from left to right):

- **Types of damage:** In this column, the most severe damage or effects of the problems are considered in relation to:
  - *Human health*, which includes illness and injury (from exposure to environmental contaminants) such as cancer, gastrointestinal disease, birth and development defects, injurious effects on such organs as the liver, kidneys, or lungs.
  - *Ecosystems effects*, which include the death of individual organisms, disturbance of the reproductive and predatory processes that regulate relationships among species and alteration of such factors as the food chain and climate, which control key activities within ecosystems.
  - *Quality of life and the economy*, which include a series of effects related to the well-being of individuals and society. For example, a reduction of the fishing catch, the cost of treating polluted water, the reduction of productivity in the economy, bad odors, and the effects of air pollution in the reduction of visibility.
- **Path by which such damage occurs:** This column considers human activities that cause agents of contamination to occur, such as industries, the burning of trash and solid waste materials, etc.
- **Contaminants:** This column is for recording the chemical contaminants or physical elements that affect human beings and ecosystems, such as particles in suspension, heavy metals, pesticides, and carbon monoxide.
- **Sources or origin of contaminants:** This column considers sources of the elements of contamination such as industries, vehicles, homes, open trash fires, and agricultural, urban, and aquatic activities.
- **Who is affected and where does it occur?** This column is designed to locate the problem in a particular geographic area and to specify the population groups where the impact is most severe. For example, although a particular problem may concern the entire country, it is more likely to affect people in urban areas, specifically in the periurban areas inhabited by large numbers of low-income families.

- **Causes:** This column is for specifying the causes of the problems, such as a lack of infrastructure, regulations, alternative methods, and education campaigns.

Note that the matrix form begins by identifying the most obvious types of damages or effects of a specific environmental problem and continues to advance, left to right, column by column, until it identifies the principal causes.

It is possible that all the effects listed in the first column of the form are present to some extent in the specific place or region suffering from an environmental problem, but not all the effects need to be given the same level of importance. Therefore, the single item considered the most serious should be circled in that column (and in each succeeding column of the form). Only when it is absolutely certain that more than one item has the same level of importance should more than one be circled. The selection of one item as the principle problem does not imply the dismissal of other problems. For example, if workshop participants decide that the most serious evidence of pollution caused by wastewater is infantile diarrhea, it is also possible that improperly treated wastewater, perhaps to a lesser extent, is affecting a creek which serves as a recreation site for the community. Reducing recreation possibilities also impacts the quality of life. Nevertheless, if diarrhea is felt to be the most serious manifestation of the problem, only that effect should be circled.

It is also possible that the effect the community considers the most serious is not among those listed in the columns. In that case, the missing item should be added to the form, remembering that CEAP attempts to go from the whole to the part and, in this case, from the general to the particular, not the reverse.

### TRACING THE PATH OF THE ANATOMY

Drawing one circle in each matrix column establishes the *anatomy* of the pollution problems. This exercise constructs the *path* from the effect to the cause, passing through the means by which those who are affected receive the contaminating agents, what the contaminants are, the sources that produce them, and identification of who are the most affected and where they are located.

The *anatomy* or *path* constitutes a logical sentence that may be read in both directions, step by step demonstrating its validity. The *path*, for example, may be read from left to right:

"An injury to health occurs in the form of diarrhea, caused by the drinking of water contaminated by wastewater which contains pathogenic agents that originated in urban and rural residences; this injury particularly impacts persons who do not have access to treated water, which is caused by the lack of low-cost solutions for wastewater treatment and lack of an adequate drinking water distribution system."

The *path* also may be read from right to left:

"Due to the lack of low-cost solutions for wastewater treatment and an adequate drinking water distribution system, persons who do not have access to treated water are affected by the fact that urban and rural residences give rise to pathogenic agents which contaminate water sources and produce injuries to health, primarily in the form of diarrhea."

**EXAMPLE OF THE ANATOMY OF PROBLEMS CONSIDERED BY A COMMUNITY**

<b>ANATOMY OF PROBLEMS RELATED TO WASTEWATER</b>					
<b>Types of damage</b> (1)	<b>Path by which damage occurs</b> (2)	<b>Contaminants</b> (3)	<b>Sources</b> (4)	<b>Who is affected and where does it occur?</b> (5)	<b>Causes</b> (6)
<p><b>Health</b></p> <ul style="list-style-type: none"> <li>• Diarrhea, cholera, or typhoid</li> <li>• Toxicity</li> <li>• Diseases transmitted by vectors</li> </ul> <p><b>Ecosystems</b></p> <ul style="list-style-type: none"> <li>• Dead fish</li> <li>• Negative changes in aquatic ecosystems</li> </ul> <p><b>Quality of life and the economy</b></p> <ul style="list-style-type: none"> <li>• Aesthetic damages, including bad odors</li> <li>• Reduction in the fishing catch</li> <li>• Decrease in tourism</li> <li>• Increase in health and potable water treatment costs</li> </ul>	<p>Drinking water from surface or subterranean sources contaminated by wastewater</p> <p>Consumption of food contaminated by wastewater</p> <p>Consumption of contaminated fish bred in water contaminated by wastewater</p> <p>Direct contact with contaminated water by bathing, washing clothes, work, or recreation</p> <p>Breeding of disease vectors in stagnant wastewater</p> <p>Odors coming from wastewater drainage systems, sewage treatment plants, or lack of same</p> <p>Nutrients accumulated in lakes or reefs</p> <p>Reduction of oxygen dissolved in surface waters</p> <p>Toxic contamination of surface waters</p> <p>Solid suspensions occluding reproduction areas and reducing the penetration of light in surface waters</p>	<p>Pathogens</p> <p>Nutrients</p> <p>Heavy metals</p> <p>Toxic substances</p> <p>Organic wastes</p> <p>Suspended solids</p> <p>Fats and oils</p> <p>Detergents</p>	<p>Rural and urban homes</p> <p>Industries</p> <p>Agroindustries</p> <ul style="list-style-type: none"> <li>• Coffee</li> <li>• Sugar cane</li> <li>• Food</li> <li>• Fish farming</li> </ul> <p>Open drainage system</p> <p>Drainage system spills</p> <p>Sewage treatment plants</p>	<p>General population</p> <p>Population of urban centers</p> <p>Residents who live in the area of treatment plants</p> <p>Residents who live in the periurban areas</p> <p>Infant population</p> <p>Persons without access to a drainage system</p> <p>Fishermen</p> <p>Tourists</p> <p>Specific rivers, lakes, and reefs</p>	<p>Lack of drainage systems or hook-ups</p> <p>Lack of plants for wastewater treatment</p> <p>Lack of treatment of wastewater resulting from industrial and agricultural processes</p> <p>Poor maintenance of drainage or wastewater treatment systems</p> <p>Improper sanitary practices at the community level</p> <p>Lack of a potable water distribution system or maintenance of such system</p> <p>Lack of legislation or standards for the control of wastewater</p> <p>Insufficient compliance with existing legislation</p>

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## SUGGESTED QUESTIONS FOR IDENTIFYING COMMUNITY GOALS AND OBJECTIVES

*This list of questions may be used during the Third Community Workshop as a preliminary exercise leading to the development of strategies. During this workshop session, the facilitator will encourage participants to **brainstorm** ideas, which will be noted on easel paper as they occur. The facilitator will also call the participants' attention to the results of the second part of the community survey, if it has been implemented.*

- **What are the community's goals and objectives in terms of:**
  - Air pollution?
  - Lead contamination?
  - Pollution of the drinking water distribution system?
  - Wastewater or excreta?
  - Solid waste?
  - Pesticide contamination?
  
- **As a community, where are we today in terms of:**
  - Community health?
  - Deterioration of the quality of life?
  - Deterioration of natural resources?
  
- **What ought to be done to improve future conditions?**
  
- **What is the vision of the community in terms of the environment?**
  
- **How can local public and' private institutions support the vision of the community?**
  
- **What resources does the community have to carry out these changes?**

## PROPOSED PROGRAMS AND CONCEPTS FOR USE IN FORMULATING STRATEGIES

*The following list may be used during the Third Community Workshop session on formulating strategies related to environmental pollution. The objective is to familiarize participants with programs and concepts that tend to offer a solution to environmental pollution problems and to facilitate participation in the weighing or formulating of strategies. The facilitator should allow participants time to read this list and discuss it among themselves. This list is an attempt to respond to the question what can be done to reduce environmental pollution problems.*

### LIST OF PROGRAMS AND CONCEPTS

**Low-cost technology:** A series of low-cost technologies may be carried out through municipal action and community-based organizations (CBOs). Such technologies are especially designed to improve the handling of solid waste, wastewater, and potable water services. *(The Appendix of this manual includes an extensive list of these technologies related to wastewater and solid waste.)*

Among the technologies and methods to improve the handling of wastewater are:

- Improved latrine systems
- Stabilization and oxidation ponds
- Reduced diameter drainage pipes
- Sand filter systems
- Latrine emptying technologies

Among the technologies and methods to improve the management of solid waste are:

- Creation of small businesses
- Reduction, recycling, and reuse of waste materials
- Appropriate packaging of products (incentives directed toward industries for **the minimization** of solid waste)

**Public education:** Training and education may be carried out to improve environmental pollution problems.

Training programs may be developed for:

- Municipal and government employees
- CBO members
- Members of the private sector
- Community and religious leaders
- Professors and students
- Members of the community in general

Training programs may be conducted through

- Mass campaigns
- Preparation and selective distribution of written material
- Newspaper radio and television announcements
- Workshops designed for the purpose

**List of Programs and Concepts, continued**

**Community action programs:** Community action programs tend to bring communities, CBOs, and individuals together to work collectively for the solution of environmental pollution problems.

Such programs can be designed to promote:

- Self-help
- Use of appropriate technology
- Education programs
- Training for the populace

**Programs related to legislation and monitoring:** Programs related to environmental strategies can be developed to improve the body of environmental legislation.

A program of this nature is needed when:

- There are no laws related to environmental pollution
- The laws exist but there is little or no compliance
- The legislation is scattered, found attached to various laws on health or in municipal codes
- There are no monitoring programs to allow verification of compliance or noncompliance with the standards established in law

**Programs to improve user tariffs:** To make municipal service programs cost effective and allow cost recovery, municipal governments may need to institute tariffs charged to users, since existing rates for providing services are often low or nonexistent. Tariff improvement programs assist in reducing pollution problems, since an improved tariff system will allow for expanded municipal services.

**Privatization:** Many municipalities are considering transferring municipal services to the private sector or nongovernmental organizations (NGOs) as a solution for providing improved services. Municipalities are presently "privatizing" municipal services either generally or partially.

**Economic instruments:** When it is feasible to estimate the damage derived from pollution in incremental units, charges may be imposed on industries and other sources of pollution.

Economic charges or instruments include:

- Effluent and emissions charges. Government agencies can levy fees based on the quantity and/or quality of pollutants discharged into the environment by an industrial facility or the cost required to "clean up" the damage associated with such pollution.
- User charges. Direct payment for the costs of collective or public treatment of pollution is required most often in the collection and treatment of municipal solid waste and for the discharge of wastewater into sewers.
- Product charges. Fees can be added to the price of products or product inputs that cause pollution in the manufacturing phase or for which a special disposal system has been established.
- Administrative charges. Government authorities can levy charges for the issuance of licenses connected with the control of pollution.
- Tax differentiation. Taxes can be used to promote consumption of products that are environmentally safe.

**List of Programs and Concepts, continued**

**Market incentives:** A series of incentives may be offered industries and other sources of pollution. Incentives can include those which involve the sale or purchase of "right-to-pollute allowances."

Among these types of incentives are:

- Marketable permits. A system of transferable pollution licenses, which refers to a permissible pollution level, can be converted into permits by the government and distributed to firms and industries at a specified price.
- Marketable discharges. This system of transferable discharge licenses permits the transfer of all or part of allowable or authorized emissions levels to another entity for monetary compensation.

## SUGGESTED QUESTIONS FOR FORMULATING ENVIRONMENTAL STRATEGIES

*This Annex is divided into two parts. The first part includes two basic questions designed to facilitate formulation of strategies. Part two, which is optional, includes a series of questions that serve to broaden the scope of the strategies. The purpose of this Annex is to respond to questions with regard to where action should be taken and how to accomplish it. During this session, it is important for participants in the Third Community Workshop to meet in working groups tailored to particular pollution problems (Annex 3).*

### PART I:

- **At what point or points of the path that was developed during the session regarding the anatomy of the environmental problems should action be taken?**

*This is a case of identifying where the efforts of the community can be focused to be most efficient (obtain the best return for the effort and resources invested) and most effective (attain the desired results).*

- **What concrete steps can be taken at the point or points identified in response to the preceding question?** (To answer this question, Annex 3 of this Module should be considered with regard to the programs and concepts that may be utilized in the definition of environmental pollution strategies.)

*This is a case of determining exactly what can be done to minimize the damage identified as the most serious effect of the environmental pollution problem and what can be done to attain the community's established goals and objectives. The answer to this question is itself the STRATEGY or STRATEGIES being sought. During this process, participants must continually verify that the strategy being considered is directly related to the result being sought and to each of the components along the path. For example, it is easy to fall into the error of proposing a strategy of training fishermen in appropriate fishing techniques, when we know that the principal problem affecting them is poisoning from the water they use for drinking, which has been polluted by chemical wastes discharged into the water source by a nearby factory. It may be very important for the fishermen to improve their fishing techniques, but that is not going to resolve the poisoning problem.*

**PART II:** *This second part is optional and may be utilized after the strategies have been identified.*

- **Can local institutions effect change through the following groups?**
  - Municipal government
  - Nongovernmental organizations (NGOs) and community-based organizations (CBOs)
  - Private sector
  - Schools and universities
  - Media

*To the extent possible, an attempt can be made to specify which institutions would be capable of assuming responsibility for carrying out identified strategies. These considerations may have to be revised upon entering the CEAP phase related to action plans.*

- **What economic resources and what technical assistance does the community have for instituting those changes? Can the following be counted on for that purpose?**
  - Municipal government
  - NGOs and CBOs
  - Private sector
  - Schools and universities
  - National and international finance agencies

*To the extent possible, an attempt can be made to specify which national and international finance institutions would be capable of assuming the cost of carrying out the identified strategies. This category can include aspects related to technical assistance that might be available for implementation of strategies. These considerations may have to be revised upon entering the CEAP phase related to action plans.*

- **Is there any legal authority or framework applicable to the strategy proposed?**

*To the extent possible, an attempt can be made to consider the juridical/legal framework applicable to specific environmental strategies to be implemented. The juridical framework must be evaluated in respect to the identified environmental pollution problems to determine if any of the strategies proposed are in conflict with existing laws, regulations, or standards. In such cases, what changes to existing legislation are necessary to promote the changes, and what sectors (public, private, or CBOs) could promote these changes? These considerations may have to be revised upon entering the CEAP phase related to action plans.*

## WASTEWATER AND SOLID WASTE STRATEGIES DEVELOPED BY A COMMUNITY

*These strategies demonstrate the work accomplished by a community, which implemented the CEAP steps that led to formulation of environmental strategies.*

Programs	I. Strategies for wastewater
Training and education	<p><b>Objective:</b> To promote training and education programs in:</p> <ol style="list-style-type: none"> <li>a) Sanitary practices</li> <li>b) Consciousness raising with regard to the problem of wastewater</li> </ol> <p>Consciousness-raising programs need to be primarily directed to the following target groups:</p> <ul style="list-style-type: none"> <li>• Community organizations</li> <li>• Agroindustrial sectors</li> <li>• Civil authorities</li> <li>• Political leaders</li> <li>• Water users</li> </ul>
Environmental laws, incentive programs and monitoring	<p><b>Objective:</b> To promote programs to strengthen compliance with existing legislation and create incentives for monitoring, based on:</p> <ol style="list-style-type: none"> <li>a) Application of the principle that "the polluter pays"</li> <li>b) Internalization of the costs of pollution</li> </ol> <p>The aforesaid programs of legislation, incentives, and monitoring need to be primarily directed to industries that are responsible for the emission of pollutants, and such programs must promote</p> <ul style="list-style-type: none"> <li>• Technological reconversion and/or the use of clean, low-cost technologies</li> <li>• Fines for pollution and establishment of quotas for the payment of clean-up costs</li> </ul>
Municipal development	<p><b>Objective:</b> To promote the strengthening of municipal governments in relation to:</p> <ol style="list-style-type: none"> <li>a) Finance items (to support better administration of available resources and development of cost accounting that includes environmental and service costs on the basis of a new definition of rates)</li> <li>b) Identification of low-cost technologies</li> <li>c) Identification of a menu of technological alternatives accessible to municipal governments in accordance with their characteristics</li> <li>d) Development of mechanisms for the control and monitoring of water pollution</li> <li>e) Strengthening legal frameworks and municipal laws</li> <li>f) Negotiating the resources for implementation of projects, including feasibility and technical design studies</li> <li>g) Designing, implementing, administering, operating, and maintaining existing wastewater systems</li> </ol>

Programs	II. Strategies for solid waste
Training and education	<p>Objective: To promote training and education programs in areas related to:</p> <ol style="list-style-type: none"> <li>a) Cost/benefit relationships in the management of solid waste, utilizing the mass media for that purpose</li> <li>b) Minimizing the production of solid waste in primary and secondary production areas, by means of informal communications</li> </ol> <p>The aforesaid consciousness-raising programs need to be primarily directed to the following target groups:</p> <ul style="list-style-type: none"> <li>● Primary and secondary producers</li> <li>● Community organizations</li> <li>● NGOs, local rank-and-file leaders, and religious leaders</li> <li>● Private sector</li> <li>● Civic and cultural clubs</li> <li>● Homemakers</li> </ul>
Municipal development	<p><b>Objective</b> To promote technical and managerial training of municipal personnel in the overall handling of solid waste in relation to:</p> <ol style="list-style-type: none"> <li>a) Developing a training program for municipal personnel in the management and final disposition of solid waste</li> <li>b) Financial considerations (profitability in the management of solid waste; design, revision, and application of a system of negotiated charges; tax collection; municipal budgets)</li> <li>c) Promoting the provision of solid waste collection and treatment through private individuals (credits, the creation of revolving funds)</li> <li>d) Promoting the application of a regulatory framework (review and adaptation of standards for the classification of wastes; preparing codes, regulations, and sanction mechanisms)</li> <li>e) Offering incentives to the formation of microenterprises (businesses for private solid waste collection activities) through such fiscal incentives as exemption from licenses, the fixing of realistic rates, and the creation of special funds</li> <li>f) Identifying low-cost technologies for the solid waste collection, management, and disposition system (the adoption of alternative models for the management and disposition of wastes, including manually operated sanitary land fills)</li> <li>g) Developing monitoring systems to determine the efficiency of services</li> <li>h) Developing resources for the implementation of projects (seeking national and international financing and technical assistance)</li> </ol>

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## SAMPLE LETTER OF INVITATION TO THE THIRD COMMUNITY WORKSHOP

As you are aware, the Community Environmental Action Plan (CEAP) project is presently being conducted in our community. CEAP is a project designed to consolidate environmental programs, identify and assign priorities to environmental pollution problems, identify strategies, and a small number of high-priority actions that can be implemented, taking into consideration the community's resources and institutional capacity.

As part of CEAP activities, the Third Community Workshop is now being organized with the following objectives:

- To identify the *anatomy* of the pollution problems. This step prior to formulating environmental strategies is designed to break out, or separate, the pollution problems into sub-components to facilitate adequate identification of strategies and action plans.
- To identify the objectives and goals of our community. This means determining our community's perception of itself and how it visualizes its development during the coming years, should the most severe pollution problems be reduced or eliminated.
- To identify and formulate environmental strategies, a process through which solutions are sought for the most severe pollution problems that affect the community, by means of formulating viable implementation strategies and action plans.

Your participation in this Workshop is of vital importance, since it will allow your point of view (or that of your institution) to be incorporated into the CEAP preparation process.

For any additional information that you may require and to confirm your participation, or that of a representative, please communicate with Mr./Ms. \_\_\_\_\_, who is in charge of the workshop, at telephone no. \_\_\_\_\_.

I appreciate your participation and support of this important effort.

Very sincerely yours,

Annex: Workshop Agenda

## SAMPLE AGENDA FOR THE THIRD COMMUNITY WORKSHOP

**Workshop Objectives:** *To identify the **anatomy** of high-priority problems, community goals and objectives, and the most feasible strategies to resolve priority environmental problems of the community.*

- 8:00-8:30 a.m.                      Registration of participants
- 8:00-8:45                              Opening of the event. Two persons will open the event. One of those persons may be a municipal authority or a representative of another public institution, a member of a community-based organization, or a nongovernmental organization, or possibly a key personality of the community, such as a community leader or well-known expert in environmental pollution matters. The second should be a member of ACCEAP.
- 8:45-9:00                              Presentation of the participants. Explanation and approval of the agenda.
- 9:00-9:15                              Warm-up.
- TOPIC I:**                              **Anatomy of previously ranked problems.** *Key aspects of the problems ranked in the Basic Community Profile and during the Second Community Workshop will be determined during this part of the workshop. This step, prior to identification of the environmental strategies, is designed to break down the pollution problems, that is, to separate them into sub-components to facilitate the identification of appropriate strategies and action plans. A series of forms (Annex 1) have been prepared and will be distributed among participants for these purposes.*
- 9:15-9:45                              **Plenary session**
- Presentation of materials and methods for identifying the *anatomy* of the problems and an explanation of how the *anatomy* of the problems functions
- 9:45-10:00                              Recess and coffee**
- 10:00-12:00                              Work in groups
- 12:00-12:30                              Presentation of conclusions. Plenary session.
- 12:30-2:00                              Lunch**

**TOPIC II:** **Identification of community goals and objectives and of environmental strategies.** *Identification of community goals and objectives is a key step which must be taken prior to identifying environmental strategies. Community goals and objectives are a series of "objective images" that must be formulated by **brainstorming**. A list of questions (Annex 2) will be distributed to be used for these purposes.*

2:00-2:45

**Plenary session**

Presentation of materials and methods for establishing the community's goals and objectives

- *Discussion of possible programs and concepts*
- *Generating a brainstorming session*

**TOPIC III:**

**Identification of environmental strategies.** *The identification of strategies related to environmental pollution is the central focus of this workshop. On the basis of the **path** or **anatomy** of the problems ranked and of the **goals and objectives of the community**, the workshop will now proceed to identify the most feasible strategies to implement. A series of informal discussions will be carried out during this part of the workshop to consider the strategies which are most feasible using a series of previously prepared questions. The work to be accomplished during this session may be based on a series of documents prepared for those purposes (Annexes 3, 4, and 5).*

2:45-3:00

**Plenary session**

Weighing of strategies

- Pollution Problem 1
- Pollution Problem 2
- Pollution Problem 3

3:00-4:00

**Group sessions**

Work in groups

**4:00-4:15****Recess and coffee**

4:15-5:00

Work in groups

5:00-5:30

**Plenary session**

Presentation of conclusions

5:30-6:00

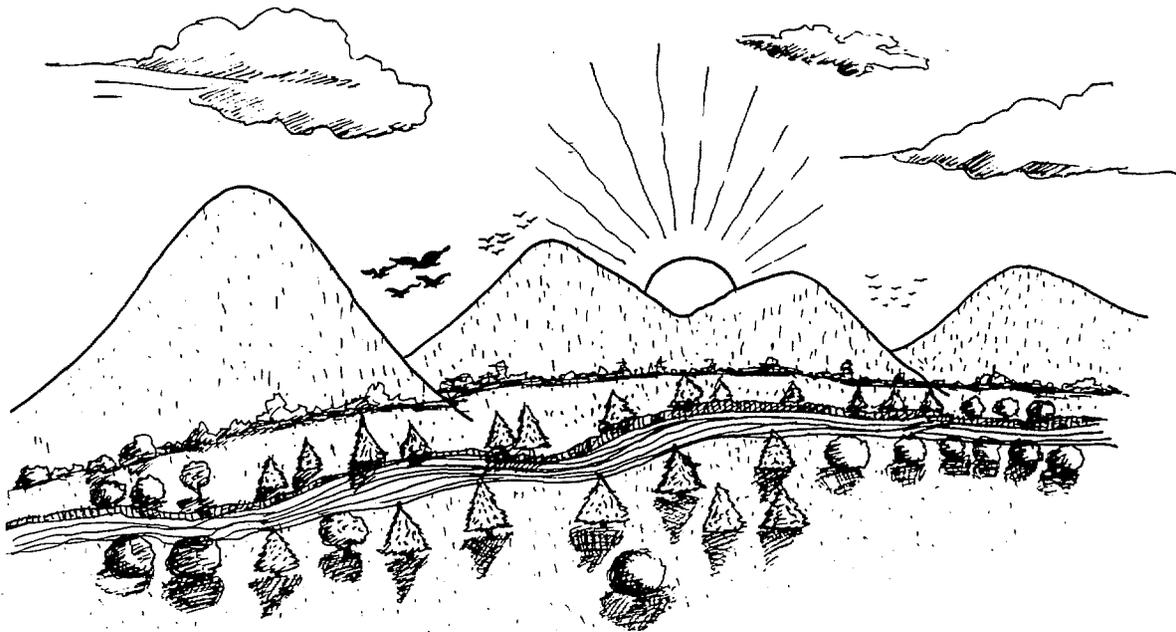
Evaluation and closure

**6:00****ACCEAP meeting to discuss workshop results**

## OBJECTIVES AND CONTENTS

The objective of this Module is to identify a series of priority actions for the previously identified pollution-related strategies. Module VI contains:

- Plans for community action
- Selecting strategies that can be converted to action plans
- Considering innovative technologies to solve pollution problems
- Formulating action plans
- Matrix forms for use in preparing action plans
- Fourth Community Workshop
- Participants in the Fourth Community Workshop
- Time frame for activities related to action plans
- Annexes



## GENERAL INSTRUCTIONS

PLANS FOR COMMUNITY ACTION  
ON ENVIRONMENTAL POLLUTION

One of the principal CEAP objectives is to prepare a series of plans for priority actions in the area of environmental pollution. These plans should have the possibility of being implemented, using available resources and institutional capacity. They will need to be designed:

- To assist municipal governments and CBOs in obtaining access to sources of national as well as international funding
- To make municipal governments and CBOs aware of new, low-cost technologies available for the solution of pollution problems
- To systemize municipal and community participation, increasing the ability of the community to help itself and to sustain its actions and projects
- To assist in integrating the efforts of municipal governments, CBOs, and other key economic and social sectors of the community in relation to pollution problems

*To carry out this CEAP stage, a community needs to have previously identified and ranked its environmental pollution problems; to have established which elements produce the greatest risks (where action should be taken, identifying the anatomy or route of the problems); and to have formulated a series of strategies to resolve the most critical problems affecting the community.*

SELECTING STRATEGIES THAT CAN  
BE CONVERTED TO ACTION PLANS

The task of this CEAP stage is to convert the strategies formulated during the Third Community Workshop into a series of high-priority actions. To that end, participants in the Fourth Community Workshop must be offered the opportunity to:

- Select those strategies which are most effective in terms of risk reduction, costs, and institutional capabilities
- Reformulate (if necessary) strategies identified during the Third Community Workshop

ACCEAP must develop a series of criteria which allow a small number of strategies to be chosen which are capable of being broadened and converted into action plans. Participants in the Fourth Community Workshop are not expected to undertake an exhaustive analysis of the strategies or their relationship to such criteria.

*Annex 1 suggests a series of criteria for selecting the most appropriate strategies.*

INNOVATIVE TECHNOLOGIES TO  
SOLVE POLLUTION PROBLEMS

Presented in conjunction with the CEAP Manual is an **Appendix** that includes the description of projects, technologies, and innovative methods, low in cost, that may be used in formulating action plans dealing with wastewater and solid waste. The purpose of the **Appendix** is to demonstrate the existence of nontraditional or informal solutions that have been successful in several parts of the

world and to demonstrate that such solutions can be applied through CEAP to resolve pollution problems. Solutions of this type already exist for the majority of pollution problems.

It is recommended that copies of the low-cost alternative technology **Appendix** found in this Manual be distributed to participants in the Fourth Community Workshop, although they are not expected to make an exhaustive analysis of it. The objective is to allow solutions of this sort to be a part of the knowledge of participants when they formulate the action plans recommended in this Module. In case the entire **Appendix** cannot be distributed, it is recommended that the participants be sent at least those matrix forms included in it.

*The Appendix included in this Module, which describes innovative, low-cost projects, technologies, and methods is merely illustrative in nature. It is designed to familiarize communities with informal solutions. Participants in the Fourth Community Workshop may choose for their planning actions solutions completely different from those included in the Appendix.*

## FORMULATING ACTION PLANS

In the CEAP process, an action plan may be defined as a conjunction of actions designed to solve a specific problem. Such a plan must respond to five basic questions:

- **What?** This refers to the type of actions that must be taken to respond to the defined strategies.
- **Who?** This refers to the actors (who may be individuals, CBOs, and public or private, local or national insti-

tutions) responsible for carrying out the proposed priority actions.

- **How?** This refers to the processes or methods to be followed to implement the proposed actions.
- **When?** This refers to the time frame required for implementation of the proposed actions.
- **How much?** This refers to possible local, national, regional and international funding requirements and sources.

## MATRIX FORMS FOR USE IN PREPARING ACTION PLANS

To formulate the action plans, ACCEAP should prepare a series of matrix forms, including the following:

- Short-term (actions lasting less than a year)
- Medium-term (actions lasting one to three years)
- Long-term (actions lasting three to six years)
- Areas of possible problems
- National institutions capable of assisting in implementation of action plans
- Possible funding sources
- Legislative necessities

*Annex 2 provides an example of matrix forms that may be used in preparing action plans. Annex 3 includes a series of questions that may be used for formulating action plans. Annex 4 includes an example of an action plan*

#### **FOURTH COMMUNITY WORKSHOP**

The members of ACCEAP will be responsible for preparing and conducting the Fourth Community Workshop. To prepare action plans, they must select those strategies that are the most appropriate and feasible to implement. They will also review a series of innovative, low-cost technologies that provide nontraditional solutions to pollution problems, utilizing a series of matrix forms designed to facilitate preparation of action plans. This workshop should proceed as follows:

- Explanation of the objectives of the workshop
- Presentation of the criteria and selection of the most effective strategies
- Brief introduction of innovative, low-cost technologies designed to reduce pollution problems
- Introduction of the matrix forms for preparation of action plans
- Development of action plans

This workshop will be carried out through informal discussions, during which the action plans which have the greatest possibility of being implemented, in terms of available resources and institutional capabilities, will be considered. It is recommended that, prior to holding the workshop, matrix forms be prepared on easel sheets similar to those to be used during the session, so that they may be

seen by all participants at the beginning of the discussions and during the workshop. Action plans identified during this session are to be noted on them at the end of the discussion.

This workshop will last one day, with discussions conducted by a moderator during the plenary as well as group sessions.

*Annex 5 includes a model letter to convene the Fourth Community Workshop, and Annex 6 provides a model agenda for that workshop. It is further recommended that Annexes 1F, 1G, and 2 of Module I of this Manual be consulted with regard to conducting this workshop*

#### **PARTICIPANTS IN THE FOURTH COMMUNITY WORKSHOP**

It is important to include representatives of the greatest possible number of social and economic sectors of the population in the Fourth Community Workshop. To achieve that, ACCEAP, in issuing invitations to the Fourth Workshop, should include multi-sectorial groups. A certain level of continuity is essential in terms of participants in the different CEAP workshops. ACCEAP should therefore issue invitations to those who participated in prior CEAP workshops, as well as to other persons.

**TIME FRAME FOR ACTIVITIES  
RELATED TO ACTION PLANS**

ACTIVITY	DURATION No. Weeks
<b>Preparation of matrix forms for developing action plans</b>	1
<b>Review of low-cost technologies</b> <ul style="list-style-type: none"> <li>• Distribute the document describing innovative or low-cost technologies (or the matrix forms included in that document) to workshop participants</li> </ul>	2
<b>Fourth Community Workshop</b> <ul style="list-style-type: none"> <li>• Send a letter of invitation to the workshop, along with the agenda</li> <li>• Make other preparations for the Fourth Workshop</li> <li>• Conduct the workshop</li> <li>• Evaluate and select strategies</li> <li>• Identify community goals and objectives</li> <li>• Formulate action plans</li> </ul>	2
<b>Total Duration of the Module: 3 Weeks</b> (Some activities overlap.)	



Annexes ⇒



## **ANNEXES: MODULE VI**

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The following annexes are designed to support the activities described in Module VI. These annexes include material designed to identify action plans and prepare and conduct the Fourth Community Workshop. The section contains:

- Annex 1: Suggested criteria for selecting strategies related to environmental pollution
- Annex 2: Sample forms for preparing community action plans
- Annex 3: Suggested questions for formulating community action plans
- Annex 4: Sample action plan
- Annex 5: Sample letter of invitation to the Fourth Community Workshop
- Annex 6: Sample agenda for the Fourth Community Workshop

## SUGGESTED CRITERIA FOR SELECTING STRATEGIES RELATED TO ENVIRONMENTAL POLLUTION

<b>CRITERIA TO EVALUATE THE EFFECTIVENESS AND FEASIBILITY OF ENVIRONMENTAL STRATEGIES IDENTIFIED</b>
<i>Objective: The following criteria may be used to select the most feasible strategies for implementation.</i>
<b>Possibility of risk reduction and prevention.</b> This refers to the effect of the proposed strategy on the reduction or prevention of risks generated by the identified problems.
<b>Cost.</b> This refers to the feasibility of the strategy in relation to the economic, social, political, cultural, and ecological costs that have to be met to implement programs growing out of the strategy.
<b>Cost-effectiveness.</b> This refers to the relationship between the cost of implementing a program based upon a particular strategy and its possible effectiveness in risk reduction. Aspects related to the possible profitability of the program may also be considered under this heading.
<b>Technologies and local technical capacity to promote the strategies selected.</b> Technologies that are available for the implementation of a particular strategy must be considered under this item. Certain technologies are often not available, not known, difficult to carry out, or involve a prohibitive cost. It may also be that the implementation of a particular strategy requires either personnel with a greater technical capacity or simply a greater number of technical personnel than a particular institution or community may have available at the present time.
<b>Prior experience.</b> Experience in programs, projects, and technologies that are essential to carrying out the strategies under consideration must be considered under this item. If strategies being considered are similar to strategies which have met with obstacles and difficulties in the past, they must be evaluated with caution.
<b>Equity.</b> This considers the population groups most exposed to environmental pollution (e.g. residents of outlying suburban areas, indigenous groups, agricultural workers, and women and children exposed to high pollution indexes who have limited access to health services).

## SAMPLE MATRIX FORMS FOR PREPARING COMMUNITY ACTION PLANS

<b>ACTION PLAN:</b>			
<b>I. PERIOD OF TIME NECESSARY FOR THE PROPOSED ACTIONS TO BE IMPLEMENTED</b>			
<b>Initial actions of less than a year</b>	<b>Medium-range actions 1 to 3 years</b>	<b>Long-range actions 3 to 6 years</b>	<b>Areas of possible problems</b>

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<b>ACTION PLAN:</b>		
<b>II. INSTITUTIONS THAT MAY BE ABLE TO ASSIST IN IMPLEMENTING THE PROGRAM</b>		
<b>Type: local, national, regional, and international cooperation</b>	<b>Institutions</b>	<b>Actions</b>

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<b>ACTION PLAN:</b>		
<b>III. POSSIBLE SOURCES OF FINANCING</b>		
<b>Type: local, national, regional, and international cooperation</b>	<b>Institutions</b>	<b>Type of assistance</b>

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<b>ACTION PLAN:</b>		
<b>IV. LEGISLATIVE REQUIREMENTS</b>		
<b>Existing legislation</b>	<b>Institutions</b>	<b>Needed legislation</b>

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## SUGGESTED QUESTIONS FOR FORMULATING COMMUNITY ACTION PLANS

*These questions may be used to facilitate the filling out of matrix forms related to action plans.*

- **What priority actions must be carried out to implement the strategy identified?**

*This is a case of determining, step by step, the actions that must be carried out to reach the objectives of the identified strategies and reduce the risks caused by the environmental pollution problems. The response to this question constitutes the ACTION PLANS. These steps must be broken down into actions lasting six months to a year, one year to three years or three years, to six and entered on the matrix forms prepared for the purpose. A close relationship must be maintained during this process between the actions being formulated and the strategy or strategies which gave rise to such action plans.*

- **What are the possible problem areas which may affect the implementation of the proposed actions?**

*This is a case of determining which circumstances are favorable and which are adverse to the proposed actions. For example, if actions have to do with construction of a "local" system for the treatment of wastewater, such as biofilters or oxidation ponds, unfavorable circumstances might include the possibility of bad odors produced by the oxidation pond or the biofilter if they are not adequately "administered," the possible devaluation of real estate in the area, and the possible opposition of residents in areas where the installation of an oxidation pond is being planned. It is important to compare the results of the matrix form in relation to the periods of time and the possible areas of problems or conflicts. If necessary, appropriate adjustments can be made between the columns after this matrix form has been completed.*

- **What institutions are capable of assisting in implementing the proposed program?**

*This is a case of identifying who can and who ought to lead in the promotion, management, and application of the action plans. For example, if the school superintendent in a particular community (should the superintendent be an active leader) puts forth a plan of action for installation of an oxidation pond, the plan will surely not be as successful as if the mayor himself directly assumes that responsibility. In such a case, the superintendent would be more valuable presiding over a civic committee that, along with other community personalities, assumes the responsibility for supporting the mayor in his efforts.*

- **To what extent is the assistance of local, national, regional, or international cooperation agencies necessary to promote the proposed action plans?**

*This is a case of identifying where specific cooperation is needed and for what purpose. Such assistance need not be merely in terms of money or technology. It could also take the form of training for local people, including professionals, as well as the strengthening of*

*community institutions. There are many doors waiting to be opened, and much assistance is available for the resolution of community environmental problems. The problem is that communities often request assistance without knowing exactly what help they need, or they accept assistance without questioning whether the assistance provided will help solve the problems under consideration.*

- **What legislative needs must be met to promote the identified action plans?**

*This is a case of determining legislative needs in terms of strengthening existing laws, creating new laws, codes, and standards and enforcing compliance with such legislation to be able to carry out proposed action plans. For example, if there is a standard that stipulates that all municipalities must treat their wastewater using conventional systems, or in a centralized sewage treatment plant, it will be necessary to amend that standard to use nonconventional systems that allow the population to treat their wastewater at the local level, by means of biofilters or oxidation ponds.*

## SAMPLE ACTION PLAN

*This action plan shows the work carried out by a community after having taken the CEAP steps involving the formulation of action plans.*

<b>ACTION PLAN: Wastewater</b>			
<b>PERIOD OF TIME NECESSARY FOR THE PROPOSED ACTIONS TO BE IMPLEMENTED</b>			
<b>Initial actions of less than a year</b>	<b>Medium-range actions 1 to 3 years</b>	<b>Long-range actions 3 to 6 years</b>	<b>Areas of possible problems</b>
<ul style="list-style-type: none"> <li>● Negotiate the technical and financial resources necessary for implementation of the program through the Association of Municipalities.</li> <li>● Define the functions of municipal governments in wastewater management.</li> <li>● Prepare diagnostics and develop mechanisms for the control and monitoring of water pollution.</li> <li>● Apply for financing for acquisition of necessary equipment and install pollution control laboratories.</li> <li>● Negotiate economic resources for the adoption of systems to treat wastewater. International agencies should fund pilot actions which are repeatable in other localities through provision of "seed money."</li> <li>● Coordinate the technical and legal efforts of institutions related to wastewater treatment.</li> <li>● Promote the participation of civic groups.</li> </ul>	<ul style="list-style-type: none"> <li>● Negotiating the resources for the design and execution of the projects.</li> <li>● Obtaining the commitment of the central government to carry out a co-sponsorship system for environmental clean-up projects in municipalities with limited economic resources.</li> <li>● Identifying a menu of technological alternatives accessible to municipal governments in accordance with their characteristics.</li> <li>● Developing training programs for specialists in control and monitoring.</li> <li>● Defining mechanisms to make wastewater management profitable.</li> <li>● Defining rates.</li> <li>● Contemplating the possibility of services.</li> <li>● Providing training for municipal personnel in wastewater management techniques.</li> <li>● Having 1-2 monitoring laboratories in the region with adequate equipment and personnel.</li> </ul>	<ul style="list-style-type: none"> <li>● Strengthening municipal government institutions by 80%.</li> <li>● Strengthening laws and regulations related to wastewater by 100%.</li> <li>● Having the capacity to prepare technical studies and carry out 80% of projects.</li> <li>● Establishing a capacity to monitor 80% of the region.</li> <li>● Convincing 80% of the municipal governments to use alternative technologies.</li> <li>● Establishing a process of information dissemination in relation to low-cost technologies that are effective.</li> <li>● Training municipal authorities in management and technical training courses.</li> <li>● Organizing a training program at the regional level for municipal authorities in environmental pollution matters.</li> </ul>	<ul style="list-style-type: none"> <li>● A program of this sort is at risk of being interrupted by a change in governments.</li> <li>● Technical and economic capacity of municipal governments to negotiate, administer, and maintain a treatment system is limited.</li> <li>● Communities that would use the service lack the economic capacity to sustain it.</li> <li>● There is a lack of knowledge and distrust of non-conventional technological solutions in relation to their acceptance as well as to their implementation.</li> <li>● The strategy may face political opposition because the subject of industrial and agricultural wastewater affects economic interests.</li> <li>● As conceived at the present time, the system favors large municipal governments and leaves out the smaller ones.</li> <li>● It has not been possible to capture the interest of the entire community in small cities; some sectors insist on traditional systems (latrines, etc.).</li> </ul>

## **SAMPLE LETTER OF INVITATION TO THE FOURTH COMMUNITY WORKSHOP**

As I am sure you are aware, the Community Environmental Action Plan (CEAP) project is presently being implemented in our community.

As part of CEAP activities, the Fourth Community Workshop is now being organized. The objective of this workshop is to select a small number of strategies that have the possibility of being carried out and, on the basis of those strategies, to develop action plans that, in terms of the availability of resources and institutional capacities, can feasibly be implemented.

Your participation in this workshop is of vital importance to the culmination of the project, and I want to take this opportunity to express my appreciation for your participation.

For any additional information that you may require and to confirm your participation, or that of a representative, please communicate with Mr./Ms. \_\_\_\_\_, who is in charge of the workshop, at telephone No. \_\_\_\_\_.

I again appreciate your support for this important effort.

Very sincerely yours,

Annex: Workshop Agenda

## SAMPLE AGENDA FOR THE FOURTH COMMUNITY WORKSHOP

**Workshop Objectives:** *To select a small number of strategies that have the possibility of being carried out and, on the basis of those strategies to develop action plans that, based on available resource and institutional capacities, are capable of being implemented.*

- 8:00-8:30 a.m. Registration of participants
- 8:00-8:45 Opening of the event. Two persons will open the event. One of those persons may be a municipal authority or represent another institution. The second should be a member of ACCEAP.
- 8:45-9:00 Presentation of participants. Explanation and approval of the agenda.
- 9:00-9:15 Warm-up.
- TOPIC I:** *Identification of the strategies that have the best possibility of being carried out. During this part of the workshop, and on the basis of a series of criteria, the environmental strategies that have the best possibility of being carried out will be identified. A series of documents (Annex 1) can be used for these purposes.*
- 9:15-9:30 **Plenary session**
- Presentation of materials and criteria for the selection of strategies. Discussion of the strategies identified during the Third Community Workshop
- 9:30-10:00 **Group session**
- Selection of strategies
- 10:00-10:15 **Recess and coffee**
- 10:15-11:15 Continuation of the previous session
- TOPIC II:** *Identification of action plans. Remaining in the same groups as in the previous session, participants will proceed to develop action plans during this part of the workshop. A series of documents prepared for the purpose (Annexes 2, 3, and 4) will be distributed.*

- 
- 11:15—11:30            **Group session**  
Presentation of materials and methodology for the development of action plans
  - 11:30—12:15           **Identification of action plans**
  - 12:15—1:30            **Lunch**
  - 1:30—3:00             **Continuation of the previous session**
  - 3:00—3:15             **Recess and coffee**
  - 3:15—4:30             **Continuation of the previous session**
  - 4:30—5:30             **Plenary session: presentation of the conclusions of working groups, evaluation, and closure**
  - 6:00                     **ACCEAP meeting to discuss the next steps after completing all phases of CEAP**

**OBJECTIVES AND CONTENT**

The objective of this Appendix is to present a range of alternative low-cost wastewater and solid waste technologies. These technologies will assist individuals, community leaders, and municipalities in the following areas:

**Wastewater**

- Latrine Styles
- Latrine Emptying Technologies
- Sewerage Systems
- Aquatic Treatment Systems
- Land-Based Treatment Systems
- Integrated Treatment Systems
- Alternative Financing for Wastewater Treatment

**Solid Waste**

- Collection, Transportation, Disposal, and Resource Recovery
- Composting
- Incineration
- Landfills



<b>APPENDIX</b>	<b>ALTERNATIVE WASTEWATER AND SOLID WASTE SANITATION SYSTEMS</b>
<b>INTRODUCTION</b>	

The deficit in environmental sanitation services being experienced at the present time by a large number of developing countries is often caused by a combination of factors. These include rapid, disorganized population growth and limited national and municipal budgets, incapable of meeting the growing demands for sanitation services and associated infrastructure works. Another significant cause of the deficit is the high cost of sanitation service systems and the limited capacity of such systems to generate capital recovery.

The lack of environmental sanitation services is coming to occupy an increasingly important position in the programming budgets of governments, international finance agencies, and municipalities. The cause is simple; the lack or deficiency of environmental sanitation services has strong repercussions in terms of public health. Morbidity and mortality indicators clearly indicate that acute diarrheic and hydro-transmissible diseases, acute respiratory disease, and various types of dermatitis are all highly correlated to the lack of municipal sanitation services. The lack of environmental sanitation services is also accompanied by a series of environmental and economic impacts, particularly in terms of the pollution and degrading of surface water, groundwater, soil, and air.

This Appendix includes a series of innovative and low-cost systems which present an alternative to the more costly traditional systems. It describes a series of nonconventional systems for sewage treatment and solid waste collection, transportation, and disposition. By design, this Appendix is neither complete nor exhaustive. Many existing plausible, low-cost interventions, innovative in nature, have not been included in this document, whose intent is merely to provide a tool for municipal governments and community-based organizations engaged in the process of searching out feasible solutions to environmental pollution problems.

A variety of nonconventional systems for wastewater and excreta treatment may be constructed and financed at the municipal or community level. Such alternative treatment systems frequently require not only community institutions but individuals to play an important role in their operation and maintenance. Participation of residents in the planning, financing, and construction of such wastewater and excreta treatment systems is therefore essential and results in individual as well as community pride of ownership and interest in the sustainability of the systems.

In terms of solid wastes, various innovative methods offer more efficient and complete service, in many cases, than that provided by traditional systems. Trash collection services in periurban areas, for example, are practically nonexistent in large parts of the world. Lack of such service is usually due to a series of obstacles, including the lack of municipal funds, political commitment, land-ownership problems, and/or difficult road conditions that impede the access of large trash collection trucks. Informal solutions, however, such as those implemented by well-managed small businesses, have proven capable of providing efficient services that can overcome the aforementioned obstacles.

Generally, it is fair to say that the more costly the solutions to municipal services, the more difficult they are to attain. The great majority of municipal governments are in the midst of a decentralization

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process, which causes them to re-evaluate their resources, often generating disadvantageous situations. Municipal governments are also undergoing an economic process that can often be inflationary, where municipal budgets, if not actually constrained, are at least affected by a drop in the purchasing power of the national currency. Such economic weakness is aggravated by the lack of human and technological resources, as well as by the lack of legislation or of compliance with existing legislation, standards, and adequate norms related to environmental pollution. In that context, low-cost solutions offer an alternative that allows relief from the burden carried by municipal governments regarding the need to increase urban infrastructure capacity and reduce the impact of pollution on the community in terms of health, quality of life, and ecosystems.

### **USING THE APPENDIX**

This document, which describes innovative, low-cost projects, technologies, and methods, is merely illustrative in nature. Designed to familiarize communities with a series of informal, low-cost solutions, it is not meant to be coercive in any way, and communities participating in CEAP may choose their planning actions among solutions completely different from those included in this Appendix.

**PART I**

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**WASTEWATER: LATRINE STYLES (PRIMARY DEPOSIT TECHNOLOGIES)**

## A. LATRINES AND THE SANPLAT SANITARY PLATFORM

### Project Description:

- Promote latrine construction and use of Sanplat Sanitary Platforms.

### Problem Area:

- Latrines were being used without a secure platform allowing disease spreading flies and rodents to gain access to the pit.

### Approach:

- To promote latrines with a Sanplat platform, the Bangladesh Rural Sanitation program sponsored advocacy programs and training on national and local levels.

### Benefits:

- The Sanplat platform is a low-cost reusable concrete platform that facilitates latrine use and improves public health conditions.
- The advocacy and construction of the Sanplat platform have benefited from cooperative arrangements between institutions and organizations.
- The Sanplat platform can be constructed from locally available materials and is easily replicated.
- The Sanplat platform has a removable drop-hole cover, which thereby reduces the number of flies that can access excreta and spread disease.
- When an existing latrine with a Sanplat platform is filled to capacity, the platform can be transferred to a new latrine.

### Disadvantages:

- In extremely remote areas, residents may find it difficult to obtain concrete and/or to transport the concrete Sanplat platform.
- Basic carpentry and masonry skills are required to construct the Sanplat mold and platform.

### Location of Project:

- Bangladesh and East Africa, rural areas.

### Date of Implementation:

- 1993-present.

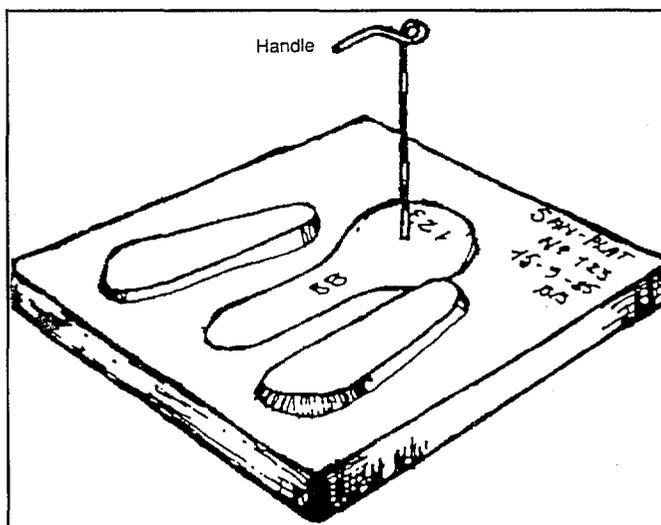
### Source of Funding/Implementing Agency:

- Bangladesh National Sanitation Program.
- IDRC of Canada, SIDA of Sweden, and the World Bank developed the Sanplat System.

#### Sanplat Platform

The Sanplat is a concrete slab that serves as a reusable latrine pit platform. One bag of cement can build five to eight Sanplat platforms which can be constructed in three sizes: small (60 x 60 cm), medium (1.2 m), large (1.5 m). Each Sanplat platform should include the following: smooth and sloping surfaces for easy cleaning, a child safe drop hole, a tight-fitting lid to prevent odor and restrict flies, and elevated footrests to prevent fouling of the slab.

#### Sanplat Platform



Graphics Source: Brandberg, Bjorn, "A Sanitation Revolution in Bangladesh?" Waterlines, Vol. 11, No. 4 April 1993.

**Source:**

- Brandberg, Bjorn, "Improved sanitation using the Sanplat System," *Waterlines*, Vol. 12, No. 4, April 1994; "A Sanitation Revolution in Bangladesh?" *Waterlines*, Vol. 11, No. 4, April 1993;
- "Rural Sanitation in Bangladesh, Report to UNICEF," Bangladesh, 1992.

**B. STONE DOME TECHNOLOGY AS A STRUCTURAL SUPPORT FOR LATRINES****Project Description:**

- Utilization of stone in place of wood as the medium to construct a "stone dome" to serve as the latrine platform.

**Problem Area:**

- In deforested communities, residents were unable to use latrines due to a lack of wood to construct the latrine platform.

**Approach:**

- The latrine pit is dug manually and secure liner is placed inside of the pit.
- Small to medium-sized rocks are set in mortar to construct an arch of stone over the pit.

**Benefits:**

- Stone dome latrine platforms are resistant to termite and other insect damage.
- Stone dome technology provides a means for residents to build a latrine support platform when conventional materials like wood are unavailable or too expensive.
- Stone can be collected locally and usually free of charge.
- If available, a Sanplat platform can be placed over the small dome opening.

**Disadvantages:**

- If latrine emptying technologies are unavailable than the stone dome platform will become obsolete once the latrine is full.
- Basic masonry skills are necessary to ensure proper construction.

**Source of Funding/Implementing Agency:**

- UNICEF.

**Location of Project:**

- Tigray, Ethiopia.

**Date of Implementation:**

- 1994.

**Source:**

- Bradley, Sarah Murray, "Swapping Information in High Places--Sanitation Decisions in Ethiopia," *Waterlines*, Vol. 12, No. 4, April 1994.

**Latrine Pits**

The past decade has seen a re-emergence in the popularity of using non-technical systems for the collection and disposal of human excreta. Latrine pits represent an immediate, low-cost solution to combat the public health threats of unsanitary defecation practices. Latrine pits are suitable for both rural and urban areas given appropriate soil characteristics, water table levels, and systems to safely collect and dispose of non-infiltrating excreta. Latrines serve as concentrators of excreta reducing the likelihood of the transmission of disease through mobile vectors like water, rodents, and flies.

Source: Pickford, John, *Low-Cost Sanitation: A Survey of Practical Experience*, IT Publications, 103-105 Southampton Row, London WC1B 4HH, UK, 1995.

## C. VIETNAMESE DOUBLE VAULT: ON-SITE COMPOSTING OF EXCRETA

### Project Description:

- Build above-ground concrete vaults to serve as both latrines and composting chambers.

### Problem Area:

- Rural and urban residents were defecating in an unsanitary manner exposing the population to public health threats. In addition, the excreta waste was not being consolidated and used as an agricultural fertilizer.

### Approach:

- The double vaults, known as a Vietnamese Double Vault, are approximately 2m x 1m x 1m, and constructed above ground to prevent the possibility of submersion by rainwater.
- A hole is made on the top of each vault for defecation along with a separate groove to funnel urine to a receptacle outside of the vault.
- The vaults are water tight and a small door is built into the rear of the tank to allow the removal of the composted excreta.
- Wood ashes and soil are sprinkled after every deposit to neutralize odor.
- After one side of the vault is full, soil is added and the vault is left dormant to compost in an anaerobic environment.
- While one side of the vault is in disuse, the other side of the vault serves as the new receptacle for excreta.
- After two months the dormant side of the vault is emptied and the dry compost sludge is suitable for fertilizer.

### Benefits:

- Health risks associated with unsanitary defecation practices are reduced.
- The process of anaerobic composting has been demonstrated to destroy 85 percent of the ova of intestinal worm parasites.
- The anaerobic composting process enhances the excreta as a fertilizer for agricultural applications.

### Disadvantages:

- The monetary investment required for the construction of this system may prove to be prohibitively expensive for some families.
- The double vault system is not well-suited for densely populated urban areas where disposal of the compost is problematic.
- Failure to control the moisture content of the latrine, as a result of poor construction techniques and/or mixture of urine in the chamber, can result in inadequate anaerobic digestion and an increase in the probability of parasitic infections from compost handling and agricultural use.
- The tendency of users to not apply ashes or soil after each deposit reduces the efficacy of the system.

### Location of Project:

- Socialist Republic of Vietnam.

### Date of Implementation:

- Style originated in the 1950s.

### Source:

- International Water and Sanitation Centre, Vol. 6, No. 1, 1995.
- Rybczynski, Witold, Chongrak Polprasert, and Michael McGarry, *Low-Cost Technology Options for Sanitation: A State of the Art Review and Annotated Bibliography*, 1978.

**D. PIT PRIVY LIQUEFIER: EXTENDING THE LIFE SPAN OF A LATRINE****Project Description:**

- Utilize pit privy liquefiers to dissolve excreta before discharge into latrine pits to facilitate excreta percolation into the soil, thereby reducing the need for frequent latrine emptying services.

**Problem Area:**

- In areas of high population density, latrine pits required frequent emptying service.

**Approach:**

- The pit privy liquefier is a low water flush unit attached to the bottom of the toilet.
- If the soil is impermeable or the latrine is full, the liquefier can be attached to an effluent pipe drawing the wastewater to a second latrine or soak way.

**Benefits:**

- Liquid excreta percolates more readily into the latrine walls thereby extending the life of the pit.
- This advanced soaking away process and corresponding compaction of solids will result in an extension in the life of the pit.
- Hygiene standards are comparable to full water flush installations and anaerobic odors are reduced.

**Disadvantages:**

- Access to a water source is essential.
- The liquefier requires proper installation and maintenance.

**Source of Funding/Implementing Agency:**

- The system was patented by the H.S. Organization, South Africa.

**Location of Project:**

- South Africa.

**Date of Implementation:**

- 1990.

**Source:**

- International Water and Sanitation Centre, Vol. 6, No. 1, 1995.

**Latrines and Soil Purification**

As a general rule, if the latrine is dug in fine sand or loam with a year-round distance of two meters between the bottom of the latrine pit and the groundwater, then virtually all bacteria, viruses, and other fecal organisms will be removed. All latrine pits should be lined unless the soil is stable in both dry and wet conditions. Ideally the top quarter of the latrine will be lined with an impervious layer to prevent surface water from entering the pit. The top lining also serves as a structural support for the base of the latrine. The lining in the lower half of the pit should allow liquid to percolate into the soil. Liners can be constructed from bricks, masonry blocks, stones, barrels, or wood.

Source: Pickford, John, *Low-Cost Sanitation: A Survey of Practical Experience*, IT Publications, 103-105 Southampton Row, London WC1B 4HH, UK, 1995.

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**E. LATRINE TECHNOLOGY MATRIX**

<b>Types of Pit Latrines</b>			
<b>Type</b>	<b>Nature of Innovation</b>	<b>Benefits</b>	<b>Disadvantages</b>
Communal or Public Latrine	<ul style="list-style-type: none"> <li>The communal or public latrine is located in congested areas, usually in market places or near sporting arenas.</li> </ul>	<ul style="list-style-type: none"> <li>Provides public latrine access in crowded areas giving individuals an alternative to unsanitary defecation.</li> </ul>	<ul style="list-style-type: none"> <li>To ensure cleanliness and general maintenance of the latrine a supervisor should be hired by the community to monitor the latrine and collect a user fee.</li> </ul>
Borehole Latrine	<ul style="list-style-type: none"> <li>Narrow diameter latrine dug with a hand auger.</li> </ul>	<ul style="list-style-type: none"> <li>Applicable in congested urban areas.</li> </ul>	<ul style="list-style-type: none"> <li>Unsuitable for areas with a high groundwater table.</li> </ul>
Bucket Latrine	<ul style="list-style-type: none"> <li>A sitting platform is erected with a small bucket underneath which serves as the receptacle of the excreta.</li> </ul>	<ul style="list-style-type: none"> <li>The buckets are usually emptied at night, hence the term "night soil" by a person contracted by the residence to provide the service.</li> <li>Daily emptying service reduces the propagation of flies and the general odor.</li> </ul>	<ul style="list-style-type: none"> <li>This system of collection does not address the final disposal of the excreta.</li> <li>The collectors of the excreta are exposed to pathogens.</li> </ul>
Pour-Flush Latrine	<ul style="list-style-type: none"> <li>A latrine system that uses a conventional toilet with a chute that drains the effluent into a temporary water sealed pan before discharging into the latrine pit.</li> </ul>	<ul style="list-style-type: none"> <li>A properly functioning water seal is essential to reducing odor and flies.</li> </ul>	<ul style="list-style-type: none"> <li>Problems with the water seal are common.</li> <li>Approximately 1 liter of water is necessary to manually "flush" the excreta.</li> </ul>
Variated Pour-Flush Latrine	<ul style="list-style-type: none"> <li>A modified pour-flush latrine system in which the pan which is the first receptacle of the excreta is hinged and counter weighted so that the weight of the excreta tilts the contents of the pan into the pit.</li> <li>An automatic water valve refills the pan with water from a nearby storage tank.</li> </ul>	<ul style="list-style-type: none"> <li>Automated system does not require manual flushing.</li> </ul>	<ul style="list-style-type: none"> <li>Proper maintenance of the system is essential for its utility.</li> <li>As in all latrine systems, if water is applied excessively the possibility exists for an increase of fly and mosquito breeding and contamination of groundwater.</li> </ul>

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Types of Pit Latrines			
Type	Nature of Innovation	Benefits	Disadvantages
Reid's Odorless Earth Closet	<ul style="list-style-type: none"> <li>A large pit (1x2x3 m deep) covered by a concrete slab. The squatting plate is nonconventionally located to one side of the plate, rather than on the plate, and is connected to the pit by a sloping chute. A vent pipe draws air from the toilet chute up the pipe.</li> </ul>	<ul style="list-style-type: none"> <li>Proper construction results in an air tight odorless system.</li> <li>Since very little light is exposed to the pit, fewer flies congregate to breed.</li> <li>Large volume of the pit facilitates decomposition and infiltration which extends the life span of the pit.</li> </ul>	<ul style="list-style-type: none"> <li>Material costs of the concrete may prove prohibitively expensive for the implementation of this style of latrine system.</li> </ul>
Vietnamese Double Vault Composting Latrine	<ul style="list-style-type: none"> <li>An above-ground concrete double tank system that separates fecal waste from urine to promote anaerobic composting of human excreta.</li> </ul>	<ul style="list-style-type: none"> <li>Provides a rich fertilizer suitable for agricultural use.</li> <li>Vault has dual functions as the primary receptacle and final treatment system for excreta.</li> </ul>	<ul style="list-style-type: none"> <li>Disposal of the composted human excreta in urban areas may be problematic.</li> <li>Improper use and failure to control the moisture content results in incomplete anaerobic digestion.</li> </ul>
Letrina Abonera Seca Familiar (LASF) or Dry Alkaline Family Fertilizer Latrine.	<ul style="list-style-type: none"> <li>An above-ground, double-vault, concrete composting system developed by CEMAT in Guatemala.</li> <li>Functions on the same principles as the Vietnamese Double Vault Composting Latrine.</li> </ul>	<ul style="list-style-type: none"> <li>Suitable for urban areas.</li> <li>LASF has dual functions as the primary receptacle and final treatment system for excreta.</li> </ul>	<ul style="list-style-type: none"> <li>Users must be vigilant not to allow water or urine to enter the interior of the vault because this will interrupt the composting process.</li> </ul>
Multrum Composting Toilet	<ul style="list-style-type: none"> <li>An above-ground, water-tight container with a sloping bottom and air vents that promote aerobic decomposition.</li> <li>The system accepts both liquid and solid excreta and requires the mixture of organic kitchen and garden wastes and wood ashes as neutralizing agents.</li> <li>A small door at the bottom of the sloping floor allows the removal of thoroughly composted material.</li> </ul>	<ul style="list-style-type: none"> <li>The air ducts and a vent pipe evaporate humidity and reduce odors while promoting aerobic composting which results in a sustained high temperature that kills the majority of pathogens.</li> <li>The ability of this water tight system to accommodate urine allows its implementation in areas of dense population and a high water table.</li> </ul>	<ul style="list-style-type: none"> <li>Users need to regularly add organic kitchen and garden wastes in addition to wood ashes to neutralize the acidity of the excreta.</li> <li>Water for anal cleansing should be used sparingly to not interfere with the aerobic composting process.</li> </ul>

Types of Pit Latrines			
Type	Nature of Innovation	Benefits	Disadvantages
Vault and Vacuum Truck System	<ul style="list-style-type: none"> <li>Large household water tight vaults are constructed as the receptacle of human excreta and emptied every 2-4 weeks by vacuum trucks.</li> </ul>	<ul style="list-style-type: none"> <li>This system is much less expensive than conventional water-based sewerage systems.</li> </ul>	<ul style="list-style-type: none"> <li>A properly functioning water seal is necessary to reduce odor and flies. •System requires either municipal or private trucks to collect the excreta on a regular basis.</li> <li>Residents must have the financial means to pay service fees.</li> </ul>
Ventilated Improved Pit Latrine	<ul style="list-style-type: none"> <li>A vent pipe draws odors out of the latrine.</li> <li>The vent pipe is covered with a fine screen that prevents the entrance of flies.</li> <li>Care is taken to ensure that the latrine is fully enclosed, thereby reducing the likelihood of flies.</li> </ul>	<ul style="list-style-type: none"> <li>Odor and flies are reduced.</li> </ul>	<ul style="list-style-type: none"> <li>Care must be taken to ensure that the screen in the vent pipe is properly secured and free of holes.</li> </ul>
Pit Privy Liquefier	<ul style="list-style-type: none"> <li>Lower flush unit liquefies human excreta before disposal in an unlined latrine pit.</li> </ul>	<ul style="list-style-type: none"> <li>Liquid excreta percolates into the soil, thereby extending the life of the pit.</li> </ul>	<ul style="list-style-type: none"> <li>System would not be suitable for regions with a high water table because of the probability of groundwater contamination.</li> <li>Water for flushing is essential.</li> </ul>

**Matrix Source:** International Water and Sanitation Centre, Vol. 5, No. ¼, 1994; Roche, Robert, Piers Cross, Bertrand Ah-Sue, and Steve Maber, "Position Paper 3, Technology Development," in *Water Supply and Sanitation in Africa: Laying the Foundation for the 1990s*, UNDP/PROWESS-AFRICA; Rybczynski, Witold, Chongrak Polprasert, and Michael McGarry, *Low-Cost Technology Options for Sanitation: A State of the Art Review and Annotated Bibliography*, 1978.

**PART II**

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**WASTEWATER: LATRINE EMPTYING TECHNOLOGIES**

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## A. VAULT AND VACUUM TRUCK

### Project Description:

- Construct large water-tight residential concrete vaults to serve as temporary depositories for excreta.
- Vaults are emptied by a vacuum truck when filled to capacity.

### Problem Area:

- Residents in congested urban areas lacked non-infiltrating latrines that would prevent groundwater contamination and non-manual latrine emptying services.

### Approach:

- Families construct above ground or below ground concrete vaults to temporarily store both liquid and solid excreta until a vacuum truck empties the vault.
- Vaults are water tight to prevent leakage of excreta which could contaminate water sources and contribute toward other public health problems.

### Benefits:

- This system is much less expensive than conventional water-based sewerage systems.
- The removal of sludge allows families to continue to use existing latrines.
- In areas of high population density this system provides a sanitary method of human excreta deposit and collection using very little land space.
- The mechanical nature of the vacuum truck service reduces direct contact of the truck operators with the excreta, thereby reducing their exposure to disease.

### Disadvantages:

- The vault vacuum truck system will only be feasible in areas that have suitable roads for the passage of the truck.
- Capital costs to acquire the truck can be high and maintenance will be required on a regular basis.
- Residents must have the financial means to purchase the concrete required for the construction of the vault and pay for the vacuum truck collection service.
- To construct a secure and water-tight vault, residents may need technical assistance.
- Collected excreta requires treatment and disposal.

### Location of Project:

- System widely used in Taiwan and Japan.

### Source:

- Howgrewe, William, et al, "The Unique Challenges of Improving Peri-Urban Sanitation," WASH Reprint: Technical Report No. 86, Environmental Health Project, USAID, 1994.
- Rybczynski, Witold, Chongrak Polprasert, and Michael McGarry, *Low-Cost Technology Options for Sanitation, A State of the Art Review and Annotated Bibliography*, 1978.

#### Pit Latrines with Cartage Systems

The Kenya Water for Health Organization (KWAHO), a nongovernmental organization in Nairobi, Kenya, joined forces with the Norwegian Agency for Development to promote the construction of ventilated improved pit latrines and the establishment of a vacuum truck and cartage service. The vacuum truck is small enough to access homes located on narrow and winding streets, yet powerful enough to forcefully remove dense sludge from the latrine pits. A 13-member community board is responsible for the operation and management of the vacuum truck service. Community members are hired to operate the truck and fees are charged to residents for emptying services.

Source: "Bringing Village People in Planning: KWAHO's Urban Challenge," UNDP, July 1992.

**B. MANUAL PIT LATRINE EMPTYING TECHNOLOGY (MAPET)****Project Description:**

- Manually powered latrine emptying system consisting of a two-wheel cart with a metal collection barrel, hand pump, and plastic suction hose.

**Problem Area:**

- Residents lacked a low-cost technology for latrine emptying which could accommodate the narrow streets of their neighborhoods.

**Approach:**

- Individuals or microenterprises lease or buy the MAPET operational system from the municipality and charge customers a small fee for emptying services.
- The MAPET is operated manually and consists of a piston pump with a flywheel and a 200-liter vacuum tank mounted on a pushcart.
- A lengthy hose pipe is connected to the tank to transport the sludge from the latrine to the tank.
- Depending upon the experience of the pit emptier, sludge may be liquefied for improved suction removal.
- The collected sludge waste is buried on site if possible. Waste is spread out at a depth of two feet underground with caution taken in areas that have a high groundwater level.

**Benefits:**

- The MAPET is a low-cost alternative to the vacuum truck system.
- Houses located along narrow streets that would otherwise be inaccessible for vacuum truck emptying services can be accommodated by the smaller MAPET system.
- This technology is powered entirely by human energy, requires low capital input, and can be constructed from locally available materials.
- The MAPET system is designed to be operated by low-skilled personnel.
- Residents have the freedom to contract with individuals or microenterprises, thereby creating a competitive environment which should reduce service fees.

**Disadvantages:**

- In areas of loose sand, the mobilization of the pushcart is reduced.
- Heavy loads and difficult terrain result in more frequent mechanical failures.
- Disposal of sludge becomes problematic if space is not available on site, and/or if water tables are high.
- The range of disposal distance is limited to approximately 1 kilometer because the pushcarts are operated manually.
- The operational requirements of the technology can expose workers to excreta.

**Source of Funding/Implementing Agency:**

- Municipality of Dar es Salaam builds and leases MAPET operating systems.

**Location of Project:**

- Tanzania, Dar es Salaam. (80 percent of the housing units have pit latrines).

**Date of Implementation:**

- 1994-present.

**Source:**

- Muller, Maria S., and Jaap Rijnsburger, "MAPET: An Appropriate Latrine-Emptying Technology," *Waterlines*, Vol. 13, No. 1, July 1994.

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PART III

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WASTEWATER: SEWERAGE SYSTEMS

## A. SMALL DIAMETER GRAVITY SEWERS

### Project Description:

- Construction of small diameter gravity sewers (SDG) in place of expensive conventional gravity sewers.

### Problem Area:

- Communities that wanted a conventional gravity sewerage system could not afford the extensive excavation and material costs.

### Approach:

- Small diameter pipes are laid in narrow and shallow excavation trenches to connect residences to the system.
- Septic tanks serve as intermediary depositories for wastewater collected from residences upon which grease, grit, and solids settle to the bottom of the tank before the effluent enters the piping system.
- PVC plastic pipes, economical and resistant to the erosion of the effluent, of approximately 10 centimeters in diameter are laid in the ground following the downward sloping contour of the land to ensure gravity drawn transportation of the effluent.
- Uphill sections in the distribution system of the pipes can be incorporated, if elevation and pressure in the upstream pipes are sufficient to maintain flow in the desired direction.
- Manholes are installed only at the junction of major cross lines.

### Benefits:

- Excavation costs are significantly less than for conventional sewer systems because the small diameter pipes can be laid in narrow trenches.
- Fewer manholes are installed and overall construction materials are less expensive because of the smaller scale of the system.
- Operations and management (O&M) of the SDG system can be carried out by low to medium skilled personnel.
- Final treatment costs are reduced as a result of the removal of solids in the septic tanks.
- Necessary lift or pumping stations will be smaller and less expensive than those required for conventional sewer systems because of the smaller scale of the SDG system.

### Disadvantages:

- The SDG system requires that the majority of the connected residences are at an elevation above the terminus of the system
- This system does not provide the excess capacity of conventional sewer systems, therefore if a community experiences significant growth an expansion in the system will be required.
- SDG sewers are not suitable for industrial wastewater with a high concentration of grit and solids.
- De-sludging interceptor tanks must be incorporated into the flow network and collected sludge must be disposed in a safe manner.
- Communities must not flush objects that have the potential to clog the small diameter pipes.
- All system components must be corrosion resistant.

### Location of Project:

- SDG systems are in use in North America, South America, Asia, and Africa.

### Source:

- U.S. Environmental Protection Agency, *EPA Manual: Wastewater Treatment /Disposal for Small Communities*, USEPA, Washington, D.C., September 1992.

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## B. CONDOMINIAL SEWERAGE SYSTEMS

### Project Description:

- Utilization of small diameter pipes and creative engineering designs allow the condominium sewerage system to function as a low-cost alternative to conventional sewerage systems.

### Problem Area:

- In low-income and irregularly designed neighborhoods, conventional sewerage systems were typically both unaffordable and impossible to build according to standard engineering designs.

### Approach:

- Shallow subsurface drainage lines are laid in such a manner to allow all of the houses on one block to attach to the same line.
- Cost-effective engineering designs locate drainage pipes according to the particular layout of the neighborhood, thereby reducing material and excavation costs.
- Sewerage lines are located either in a zig-zag style through residents backyards, front yards, or along sidewalks.
- The feeder line runs in areas that will not have constant automobile traffic compressing the soil above.
- When feeder lines cross streets they are encased in cement or cast iron braces, thereby allowing the shallow depth and low gradient of the line to be maintained.
- The diameter of the feeder line is smaller than in a conventional system and the gradient in which the feeder line is laid is reduced.
- Residents are required to purchase household sanitary fixtures to complement the new sewerage system.

### Benefits:

- Condominial sewerage systems are capable of serving residents in high-density irregular settlements that otherwise would not be able to obtain conventional sewerage systems because of financial and/or conventional engineering constraints.
- Condominial sewerage systems are much less expensive than conventional systems because of modifications in the engineering of the below-ground drainage system, relaxed technical standards, and reduction in the size of the drainage pipes.
- A community sense of ownership and responsibility for the maintenance and operation of the system can be created if residents contribute financially and assist in the construction of the system.

### Disadvantages:

- Relaxed maintenance schedules, faulty engineering designs, poor construction, and use of inappropriate materials can result in a failure of the system.
- Lack of effort by institutional agencies to educate the public about the condominium sewerage system and include customers in project planning and implementation can reduce hook-up percentages.
- Municipal and local residents must have the financial means and technical capabilities to maintain the system.
- Residents must become accustomed to using indoor plumbing systems and not flush potentially pipe-clogging objects in the system.

### Location of Project:

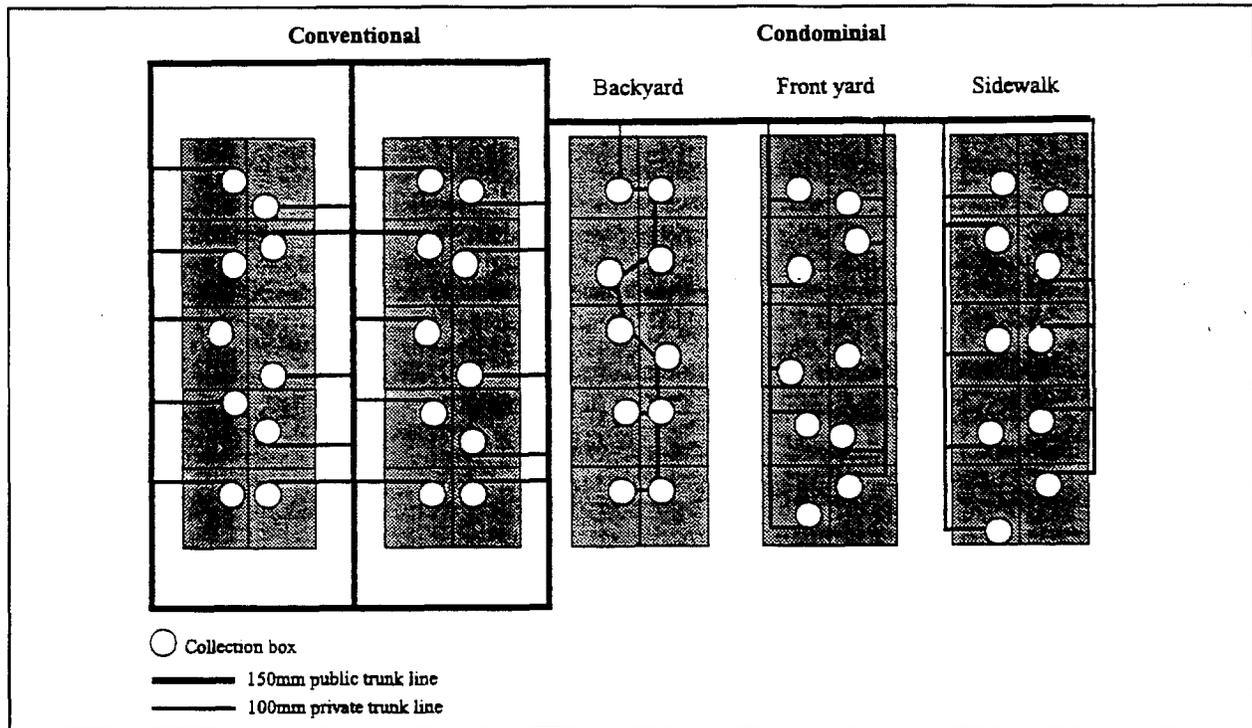
- Brazil, low income urban areas.

### Date of Implementation:

- 1980s to present.

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## Conventional Versus Condominial Sewerage Systems



Source: Franca, 1994; COMPENSA, 1994; Petrolina Public Works, 1994; and UNDP-World Bank; Water and Sanitation Program.

### Source of Funding/Implementing Agency:

- Brazilian municipal governments.

### Source:

- Watson, Gabrielle, "Good Sewers Cheap? Agency-Customer Interactions in Low-Cost Urban Sanitation in Brazil," International Bank for Reconstruction and Development/The World Bank, *Currents*, March 1995.

## C. PRESSURE SEWERS

### Project Description:

- Construct a low-cost nonconventional sewerage system using small diameter pipes and a pressurized pumping system to force wastewater over inclines or along horizontal planes.

### Problem Area:

- Communities in extremely level or hilly areas were unable to build conventional sewerage systems because of the prohibitive excavation expenses.

### Approach:

- The pressure of effluent being pumped into small diameter sewer pipes forces the liquid over inclines and along stretches of horizontal terrain.
- Two different types of pumps are used to discharge the effluent from the residential system to the main line.
- Grinder pumps (GP) range in motor size, from 3-5 horsepower, depending on whether the pump is servicing a single home or group of homes.

- The GP macerates the solids into a slurry before discharging the effluent to the main line.
- The septic tank and effluent pump (STEP) system removes solids, grit, grease, and other potentially pipe-clogging substances before pumping the effluent into the main line.
- Both types of pumping systems discharge into a transportation network of small diameter 30 mm plastic PVC pipes.
- The pipes are buried in shallow trenches and capable of transporting effluent for long distances over inclines because of the pressure system.
- The effluent from the main line is eventually discharged into a treatment plant.

**Benefits:**

- Pressure sewer systems are most suitable in areas of low population density and widely varied topography.
- Pressure sewer systems are less expensive for the municipality than conventional sewer systems because of the use of inexpensive materials, reduction in excavation costs, and the material and electrical costs associated with operation of the effluent pumps being the responsibility of the homeowner.
- Pressure sewers can serve communities that otherwise would not be able to construct a conventional sewer system because of any one of the following conditions:
  - High groundwater levels would prohibit the deep excavation required in conventional sewer systems.
  - Excessive costs associated with excavation in an area of shallow bed rock.
  - Extremely flat terrain where the conventional sewer requires the system to progressively slope downward resulting in excessive costs from massive excavation.

**Disadvantages:**

- Pressure sewers require regular maintenance to ensure that the GP or STEP pump is operating effectively.
- Communal pump stations have led to disputes in regard to maintenance fees and service calls.
- Mechanical parts and skilled technicians need to be available to install and service pumps.
- Regular sludge removal and disposal is necessary from the septic tanks associated with the STEP pumps.
- Proper ventilation systems must be incorporated in the early stages of the construction process to prevent odors.
- Noncorrosive materials should be used in all aspects of the system.

**Source:**

- U.S. Environmental Protection Agency, *EPA Manual: Wastewater Treatment/Disposal for Small Communities*, USEPA, Washington, D.C., September 1992.

## D. VACUUM SEWERS

### Project Description:

- Centralized suction pump station draws effluent through a non-conventional sewerage system of small diameter pipes toward the treatment plant.

### Problem Area:

- Communities located in areas of extremely level or hilly terrain were unable to construct conventional gravity flow sewerage systems.

### Approach:

- A vacuum pump station is located in the center of the distribution network, preferably in the lowest point of the collection area.
- The piping system is laid out in a "sawtooth" manner and must be secure and leak free to ensure that both the air and the liquid sewage will be drawn through the pipes.
- The suction force produced from the central pumping station draws the air and sewage mixture with enough force to pull the sewage over inclines and along flat areas.

### Benefits:

- This system is less expensive than conventional gravity-based sewerage systems and appropriate in areas that could not accommodate the conventional system because of topographical and hydrological constraints.
- Excavation and material costs are reduced because the use of small diameter pipes require narrower trenches.

### Disadvantages:

- Capital costs for the central vacuum pump are high and skilled operators, mechanics, and parts must be available.
- The construction process must be coordinated with an engineer who is familiar with the operational mechanics of the vacuum pump system.
- Sewage must be transported to an intermediary or final discharge site.

### Source:

- Quatfass, Dietrich G., and Ruud Krijn, "The Vacuflow Sewerage System," *New World Water*, 1995.

**PART IV**

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**WASTEWATER: AQUATIC TREATMENT SYSTEMS**

## A. AQUACULTURE: AN EXCRETA RECYCLING SYSTEM

### Project Description:

- Collected excreta either in solid or waterborne form are discharged into freshwater aquaculture fish ponds for neutralization and purification.

### Problem Area:

- Communities lacked the infrastructure and monetary means to construct a conventional wastewater treatment plant. As a result, wastewater was being discharged without treatment into surface water sources.

### Approach:

#### *Dry Systems*

- Human excreta is collected and transported by carts, vacuum trucks, or by boats to aquaculture ponds for disposal.
- Before the ponds are flooded excreta is spread on the bottom to promote biomass growth.
- The ponds are flooded with water and stocked with fish.
- The process of draining ponds, applying excreta, and flooding ponds with stocked fish will be repeated as often as necessary.
- In parts of Thailand, Indonesia, and Vietnam, overhanging latrines are constructed directly over fish ponds eliminating the excreta transportation stage.

#### *Wet systems*

- Excreta transported by a water-based sewerage system is discharged directly to the aquaculture ponds.
- Effluent that receives primary treatment may be discharged in aquaculture ponds for secondary treatment.

### Benefits:

- Freshwater aquaculture systems serve the dual function of inexpensively purifying solid and waterborne excreta while generating a potential source of income and food source through fish production.
- Aquaculture ponds represent a low-cost, alternative system for wastewater and excreta treatment
- Aquaculture ponds are inexpensive to construct and can be maintained by low-skilled workers.
- Aquaculture ponds are suitable for both rural and urban communities.
- Carp and tilapia are two species of fish especially good for aquaculture and may be used for human, livestock, or fish consumption.

### Disadvantages:

- Aquaculture ponds cannot absorb large amounts of toxic or industrial wastes which often become mixed with waterborne sewage.
- Fish raised on excreta have the potential to spread the oriental liver fluke and other parasites if not properly cooked before human consumption.

### Source of Funding/Implementing Agency:

- Various private and municipal projects.

### Location of Project:

- China, Taiwan, Malaysia, Thailand, Bangladesh, India, Indonesia, Israel, Germany.

### Date of Implementation:

- Ongoing practices.

**Source:**

- Edwards, Peter, "Integrated Resource Recovery--Aquaculture: A Component of Low Cost Sanitation Technology," World Bank Technical Paper Number 36, UNDP and World Bank.
- Pickford, John, *Low-Cost Sanitation: A Survey of Practical Experience*, IT Publications, 103-105 Southampton Row, London WC1B 4HH, UK, 1995.

**B. ALGAE WASTE STABILIZATION PONDS****Project Description:**

- Absorption and neutralization of wastewater and excreta through the biochemical reactions of algae and bacteria growing in waste stabilization ponds.

**Problem Area:**

- Wastewater and excreta were not receiving primary treatment before disposal and thus were creating serious health problems.

**Approach:**

- Algae waste stabilization ponds are constructed at a shallow depth of 20-40 centimeters to promote sun light penetration and algae growth. Wastewater and excreta are deposited in the ponds upon which the biochemical reaction of bacteria and algae purify the water.

**Benefits:**

- A low-cost, low-maintenance system for wastewater and excreta treatment and disposal.
- Algae can be harvested and used as fish and animal fodder.
- Small amounts of industrial wastewater can be accommodated by the ponds if certain nutrients are added.
- Algae is approximately 50 percent protein and can grow at a biomass rate significantly greater than traditional fodder crops.

**Disadvantages:**

- Acquiring land to establish the waste stabilization ponds may be problematic in congested urban areas.
- Livestock may have problems digesting large quantities of harvested algae because of inability to digest the nonprotein component of the algae plant.
- Problems have been encountered in finding a satisfactory algae harvesting technology.
- Waste stabilization ponds are most efficient in tropical climates where growing conditions for algae and bacteria enhance waste decomposition and neutralization.

**Location of Project:**

- Pilot projects exist in Mexico, Japan, and Formosa.

**Date of implementation:**

- On going.

**Irrigation Oxidation Ponds**

Over the past 20 years, the largest forest in Lima, Peru, has been irrigated from treated wastewater. In the South Cone of Lima, two oxidation ponds have provided the dual service of processing 250 liters per second of Lima's wastewater and providing reused water for irrigation. On an experimental basis, staff from the Ministry of Transportation, the institution responsible for the operation and maintenance of this system, are using these waters for agriculture and aquaculture. Research indicates that after four months of treatment in the oxidation pond, the water is sufficiently clean to be used for utilitarian purposes.

Source: Kennett, Milagros N., urban environmental specialist, Project in the Environment and Development (PRIDE), Washington, D.C., July 1996.

**Source:**

- Rybczynski, Witold, Chongrak Polprasert, and Michael McGarry, *Low-Cost Technology Options for Sanitation, A State of the Art Review and Annotated Bibliography*, 1978.

**C. AQUATIC WEEDS****Project Description:**

- Gently sloping terraced ponds with weeds and bulrushes purify excreta and waterborne sewage.

**Problem Area:**

- Residential and light industrial wastewater was not being treated before discharge.

**Approach:**

- Excreta and wastewater are discharged in the primary aquatic reed pond that is situated at the highest elevation.
- Wastewater slowly inundates the secondary and tertiary ponds upon which the aeration process of oxygen passing through the root structure of the weeds purifies the water.

**Benefits:**

- Shallow terraced aquatic weed ponds represent a low-cost alternative to conventional wastewater treatment plants.
- This system can be constructed and managed by low-skilled personnel.
- The nutrients from the excreta promote the growth of aquatic biomass which can be collected and used as animal fodder.

**Disadvantages:**

- In tropical areas the density of aquatic weeds in the ponds may promote mosquito breeding.
- Acquiring land to construct the ponds may be prohibitively expensive in urban regions.
- Maintenance of the ponds is necessary to regulate the gradual flow of water through the ponds.

**Location of Project:**

- Practiced widely in Southeast Asia.

**Source:**

- Rybczynski, Witold, Chongrak Polprasert, and Michael McGarry, *Low-Cost Technology Options for Sanitation, A State of the Art Review and Annotated Bibliography*, 1978.

**PART V**

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**WASTEWATER: LAND-BASED TREATMENT SYSTEMS**

## A. RAPID INFILTRATION

### Project Description:

- Shallow earthen holding ponds are designed to accommodate a repetitive cycle of flooding, infiltration/percolation, and evaporation of wastewater.

### Problem Area:

- Community lacked a conventional wastewater treatment system capable of treating both residential and light industrial wastewater.

### Approach:

- Shallow basins are constructed in areas with sandy or sandy loam soil that will allow large volumes of water to rapidly percolate through a wide zone of unsaturated soil.
- Wastewater is treated by the natural soil filtration process, rendering the percolate sufficiently clean as to not contaminate groundwater.

### Benefits:

- This is a low-cost system of wastewater disposal, requiring only minimal site preparation, construction costs, maintenance, and monitoring.
- This soil-based system of wastewater treatment is appropriate for domestic, light industrial, and industrial organic wastewater that would be unsuitable for a biomass aquatic treatment pond.
- System requires less land than other land application disposal methods.
- This is a "zero discharge" system of wastewater disposal, providing groundwater recharge rather than secondary discharge into surface water.

### Disadvantages:

- Seasonal variations in the level of the groundwater table may result in insufficient percolation distance threatening the groundwater with contamination.
- This system is only appropriate in soils with a high sand to sandy loam soil content because they facilitate infiltration.
- If infiltration and percolation is excessively rapid then the soil will not provide adequate filtering to treat the wastewater.

### Source:

- U.S. Environmental Protection Agency, *EPA Manual: Wastewater Treatment /Disposal for Small Communities*, USEPA, Washington, D.C., September 1992.

## B. INTERMITTENT SAND FILTER

### Project Description:

- Percolation of wastewater through a three-tier gravitational system of progressively finer sand beds capable of accommodating an intermittent cycle of wastewater flooding.

### Problem Area:

- Community lacked a conventional wastewater treatment system to treat both residential and light industrial wastewater.

### Approach:

- The filtration system consists of three lined beds of progressively finer sands constructed in a manner so that once the effluent has filtered through the bed at the highest elevation it will be drawn by gravity and filter through the next two beds.
- Wastewater is treated through the sand filtration process.
- A water impervious liner is applied to the bottom of the filtration beds to prevent groundwater contamination.

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- The filter beds are flooded with effluent on a periodic basis so that the beds will have time to dry between flooding.

**Benefits:**

- This is an inexpensive, non-technical system for treating residential and light industrial wastewater.
- Depending on the size of the filtration beds, entire communities can be serviced through this system.
- Sludge disposal is required at long intervals, 10 to 20 years, depending on the volume of wastewater being treated.
- This system is appropriate in areas of high groundwater levels because the impervious bed liners will prevent groundwater contamination.

**Disadvantages:**

- If the liner is inadequately installed or damaged, then groundwater may become contaminated.
- In heavily urbanized areas, it may be problematic to acquire the necessary amount of land for the construction of the filtration beds.

**Source:**

- U.S. Environmental Protection Agency, *EPA Manual: Wastewater Treatment /Disposal for Small Communities*, USEPA, Washington, D.C., September 1992.

## C. OVERLAND FLOW

**Project Description:**

- Wastewater is sprayed over terraced vegetated slopes and purified through evaporation, soil filtration, and absorption by vegetative matter.

**Problem Area:**

- Area lacked a conventional wastewater treatment system capable of treating both residential and light industrial wastewater.

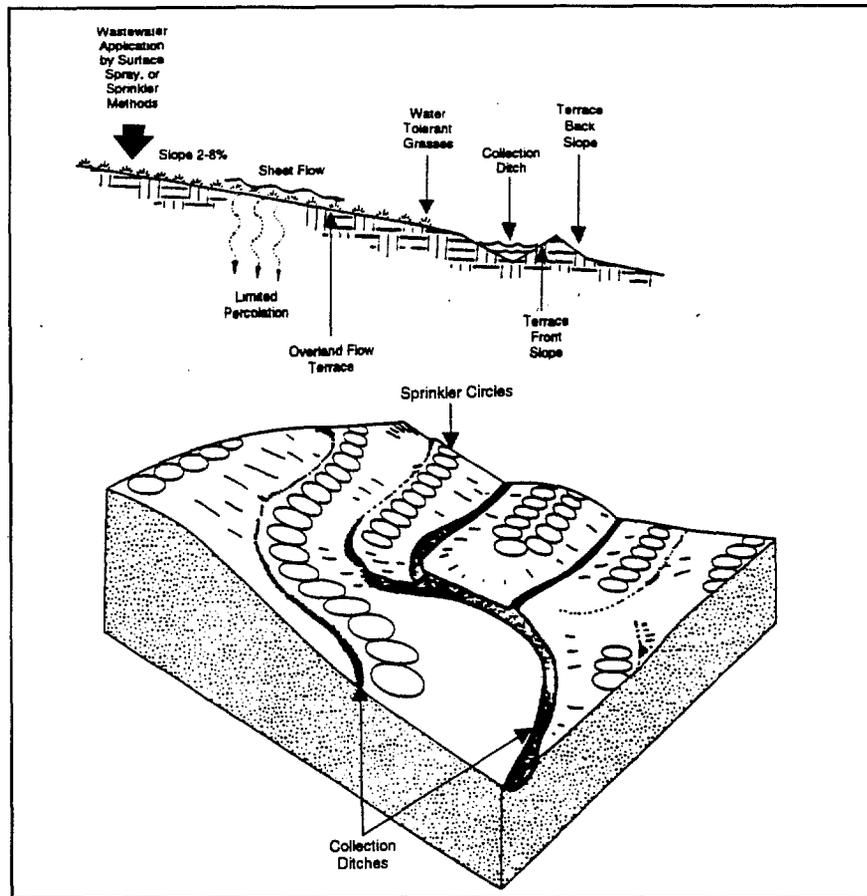
**Approach:**

- Wastewater is applied intermittently across the top of the slope through sprinklers and allowed to flow over water-tolerant grasses.
- A runoff collection channel at the bottom of the slope collects the effluent to be dispersed over the slope a second time or discharged.
- The common operational practice is to let wastewater flow continually for a period of 12 hours to be followed by a 12 hour drying period. Holding tanks large enough to store collected effluent for a 12-hour period are required.
- The wastewater is treated through a combination of sedimentation, filtration, and the biochemical reactions of the wastewater with the vegetation.
- Terraced slopes should be at a grade of 2 to 8 percent and long enough to allow adequate time for filtration and treatment.

**Benefits:**

- This technology is suited for rural communities and seasonal industries that produce organic effluent.
- Construction expenses for this system are low and maintenance and supervision of the system is not complicated.
- The system is most appropriate in warm climates with a rich soil that supports vigorous vegetative growth.
- An economic return can be generated from this system if the irrigated vegetation can be harvested and sold as fodder.

## Overland Flow System



**Source:** U.S. Environmental Protection Agency, *EPA Manual: Wastewater Treatment /Disposal for Small Communities*, USEPA, Washington, D.C., September 1992.

### Disadvantages:

- System cannot function properly in cold weather as a result of reduced soil filtration and restricted vegetative growth.
- Soil on the slope must be suitable to sustain a thick vegetative cover capable of absorbing large quantities of water.
- If the soil on the slope is too permeable and a high groundwater level exists, then this system may contaminate the groundwater.
- Wastewater collected at the base of the slope needs to be either discharged into surface water or pumped to the top of the slope to be dispersed for a second time.

### Source.

- U.S. Environmental Protection Agency, *EPA Manual: Wastewater Treatment /Disposal for Small Communities*, USEPA, Washington, D.C., September 1992.

**PART VI**

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**WASTEWATER: INTEGRATED TREATMENT SYSTEMS**

## **A. SIRDO: INTEGRATED TREATMENT SYSTEM FOR RECYCLING WASTEWATER**

### **Project Description:**

- The Integrated System for Recycling Solid Waste (referred to by its acronym in Spanish as SIRDO) is a holistic wastewater treatment and compost facility capable of treating wastewater and composting sludge waste.

### **Problem Area:**

- Neighborhoods lacked a conventional wastewater treatment system capable of treating residential wastewater.

### **Approach:**

- The SIRDO system separates "gray waters" (those containing detergents, soap, etc.) from "black waters" (those coming from the toilet) through two different drainage pipes. Grey water is filtered and approximately 80 percent can be reused for irrigation.
- Black water is piped into a concrete holding tank where sludge settles to the bottom of the tank.
- Settled sludge waste is spread in an aerobic decomposition chamber along with other organic household wastes. Solar drying evaporates any remaining liquid, and, within a year, the sludge is transformed into fertilizer.
- The treated black waters are used to irrigate fields and gardens or to support aquaculture. Community members are responsible for day-to-day operational activities from changing filters to shoveling sludge and compost.

### **Benefits:**

- The SIRDO system is 20-40 percent less costly than conventional sewerage systems and provides peri-urban residents a utilitarian technology to treat and reuse wastewater.
- Treated effluent is used to irrigate agricultural fields and the sludge is transformed into a rich organic fertilizer through an aerobic composting process.
- The SIRDO system is a technological alternative to expensive conventional sewerage treatment that yields both treated water and compost sludge which can be used for agricultural purposes.
- The training that accompanies the proper functioning of the SIRDO provides residents the opportunity to learn new skills and fosters the feeling of community ownership and responsibility for the SIRDO.

### **Disadvantages:**

- The establishment of the SIRDO system will require financial, technical, and managerial assistance.
- The operation and maintenance of the SIRDO system will require the formation of a community organization capable of delegating operational responsibilities throughout the various stages of the treatment process.

### **Location of Project:**

- Mexico: Mérida and suburbs of Mexico City.

### **Date of Implementation:**

- Project initiated in 1978.

### **Source of Funding/Implementing Agency:**

- Appropriate Technology Group (GTA for Grupo Tecnología Alternativa), Mérida, Mexico, and National Wildlife Federation, Washington, D.C.

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**Source:**

- Schmink, Marianne, "Community Management of Waste Recycling: The SIRDO," *SEEDS*, No. 8, 1984.

**B. METHANE GAS PRODUCTION THROUGH AEROBIC COMPOSTING****Project Description:**

- Anaerobic composting of human and animal excreta to produce methane gas as a energy source for cooking or to power small engines.

**Problem Area;**

- Residents were defecating in random areas exposing the community to public health risks and not capitalizing on the energy potential of methane gas production.

**Approach:**

- Small "methane digester" plants of (1-6 cubic meters) for an individual farmer or (30 cubic meters) for a small community are constructed so that they are both air and water tight.
- Anaerobic composting tanks are constructed below ground with a small opening at the top of the tank to allow the release of the methane gas.
- Human and or animal excreta are added in sufficient quantities to promote anaerobic decomposition and methane gas production.
- Methane gas is either used immediately on site or piped to a site close by for use.
- Composting tanks are emptied when they become full or if the anaerobic reaction has ceased to produce methane gas.

**Benefits:**

- This is a sanitary and utilitarian system to dispose of excreta.
- Methane gas can be used for cooking, heating, and lighting, thereby reducing a communities dependence on wood or commercially purchased fossil fuels.
- The compost excreta serves as a rich fertilizer and approximately 93.6 percent of the eggs of hookworm, ascarid, and schistosome are destroyed after a two-month anaerobic composting period.
- Compost excreta may be applied to agricultural fields or used for aquaculture.

**Disadvantages:**

- The technology and the expenses associated with the construction of the anaerobic biodigester can be too expensive in very poor communities.
- Handlers of excreta waste can be exposed to pathogens.

**Source of Funding/Implementing Agency:**

- Municipalities, individuals.

**Location of Project:**

- Development began in India in 1938, system is widely used in India, China, Korea, Taiwan, Philippines, Thailand, Indonesia, and Japan.

**Source:**

- International Water and Sanitation Centre, Vol. 6, No. 1, 1995.
- Rybczynski, Witold, Chongrak Polprasert,., and Michael McGarry, *Low-Cost Technology Options for Sanitation, A State of the Art Review and Annotated Bibliography*, 1978.

### C. BELTSVILLE AERATED RAPID COMPOSTING SYSTEM (BARC)

**Project Description:**

- The Beltsville Aerated Rapid Composting System (BARC) is a rapid aerobic composting technology for collected excreta from pit latrines.

**Problem Area:**

- The community, which lacked a final disposal system for excreta, was being exposed to serious health risks

**Approach:**

- Pit latrines are emptied with a vacuum truck and the excreta is deposited on level ground.
- The excreta is mixed with sawdust or wood chips to absorb excess liquid and provide aeration before being covered with a layer of old compost to control odors and contain heat loss.
- Air is drawn through the compost pile by a 13 horsepower blower, so that the pile does not need to be turned manually.

**Benefits:**

- The BARC system is a low-cost composting technology to treat and transform collected excreta from pit latrines into a marketable fertilizer.
- This system is easy to maintain and appropriate for rural areas with a low population density.
- The limited equipment required includes a front-end loader and a small horsepower blower.
- The aerobic composting process kills pathogenic bacteria, viruses, and helminths.
- Compost excreta may be sold or used by the municipality as an agricultural or landscape fertilizer.

**Disadvantages:**

- Requires training in the methodology of the system.
- Requires an open area of land far away from a population center to avoid odor problems.
- If the system is not to be dependent on municipal subsidies, then commercial markets must be found to purchase the final compost product.
- The use of heavy machinery like a front-end loader, vacuum truck, and mechanical air blower may be prohibitively expensive to acquire and maintain in some communities.

**Location of Project:**

- Beltsville, Maryland, USA.

**Date of Implementation:**

- 1980-present.

**Source of Funding/Implementing Agency:**

- United States Department of Agriculture, Agricultural Research Service Laboratories.

**Source:**

- Patterson, James. National Capital Park Service, Washington, D.C.
- Shuval, Hillel I., et al, "Night Soil Composting," Appropriate Technology Water Supply and Sanitation, World Bank, 1981.

**PART VII**

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**WASTEWATER: TREATMENT MATRIX**

**WASTEWATER/EXCRETA TREATMENT MATRIX**

<b>Disposal Alternatives for Excreta and Wastewater</b>			
<b>Method</b>	<b>Type of Disposal Innovation</b>	<b>Benefits</b>	<b>Obstacles</b>
Waste Stabilization Ponds	Raw or partially treated sewage is neutralized and purified in shallow ponds from interaction with reeds, algae, and bacteria.	A low technological approach that can accept a large volume of excreta and wastewater.	Acquisition of land to create the waste stabilization pond may be unavailable or expensive in congested urban areas.
Algae Production	Modified waste stabilization pond that neutralizes excreta through the growth of algae.	Excreta is neutralized by the biochemical interaction with algae. Algae can be harvested as a fodder crop for livestock or processed for fish food.	Algae harvesting technology is not advanced. Acquisition of land to create the waste stabilization pond may be unavailable or expensive in congested urban areas.
Aquaculture	Raw excreta and wastewater are discharged in ponds stocked with fish.	Excreta promotes algae growth which is consumed by the fish. Excreta is consumed directly by the fish. Fish is suitable for human consumption or may be processed into a protein rich fish meal to be used as animal or fish food.	Improperly cooked fish can transmit liver fluke and other parasitic organisms to humans.
Aquatic Weeds	Excreta and untreated effluent are deposited in gently sloping terraced ponds which are planted with weeds and bulrushes. The waste is purified through interaction with the root system of the aquatic plants.	Nontechnological system capable of treating a large volume of wastewater. Aquatic weeds can be harvested and used as animal fodder.	Acquisition of land to create the waste stabilization pond may be unavailable or expensive in congested urban areas. In tropical areas, the abundance of weeds in standing water may promote mosquito breeding.
Natural Drying	Spread excreta on sandy or gravel beds in layers 200-300 mm thick.	Dried excreta can be used as an agricultural fertilizer or buried for disposal.	In humid climates, the excreta may not become sufficiently dried to kill pathogens and parasitic eggs. Process entails extended human contact with the excreta increasing the possibility for the transmission of disease.

<b>Disposal Alternatives for Excreta and Wastewater</b>			
<b>Method</b>	<b>Type of Disposal Innovation</b>	<b>Benefits</b>	<b>Obstacles</b>
Aerobic Composting	Excreta is mixed with sawdust or wood chips to absorb excess liquid and provide aeration. The excreta is divided into piles that are turned regularly through a mechanical or manual process to expose the excreta to air.	Aerobic composting rapidly decomposes excreta. The high temperatures produced by the aerobic process kill pathogens and parasitic eggs. Compost excreta can be used as fertilizer.	Compost piles need to be turned on a regular basis. Often times the income generated from the sale of the compost does not offset the production costs.
Anaerobic Composting	Excreta is stored in an undisturbed dry environment for a period of 2 to 6 months. Compost has minimal exposure to air.	Properly functioning anaerobic process kills pathogens and parasitic eggs. Compost can be used as agricultural fertilizer.	Failure to control the moisture content of the composting piles will result in inadequate anaerobic digestion and failure to kill pathogens.
Rapid Infiltration of Waterborne Sewage	Soil-based wastewater treatment method consisting of a series of exposed soil surfaces suitable for a repetitive cycle of flooding, evaporation, percolation, and drying.	System requires little maintenance or supervision and can be operated year round. This is a "zero discharge" method that provides groundwater recharge rather than a discharge into surface water.	System is only feasible in areas where the soil will provide acceptable treatment before the percolate reaches the groundwater.

Source: Pickford, John, *Low-Cost Sanitation: A Survey of Practical Experience*, IT Publications, 103-105 Southampton Row, London WC1B 4HH, UK, 1995; U.S. Environmental Protection Agency, *EPA Manual: Wastewater Treatment/Disposal for Small Communities*, Washington, D.C., September 1992.

**PART VIII**

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**WASTEWATER:  
ALTERNATIVE FINANCING FOR WASTEWATER TREATMENT**

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## A. SANITATION LOAN PROGRAM: COOPERATIVE HOUSING FOUNDATION (CHF)

### Project Description:

- Improve sanitary conditions through home improvement loan programs for low-income families.

### Problem Area:

- Low-income families did not qualify for home improvement loans from commercial banks.

### Approach:

- Cooperative Housing Foundation (CHF) provides institutional support and technical assistance to an intermediary lending organization.
- The intermediary organization receives the loan from CHF at a below market interest rate to be paid in three to five years.
- The intermediary organization offers loans to low-income member families at a rate below market interest rates.
- Loans are available to participating families under four basic categories: home improvement loans, mortgage and construction loans, community service loans, and small business loans.
- Loans are calibrated based on the families income so that the terms of the loan repayment may be met.
- Loans are usually under US\$1,000 and the default rate has been less than 5 percent.
- The intermediary organization operates under the system of a revolving loan fund, in which loan repayments are returned to a general loan availability fund.

### Creative Publicity: Comic Books

CHF and the Honduran Federation of Credit Unions (FACACH) used an informational comic book to convey information to low-income families about home improvement loan opportunities. Through a series of interviews with potential beneficiaries it was concluded that comic books were the primary reading material of low-income families in the area. The CHF and FACACH comic book uses a simple text and informative pictures depicting urban Hondurans and low-income homes to inform the reader of the availability of home improvement loans. The loan could potentially be used for a variety of home sanitation improvements from latrine systems to water storage tanks. The comic books were distributed at corner stores, churches, and schools. The use of comic books as a means of information dissemination was very successful and resulted in an increase in the number of residents who sought loans.

### Benefits:

- By increasing the price range of options available to households, lending organizations can increase the demand for urban sanitation facilities.
- People who traditionally would not qualify for loans in the formal financial sector can receive loans.
- Since families are borrowing for specific self-identified projects, they have a sense of ownership of the improvement, which increases their interest in utilizing and maintaining the designated improvement.
- In addition to home sanitation improvements, participants may use their loans to make a legal connection to a city's waterborne sewerage system if in existence.
- Low-income families and intermediary organizations have proven to be good credit risks.

### Disadvantages:

- Funding from development agencies or foundations are necessary to implement and support the early development of loans and an intermediary organization.

- Intermediary organizations need to establish loan eligibility requirements that will serve low-income families and offer loans for activities in demand by the beneficiaries.

**Source of Funding/Implementing Agency:**

- Cooperative Housing Foundation (CHF); John D. and Catherine T. MacArthur Foundation. United States Agency for International Development (USAID), UNICEF.

**Location of Project:**

- Belize, Costa Rica, El Salvador, Guatemala, Honduras, Panama.

**Date of Implementation:**

- 1985-present.

**Source:**

- "Supporting Shelter and Community Improvements for Low-Income Families in Central America: Cooperative Housing Foundation," *Environment and Urbanization*, Vol. 5, No. 1, April 1993.
- Howgrewe, William, et al, "The Unique Challenges of Improving Peri-Urban Sanitation," WASH Reprint: Technical Report No. 86, Environmental Health Project, USAID, March 1994.

## B. COMMUNITY SELF-FINANCED WATER AND SANITATION SYSTEMS

**Project Description:**

- A community unites to finance and construct a water and sanitation system with sponsorship and technical assistance from CARE, a non-profit development organization.

**Problem Area:**

- Community lacked satisfactory solid waste and wastewater sanitation services.

**Approach:**

- CARE is supporting a five-year project to assist rural Indonesian communities to finance, construct, maintain, and manage their own community water and sanitation systems.
- Communities mobilize available resources like skilled and unskilled labor, collect locally available materials, and raise money in the community and from bank creditors to apply toward the construction of an autonomous water and sanitation system.
- Communities receive assistance from CARE, both financially and technically, through all phases of the project: site selection, committee formation, planning, implementation, operations and maintenance, and evaluation and monitoring.

**Benefits:**

- Communities that finance the construction of their sanitation system develop a sense of ownership and interest in the successful management and sustainability of the system.
- CARE has found that a community's willingness to pay has proven a reliable indicator of a project's future success.
- Communities and individuals learn how to organize and work collectively, which in turn may result in those new skills being applied toward other community concerns.

**Disadvantages:**

- Community members, government representatives, and credit organizations must overcome the belief that a community is too poor to enter a self-financed community sanitation project.
- The community must gain access to credit from banks at a low interest rate and secure financial and technical assistance from a development organization.

**Location of Project:**

- Indonesia, 35 rural communities in the provinces of West Java, East Java, and West Nusa Tenggara Barat.

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**Date of Implementation:**

- 1994-present.

**Source of Funding/Implementing Agency:**

- CARE, Government of Indonesia, participating communities.

**Source:**

- O'Brien, Dan, and Budi Rahardjo, "Community Self-Financing of Water and Sanitation Systems," *Waterlines*, Vol. 12, No. 3, January 1994.

**C. ORANGI PILOT PROJECT: A COMMUNITY SANITATION ACTIVITY****Project Description:**

- The Orangi Pilot Project was a community-sponsored initiative to self-finance and construct a sewerage system in the squatter settlements of Karachi, Pakistan.

**Problem Area:**

- The low-income settlements in Karachi, Pakistan, lacked adequate sewerage collection systems.

**Approach:**

- The community joined forces with a local community organizer and discovered alternative, low-cost strategies to meet sanitation goals.
- Community members formed a sanitation committee and contributed their own money and labor toward the construction of a small diameter gravity sewer.
- The community increased its pressure on the municipal government to construct the main trunk drains.
- Sanitary latrines, household septic tanks, and connections to underground sewers on adjoining lanes were constructed through individual and community efforts.
- Each residential block elected a wastewater manager to collect funds, purchase construction materials, and supervise community construction activities.

**Benefits:**

- This project was a low-cost, step-wise, community-financed approach toward the provision of wastewater services.
- Residents were engaged in the financing, planning, and construction of the system and therefore developed a sense of ownership of the system.
- Infant mortality rates per thousand have fallen from 130 in 1982 to 37 in 1991, in part because of improved sanitation.
- Community groups formed to construct the sewers can apply their experience working with residents and municipal government toward solving other community problems.
- Within a few years, 600,000 poor people outside Karachi were connected to a sewerage system.

**Disadvantages:**

- A strong organization is required to educate, motivate, and manage the community sewer construction project.
- Residents who do not have tenure to their homes and land will be less likely to contribute financially to the construction of the sewers.
- Collected raw sewage is discharged into the sea without primary treatment.

**Source of Funding/Implementing Agency:**

- The community of Orangi (outskirts of Karachi) and the municipality of Karachi, Pakistan. United Nations Center for Human Settlements (Habitat).

**Location of Project:**

- Karachi, Pakistan.

**Date of Implementation:**

- 1981-1984.

**Source:**

- Sinnatamby, Gehan S., "Solid Waste Management in Orangi-Karachi, Pakistan," United Nations Center for Human Settlements (Habitat), November 1984.
- "Mega Cities in Mega Crisis," *Water & Environment*, March 1994.
- "Orangi Pilot Project, Karachi, Pakistan," International Water and Sanitation Centre, Vol. 6, No. 2, 1995.
- Hasan, Arif. "Replicating the Low-Cost Sanitation Programme Administered by the Orangi Pilot Project in Karachi, Pakistan," The Human Face of the Urban Environment, Second Annual World Bank Conference on Environmentally Sustainable Development, Washington, D.C., September 19-21, 1994.

**D. PUBLIC-PRIVATE WASTEWATER TREATMENT PLANT****Project Description:**

- In the industrial region of Vallejo, a suburb of Mexico City, 26 companies organized and created a new for-profit company called Aguas Industriales de Vallejo (AIV). Under the management of this new company, the old municipal wastewater treatment plant was renovated.

**Problem Area:**

- In the industrial region of Vallejo, Mexico, provision of water for industrial uses was unreliable and wastewater treatment for both industry and residential homes was limited.

**Approach:**

- The wastewater treatment plant was renovated to improve the quality and reliability of water provision and wastewater treatment for both residential and industrial uses.
- Each shareholder in the new company invested based on its water usage with the understanding that they would receive discounted water service upon completion of the plant.
- AIV renovated the treatment plant from financial "dues" paid by representative stockholders.
- The local municipality built and is responsible for maintenance of the distribution network to connect participating companies and residential neighborhoods to the treatment plant.
- The newly formed AIV manages and maintains the wastewater treatment plant under a 10-year renewable concession from the municipality.

**Benefits:**

- AIV guarantees treated water to shareholder companies at a cost of 75 percent of the current price charged by the government.
- Participating companies expect to recover their initial investment in three years as a result of the discount they receive on their water bills.
- The plant processes primarily residential wastewater and offers secondary treatment appropriate for industrial effluent.
- Participating companies have a reliable source of treated wastewater appropriate for their industrial water demands for cooling or processing.

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**Disadvantages:**

- The municipality must agree to the joint venture project.
- The municipality must be vigilant to ensure the quality of water provision and adequate wastewater treatment.
- Residential service fees must remain affordable.

**Source of Funding/Implementing Agency:**

- The majority of the expenses for the initial renovation of the wastewater treatment plant will be derived from equity contributions by participating companies.
- The municipality will be responsible for construction and maintenance of the sewerage system connecting industries and residences.

**Location of Project:**

- Vallejo area of Mexico City, Mexico, the largest industrialized area in Mexico.

**Date of Implementation:**

- 1991.

**Source:**

- International Finance Corporation, "Investing in the Environment: Business Opportunities in Developing Countries," IFC, Washington, D.C., 1992.

**PART IX**

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**SOLID WASTES:  
COLLECTION, TRANSPORTATION, DISPOSAL, AND RESOURCE RECOVERY**

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## A. PROESA MICROENTERPRISES: SMALL-SCALE BUSINESS, LARGE-SCALE SERVICE

### Project Description:

- Establishment of waste collection microenterprises using human-powered tricycles and push carts to improve trash collection services in areas that are traditionally excluded from conventional municipal waste collection.

### Problem Area:

- In the city of Machala, Ecuador, (population 170,000) tons of trash went uncollected on a daily basis because of inadequacies in the municipal collection service.

### Approach:

- The municipality of Machala, Ecuador, undertook a strategic study and developed an action plan for the creation of small waste collection businesses (microenterprises).
- The first microenterprise was established with financial and technical assistance from a large NGO, Catholic Relief Services. Contracts allowing the microenterprise to collect solid waste in a particular zone of the city were developed and signed with the municipality.
- Sections of the city traditionally under-serviced were divided among several microenterprises.
- The owners of the microenterprises were offered municipal loans to acquire pedi-carts or handcarts to transport the garbage.
- When the final disposal site of the garbage was more than several kilometers from the collection area, then the municipality provided intermediary transportation vehicles (tractor trailers and trucks) to collect trash from the microenterprises and transport it to a local landfill.
- As part of an ongoing project, the microenterprises collect trash in designated neighborhoods on a regular basis, so that residents become accustomed to the collection schedule. A metal triangle is rung to announce to the neighborhood that the collection cart is passing.
- Residents store and transport garbage to the waste collection carts with reusable burlap bags.
- Residents pay for trash collection services either directly to the microenterprise or through a surcharge on their monthly electric bill.
- The sustainability of the microenterprises depends on their ability to provide consistent collection services that will ensure payment from residences.

### Benefits:

- Through microenterprises, trash can be collected in neighborhoods which are inaccessible to conventional dump truck collection services because of narrow and unpaved roads or high cost of conventional service.
- Typically, use of appropriate technology by the microenterprise companies makes the enterprise more efficient and less expensive to operate than conventional systems of solid waste collection.
- The majority of collected refuse is organic in composition, thus, the removal of this waste reduces the number of breeding areas for vermin and disease-spreading insects.
- Waste collection microenterprises create permanent jobs for low-skilled workers.
- Opportunities exist for the microenterprise to expand its activities into waste recycling and the production of composted fertilizer to be sold for profit.

- The community benefits from clean streets and open spaces.

**Disadvantages:**

- Possibilities exist for confrontations with residents and the local municipality over the imposition and collection of waste service fees.
- If fees for collection are charged on residential electric bills, alternative payment options need to be established for those households without electricity.
- The microenterprise will require financial assistance for initial purchases of bicycles and pushcarts, as well as for extending loans to potential owners.
- Systems need to be put in place either for recycling and resource recovery or final sanitary disposal of the waste.
- Because the primary collection vehicles are human-powered, the intermediary dump site, recycling center, or final landfill will need to be located close to the primary collection sites.

**Location of Project:**

- Machala, Ecuador. Other projects based on the Machala experiment are being carried out in marginal neighborhoods of the following Ecuadorean cities: Quito, Atacames, San Lorenzo, Baños, and Babahoyo.
- Similar microenterprise projects exist in Colombia, Costa Rica, and Peru.

**Source of Funding/Implementing Agency:**

- USAID Regional Housing and Urban Development Office in Quito, Ecuador.
- Contributing municipalities.
- Catholic Relief Services.
- Lutheran World Relief.

**Date of Implementation:**

- 1995-present.

**Source:**

- Milligan, Chris, "Environmental Quality Management in Machala, Ecuador," *Voices from the City*, Environmental Health Project, Vol. 6, March 1996.
- Video, "PROESA: Proyecto Promoción del Empleo la Salud y el Medioambiente, Un Sistema de Privatización del Servicio de Limpieza Pública," Instituto Peruano de Economía Social, Lima, Peru, 1995.

**The Role of Municipalities in  
Microenterprise Development**

It is often in the interest of a municipality to encourage the formation of numerous microenterprises to increase city-wide waste collection service. These small businesses can then be held accountable through a licencing process to ensure fair prices and satisfactory service. Municipalities can facilitate the establishment and success of microenterprises through various low-interest loans for start-up expenses and vehicle acquisition. Municipalities cooperate with the microenterprises by picking up waste that has been deposited at centrally located transfer depots. In this manner, the municipality and the microenterprise can enjoy a mutually beneficial relationship.

**Source:** World Bank, "Private Sector Involvement in Solid Waste Management: Keys to Success," SID Drinking Water and Environmental Working Group, World Bank, February 21, 1996.

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## **B. PRIMARY COLLECTION OF SOLID WASTE: EMPLOYING "STREET BEAUTIFIERS"**

### **Project Description:**

- Waste pickers are employed as intermediaries by Exnora International, a non-profit organization, to collect and transport solid waste from neighborhood collection sites to regional disposal centers.

### **Problem Area:**

- In Madras, India, trash was being deposited in small waste collection containers spread throughout the neighborhoods. However, the Madras Municipal Corporation (MMC) was unable to promptly collect the refuse. As a result, trash pickers displaced the trash in search of recyclables, leaving it in the streets and thereby hindering the collection process.

### **Approach:**

- Working with local residents, trash pickers, and the MMC, Exnora gave financial and technical assistance to coordinate a collection program called, "Civic Exnora", which employs the trash pickers as intermediaries. The "street beautifiers" transport the trash from local disposal sites to regional disposal sites.
- In this ongoing project, trash collection is partially financed through fees paid by residents.
- Payments received from the residents are applied toward the salaries of the "street beautifiers" as well as toward the purchase of three-wheeled collection carts.
- The municipality is responsible for collecting trash deposited at regional collection sites.

### **Benefits:**

- The employment of the trash pickers as intermediaries allows them to collect and sell recyclables while transporting and disposing trash which previously cluttered the streets.
- As a result of the Exnora Method, approximately 20 percent of the primary trash in Madras is collected in this manner.
- The incorporation of the waste pickers into the solid waste management plan offers them a regular income and opportunities for social advancement.
- The organizational structure necessary for the successful operation of this collection process has increased public awareness about solid waste disposal problems and improved the working relationship between the residents and the MMC.

### **Disadvantages:**

- The replicability of the Exnora Method requires sound administrative and financial management by an intermediary, nongovernmental organization to coordinate waste collectors, ensure that service is prompt and that residents pay waste collection fees.
- The municipality must be regularly collecting and transporting the trash from regional disposal sites to a final landfill or recycling center.
- The success of the project depends on households paying for waste collection service.
- Garden wastes and heavy construction wastes would still require direct collection by the municipality.

### **Source of Funding/Implementing Agency:**

- Exnora International implements the solid waste recovery and disposal plans.
- United States Agency for International Development ( USAID).
- Danish Government Development Agency.

**Location of Project:**

- Madras, India.

**Date of Implementation:**

- 1989-present

**Source:**

- Donahue, Bridget, "Madras, India--Exnora's Response to Waste Collection/Removal," *Voices from the City*, Environmental Health Project, Vol. 6, March 1996.
- Furedy, Christine, "Garbage: Exploring Non-Conventional Options in Asian Cities," *Environment and Urbanization*, Vol. 4, No. 2, October 1992.

**C. RECYCLING FOR PROFIT: "ECO-AIDES" KEEP MANILA CLEAN**

**Project Description:**

- The organization of waste pickers to collect household recyclables and resell them at local redemption centers.

**Problem Area:**

- In Manila, waste pickers would scavenge for recyclables in a disorganized fashion, leaving behind substantial amounts of uncollected garbage in the streets.
- Since much of the waste stream was determined to be recyclable, the community was losing an opportunity to recover more of its waste collection costs through the marketing of recyclables.

**Approach:**

- Through initial workshops for residents, households are educated and encouraged to separate organic wastes (vegetable peels, food scraps) from dry wastes (paper products, plastics, bottles, tin cans) to facilitate the recycling process.
- Community members, often local waste pickers, are registered as "Eco-Aides" and are organized by the Metro Manila Council of Women Balikatan Movement, a nonprofit organization, to collect recyclables on a regular basis from designated collection points along streets and waterways.
- The Eco-Aides are offered small loans by the Council to procure small handcarts or boats to be used as vehicles for transporting recyclables.
- Eco-Aides sell recyclables at pre-established prices to redemption centers set up by the Council.
- The redemption centers are managed by a group of community volunteers who accumulate and sell the material to private corporations.

**Benefits:**

- Recycling reduces the total volume of trash that may otherwise be disposed in an unsanitary manner.
- Waste collection expenses can be partially or entirely offset through the sale of recyclables.
- Residents are provided a no-cost method to dispose of their dry solid waste.
- Costs associated with the maintenance and operation of the redemption center and payment to the Eco-Aides are covered from the sale of the recyclables to commercial markets.

- The Eco-Aides are primarily chosen from those who previously lived as scavengers, thus the formalization of this recycling activity offers them increased social standing, regular income, uniforms, and equipment.

**Disadvantages:**

- Residents need to sort dry wastes from organic wastes and be amenable to recycling.
- Coordination among residents, Eco-Aides, and commercial shops needs to be well planned to ensure that recyclables are collected regularly.
- Competition for recyclables between itinerant scavengers and Eco-Aides can undermine the organization.
- The profitability of the redemption centers is highly dependent on a staff of volunteers.
- The initial success of the redemption centers sparked a proliferation of privately owned "junk shops" which collectively posed severe competition to the centers. As a result, some Eco-Aides began to sell their material to these private shops for a higher price.
- The continued success of the project is dependent on market forces. In 1980 for example, the market for recyclables became saturated, and the redemption centers suffered heavy losses.

**Source of Funding/Implementing Agency:**

- Metro Manila Council of Women Balikatan Movement (15 Regency Park, 207 Santolan Road, Manila, Philippines).

**Location of Project:**

- Manila, Phillipines, and 21 villages surrounding Metro Manila.

**Date of Implementation:**

- 1978-present.

**Source:**

- "Manila Recycling Project," *Voices from the City*, Water and Sanitation for Health Project. Vol. 4, April 1994.
- Cointreau, Sandra J., "Solid Waste Recycling: Case Studies in Developing Countries," UNDP, 1987.
- Holmes, John R., *Managing Solid Wastes in Developing Countries*, John Wiley & Sons, 1984.

**D. SOLID WASTE RECYCLING: ZABALEEN PROJECT**

**Project Description:**

- A cooperative effort to enhance waste collection by making capital and organizational innovations available to the Zabaleen--traditional waste pickers in Cairo, Egypt, making it profitable to collect from low-income neighborhoods.

**Problem Area:**

- In Cairo, families within the class groups, Wahi and Zabaleen, have traditionally been engaged in the collection and informal management of

**The Zabaleen Strategy**

The Zabaleen and Wahi have traditionally supported themselves on the economic derivatives of solid waste collection. Household wastes are collected from containers located in the rear of buildings. The Zabaleen transport the garbage in donkey carts to their family compound where it is sorted into 15 marketable items. Organic waste is used for pig feed, and reusable materials are sorted for sale. Thus where the system is in practice, it entirely covers its cost. The Zabaleen make a subsistence living off the sale of the recyclables, with little or no cost to the residents for collection services.

a waste collection system. The Zabaleen support themselves through the sale of salvaged recyclables and use organic matter in the waste stream to feed their pigs; however, more than 600 tons of garbage remained uncollected on a daily basis, mostly from lower income neighborhoods.

- The Zabaleen are limited in number and could not service all households using the traditional way they practiced their trade.

**Approach:**

To service the poorer neighborhoods, the community undertook a series of innovations:

- User fees were put into place so that the Zabaleen could directly charge residents for collection.
- The community established a church-affiliated organization, called a Gamaya, to administer the assignments of routes, collect fees, and supervise the service.
- With technical assistance from the funding agencies, the Gamaya developed its institutional capacity to the point where it could offer credit to the Zabaleen for upgrading their hauling and processing techniques.
- A series of innovative processing techniques were undertaken including plastic granulation, rag pulling, paper bailing, and bundling of tin plate cans.

**Benefits:**

- Trash collection in low-income neighborhoods improved as a result of the project.
- This system is cost-efficient and sustainable. It generates income for Zabaleen families, and garbage is collected daily.
- Modest inflows of money allow the Zabaleen to invest in the processing of marketable recyclables (paper, textiles, tin cans, etc.).
- The community is highly involved and literally owns the project.
- Markets have been found for the majority of waste materials, and only 15 percent of the original waste volume needs to be dumped.
- Organic matter, not consumed by the Zabaleen's pigs and goats, is composted and sold as fertilizer.
- The donkey and hand carts used by the Zabaleen to collect refuse allow them to enter streets that would be too narrow for modern trucks.
- The Wahi, who traditionally held collection rights to all of the buildings, took on a new role as administrators of the system, assigning routes and being accountable to a building owner.

**Disadvantages:**

- The willingness and effectiveness of the Zabaleen to collect the trash depends on their ability to maintain and keep livestock in the urban area.
- Markets will need to be created for the recycled materials.
- The project has not decreased sanitary and potentially hazardous health risks to which the Zabaleen are typically exposed.

**Source of Funding/Implementing Agency:**

- World Bank, Oxfam, and Ford Foundation.
- Local community-based organizations.

**Location of Project:**

- Cairo, Egypt.

**Date of Implementation:**

- 1986 and ongoing.

**Source:**

- Cointreau, Sandra J., "Solid Waste Recycling: Case Studies in Developing Countries," UNDP, 1987.
- Holmes, John R., *Managing Solid Wastes in Developing Countries*, John Wiley & Sons, 1984.
- United Nations Center for Human Settlement (Habitat), "Solid Waste Management in Low-Income Housing Projects: The Scope for Community Participation," UN, 1989.

**E. IMPROVING WASTE COLLECTION SERVICES: INTEGRATING WASTE SCAVENGERS****Project Description:**

- Establishment of an organized sorting and recycling program to provide support for scavengers and informal workers who are displaced when waste treatment facilities are upgraded.

**Problem Area:**

- Efforts to upgrade landfills and clean up illegal dump sites would displace the traditional occupations and residences of waste scavengers.
- Scavengers were exposed to unhealthy conditions in open and illegal dumps.
- The scavengers were undermining the recycling potential of the municipality.

**Approach:**

- World Bank loans provide for infrastructure and equipment improvement and training and resettlement of waste scavengers. The participating city then provides equipment and installation as well as accompanying training and organizational assistance for the scavengers to continue their collection and recycling work under improved hygienic conditions.
- A community could construct a refuse collection and recycling station outside the sanitary landfill with a slow-moving conveyor belt from which the scavengers select and sort materials for recycling.
- If the scavengers' homes are lost due to closing or upgrading a dump site, the project resettles them in nearby housing programs, if they are eligible, or provides building materials and sites near the new landfills.
- Job training and education programs directed at health and nutrition will be offered for the scavenger families.
- As part of the larger project, a city must go through a process of developing a social action plan to address/incorporate the scavengers into its waste management plan.

**Benefits:**

- The sorting and control of recyclables according to market demand should improve cost recovery for waste collection services and recycling efforts.
- The organized involvement of the scavengers helps reduce the waste stream in general.
- Finding a place for the scavengers in the upgrading will help prevent their sabotage of the new system and will provide them with opportunities for education and other job training.
- The scavengers will continue their activities in improved sanitary and hygienic conditions.

**Disadvantages:**

- The scavengers may resist new sanitation systems.
- The sustainability of recycling efforts by the scavengers efforts will depend on market demand and development for recyclables. The project could require occasional financial support from the municipality.

**Source of Funding/Implementing Agency:**

- BANOBRAS, Secretaría de Desarrollo Social (SEDESOL), and states and municipalities.

**Location of Project:**

- Mexico. Cities include Monclova, Queretaro, Ciudad del Carmen, and Torreon.

**Date of Implementation:**

- 1994 (start-up) and ongoing.

**Source:**

- Stein, Jack, task manager, Infrastructure and Energy Operations Division, Latin America and the Caribbean Regional Office, World Bank, Washington, D.C.
- World Bank contacts: Manuel Mariño, Juan Quintero, Menajem Basallel, Tova Solo, Carl Bartone, and Antonio Estache.
- Secretaría de Desarrollo (SEDESOL), Federal Government of Mexico.

**F. COMMUNITY PARTICIPATION IN SANITATION SERVICES IN KENYA**

**Project Description:**

- Formation of neighborhood committees and councils to organize garbage collection services and residential payment plans.

**Problem Area:**

- The Bukani estate on the outskirts of Nairobi, Kenya, faced a public health crisis as a result of illegal dumping and lack of collection services.
- The public health problems associated with uncollected garbage included air pollution caused by rotting garbage, which is exacerbated by high temperatures and flooding from blockage of drainage systems.

**Approach:**

- The community forms a committee to monitor garbage collection and proper compensation for the garbage collection service.
- Each household is given two plastic bags per week and a private company collects the garbage weekly.
- Each household pays a monthly collection fee based on a percentage of the family's monthly income.

**Benefits:**

- The collection of trash improves overall public health conditions, specifically a reduction in rodents.
- Air quality is improved since the smell of rotting garbage is no longer pervasive.
- Community involvement in the formulation of a waste management plan increases general environmental awareness and compliance with the waste collection system.
- The high degree of community participation may facilitate more intensive future household management waste systems such as composting.

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**Disadvantages:**

- Residential fees paid to community organizations or municipal councils for waste collection services are often inappropriately spent, resulting in little improvement in infrastructure collection equipment or overall quality of service. As a result, families have been less inclined to continue service collection payments.
- Garbage is transported to the edges of settlement communities and discarded in open dump sites. This merely shifts the environmental burden to a neighboring population without successfully addressing the problem.

**Source of Funding/Implementing Agency:**

- The community of Bukani, Nairobi, Kenya.
- Department of Water Resources, Kenya Water Institute, Nairobi, Kenya.

**Location of Project:**

- Nairobi, Kenya.

**Date of Implementation:**

- Ongoing practices.

**Source:**

- Matiasi, Tomas, "Institutional Development Network News," No. 4, March 1995.

**G. COMBINING YOUTH ACTIVITIES AND ENVIRONMENTAL CLEANUP****Project Description:**

- An extremely successful, self-help initiative in a large, informal settlement outside Nairobi, Kenya, combining youth sport activities with environmental cleanup.

**Problem Area:**

- Solid waste was left uncollected in the streets and vacant lots of local neighborhoods creating unsanitary and unsightly conditions.

**Approach:**

- The Mathare Youth Sports Association (MYSA), a volunteer organization, combines the enthusiasm of children for participating in competitive team sports with community service activities like garbage collection and ditch clearing.
- The league is supervised by volunteer coaches and referees most of whom are 16-17 years old.
- Through the guidance of the MYSA Community Service Council, teams coordinate with the Nairobi City Commission staff in Mathare to clear garbage and drainage ditches each weekend in different neighborhoods.
- Teams that complete their community service projects earn additional points in the league standings.
- The MYSA league has approximately 100 soccer teams competing every weekend, while another 30-40 teams fulfill their community service obligations.
- A total of 5,000 boys and girls from 50 neighborhoods participate in soccer, basketball, and girl's netball.

**Benefits:**

- The MYSA league provides recreational opportunities for poor children while promoting environmental awareness through team participation in neighborhood clean-up activities.

- A sense of environmental responsibility is instilled in children as a result of their participation in clean-up activities.
- The children and the communities as a whole realize immediate public health benefits from cleaner streets and open spaces.
- Clean-up costs are low because of the volunteer status of organizers and players.

**Disadvantages:**

- Although discarded trash is collected and existing drainage systems cleared, the fundamental problem of inadequate solid waste management and sewerage systems remain.
- Children are potentially exposed to hazardous health conditions during clean-up activities.

**Source of Funding/Implementing Agency:**

- MYESA relies entirely on donations from individuals and businesses in the community.

**Location of Project:**

- Nairobi, Kenya. Illegal or informal settlements in Mathare Valley.

**Date of Implementation:**

- 1987-present.

**Source:**

- Mathare Youth Sports Association, "A New Approach to Youth Activities and Environmental Clean-Up: the Mathare Youth Sports Association (MYESA) in Kenya," *Environment and Urbanization*, Vol. 4, No.2, October 1992.

**H. ADDRESSING WASTE MANAGEMENT GAPS THROUGH RECYCLING****Project Description:**

- Improvement of solid waste management systems and reduction of the waste volume through an emphasis on recycling.

**Problem Area:**

- Waste collection and disposal was costly and placed a burden on landfills.

**Approach:**

- Members of the community, usually scavengers, are hired to collect recyclables along designated routes at specified times.
- The collectors are provided with low-interest loans to obtain hand carts used to transport the recyclables.
- The collectors primarily service businesses.
- In residential areas, curbside recycling programs are serviced by municipal trucks. If truck service is unavailable, then neighborhood drop off stations are established.

**Benefits:**

- An advanced recycling system will reduce the waste stream, provide employment, increase cost recovery, and promote community participation.
- The cost of curbside recycling can be off-set through the market sale of recyclables.
- If people can be persuaded to transport their recyclables to neighborhood collection sites, then collection cost can be reduced even more dramatically.

**Disadvantages:**

- Individuals and businesses must be willing to separate recyclables from garbage.

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- The potential exists for competing waste collectors to usurp recyclables before the designated collectors.

**Source of Funding/Implementing Agency:**

- Compromiso Empresarial para el Reciclaje (CEMPRE), a nongovernmental organization, and various municipalities.

**Location of Project:**

- Brazil--various cities.

**Date of Implementation:**

- Ongoing projects, early 1990s start-up, currently being re-evaluated.

**Source:**

- Aquino, John T., et al, "Brazil: A Fertile Market," *Waste Age*, April 1995.
- Wells, Christopher, Compromiso Empresarial para el Reciclaje (CEMPRE), Rio de Janeiro.

**Collection Bins Promote Recycling**

In Bandung, Indonesia, a municipal solid waste and recycling project increased community participation by providing waste collection containers for recyclables and nonrecyclables. Individuals, businesses, and market areas received containers large enough to store several days worth of refuse. Municipal employees empty individual containers along defined routes three days a week with manually operated handcarts. The collected solid waste is transported to regional transfer recycling depots. Large containers used in marketplaces are emptied by municipal trucks. Collected solid waste that cannot be recycled or composted is loaded into diesel-powered compaction vehicles for final disposal at a landfill.

**Source:** Holmes, John R., *Managing Solid Wastes in Developing Countries*, John Wiley & Sons, 1984, p.103-126.

**I. INTEGRATED WASTE MANAGEMENT RECYCLING PLAN: PUERTO RICO****Project Description:**

- Development of an integrated system of collection, transfer stations, and disposal sites whose centerpiece is market-driven recycling partnerships between the public and private sectors.

**Problem Area:**

- Waste collection and disposal was costly and the current system needed innovative improvements.

**Approach:**

- The island is divided into nine regions and each will have a transfer station that will feed waste into a regional landfill or waste-to-energy plant (WTE).
- Central locations for transfer and disposal will be used to create economies of scale, and all facilities in an area will be operated by a single company.
- The project incorporates the private sector and industry into the plan. For example, chicken wastes from Puerto Rico's poultry industry will be collected and converted into methane gas and fertilizer.
- Private sector companies, including U.S. owned companies, are offered tax and other incentives by the government to invest in the infrastructure development.
- Additional revenue generation will be received from disposal fees.

**Benefits:**

- Recyclables not previously removed from the waste stream will be separated at these regional disposal sites, and recycling will be geared to local market demands.

- High market prices for certain recyclables make a joint venture recycling project a profitable means for reducing the amount of solid waste that requires sanitary landfill disposal.

**Disadvantages:**

- Access to markets for recyclables is limited and off-island markets mean increased transportation costs.

**Source of Funding/Implementing Agency:**

- Government of the Commonwealth of Puerto Rico.
- Puerto Rico Solid Waste Management Authority (SWMA).
- Different government agencies will be combining resources to build a comprehensive solid waste infrastructure. Part of the financing will be provided by the government-owned Government Development Bank and the Economic Development Bank.

**Location of Project:**

- The Commonwealth of Puerto Rico.

**Date of Implementation:**

- Five-year plan beginning in 1995.

**Source:**

- Boltz, Christine, "Building a New Waste Management Strategy in Puerto Rico," *Waste Age*, June 1995.
- Puerto Rico Solid Waste Management Authority, San Juan, Puerto Rico.

## J. WASTE PAPER RECOVERY AND SALES

**Project Description:**

- A mutually beneficial relationship, where residents separate recyclable paper materials from their waste and sell them to paper companies who demand a quality source of re-usable paper.

**Problem Area:**

- Paper companies are experiencing a growing demand for a reliable, quality source of waste paper, yet the separation and collection of waste paper is an underdeveloped process.

**Approach:**

- Private paper companies take the initiative by identifying, collecting, and buying waste paper directly from individual households or communities.

**Benefits:**

- The sale of waste paper reduces the waste stream and counters waste collection expenses.
- The sale of waste paper could contribute to economic and environmental development by supporting the health of the paper industry while reducing its burden on forests.
- Individuals see an immediate financial benefit from the sale of the paper.
- Communities can organize, centralize the collection of waste paper, sort it for quality, and assign the money for community funds.
- Due to the expense of raw lumber, paper companies find that recycled paper of a high quality is an inexpensive input for many of their final products.

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**Disadvantages:**

- Success is dependent on availability of cheap transport, especially for retrieval from remote or rural areas.
- Merchants must be willing and able to develop the transportation and sales networks.
- An investment of time and money must be made to educate communities on how to separate their waste paper and make them aware of the market potential.

**Location of Project:**

- Colombia and Mexico.

**Date of Implementation:**

- 1980s-present.

**Source of Funding/Implementing Agency:**

- Private enterprise initiatives by paper companies such as Carton de Colombia, Cartones Americanos in Cali, Colombia, and Carton y Papel de Mexico.

**Source:**

- Holmes, John R., *Managing Solid Wastes in Developing Countries*, John Wiley & Sons, 1984.

**K. COLLECTION AND TRANSPORTATION SYSTEMS MATRIX**

<b>Collection and Transportation Systems</b>			
<b>Vehicle</b>	<b>Nature of Innovation</b>	<b>Benefits</b>	<b>Disadvantages</b>
Open Handcart	A two-wheel handcart is used for door-to-door collection and transportation either to transfer depots or final disposal location.	Inexpensive transportation system capable of collecting refuse from areas that would be inaccessible to large garbage collection trucks.	Since the handcart is human-powered, the distance from collection to disposal cannot be excessively great.  Community participation is necessary for successful door-to-door collection.
Open Handcart with Barrels	A narrow two-wheel handcart that can be designed to accommodate two to six barrels as receptacles for collected waste.	Inexpensive transportation system capable of collecting refuse from areas that would be inaccessible to large garbage collection trucks.  The size of the barrels facilitates the transfer of garbage from the cart to a secondary disposal site.  Multiple barrels allow for waste separation upon collection.	Since the handcart is human-powered, the range of distance from collection to transfer or disposal site cannot be excessively great.  Community participation is necessary for successful door-to-door collection.
Animal-Drawn Cart system	A two-wheel open cart, pulled by one or two donkeys, to transport solid waste.	The collection routes can be extensive and the final sorting or disposal sites relatively far from the waste source due to the use of animal power.	Waste collectors need to have the means to support their animals.
Pedi-Cycles	Tricycle that has a walled rear cart built on the tricycle frame.	The range of the collection distances can be expanded as a result of improved mobility.	Unpaved roads and loose sand inhibit collection service.

**PART X**

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**SOLID WASTES: COMPOSTING**

## A. WASTE COLLECTION AND COMPOSTING: ORANGI PILOT PROJECT

### Project Description:

- Extend systematic waste collection services to low-income settlements in Karachi, Pakistan, and initiate a composting project from organic waste matter.

### Problem Area:

- Before the Orangi Pilot Project (OPP), more than half of the community dumped its refuse in streets, vacant lots, or along the banks of storm water channels. Open burning of waste and raw decomposition contributed to air pollution problems.

### Approach:

- Since two thirds of the community's solid waste was organic in nature, there was a great potential for establishing a community composting system.
- The community researched composting methods that would be easy to manage and would produce high-quality compost in 15 to 21 days.
- The community selected the windrow aerobic composting system which entails elongated piles of open refuse which are regularly turned to reincorporate air into the piles. To enhance the composting process, poultry waste and water could be added to the piles.
- To extend primary waste collection service to more residents, locally made dustbins were distributed to households, and larger containers were made available for small businesses and markets.
- The smaller containers were serviced by handcarts and pedi-cycles. Large containers were emptied by motorized vehicles.
- Collection and transportation of the solid waste took place at night to avoid traffic congestion in urban centers.

### Benefits:

- The composting project reduces the overall amount of waste to be land filled.
- Partial cost recovery exists based on the sale of organic compost fertilizer.
- The use of pedi-cycles and hand carts extended collection service to areas that would be inaccessible for municipal dump trucks.
- Public health problems associated with uncollected trash are reduced.

### Disadvantages:

- Sustainable systems of waste collection and composting need to be established.

### Source of Funding/Implementing Agency:

- The community of Orangi (outskirts of Karachi) and the municipality of Karachi, Pakistan.
- United Nations Center for Human Settlements (Habitat).

### Location of Project:

- Karachi, Pakistan.

### Date of Implementation:

- 1981-1984.

### Source:

- Sinnatamby, Gehan S., "Solid Waste Management in Orangi-Karachi, Pakistan," United Nations Center for Human Settlements (Habitat), November 1984.
- Water & Environment Report, "Mega Cities in Mega Crisis," *Water & Environment*, March 1994.

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- Holmes, John R., *Managing Solid Wastes in Developing Countries*, John Wiley & Sons, 1984.

## B. HOUSEHOLD COMPOSTING PROJECTS

### Project Description:

- To save landfill space and reduce waste collection costs, municipally sponsored composting initiatives that encourage residents to set up backyard compost bins for kitchen scraps and yard trimmings are growing in popularity.

### Problem Area:

- Landfills were reaching capacity limits, and expenses associated with solid waste collection and disposal were absorbing larger percentages of municipal budgets.

### Approach:

- In 1993, the state of Massachusetts, USA, began providing grant funds to its municipalities that promote home composting programs by distributing compost bins to households.
- In Idaho, the Southern Idaho Regional Solid Waste District purchased compost bins and sold them to community residents for \$10 a piece (representing a \$25 subsidy). The compost bins serve as an alternative for those households accustomed to burning their trash in backyard barrels.
- In California, competition among haulers for contracts enabled the city of Manhattan Beach to offer residents both recycling and compost bins. To satisfy state waste diversion goals, the city required the hauling contractor to have a financial stake in supporting the composting/recycling program.

### Benefits:

- Composting at the household level is a waste management tool with no correlating collection and disposal costs.
- Waste streams have been reduced from 5 percent in New Jersey and up to 28 percent in Minnesota's Fillmore County.
- Composting reduces the need for increased landfill capacity and the burden on the collection system by redirecting funds away from trucks, hardware, and transfer stations.
- Composting facilities cost less to build than counterpart treatment facilities.
- Compost can be used as a fertilizer on a household level or collected and sold as a commercial product.

#### Teaming Municipalities with Private Contractors

Partnerships between communities and private companies may be the way to get the most out of a community composting program. Where municipalities have community access and organizational capacity, they generally lack market expertise and sufficient project funding. Private contractors, however, can use their experience to provide characterization data for the compost contents, commercialize the product, and provide instructions to the buyers.

- When properly applied, mature, stable compost can help crop growth; including higher yields, better soil moisture retention, reduced leaching of soil nutrients, reduced irrigation needs, and suppression of pests and pathogens.
- The community increases its environmental awareness concerning solid waste.

**Disadvantages:**

- Often composting programs implemented in the USA have required or relied on state legislation or funding.
- Composting sites, especially multi-family or municipal sites, need to be well planned and aerated to minimize odor.
- Transportation costs of hauling organic composts to a central facility for processing and redistribution are generally high, and the sale of the compost may or may not offset production and transportation costs.
- Based on a community's profile, particularly in certain peri-urban areas in developing countries, there may be little use for composting at the household level.
- Large tracts of land are necessary for successful implementation on a community-wide scale.

**Source of Funding/Implementing Agency:**

- Various U.S. states and municipalities.

**Location of Project:**

- States of California, Idaho, Massachusetts, Minnesota, and New Jersey in the USA.

**Date of Implementation:**

- Ongoing practices (1980-present) in various stages of pilot to fully developed programs.

**Source:**

- Dabaie, Michael, "Getting the Most from Compost," *Waste Age*, November 1994.
- Roulac, John, "The Economics of Home Composting," *MSW Management*, October 1994.
- Snow, Darlene, "Organics Composting," *MSW Management*, October 1994.

**C. ORGANIC WASTE COLLECTION AND COMPOSTING THROUGH BIODIGESTION****Project Description:**

- Organic waste matter is sorted from the waste stream and processed into compost through the use of an aerobic biodigestor.

**Problem Area:**

- The use of open pit garbage dumps created a severe situation of environmental contamination and attracted large numbers of rats and flies which are mobile vectors of disease.

**Approach:**

- Municipal trucks pick up garbage at local produce markets, insuring a high organic level content, and dump the trash at a separation station.
- Workers separate recyclables such as glass, tin, paper, and plastic, and pass the organic matter through a machine which chops the matter into small pieces to facilitate decomposition.

- Shredded organic matter is left to decompose in piles of 1.5 meters in height, until it is placed in a "biodigester," a rotating tube 12 meters long and 1.5 meters in diameter.
- The organic matter remains in the tube for 7 days in which composting temperatures and humidity levels are optimum.
- The organic matter is then chopped to even smaller pieces before being bagged and sent to market for sale.
- Plan International's technical assistance and training in plant operations and management eventually may help this solid waste management system become an independently managed community enterprise.

**Benefits:**

- The biodigester plant has the potential to be financially autonomous if enough composted fertilizer can be produced and sold for a profit.
- Public health and environmental conditions will improve as a result of the removal of the organic waste matter from the waste stream.
- Compost can be used by local farmers as a substitute for more expensive chemical fertilizers.

**Disadvantages:**

- Financing and technical assistance are required for start up costs and management of this project.
- The potential exists for problems associated with cost recovery and marketing of the final composted product.

**Source of Funding/Implementing Agency:**

- Plan International.
- Municipality of Joyocoto.
- Provincial Council.

**Location of Project:**

- Joyocoto, Ecuador.

**Date of Implementation:**

- 1995.

**Source:**

- Wittkowski, D., CRS/Ecuador, "Guaranda Organic Fertilizer Plant," Unpublished Memorandum, March 21, 1995.

**PART XI**

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**SOLID WASTES: INCINERATION**

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## A. SIMPLE INCINERATION

### Project Description:

- Solid waste is collected and burned in an incinerator as a final disposal alternative to sanitary landfills.

### Problem Area:

- Not all solid waste is appropriate for landfills, recycling, or re-use. Furthermore, some communities may have severe land constraints for locating landfills.

### Approach:

- The collected refuse is deposited on the ground near the incinerator to promote desiccation and facilitate combustion.
- If built according to proper dimensions, one incinerator per 200-300 people is adequate to handle their garbage.
- A basic incinerator can be built out of locally produced cement blocks and metal.

### Benefits:

- Basic incineration facilities are inexpensive to build and operate.
- Incineration can provide an environmentally superior alternative to landfills.
- Incineration is a cost effective alternative to sanitary landfills in congested urban areas where no other disposal methods exist and/or land is unavailable or expensive.
- Incineration reduces the waste stream dramatically, thereby reducing the burden on landfills and waste collection equipment.
- Incineration is a preferable manner to dispose of hospital and other hazardous wastes as long as combustion is complete.

### Disadvantages:

- Skilled personnel are needed to operate and maintain the plant
- Potentially recyclable materials could be destroyed with other waste.
- Expensive control measures are needed to prevent air and water pollution.

### Source:

- Holmes, John R., *Managing Solid Wastes in Developing Countries*, John Wiley & Sons, 1984.
- Seuss, Michael J., *Solid Waste Management: Selected Topics*, WHO Regional Office for Europe, Copenhagen, Denmark.

## B. ON-SITE INCINERATION SYSTEMS FOR HAZARDOUS SOLID AND LIQUID WASTE DISPOSAL

### Project Description:

- Hazardous waste produced on site or in local industrial plants are incinerated within the industrial complex.

### Problem Area:

- Industries often produce hazardous waste that cannot be collected and safely disposed in landfills or recycled for reuse.

**Approach:**

- A variety of incineration systems and technologies share the common operational need to provide sustained high temperatures, a sufficient degree of material combustion time, a turbulence factor to mix the waste and give it exposure to oxygen, and an abundance of oxygen to enhance the combustion process.
- Waste incinerated under these ideal conditions will contribute toward the following end-products: a significant reduction in the weight and volume of the solid waste, the production of a sterile solid residue which can be safely land filled, and the release of gases lower in toxicity.

**Cement and Lime Kilns****Benefits:**

- The incineration of hazardous waste can serve as a secondary fuel source, thereby offsetting some of the primary fuel expenses.
- The high temperatures required for the cement clinker production process thoroughly incinerate liquid and solid hazardous waste. The alkalinity of kiln material neutralizes the acid gases produced from the incineration process.
- Acidic gases and dust are absorbed by the clinker without adversely affecting cement quality.
- The most appropriate waste to be used as fuel in cement kilns contain high calorific value and low metal and water content.

**Disadvantages:**

- The quality of the clinker production may be damaged if large and bulky hazardous waste items are incinerated.
- The production costs of the clinker may increase as a result of additional incinerator maintenance.

**Co-firing in Industrial Boilers****Benefits:**

- Co-firing of wastes in industrial boilers can safely dispose of liquid wastes containing petrochemicals, metals, solvents, and other phenolic wastes if proper gas cleaning devices are installed.
- Industries save money by treating their own wastes and can collect a fee for treating the wastes of other industries.
- Heat generated from the incineration process may be used to operate the boiler.

**What to Incinerate?**

Incineration is the preferred means of disposal for wastes with the following characteristics: biologically hazardous, resistant to biodegradation, volatile, cannot be safely land filled, and laden with heavy metals (lead, mercury, cadmium, zinc).

The following hazardous wastes should be incinerated: solvent wastes, waste oils, rubber and latex wastes, hospital wastes, pesticide wastes, pharmaceutical wastes, refinery wastes, phenolic wastes, hazardous chemicals, and water contaminated with hazardous chemicals.

**Source:** Batstone, R., J.E. Smith, and D. Wilson, "The Safe Disposal of Hazardous Wastes: The Special Needs and Problems of Developing Countries," Volume III, World Bank Technical Paper Number 93, 1989.

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- On-site incineration of hazardous wastes in existing industrial furnaces require few additional capital investments.

**Disadvantages:**

- Few industrial boilers have advanced gas cleaning equipment to remove particulate. The majority have no gas cleaning equipment and therefore gas cleaning devices should be installed before co-firing.
- Only hazardous wastes which can be pumped are suitable for co-firing. Additional waste handling equipment like tanks, screens, and filtration systems may be required.

**Co-Incineration**

**Benefits:**

- Existing incinerators can be used to incinerate small amounts of hazardous waste with nonhazardous refuse.
- If the incineration facility has the technological capability, a system could be installed to transfer the heat produced from the incinerator into an energy source.

**Disadvantages:**

- Because of the low temperature of these incinerators, 750-900°C, only small amounts of hazardous waste can be safely incinerated.
- System operators need to ensure that the addition of the hazardous waste is being incinerated at sufficiently high temperatures and existing ventilation is appropriate.

**Source:**

- Batstone, R., J.E. Smith, and D. Wilson, "The Safe Disposal of Hazardous Wastes: The Special Needs and Problems of Developing Countries," Volume III. World Bank Technical Paper Number 93, 1989.

**PART XII**

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**SOLID WASTES: LANDFILLS**

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### A. LEACHATE MANAGEMENT: DEVELOPING INFRASTRUCTURE

#### Project Description:

- Installation of impervious landfill liners to prevent leachate from contaminating groundwater.
- Recirculation of leachate through the landfill to promote refuse decomposition and reduce the total quantity of leachate that will require secondary treatment.

#### Problem Area:

- Sanitary landfills without proper liners and leachate collection systems are likely to contaminate groundwater.
- Conventional systems of transporting collected leachate to a wastewater treatment plant are expensive.

#### Approach:

- The type of liner that is used will vary depending on economic capability and the permeability of the underlying soil.
- The liner is extended over the basin of the landfill and a leachate collection system is installed.
- Collected leachate evaporates in lined holding ponds before being recirculated in the landfill.
- Recirculated leachate partially dissipates in the landfill and receives treatment through the filtration process.
- To keep leachate management costs down, pre-selection considerations must include regulatory requirements, the nature of the leachate, operational considerations of the landfill site and available disposal options.

#### Benefits:

- The threat of groundwater contamination is reduced as a result of the landfill liner and leachate recirculation system.
- Due to evaporation of leachate during recirculation, there would be less leachate needing secondary treatment, thus saving costs.

#### Low-Cost Sanitary Landfills

In Peru, the project known as PROESA, in addition to serving as the liaison organization between microenterprises and municipalities, has supported step-wise improvements in the creation of a sanitary landfill (see page A-39). Through this method, a community can reduce environmental contamination and public health threats associated with final disposal of solid waste. The step-wise approach is based on the economic principle that if a community cannot afford a conventional lined landfill, then the situation necessitates flexibility and improvisation. Communities should use locally available resources to improve landfill conditions step by step.

For example, a community that cannot afford a liner and leachate collection system can site a landfill in an area with a low water table and relatively impermeable soil, thus reducing the chance of groundwater contamination. In one community that could not afford dump trucks and bulldozers to compact and cover discarded waste with a layer of sand, laborers use shovels, wheel barrows, and manual compaction rollers to perform the same function. Laborers manually compact the sand layer using modified 50-gallon drums partially full of sand that are then rolled horizontally. The drums, equipped with an extended handle, can be operated by one person.

**Source:** Bartone, Carl. Urban Development Division, World Bank. Washington, D.C., Personal Communication, July 7 1996; Video. "PROESA: Proyecto Promoción del Empleo la Salud y el Medioambiente, Una Sistema de Privatización del Servicio de Limpieza Publica." Instituto Peruano de Economía Social. Lima, Peru, 1995.

- Leachate recirculation leads to reduction in the organic strength and quantity of the leachate; increased rate of landfill stabilization; enhanced gas production rates; immobilization of metals from land filled material; improved landfill settling rates; and increased landfill decomposition rates.

**Disadvantages:**

- In areas of high annual precipitation the benefits of leachate recirculation are reduced.
- Potential problems associated with recirculation include leakage off side slopes and localized accumulation of leachate within the landfill.

**Source:**

- Lange, Debora A., John C. Broschious, and Edward G. Zullo, "Leachate Management Design in Mexico," *Waste Age*, February 1996.
- O'Leary, Kevin, "Development of Leachate Disposal Process," *Waste Age*, July 1995.

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**PART XIII**

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**ORGANIZATIONS AND TECHNOLOGIES**

**A. WASTEWATER SANITATION SYSTEMS CONTACT SHEET**

Innovation/Organization	Pertinent Information	Address
Dry Pit Compost Latrines (Letrinas Aboneras Secas Familiares)	A source for definitions and basic concepts, criteria for the use of dry latrines, technical specifications for dry latrines, and costs.	Jean Gough, c/o UNICEF Apartado Postal 1114 San Salvador, El Salvador Fax: +503-2 790608
Pit Privy Liquefier	A contact for information on the pit privy liquefier.	R.J.H. Schroeder, The HS Organization P.O. Box 1736 Pinetown 3600 South Africa Tel: +27-31-7003493 Fax: +27-31-7003496
Sanplat System	Sanplat molds and manuals can be obtained from this address.	LCS ProMotion Flo 18, S-46796 Grastorp, Sweden, Tel: +46-514-40058 Fax: +46-514-40273
SIRDO System	Contacts for information on the SIRDO technology.	<ul style="list-style-type: none"> <li>•Arq. Josefina Mena Abraham Grupo de Tecnologia Alternativa Alamo 8-16, Col. Los Alamos San Mateo, Naucalpan 53230, Estado de Mexico, Mexico Tel: + 344-0312 Fax: +343-3748 E-mail: glusker@profmexis.sar.net</li>   <li>•Claudia D'Andrea National Wildlife Federation 1400 16th Street, N.W. Washington, D.C. 20036 Tel: +202-939-3311 Fax: +202-797-5480</li> </ul>

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**A. WASTEWATER SANITATION SYSTEMS CONTACT SHEET (Continued)**

<b>Innovation/Organization</b>	<b>Pertinent Information</b>	<b>Address</b>
Orangi Pilot Project	Source for information on non-conventional sewage disposal and treatment alternatives.	Dr. Akhter Hameed Khan Orangi Pilot Project- Research and Training Institute ST-4, Sector 5/A, Qasba Township, Manghopir Road Karachi, Pakistan Tel: +92-216652297/6658021
Pan American Center for Human Ecology and Health	A regional organization providing technical assistance in solid waste and wastewater treatment systems.	Dr. Stephen W. Bennett Pan American Center for Human Ecology and Health P.O. Box 249 Toluca, Mexico
Cooperative Housing Foundation	A nonprofit development organization that assists communities to build better housing and sanitation systems.	Cooperative Housing Foundation P.O. Box 91280 Washington, D.C. 20080 USA Tel: +301-587-4700 Fax: +301-587-2626

**B. SOLID WASTES SANITATION SYSTEMS CONTACT SHEET**

<b>Innovation/Organization</b>	<b>Pertinent Information</b>	<b>Address</b>
Exnora International	Source for information on the activities and strategies of Exnora International.	Exnora International 42 Giriappa Road, t. Nagar Madras 600 017, India
Instituto Peruano de Economia Social	Microenterprise development for solid waste collection and manual methods to manage a sanitary landfill.	César Zela Fierro Instituto Peruano de Economia Social Av. Javier Prado Este 1530 Lima, 27-Peru Tel: 51-14-75-1325 Fax: 51-14-75-0368
Instituto de Promocion de la Economia Social	Microenterprise development and solid waste recycling in Lima, Peru.	Jorge L. Price Instituto de Promocion de la Economia Social Av. Javier Prado Este 1530 Lima, Peru Tel: 511-475-1325 Fax: 511-475-0368

PART XIV

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