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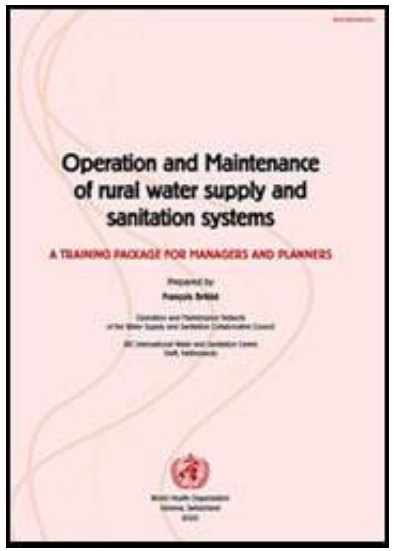

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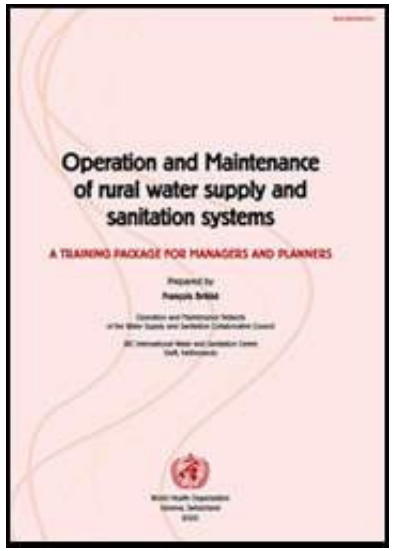

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Prepared by
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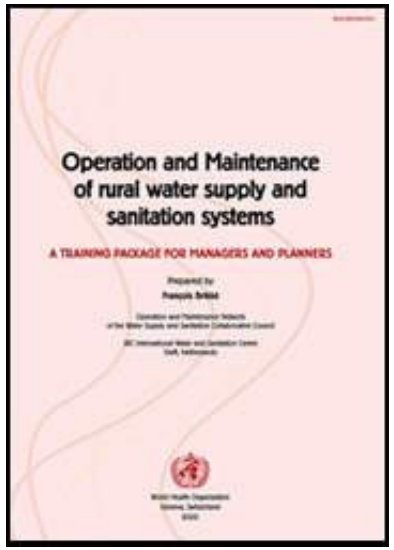

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Preface

The aim of Operation and Maintenance (O&M) programmes, as described in this training package, is to improve the efficiency, effectiveness and sustainability of water supply and sanitation services. Operation and Maintenance activities, which

encompass not only technical issues, but also managerial, social, financial and institutional issues, must be directed towards the elimination or reduction of the major constraints which prevent the achievement of sustainability.

This document and the training activities described in it are intended for managers and planners who are concerned with the challenging problem of how to implement effective operation and maintenance of rural water supply and sanitation services in developing countries. In addition to the traditional management aspects of operation and maintenance, this training package highlights the importance of community participation, with a right gender balance, in order to make more efficient use of local human resources for sustainability.

The courses in this training package are based on participatory training methodologies, an important feature of which is to draw on the experiences of all the participants, under the guidance of an experienced facilitator and resource persons. The courses should be adapted to the local situation, and the modules can be modified with additions or deletions according to local needs.

The package is based on material and documentation of global experiences provided by various agencies and institutions in the water supply and sanitation sector. This work was initiated in 1991 at a meeting in Oslo, Norway, which called for an overall effort and the establishment of the Operation and Maintenance Working Group (currently the Operation and Maintenance Network) of the Water Supply and Sanitation Collaborative Council.

We are confident that this document will make an effective and useful contribution to progress in the rural water supply and sanitation sector.

Jos A. Hueb
Coordinator
Operation and Maintenance Network

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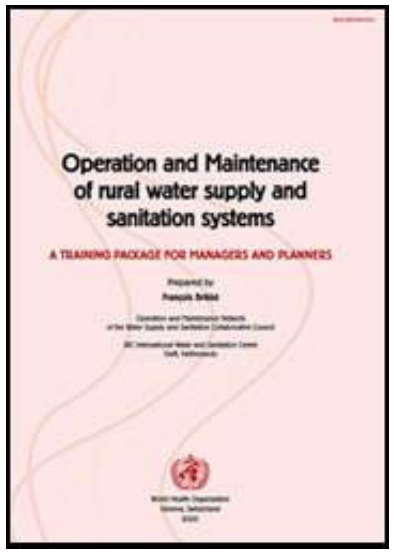

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Acknowledgements

This training package was first designed in 1991 by Teun Bastemeyer from the IRC International Water and Sanitation Centre, under the guidance and advice of the Operation and Maintenance Working Group of the Water Supply and Sanitation Collaborative Council. Subsequently, Franois Brikk - with the help of the following staff of IRC: Peter Bury, Christine van Wijk, David Saunders, Jennifer Francis, Jo Smet, Michael Seager, Kathleen Shordt and Ineke van Hooff, and Johnny Rojas of

CINARA (Centro Inter-regional de Abastecimiento y Remocin de Agua) in Colombia - developed it through various stages into the present version.

Professor Harry MacPherson and the staff of the National Directorate of Water of Namibia carried out the first testing of this package in 1993. The staff of ETSHER (Ecole Inter Etats des Techniciens Suprieurs de l'Hydraulique et de l'Equipement Rural) subsequently developed the French version of this course in Burkina Faso, while staff from the Direco Nacional de guas of Mozambique, together with the Centro de Formao Profisional de guas y Saneamiento in Maputo, the Swiss Development Cooperation agency, UNICEF, and the Netherlands Embassy in Maputo, helped to develop the Portuguese version. Some elements of the latest version of this package have been tested in Vietnam by the staff of the Centre for Rural Water and Environmental Sanitation in Hanoi and UNICEF.

Members of the Operation and Maintenance Network are thanked for their commitment and contribution to the development of this package, particularly Mr Jos Hueb, Coordinator of this Network, for his constant support and encouragement. Special thanks are due to Mr Franz Gahwiler from SKAT (Swiss Centre for Development Cooperation in Technology and Management, St Gallen, Switzerland), for his excellent review of this material, which now incorporates most of his comments.

Finally, the World Health Organization supported and promoted the development and use of this training package through the WHO Regional and Country Offices in the world. This has helped to make earlier versions of this document known to the potential beneficiaries through national workshops and training courses.

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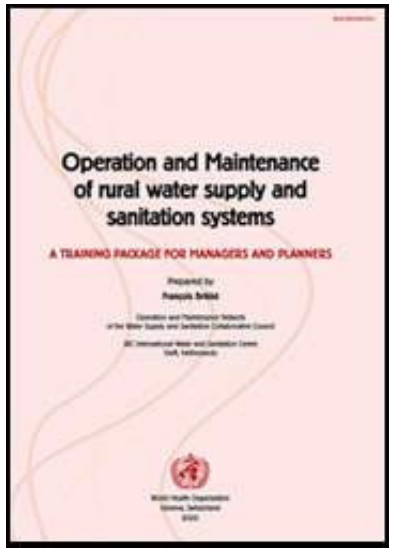

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Operation and Maintenance of Rural Water Supply and Sanitation Systems: A Training Package for Managers and Planners (IRC - WHO, 2000, 298 p.)

Part 1: Trainer's guide

1. Welcome!

How was this Training Package prepared?

In response to the shortcomings of the International Drinking Water Supply and Sanitation Decade of the 1980s, a training package was designed in 1991 by a group of sector experts from the Operation and Maintenance Working Group of the Water Supply and Sanitation Collaborative Council. A draft version was developed

by the IRC International Water and Sanitation Centre in the Netherlands and tested in 1992 in Namibia. The recommendations resulting from this field-test were then incorporated in the English version, which was subsequently translated into French and Portuguese. The revised version has since been implemented in various countries in Africa and Asia. In 1998 the World Health Organization (WHO) and the IRC decided to update the package.

The present version is therefore the result of seven years of work and experience worldwide. It incorporates recent developments and the latest findings and methodologies, which will help to improve the management of operation and maintenance (O&M) of rural water supply and sanitation services in developing countries.

Why "Management of Operation and Maintenance"?

Operation and Maintenance. These two key words appeared in the answers of many sector professionals and community workers when they were asked about what could be done to improve the performance, efficiency and sustainability of the rural water supply and sanitation services in developing countries. It is well known that O&M has been neglected in the past, or been discussed and introduced only after a project was completed. This neglect or delay in applying proper operation and maintenance has adversely affected the credibility of the investments made, the functioning of the services, the well-being of rural populations, and the development of further projects.

However, the importance of O&M has gained considerable visibility over the past few years, and it appears that policy-makers and project designers are now more

conscious of the direct links between improved O&M practices and the sustainability of water supply and sanitation services. There is also greater recognition of the need to approach these projects in a comprehensive way, emphasizing not only the design and construction but also post-construction activities.

Professionals in the sector are realizing that the implementation of O&M is not just a technical issue, but has social, community, gender, financial, institutional, political, managerial and environmental aspects as well. This is why the training package focuses on management of operations and maintenance. O&M must be organized and planned at both national and local levels, and should be managed at the community level with appropriate support from the local authorities and the private sector. This package looks into these different issues, with the aim of raising awareness and providing guidelines on O&M to project planners, programme managers and community specialists on how to improve the performance, efficiency, and sustainability of their rural water supply and sanitation services.

What is the structure of the package?

The training package is designed as a guide to facilitators who will conduct courses or workshops on management of operation and maintenance of rural water supply and sanitation services for working-level managers, as well as engineers, social workers and planners, and other specialists involved in this sector. The structure of the guide is flexible, which permits adaptation to local circumstances - e.g. shortening certain sessions, extending others, or adding locally relevant information. The package is divided into two parts: 1) Trainer's

guide, 2) Course contents.

The *Trainer's guide* provides guidelines and hints on how best to facilitate the course sessions. Adult training calls for more than teaching; it should make use of the participants' own experiences in a constructive way in order to effectively transmit basic relevant knowledge and experience. It was therefore considered pertinent to advise trainers and facilitators on how to conduct sessions that would give optimum benefits to the participants. Facilitation is an art, and you are invited to contact the sponsors and authors of this package, or other sector professionals, if your project or organization needs further advice on training-of-trainers sessions.

The *Course contents* focus on the main issues which are relevant today to improve O&M performance - such as the links between water, health, sanitation, and environmental protection; requirements and choice of technologies for operation and maintenance; institutional set-up; community management, including gender awareness and working and planning with communities; cost recovery; and monitoring for effectiveness. The contents demonstrate the use of various managerial techniques, such as analysing participation and constraints, identifying the objectives, setting up a planning matrix and indicators, planning with communities, and presenting a project. Experience has shown that the quality of the course improves if it includes working towards a concrete outcome, supported by awareness-raising which goes on throughout the course. At the end of the course, the participants are asked to prepare an individual assignment based on their experience and situation, and applying the concepts and approaches learned during the course.

We extend a cordial welcome to all who will use this training package. You may contact WHO or IRC, at the addresses given below, if you have any queries or need further information.

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2. About the training package

What are the objectives?

The general objective of the course in this training package is to improve water supply and sanitation programmes and projects by enhancing their ability to

sustain adequate O&M activities.

The specific objectives are as follows:

- **to update knowledge on the operation and maintenance aspects of rural water supply and sanitation programmes and projects;**
- **to reinforce management skills with regard to sustainable operation and maintenance;**
- **to specify approaches for better working and planning with communities;**
- **to develop the capacity to plan for operation and maintenance in one's own working environment through individual assignments.**

What is the target group and its size?

This training package is designed for working-level managers including engineers, planners, and development and social workers who are involved in the development and management of water and sanitation projects.

The ideal number of participants, which permits intensive exchange of experiences, is 12 to 15, but could go up to 20 if the course is guided by experienced trainers and facilitators. Larger groups will need a team of at least two facilitators, because the work will have to be divided frequently into two groups, some presentations and lectures being given to the whole group and participatory exercises to smaller groups. The course includes the preparation of an assignment, individually or by the group, which will require individual and team

coaching; the larger the group, the more assistance is required.

What is the duration of the course?

The course is designed for a minimum duration of 80 hours of classes, plus a field visit of one day which is strongly recommended. This is feasible within a period of two weeks, including time for any adaptations required by local circumstances and demand.

However, the course duration also depends on the participants' professional level and responsibilities. For example, high-level managers and directors may not be able to afford more than a week away from their normal duties. While the cost per participant increases if the course lasts longer, it can gain in quality if the participants are given more time to reflect on key issues and to prepare their individual assignments.

What are the expected outputs?

Experience has shown that the participants benefit most from a course if they work to produce a result, i.e. they work towards a defined product. Participants are therefore expected to carry out an individual or group assignment at the end of the course, based on their own situation and on what they learned during the course.

What is the course methodology?

The course in this package makes use of participatory learning methodologies, as far as possible, but also includes background information and overhead sheets for

lectures and presentations.

When learning, people remember 20% of what they hear, 40% of what they hear and see, and 80% of what they discover by themselves. This calls for a change in the way of teaching, from typical lecturing to a more participatory approach.

The participatory approach to training is based on the concept that professionals learn more effectively when they are presented with activities which take into account their knowledge and experience and which meet their needs. By being involved in this process, both individuals and the group gain a new awareness of their potential, develop greater self-confidence, and see new possibilities. They also become more critically aware of the reasons that underlie their perceptions, attitudes and actions.

The training also proposes the use of a video film, "Prescription for Health", produced by IDRC[1] from Canada, which can be bought or hired through any Canadian Embassy or High Commission, or by sending an order to the National Film Board of Canada.

[1] IDRC, P.O. Box 8500, Ottawa ONK1G 3H9, Canada. Tel: +1 (613) 236 6163; e-mail: info@idrc.ca

What is in the training package?

The training package is divided into two parts:

1. Trainer's guide

2. Course contents.

The first part includes a welcome note and basic information about the training package. It provides guidelines on how to be an effective facilitator, as well as advice on the preparation of course sessions and the field visit and on evaluation of the course.

The second part is divided into four modules which are subdivided into units, each one linked to a particular theme. The first module is an introduction to concepts and trends, and integration of water, health, sanitation and environmental protection. The second proposes an analysis of the present situation of O&M. The third deals with the main factors which can lead to effective O&M. And the fourth module gives practical guidance on how to plan for effective O&M.

The course follows a logical sequence of progressive learning, through raising awareness in Module 1; situation analysis in Module 2; learning in Module 3; and application of tools and knowledge in Module 4.

Each unit is organized in the same way, according to the following format:

1. Outline of session

- Objectives
- Methodology
- Materials

- Handouts

2. Notes for the facilitator

- Detailed review of each step of the session, with exercises

3. Overhead sheets

- Proposed text for transparencies to be used during a session

4. Background information

- Summary of new concepts
- Content material for presentations

- References for further reading

Proposed time-table

Week 1	Monday	Tuesday	Wednesday	Thursday	Friday
Session A	Introduction	O&M requirements	Analysis of constraints	Community management	Monitoring for effectiveness
Session B	Presentations	O&M requirements	Analysis of objectives	Community management	Monitoring for effectiveness
Session	Concepts and trends	Analysis of	Linking	Cost	Gender

Session C	Concepts and trends	Analysis of participation	Linking technology choice with O&M	Cost recovery	Gender awareness
Session D	Linking water, health, sanitation and environmental protection	Analysis of constraints	Institutional set-up	Cost recovery	Preparation of field trip
	Daily evaluation	*Daily evaluation*	*Daily evaluation*	*Daily evaluation*	

Week 2	Monday	Tuesday	Wednesday	Thursday	Friday
Session A	Field trip	Working with communities	Individual assignments	Preparation of presentations	Presentations
Session B	Field trip	Working with communities	Individual assignments	Preparation of presentations	Presentations
Session C	Lessons learnt from field trip	Planning tools	Individual assignments	Presentations	Evaluation Closing
Session D	Lessons learnt from field trip	Planning tools	Individual assignments	Presentations	
	Daily evaluation	*Daily evaluation*	*Daily evaluation*		

Each session is planned to last about two hours, depending on local circumstances and demand. The structure of the course is flexible enough to allow modifications and adaptations. For example, the one-week course in Vietnam turned out to be

more of an awareness-raising workshop than a course. While in Burkina Faso, the course was implemented for a period of three weeks, which permitted a longer field study and gave more time for individual assignments.

What are the course contents?

Module 1: Introduction

- **Unit 1: Course introduction**
- **Unit 2: Presentations**
- **Unit 3: Concepts and trends**
- **Unit 4: Linking water, health, sanitation and environmental protection**

Module 2: Situation analysis

- **Unit 1: O&M requirements**
- **Unit 2: Analysis of participation**
- **Unit 3: Analysis of constraints**
- **Unit 4: Analysis of objectives**

Module 3: Towards sustainable O&M

- **Unit 1: Linking technology choice with O&M**
- **Unit 2: Institutional set-up**
- **Unit 3: Community management**
- **Unit 4: Gender awareness**
- **Unit 5: Cost recovery**
- **Unit 6: Monitoring for effectiveness**

Unit 7: Working and planning with communities
Unit 8: Field visit

Module 4: Planning

Unit 1: Planning tools
Unit 2: Individual assignments
Unit 3: Final presentations

3. How to be an effective facilitator[1]

[1] This section contains extracts from *A manual for group facilitators*, by Brian Auvine et al., published by the Center for Conflict Resolution, 731 State Street, Madison, Wisconsin 53703, USA.

Profile

The facilitator should be a professional (resource person or trainer) who is acquainted with participatory training methodologies. This is because the course is based on using facilitation techniques rather than "conventional" teaching techniques, although the latter (such as lectures and presentations) are not excluded.

If the facilitator is going to be involved through the whole course, he/she should preferably be knowledgeable about new developments in the water and sanitation sector.

It is advisable to have a team of facilitators rather than just one because many of

the activities require the participants to work in small groups. It is sometimes necessary and useful to have a facilitator to work with each small group, as well as to coach each participant during the individual assignments.

Role of the facilitator

In the conventional teaching methodology, the teacher presents a set of concepts and provides students with exercises for assimilation - in a "top-down" approach. In the participatory approach to training, the role of the facilitator is to facilitate the process of learning, using his/her own experiences and those of the participants in order to raise awareness or transmit knowledge on a particular subject - in a "sharing" approach.

Facilitation works best when certain values are accepted and practised not only by the facilitator, but also by the entire group - values such as democracy (each person has the opportunity to participate without prejudice), responsibility (each person is responsible for his/her experiences and behaviour), and cooperation (the facilitator and participants work together to achieve the same collective goal).

As a facilitator, you can influence the group dynamics and discussions by how you present your information, what kind of atmosphere you set within the group, and your attitudes towards the people you are working with.

Many participants will be unfamiliar with facilitation as a leadership style. You should make sure everyone in the group understands what your role is. Your own attitude towards your skills and resources should be a humble one. Demonstrate

to the participants that their opinions count, by respecting their ideas as if they were your own.

Communication

Communication is the essential ingredient of any group. Your effectiveness as a facilitator depends on your ability to communicate well with the group and to help the group members to communicate effectively with each other. Some factors will enable you to communicate better, such as:

- **Your language (making sure that the terms you use are easily understood by the group)**
- **Your style (the way you dress and interact with others)**
- **The way you listen (when someone is talking, you are often not really listening but thinking about what you are going to say in answer; therefore, when you listen to someone, try not to immediately evaluate what is being said in terms of how it affects you; instead, try to understand what it means from the other person's perspective)**
- **Being aware of what is happening in the group (restlessness, silence, attention, postures)**
- **Giving feedback (after an exercise, a discussion, or a session, it helps the group to be made aware of the progress made).**

Facilitating discussions

Your role as a facilitator in a discussion is also important. Here are some hints which could enhance your work in facilitating discussions:

1. Everyone should know exactly what the discussion is about, and what is the reason for having it.

2. Use questions to stimulate discussion. The following provocative "open" questions enable the facilitator to encourage a group to find ideas in a creative way: "What is similar? What can be changed? Why? How? Who? When? By which means?". Avoid "closed" questions requiring "yes" or "no" answers, which are unsuitable for group discussions.

3. Prepare questions in advance.

4. Relate the discussion to the participant's experience (it is difficult for people to feel involved in a discussion which is highly abstract or beyond their own experience; give examples from field experiences).

5. List ideas on a board as they are proposed, and regroup or summarize them.

6. Clarify and interpret (you may sometimes rephrase what has been said to make it clearer).

7. Keep the discussion focused on the subject (your role may include reminding the group when the discussion strays off the subject or goes into matters not in the agenda that was agreed on at the beginning).

8. Keep track of time (it may be your role to make the group aware of how the discussion is proceeding and when it may be time to move on).

9. Use humour to break tension and boredom.

The use of exercises

Exercises are group activities, usually designed to aid learning and awareness. Exercises can be used to illustrate a concept or demonstrate a specific point, to promote self-awareness, to stimulate thought and discussion, or to train participants in a certain skill.

Select exercises that fit the group and its goals, and be sure you know why you are using a particular exercise. Be familiar with the exercise by previewing it before you use it; indeed, you should know what it will accomplish and how that happens. Do not present participants with a battery of exercises, all designed to make much the same point.

Giving instructions is a very important part of using exercises. The way you introduce an exercise can make a big difference to the group's understanding; you should include an explanation of the objectives, a description of what exactly the participants are supposed to do, and an estimation of how much time the exercise will take.

You should also know your own role during the exercise. Are you going to participate, or simply observe, or remove yourself entirely from the scene? At the end of the exercise, it is important for the participants and you to reflect on the results and how they relate to the participants' own day-to-day situation.

Overview of training tools which can be used by a facilitator[1]

[1] Adapted from *Training of trainers: methods for experiential learning*, by F. Little & J. van de Geer, P.O. Box 4040, 6803 EA Arnhem, Netherlands.

The various tools described in the Table below are training techniques which are most commonly found in adult learning sessions. This course will use most of the techniques described, and it is recommended that facilitators should be familiar with a new technique before using it. Some reference documents are listed at the end of this section.

TRAINING TOOLS	REMARKS
- Group discussion/Conversation A discussion is a free exchange of knowledge, ideas and opinions on a particular subject. A conversation will be more structured and prepared in advance.	• *Optimal use*: to introduce a subject; a structured conversation helps to focus thinking. • *Advantages*: group involvement; starts the thinking process. • *Disadvantages*: risk of unfocused discussions and no change in ideas; time shortage; needs preparation.
- Brainstorming The facilitator or an assistant writes down all the contributions on a board. Quality and substance are evaluated by the group afterwards.	• *Optimal use*: common method to help group members to think of possible changes or give new orientations. • *Advantages*: stimulates creativity, expands imagination. • *Disadvantages*: answers cannot always

	be implemented; effort needed can be greater than expected.
- Feedback Informing people what they did in a certain exercise, or role-play or other action in order to let them know how things can be improved	• *Optimal use*: for creating awareness on participant's skills and performance. • *Advantages*: participants become eager to learn. • *Disadvantages*: possible distrust without good feedback.
- Lecture An internally consistent, rationally clear presentation, adapted to a specific audience by using visual images, verbal illustrations and other tools.	• *Optimal use*: for transfer of model, concept or framework. • *Advantages*: opportunity for transfer of knowledge within a short space of time. • *Disadvantages*: monologue; requires good preparation in order to keep attention.
- Demonstration Letting participants go through an event that illustrates the theme of a session. Participants are asked to participate and at the same time observe what is happening.	• *Optimal use*: start of a session on a topic which needs sensitization or awareness-raising. • *Advantages*: effective way to raise awareness in a short period of time. • *Disadvantages*: can easily fail, if not adapted to the group.
- Field visit Participants are taken out into a real life situation and get the opportunity to observe	• *Optimal use*: to show real life situation. • *Advantages*: helps to clarify concepts and reach a common understanding;

some elements linked to the course.	excellent for group dynamics. • *Disadvantages*: takes much work and time to organize.
- Reading assignments During the course, participants are asked to read relevant information.	• *Optimal use*: Creates opportunity to digest written material; can be given for evening reading. • *Advantages*: easy way to cover some material. • *Disadvantages*: slows down dynamics if done in class; participants' understanding may have to be checked.
- Case study A history or example, with relevant details, is examined by the participants. They have to identify the problems and alternative solutions.	• *Optimal use*: to practise analytical skills and reflect on a situation as a group. • *Advantages*: good learning experience when successful; group reaches a common understanding. • *Disadvantages*: difficult to choose or design an appropriate case study; needs preparation, time and experience.
- Games Participants are presented with information and rules about a particular situation, and the group tries to go through a simulation of this situation.	• *Optimal use*: to practise and simulate a given situation. • *Advantages*: fun, dynamic. • *Disadvantages*: careful preparation needed with good and clear instructions; unsure outcome; risk of having participants not taking it seriously.

- Exercises Participants are asked to undertake a particular task, following lines laid down by the facilitator, in order to practise skills or test one's knowledge.	• *Optimal use*: to teach complex skills or concepts. • *Advantages*: creates confidence; very practical. • *Disadvantages*: must be realistic, relevant and motivating.
- Role-play Participants assume an identity other then their own to cope with real or hypothetical problems and situations.	• *Optimal use*: to demonstrate or practise a situation which the participants are likely to face. • *Advantages*: strong participation and surprising outcomes. • *Disadvantages*: hiding behind role description; needs "actors" focusing on the subject required.
- Small workshops Participants gather in small groups and come to a conclusion by brainstorming, identifying problems and formulating recommendations.	• *Optimal use*: to help the group to take decisions or make plans and formulate recommendations at the end of a major event. • *Advantages*: shared vision. • *Disadvantages*: experience needed in using tools and in facilitating.
- Individual assignment Participants are asked to examine in depth their own situation, and to apply what they have learned in an action plan.	• *Optimal use*: integrates learning within one's own situation. • *Advantages*: participants analyse their situation and prepare for their return.

	• *Disadvantages*: takes time and requires coaching.

Role-playing[1]

[1] **Adapted from: *Experience with newer techniques for training managers*, by Sidney Mailick & Nancy A. Bord, published by the United Nations Institute for Training and Research (UNITAR).**

Role-playing is a training technique in which the participants assume an identity other than their own, in order to experience and deal with a real or hypothetical situation or problem. It can be employed in almost any training context, e.g. to broaden a primarily teaching-oriented design.

In playing their roles, the participants act out behaviour patterns which they believe are characteristic of those roles in specific social situations. For example, during the course, a role-playing sequence is proposed between two actors, "an engineer" and "a community member", in order to illustrate the process of resistance to change.

This way of simulating reality eliminates many of the risks inherent in real life, while retaining many other aspects of the interaction which are relevant. Role-playing thus permits testing out different ways of behaviour in a given situation.

The role-playing session should start with the facilitator briefing all participants - first outlining the situation which is be acted through role-playing, and then giving a concise description of the characters involved. At the end of the role-playing, the

actors and audience discuss and draw conclusions from what has taken place.

In planning for a role-playing session, you should discuss with the participants the basic principle of the approach, the problem to be acted, and the message to be conveyed. These points should be kept in mind while preparing the role-playing with the actors prior to the session.

Brainstorming[1]

[1] From: *Cooperation planning - A working aid for beginners and for more experienced planners*, published in 1993 by Swiss Development Cooperation, Evaluation Service, CH 3003 Berne, Switzerland.

Brainstorming produces ideas, explanations and interpretations. In an organized "storming of thoughts", a small group of participants can put forward many possible suggestions on a precisely formulated theme. The method stimulates intuitive seeking and spontaneous creative associations.

Hints on preparation: the topic must be formulated precisely, with a clear statement on who is to participate and the time available. For the actual brainstorming there are some definite rules: no discussion, but note every idea without criticizing, and encourage the development of combinations and associations of ideas. Indeed, no one has a monopoly of good ideas. The contributed suggestions are written on cards and put up on a poster or board, then grouped, analysed and evaluated by a small panel. Some sort of classification is useful, such as "immediately feasible" or "needs more development".

Visualization

The visualization method uses written cards which are pasted or pinned on posters, pinboards or other surfaces in a specific order. This facilitates a clear structuring of the meeting, discussions, and workshops and the recording of statements in a concise and visible way. Concentration and attention are improved considerably and even shy participants are able to take part actively. Visualization makes the discussion more objective and even enhances the preceding steps. Evaluation and prioritizing of options are much easier when using a visible presentation.

Trouble-shooting

When there is not enough time to do what you had planned. This is the most common problem you are likely to encounter. When your agenda will not fit into the time you have, get the group to assign probable time limits to each section remaining, while prioritizing items on the agenda. Ask one person in the group to be responsible for keeping track of time, and to remind the group when the time limit is close or has been reached. When it is apparent that there is definitely not enough time, discuss alternatives with the group - such as prolonging the meeting, scheduling a later one, etc. Avoid forcing the pace in a limited time, or "stuffing" the participants with all that remains to be covered, or else the session could rapidly deteriorate.

When an exercise flops. The first thing to do is to admit it, point out where your expectations let you down, and find out the reactions of others. You should discuss what could have happened and, in this way, learn a valuable lesson. After

this, prepare to switch to something completely different, which will focus everyone's attention on another subject.

Your session and material are too simple or too complex for the group. If what you are saying is too simple for the group, boredom will result. If what you are saying is too complex, you can expect confusion and blank looks. Unfortunately, blank looks and boredom look remarkably alike, so it is not always easy to figure out which of these you are dealing with. Here are some points which will help you to be alert to the group's level of comprehension: a) before starting an exercise, ask the participants if they have done anything similar; b) begin a session by asking for an account of the group's previous experience; c) pause regularly to put questions to the group; d) avoid using "jargon" or technical terms without prior explanation; and e) consider carefully the questions put by the participants because these usually indicate whether they have understood or not.

Conflict resolution

Conflicts can arise in any group. They should first be treated as something natural, and sometimes even useful, because they can force a group to become more aware of the way the group works and thus encourage change and growth. However, conflicts can be destructive, hurt people's feelings, and destroy efforts to reach a common goal, as well as inhibit full participation within the group.

There are many points to consider in seeking solutions to a conflict. The main one is to try to sort out real disagreements from perceptual disagreements. Some disagreements could result from a wrong perception of a situation. In this case, clarification and information can help. However, many conflicts are the result of

poor communication or misunderstandings about goals and expectations.

Once you have identified a conflict and understood its nature, you will be in a better position to decide what kind of behaviour is appropriate to adopt. If the conflict is serious, stay calm and trust your intuition. You may want to intervene as a facilitator, but before attempting to do this, consider your options carefully. Beware of your own biases and weaknesses, and be sure that you are not going to overreact. Consider whether the problem can be dealt with by proposing a break (and discussing it later in another place privately), or by exercising restraint and being patient (waiting till the difficult moment passes), or by getting help (from someone with experience who is not involved in the conflict). Does the whole group appear to perceive the problem? During a crisis, people's feelings are especially important. So, allow them to express their feelings, but do not get emotionally involved.

4. Getting prepared!

Organization

A certain amount of preparatory work is required and should begin preferably six months in advance, e.g. fixing the dates of the course. This will allow those involved to fit these dates into their work schedule and plans. In setting the dates, account has to be taken of public and religious holidays and important meetings or events which the participants will have to attend.

Secretarial support greatly facilitates the organization of the course. All information and correspondence about the planning, implementation and

evaluation of the course should be filed in an orderly manner. During the course, the secretary will be required to make administrative arrangements and contacts, make photocopies, and word-process the work produced by the participants and the facilitator. A record of the work produced throughout the course should be made and kept.

The accommodation should include 1) a large meeting room for the plenary sessions, 2) separate rooms for the working groups, and 3) a place for serving refreshments, as well as lunches, during breaks. Make sure that the meeting room is available for the duration of the whole course and is not noisy, and has adequate ventilation and light, sufficient power points for a video and overhead projector, and enough space on the walls to stick up paper sheets or posters.

All teaching aids, equipment and stationery should be ordered well in advance of the course. They will include a) a white or black board; b) sufficient marker pens for white boards, to be used by the facilitator and participants; c) a flip-chart stand and paper; d) masking tape (removable) for sticking cards or paper on a wall; e) large pieces of carton paper (different colours), which can be made into cards by cutting them to the size required; f) an overhead projector with transparencies; g) a screen or white wall for projection; h) a video recorder and monitor; i) access to a photocopy machine; j) note pads, pencils and pens; and k) a pinboard, paper and pins.

A certificate of attendance should be prepared in advance, signed by the relevant authorities or sponsors of the course, which is given to all participants who complete the course.

An invitation should be sent to prospective participants through the appropriate channels of your organization. The invitation should include clear statements on the course's objectives, structure and duration, the importance of full-time attendance, arrangements for accommodating and transporting the participants, insurance and medical coverage, costs, and per diem (if available). The invitation should include a form to be filled in and returned containing information on personal data and education, curriculum vitae, present function and job description, and expectations from the course, as well as a request for financial sponsorship if available.

The field visit, which is part of the course, gives the participants an opportunity to look at the operation and maintenance arrangements in a particular community or situation. To be successful the visit has to be planned in advance, so that the local authority and community are given the date and time of arrival as well as details of the programme. Arrangements for transport and food and drink should also be made. The exact programme will depend on the distance to be travelled and the local community's size and willingness to be involved in the field visit. If the course group is large, it will have to be divided to make it easier for the participants and the community.

It is suggested that the best time for the field visit is in the morning. Many activities associated with rural water supply take place very early in the morning - e.g. the women may traditionally collect water before or at sunrise, and operators will open the valves, start the pumps, and dose the tanks with chlorine, etc. at the start of the day in order to provide sufficient water for early collections. The next peak period for water collection may be in the late afternoon or early evening, which is too late for a field visit. Special arrangements may have to be made to

ensure the group's arrival early in the morning at the selected site, and the participants should be ready to make an early start.

For further details about the field visit, see Unit 8 of Module 3.

Course contents

Facilitators should be thoroughly familiar with all the material in the learning package. In addition, because of the importance of adaptation to the local circumstances, it is proposed that the facilitator researches all relevant themes and includes this information (taken from project reports, technical or policy documents, etc.) in the course.

One or more experts with experience in the subject and in new developments could be listed as resource persons and invited to give a lecture or make a presentation during the course. It is important that these persons should be fully briefed about the course's objectives, concepts and main messages. The course unit which corresponds to the presentation should also be sent as a reference or example. These arrangements should be made well in advance.

Some countries may have difficulties in gaining access to relevant additional information, and in identifying suitable resource persons. Specialized universities or agencies in your country may be consulted. Or contact WHO or IRC, or other sector organizations and external support agencies (ESA) for further information and assistance in organizing a training-of-trainers course.

Getting started for the session

While planning for your session, make sure that you know exactly what you want to accomplish and that all the activities relate to that goal. The material you use should be relevant to the objective of the session and properly understood by the participants. Material should be presented in a logical order. After reviewing all the objectives and contents of the session, determine the time needed for each segment and make your agenda flexible. Plan to introduce variety in the pace and methods used. Every session should start with making introductions, discussing plans, and defining expectations, and end with a synthesis and summary of the session.

Before you begin, spend some time alone by yourself and make sure your agenda is clear in your mind. Seating arrangements are important, and you must decide whether the participants will be seated in a U-shape round a long table or in rows without desks, depending on the exercise to be carried out.

As you enter the room, the first few moments will influence your interaction with the group through your mutual perceptions and impressions. It is important to arrive on time, or even early. Besides setting an example by always being punctual, you will be showing courtesy and respect to the group.

Your introduction should include your credentials (justifying your being there!). This is also an opportunity to present yourself not only as an "expert", but also as a "person" and "facilitator". It may be difficult to remember all the participants' names immediately, so you can have their names written on stiff paper in front of their places, and they could also carry name labels on the front of their clothing.

The first session each day should begin with a review of the previous day's work.

This can be done in a relaxed way, with some humour, by asking the participants to recall what they did, and what were the main messages conveyed at that time. The facilitator's role will be to explain the link between the previous topic and the new one.

Leisure and recreation

Some thought should be given to the organization of free time, during which the participants will interact and can contribute to team building. Social evenings and excursions are also particularly important for participants who are away from their families during the course.

Some references on participatory training

- **CEDPA (1995). *Training trainers for development: conducting a workshop on participatory training techniques*. Washington, DC, USA, Centre for Development and Population Activities.**

- **Narayan D, Srinivasan L. (1994). *Participatory development tool kit: training materials for agencies and communities*. Washington, DC, World Bank.**

- **Servaes J, White SA. eds. (1996). *Participatory communication for social change*. New Delhi, India, Sage Publications.**

- **Thompson J, Pretty JN, Scoones I, Guijt I. (1995). *A trainer's guide for participatory learning and action*. London, International Institute for Environment and Development.**

5. Evaluation

Evaluation should be carried out daily, with a final evaluation at the end of the course.

The object of the daily evaluations is to improve the group process by letting the participants express how they feel about what is going on. This is often the only time when some participants will feel comfortable enough to express their ideas. It also makes a good ending to the day's work. However, it is not a compulsory activity which has to be done every day; a good idea is to install a "mood barometer", on which each participant can put a sticker on a scale, expressing his/her feelings about the day. Daily evaluations can help to improve the sessions in the future (with regard to facilitation, exercises, contents), as well as to identify possible points which will need to be reinforced during what is left of the course. The daily evaluation can be carried out through 1) an informal discussion, 2) a focused conversation, or 3) a daily evaluation form.

The informal discussion will start with questions which you will pose. This gives you the opportunity to ask for comments and make clarifications. This procedure may not reflect the whole group's views because some participants will be silent. Examples of questions are: "What went well in...?" "What could be improved?" "What specifically do you think you have gained from today's sessions?" "Were your expectations met today?" "Why?" "Why not?"

The focused conversation will start with an exercise in which all participants write two "positive" and two "critical" comments about the day's session in general. Each participant is given two cards for the "positive" comments, and two cards for

the "critical" comments (cards should be of different colours, e.g. yellow for "negative" and green for "critical"; only one comment per card). All the cards are then pinned or taped on a board, and grouped by categories as they are submitted. The results are discussed with the whole group, who will be asked to make clarifications and comments. This method allows every participant to express him/herself. As this type of evaluation takes considerable time, it might be used once or twice during the course.

A daily evaluation form can be prepared, on which each participant ranks the content, relevance and presentation of each session along a scale from 1 to 5 (1 = poor, 2 = limited, 3 = reasonable, 4 = good, 5 = excellent), or another system of grading. If the facilitator adopts this method, he/she will have to share the results of this evaluation before starting the next morning's session.

A final evaluation form, which may be anonymous, is proposed in the next pages to evaluate in detail all the different aspects of the course. The results of this evaluation should be included in the final report of the course.

Evaluation form

Management of operation and maintenance in rural drinking water supply and sanitation

Please mark with a tick, where applicable.

1. What do you think about the overall length of the course?

□ Far too long □ Too long □ Just right □ Too short □ Far too short

2. During the course, you worked from Monday till Friday from 9.00 a.m. till 5.00 p.m. What is your opinion about this time schedule?

_____

_____

_____

_____

_____

3. What do you think of the allocation of time for the different components of this course?

	Far too much	Too much	Just right	Too little	Far too little
Lectures					
Exercises					
Discussions					
Individual work					
Leisure					

Additional comments:

_____

_____

_____

_____

_____

4. How would you grade the relevance of the course to your country's needs?

☐ Excellent ☐ Good ☐ Reasonable ☐ Poor ☐ Not relevant

Comments:

_____
_____
_____
_____
_____

5. What do you think of the balance between theory and practice?

☐ Far too much theory	☐ Too much theory	☐ Just right	☐ Too much practice	☐ Far too much practice

6. How did you find this course in general?

☐ Too difficult ☐ Difficult ☐ Just right ☐ Easy ☐ Too easy

7. Have your expectations, which you had when you applied to join the course, been realized?

☐ Completely ☐ Largely ☐ Partly ☐ To some degree ☐ Not at all

8. To what extent, in your opinion, did this course achieve its objectives?

Objectives	Completely	Largely	Partly	Hardly	Not at all
1. Upgrade knowledge on the O&M aspects of RWS&S					
2. Reinforce management skills with regard to O&M					
3. Specify approaches to working and planning with communities					
4. Develop the capacity to plan for O&M in one's own project					

9. How useful has this course been to the specific requirements of your own job?

☐ Very useful ☐ Useful ☐ Of some use ☐ Of limited use ☐ Not useful

10. Please name any technique or method from this course which you would like to introduce or apply in your own organization.

_____

_____

_____

_____

_____

11. How relevant, on average, were the handouts and reading material provided, most of which you have probably examined?

☐ Highly relevant ☐ Quite relevant ☐ Of some relevance ☐ Of limited relevance ☐ Not relevant

12. In the list below, please give a mark for each topic or session dealt with during the course, with regard to its relevance and quality. Make additional remarks, if necessary.
(1 = poor, 2 = limited, 3 = reasonable, 4 = good, 5 = excellent)

Topic or session	**Relevance** (from 1 to 5)	**Quality** (from 1 to 5)	**Remarks**
Course introduction			
Presentations			
Concepts and trends			
Links between W, H, S, E*			
O&M technical requirements			
Analysis of participation			
Analysis of constraints			
Institutional set-up			
Community management			
Gender awareness			
Cost recovery			

Monitoring for effectiveness			
Working with communities			
Field visit			
Capacity-building			
Setting up objectives			
Planning tools			
Individual assignments			
Final presentations			

*** Water, Health, Sanitation and Environment**

13. What are the major professional problems in your work, if there are any, which were NOT discussed sufficiently in this training course?

_____

_____

_____

14. What was your experience of working relations with the following:

Main facilitator(s)	**Other training staff**	**Administration**	**Participants**
☐ Stimulating	☐ Stimulating	☐ Stimulating	☐ Stimulating
☐ Cooperative	☐ Cooperative	☐ Cooperative	☐ Cooperative
☐ Neutral	☐ Neutral	☐ Neutral	☐ Neutral

☐ Distant	☐ Distant	☐ Distant	☐ Distant
☐ Difficult	☐ Difficult	☐ Difficult	☐ Difficult

Comments:

_____
_____
_____

15. How do you rate the internal organization and logistical support during the course?

☐ Excellent ☐ Good ☐ Reasonable ☐ Poor ☐ Not applicable

Comments:

_____
_____
_____
_____
_____

16. How satisfied were you with the accommodation (classroom, etc.)?

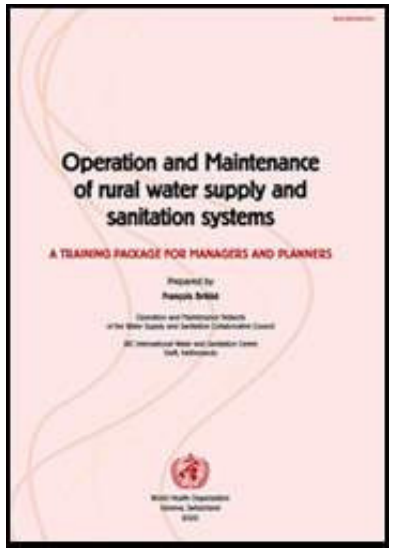
☐ Very much ☐ Much ☐ Reasonable ☐ Not much ☐ Not at all

Comments:

17. Please write down any suggestions for improving this course.

Home"" """"> ar.cn.de.en.es.fr.id.it.ph.po.ru.sw

Operation and Maintenance of Rural Water Supply and Sanitation Systems: A Training Package for Managers and Planners (IRC - WHO, 2000, 298 p.)
Part 2: Course contents
Module 1: Introduction
Unit 1: Course introduction
Unit 2: Presentations
Unit 3: Concepts and trends



- Unit 4: Linking water, health, sanitation and environmental protection
- Module 2: Situation analysis
  - Unit 1: Operation and maintenance requirements
  - Unit 2: Analysis of participation
  - Unit 3: Analysis of constraints
  - Unit 4: Analysis of objectives
- Module 3: Towards sustainable operation and maintenance
  - Unit 1: Linking technology choice with operation and maintenance
  - Unit 2: Institutional set-up
  - Unit 3: Community management
  - Unit 4: Gender awareness
  - Unit 5: Cost recovery
  - Unit 6: Monitoring for effectiveness
  - Unit 7: Working and planning with communities
  - Unit 8: Field visit
- Module 4: Planning
  - Unit 1: Planning tools
  - Unit 2: Individual assignments
  - Unit 3: Final presentations

Operation and Maintenance of Rural Water Supply and Sanitation Systems: A Training Package for Managers and Planners (IRC - WHO, 2000, 298 p.)

Part 2: Course contents

Module 1: Introduction

Unit 1: Course introduction

1. Outline of session

- **Objectives**

  - To introduce the participants to one another
  - To review the participants' fears and expectations
  - To reach a common understanding of the course's objectives and structure

- **Methodology**

  1. Welcome address
  2. Exercise for group interaction
  3. Group discussion on expectations and fears
  4. Interactive presentation on course objectives, methodology and programme

- **Materials**

√ Transparencies on the course's objectives and programme

√ Flip chart and masking tape

√ Overhead projector, screen or white wall

√ Stationery for each participant, including note pad, binder, pencil, eraser, pen and marker

√ The binder should contain the following: the course's objectives and programme, full list of participants, and practical information concerning food, lodging, transport, recreation areas, access to telephone, medical help, and contact person for information and emergencies.

- **Handouts**

√ Information on the place where the course is being held (optional)

2. Notes for the facilitator

Welcome address and introduction

The welcome address can be given by the Director of the Institute where the course is being held, or by a well-known specialist. The facilitator's introduction must clearly state his/her credentials and role, including some personal facts that would interest the participants, and he/she presents the team who will be working with the participants through the whole course. This is followed by an explanation of how the session will proceed, its objectives, and the methodology.

Interactive exercise

One way of making introductions is to ask the participants to pair up and spend a few minutes introducing themselves to each other. The facilitator then goes to each pair and, in turn, one of them will introduce the other, giving his/her name, nationality, place of residence, education, professional function, and one or two personal facts. In a course where the participants are meeting for the first time, this approach allows everyone to get acquainted with at least one person very quickly, and helps the participants to be relaxed and informal. At the end of this exercise, the participants are asked to write the name by which they would like to be called during the course on a folded sheet of paper, which will be placed in front of their respective places.

Expectations and fears

A group discussion can be started by asking the participants, "What are your expectations from this course?", or "What did you think you would get out of this course at the time when you registered for it?" If no one volunteers to speak, the facilitator chooses someone with whom to start developing ideas, which are written on the flip chart. If any statement is not expressed clearly, these persons should be helped so that it becomes clear. Once the group's views have been stated, the facilitator summarizes the participants' expectations and relates them to the objectives of the course.

The same procedure is followed with regard to anxieties within the group concerning the course's content, logistics, follow-up, etc., which can be started by asking the participants, "Have you any worries about this course?" Removal of

such fears is important and allows the facilitator to get to know the group's strengths and weaknesses, and to help the participants with any problems or difficulties that may arise.

Course's objectives, structure, methodology and programme

The facilitator describes the course's objectives, structure, methodology and programme, using the overhead projector and transparencies (see Part 1, Trainer's Guide, in the section "About the training package"). In this process the participants' expectations, which were discussed earlier (see above), should be related to the programme's objectives. Time must be set aside for questions and clarifications, so that the objectives will be clear to all and any doubts can be dispelled. However, some of the expectations may not be met, and some concerns may remain. These matters should be discussed with the group, and the facilitator should help to clear up any misunderstandings. Questions on technical matters, e.g. a maintenance plan for diesel engines, could be deferred, if feasible, till the appropriate session during the course. If any concerns still remain, the matter should be referred to the course organizers and administration.

3. Overhead sheets: Sheet 1

Course objectives

General objective

- To contribute to the sustainability of water supply and sanitation programmes and projects in rural areas

Specific objectives

- To update knowledge on O&M issues
- To reinforce management skills on sustainable O&M
- To create specific approaches for better work and planning with communities

• To develop individual assignments based on the lessons learnt and each participant's workplace

Overhead sheet 2

Course outline

Module 1: Introduction

Unit 1: Course introduction
Unit 2: Presentations
Unit 3: Concepts and trends
Unit 4: Links between water, health, sanitation and environment

Module 2: Situation analysis

Unit 1: O&M requirements
Unit 2: Analysis of participation
Unit 3: Analysis of constraints

Unit 4: Analysis of objectives

Module 3: Towards sustainable O&M

Unit 1: Linking technology choice with O&M
Unit 2: Institutional set-up
Unit 3: Community management
Unit 4: Gender awareness
Unit 5: Cost recovery
Unit 6: Monitoring for effectiveness
Unit 7: Working and planning with communities
Unit 8: Field visit

Module 4: Planning

Unit 1: Planning tools
Unit 2: Individual assignments

Unit 3: Final presentations

Overhead sheet 3

Proposed timetable

Week 1	Monday	Tuesday	Wednesday	Thursday	Friday
Session	Introduction	O&M	Analysis of	Community	Monitoring

A		requirements	constraints	management	for effectiveness
Session B	Presentations	O&M requirements	Analysis of objectives	Community management	Monitoring for effectiveness
Session C	Concepts and trends	Analysis of participation	Linking technology choice with O&M	Cost recovery	Gender awareness
Session D	Linking water, health, sanitation and environmental protection	Analysis of constraints	Institutional set-up	Cost recovery	Preparation of field trip
	Daily evaluation	*Daily evaluation*	*Daily evaluation*	*Daily evaluation*	*Daily evaluation*
Week 2	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Session A	Field trip	Working with communities	Individual assignments	Preparation of presentations	Presentations
Session B	Field trip	Working with communities	Individual assignments	Preparation of presentations	Presentations
Session C	Lessons learnt from field trip	Planning tools	Individual assignments	Presentations	Evaluation Closing
Session	Lessons learnt from field	Planning	Individual	Presentations	

D	trip	tools	assignments		
	Daily evaluation	*Daily evaluation*	*Daily evaluation*		

Unit 2: Presentations

1. Outline of session

- **Objectives**

  - **To enable the participants to present their personal experiences with operation and maintenance**

- **Methodology**

  1. Individual or group exercise
  2. Presentations by the participants

- **Materials**

  √ Transparencies on the forms to be filled in
  √ Flip chart and masking tape
  √ Large sheets of paper
  √ Overhead projector, screen or white wall

- **Handouts**

  √ Information about operation and maintenance services in the host

country

√ Forms for the exercise on initial presentations

2. Notes for the facilitator

The presentations allow the participants to share their personal experiences in different backgrounds with the group, and to give an overview of the problems which they have encountered or are likely to encounter in their professional life. This approach will help the facilitator to plan future sessions, taking into account these problems and the distinctive features of each group.

The facilitator will explain the object of the presentations and distribute a prepared form for each participant to fill in (see exercise sheet). Participants from the same department, region or project could be asked to join together and prepare a single presentation.

The group is given a maximum of 20 minutes to prepare the presentations. Each presentation is allowed 3 minutes, plus 2 minutes for questions or clarifications. Long discussions are not permitted at this stage since time will be given later during the course.

Each presentation should be written on large sheets, which will be put up on the wall during the presentation. If possible, a secretary should type out the main points and results of the presentations after the session is over, and distribute this information to all the participants.

One problem frequently encountered in this exercise is the tendency to exceed the time allocated. The facilitator must therefore be prepared to warn the participants

when their time is nearly over. This responsibility could be shared with one of the participants.

Different presentations often tend to be repetitive as regards the problems or experiences that are described. One way of overcoming this is to organize the presentations by subject, taking all the participants who work on similar projects (e.g. gravity systems, or small piped systems with motorized water lifting, etc.) and grouping them together. Questions will be allowed only after all the participants in the subject area have completed their presentations.

3. Exercise sheet

Form for initial presentations

1. Personal data

Name:

_____

Nationality:

_____

Location of professional activity:

_____

Profession and education:

_____

Present function:

_____

2. Programme/project

Name of programme/project:
Main components of the project (point by point and briefly):

_____
_____
_____
_____

3. Main O&M and management problems

_____
_____
_____
_____

Unit 3: Concepts and trends

1. Outline of session

- **Objectives**
  - **To specify the importance of O&M and management**
  - **To analyse O&M in a wider perspective of sustainability. To define the concepts of operation, maintenance and management**
  - **To raise awareness on present trends**
- **Methodology**

1. Introductory note
2. Focused discussion on the importance of O&M
3. Interactive presentation of the factors and process dealing with sustainability
4. Group exercise on definition of concepts
5. Exercise on the attributes of good management
6. Focused discussion on what is rural

- Materials

√ Transparencies on the forms for exercises
√ Flip chart and masking tape
√ Overhead projector, screen or white wall

- Handouts

√ Forms for exercises
√ Copies of selected parts of background information
√ Copies of all transparencies

2. Notes for the facilitator

Introductory note

The aim of this session is to clarify and define the key concepts around which the course has been designed. It is important for all participants to understand that the issues relating to O&M are not only technical, but also social, managerial, institutional, financial and environmental. Recent advances in water supply and

sanitation projects reflect these concepts, which are the result of trials and experiences during the past 20 years. The session will also serve to introduce the group to a participatory teaching methodology, which does not exclude presentations and lectures. It is recommended that the group should be reminded, from time to time during the course, of these concepts which are the cornerstone of the whole approach.

Focused discussion on the importance of O&M

After reminding the participants that their decision to attend this course was because they believed O&M was an important issue in their profession, the facilitator asks them, "Why is O&M important?" The group's answers to this question are written on the flip chart or board by the facilitator or one of the participants. If an answer is not clear, the facilitator helps this person and, in addition, may ask the participants to illustrate their answers with an example from personal experience in order to improve comprehension. The facilitator should ensure that the following ideas are mentioned and discussed by the group: proper functioning, user's satisfaction, sustainability, quality of life, health standards, and credibility of investments. After the session, the results of the discussion may be typed out and distributed. The facilitator should not forget to keep track of time.

Interactive presentation of the factors and process dealing with sustainability

In an interactive presentation the facilitator, from time to time during the presentation, poses questions so that the group can interact, e.g. by explaining the situation in their own words or by experiencing or proposing new ideas. The presentation starts by reminding the participants of the close links between

operation and maintenance and sustainability. The first message to be conveyed is that sustainability is a process which starts right from the planning stage, and that O&M is not simply what happens after the system has been constructed. The first overhead sheet, representing a graphic of sustainability, may now be presented. More details are provided below in the section on background information. The second message deals with the factors that influence sustainability. The facilitator can refer to the second overhead sheet and to the content details under background information. Another effective way to help the participants' comprehension is to explain the drawing with sustainability circles, step by step.

Group exercise on definition of concepts

The facilitator asks the group to define the following terms: 1) sustainability, 2) operation, and 3) maintenance. Key words suggested by the participants are then written on the board, and from these a definition is gradually formulated for each term. At this stage, full phrases may not be required for the definitions.

A set of overhead sheets provides definitions for this course (pages 41-43), which are compared with what the participants proposed. Any difficulties in understanding should be discussed until the whole group reaches a consensus.

Exercise on the attributes of good management

Management is one of the key terms in this course. It is therefore important to have a common understanding about what it entails. There are no right or wrong answers, but the objective is to highlight the participants' perception of management and to compare this with what the course will provide in terms of

management tools.

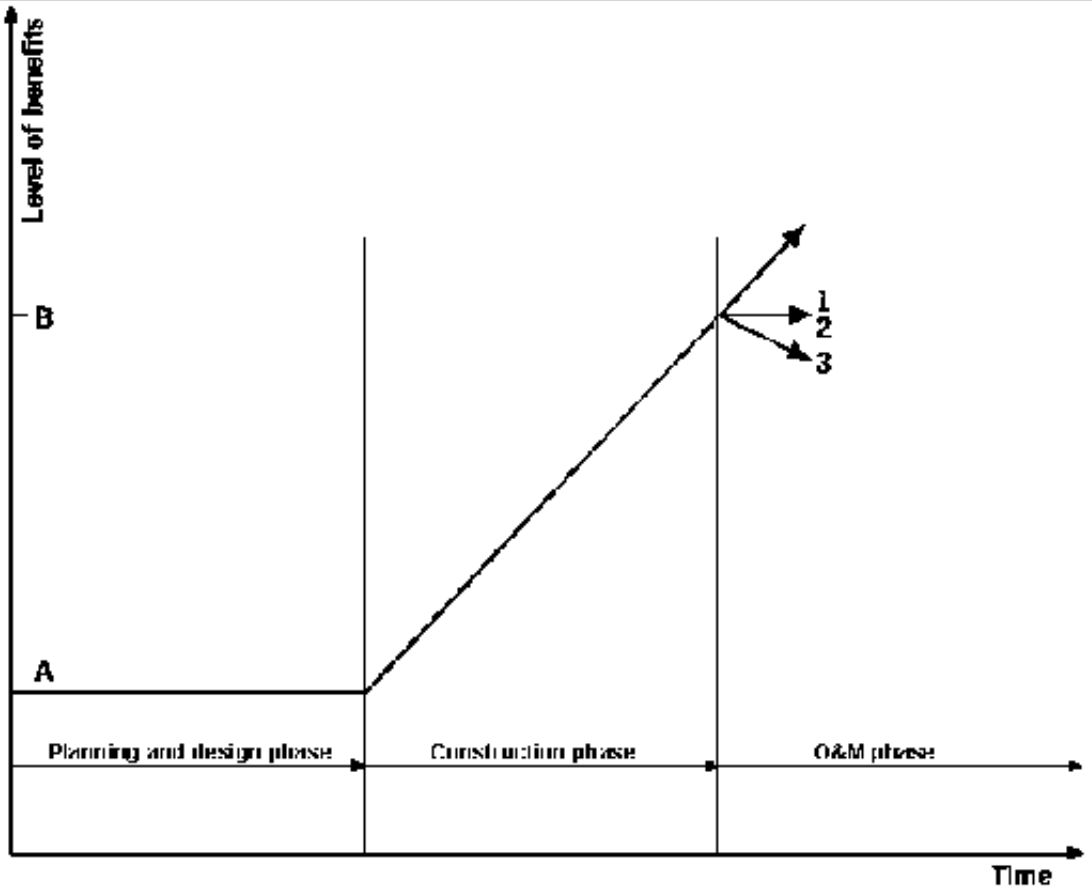
The facilitator divides the participants into three or four groups and gives them an envelope containing labels, each representing a major attribute generally connected with management (see exercise sheet). Each group must choose five major attributes, which they think are needed for the proper management of projects. Some 15 to 20 minutes are required for this exercise.

Each group puts up their labels on the board and explains briefly (in five minutes) the reasons for their choice. The facilitator then presents the group with a definition of management and highlights some issues on management, which will be worked upon in the course. Time should be set aside for discussion and questions to promote clarification.

Focused discussion on what is rural

To end the session, the facilitator asks the group to reflect on this key term in the title of the course, i.e. what do they understand by "rural"? The participants' answers may cause some difficulty because countries vary in their rural situations and characteristics. To facilitate consensus it can be proposed that, in the present context, the focus must be on low-cost technologies, including small piped-water supply systems. The aim here is not to give a precise definition of what is rural, but to provide a framework for improving rural water supply and sanitation, and to give an overview of the size and socioeconomic conditions of human settlements in the rural areas. Water supply and sanitation technologies will be reviewed during the session on "O&M requirements" (see Module 2, Unit 1).

3. Overhead and exercise sheets: Sheet 1



Sustainability in the project phases

1 & 2: Development reaches sustainability
3: Unsustainable development

- Careful planning and design of O&M must already be completed during the planning and design phase

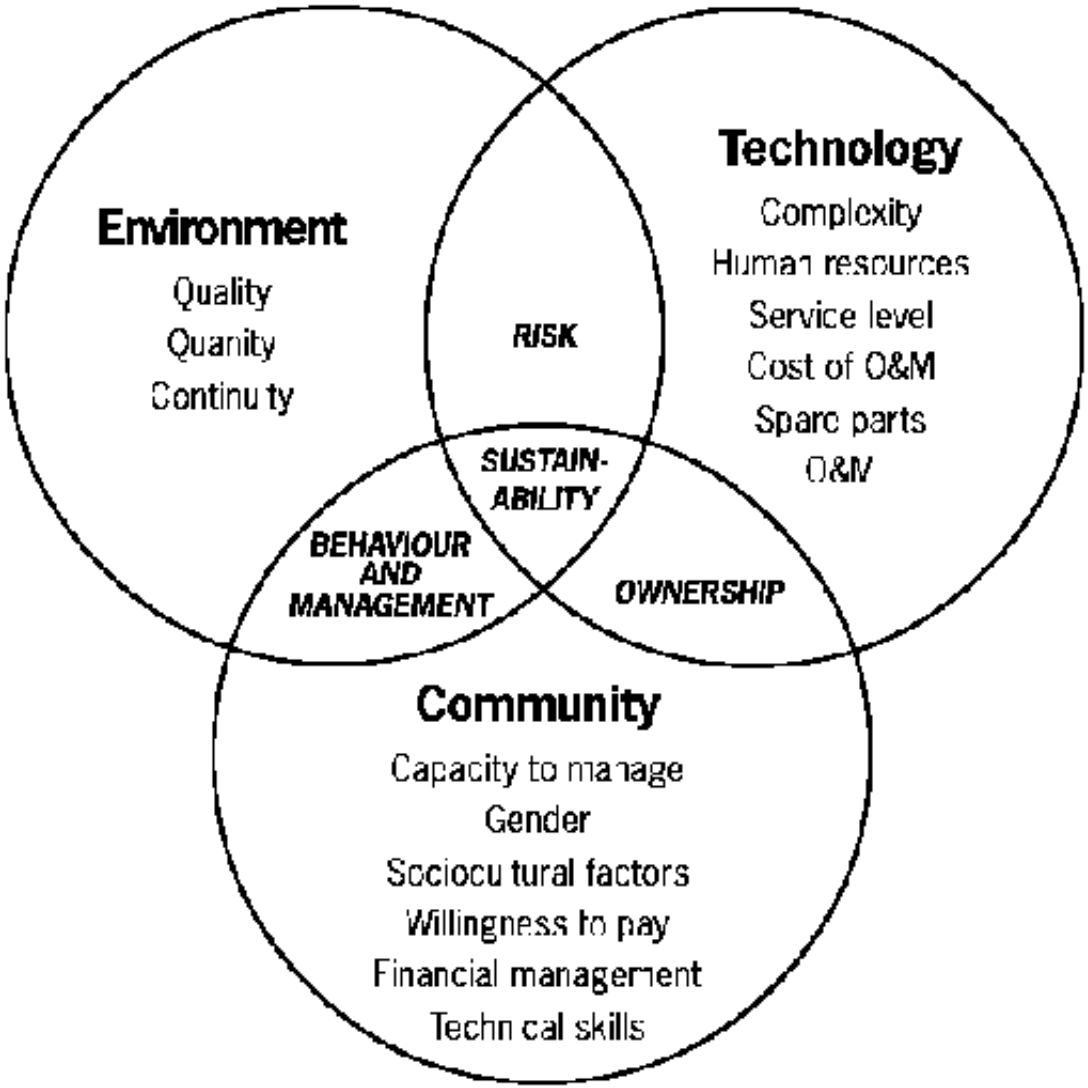
- Sustainability starts at the planning phase

- What are the factors that influence sustainability?

Overhead sheet 2

Factors which influence sustainability[1]

[1] From CINARA-IRC course material: *Gestion para la sostenibilidad en programas de agua potable y saneamiento* (Management of sustainability in drinking-water and sanitation programmes), 1994-98.



Institutional and legal framework Support - Adequate legislation - Resource development

Overhead sheet 3

Processes which influence sustainabilitv

- Demand from the community
- Responsiveness from the supporting institutions
- Participation of the community throughout the project phases
- Linking technology choice with operation and maintenance
- Integrated planning (sanitation, water, hygiene, environment)
- Planning with a gender perspective
- Decentralization and transfer of responsibilities and resources
- Capacity-building at all levels
- Communication among stakeholders
- Public-private partnership

- Co-responsibility between communities and municipalities

Overhead sheet 4

Definitions

Sustainability

A service is sustainable when:

- it functions and is being used

- it is able to deliver an appropriate level of benefits (quality, quantity, convenience, comfort, continuity, affordability, efficiency, equity, reliability,

health)

- it continues over a prolonged period of time (which goes beyond the life-cycle of the equipment)

- its management is institutionalized (community management, gender perspective, partnership with local authorities, involvement of formal/informal private sector)

- its operation, maintenance, administrative and replacement costs are covered at local level (through user fees, or alternative financial mechanisms)

- it can be operated and maintained at local level with limited but feasible external support (technical assistance, training, monitoring)

- it does not affect the environment negatively.

Overhead sheet 5

Definitions

Operation

Operation deals with the actual running of a service (e.g. provision of fuel, starting or handling of pumps, control of water collection points, general mechanical or water treatment procedures, hygienic handling, etc.).

Maintenance

Maintenance deals with the activities that keep the system in proper working condition, including management, cost recovery, repairs and preventive maintenance.

- **Crisis maintenance**: maintenance undertaken only in response to breakdowns and/or public complaints, leading to poor service level, high O&M costs, faster wear and tear of equipment, and user' s dissatisfaction.

- **Preventive maintenance**: maintenance activities undertaken in response to prescheduled systematic inspection, repair and replacement, leading to continuity in service level, O&M costs spread over time, extension of life-span of equipment, user' s satisfaction and willingness to pay.

Overhead sheet 6

Definitions

Management

Management deals with the control and organization of a service and encompasses the following main functions:

- Development of a vision and strategy
- Planning
- Organization and mobilization of resources
- Administration

- Accounting
- Leadership, motivation of personnel
- Supervision, monitoring and evaluation
- Promotion of external relationships.

This course focuses on the following managerial issues:

- Strategy development
- Planning skills
- Skills in problem-solving
- Integration of technical and social issues
- Communication (efficient presentation technique)
- Monitoring
- Human resource development

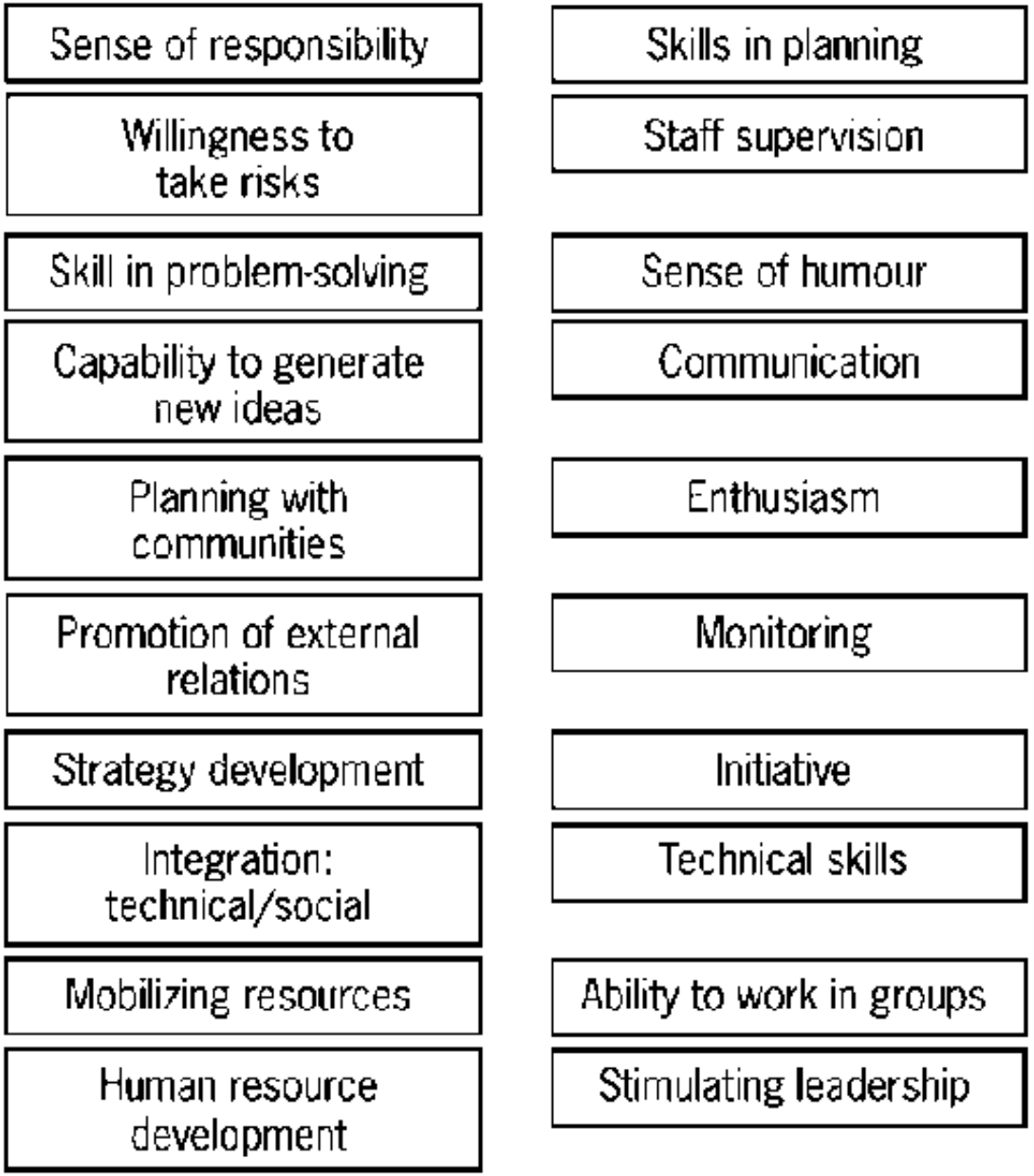
- Planning with communities.

Exercise sheet

Management attributes[1]

[1] Adapted from: Srinivasan L. *Exercise in tools for community participation - A manual for training trainers in participatory techniques* (PROWWESS/UNDP Technical Series). PROWWESS/UNDP - World Bank Water and Sanitation Program, New York, 1993.

Prepare in advance an envelope containing the following labels which describe a possible management attribute. Each group will have to choose the five most important attributes for managing O&M.



Figure

4. Background information

4.1 Operation and maintenance in the context of sustainability

Sustainability depends to a large extent on effective and efficient operation and maintenance. Many factors and processes that contribute to sustainability have a direct influence on operation and maintenance.

Sustainability can be analysed in time, as shown in the Figure on project phases. A service is sustainable when:

> **a) it is functioning and being used; b) it is able to deliver an appropriate level of benefits (*quality, quantity, convenience, comfort, continuity, affordability, efficiency, equity, reliability, health*); c) it continues over a prolonged period of time (*which goes beyond the life-cycle of the equipment*); d) its management is institutionalized (*community management, gender perspective, partnership with local authorities, involvement of formal/informal private sector*); f) its operation, maintenance, administrative and replacement costs are covered at local level (*through user fees, or alternative financial mechanisms*); g) it can be operated and maintained at local level with limited but feasible external support (*technical assistance, training, monitoring*); and h) it does not affect the environment negatively.**

Proper operation and maintenance activities will contribute to the sustainability of a service after its construction, depending on a series of factors and processes which will have to be developed during the design and planning phase, and consolidated during the construction phase. In other words, the sustainability of operation and maintenance starts right from the planning stage.

4.2 Factors which contribute to sustainability and to effective operation and maintenance

As described in the chart with circles, sustainability relies on four interrelated factors (adapted from CINARA - IRC course material, 1994 to 1998): a) technical factors, b) community factors, c) environmental factors, and d) the legal and institutional framework.

The technical factors which are likely to influence operation and maintenance as well as sustainability as a whole are: technology selection; complexity of technology; its capacity to respond to a demand and a desired service level; its impact on the environment; the technical skills needed to operate and maintain a system; the availability, accessibility and costs of spare parts; and the cost of maintenance.

The community factors which are likely to influence operation and maintenance as well as sustainability as a whole are: availability of technical skills to operate and maintain a service, and implement preventive maintenance activities and small and big repairs; capacity and willingness to pay; participation of all social groups in the community and both men and women; financial and administrative management carried out by a legitimate and organized community structure; the felt need for an improved service; socio-cultural aspects related to water; and individual, domestic and collective behaviour regarding hygiene and sanitation.

The intersection between the technical circle and the community circle indicates the level of ownership and responsibility of communities towards the service. Ownership and responsibility are the key prerequisites for sustainable operation

and maintenance.

The environmental factors which are likely to influence operation and maintenance as well as sustainability as a whole are: the quality of the water source (which will in turn influence the technology choice, and its need for treatment); and its quantity and continuity.

The intersection between the environmental circle and the community circle represents the way the community will manage water resources and especially the impact on the environment of community behaviour in terms of sanitation and management of used waters. Water resources management, pollution control, hygienic behaviour, and proper wastewater management are all crucial components for sustaining a water supply service, to which operation and maintenance must contribute.

All these factors evolve within a legal and institutional framework. At the national level there must be clear policies and strategies towards operation and maintenance, which can be implemented. Support activities, such as technical assistance, training, monitoring, water quality control, and the setting up of alternative financing mechanisms are all likely to influence operation and maintenance activities.

Financial factors are key components inherent in all the above factors (technical, community, environment and institutional).

4.3 Processes which influence sustainable operation and maintenance

Processes differ from factors since they focus on the approach and the

methodology of working. In the past, it was thought that the development or consolidation of factors alone could contribute to greater efficiency, effectiveness and sustainability. Now, however, it is realized that processes also have an important role to play. Among the processes can be listed the following: demand from the communities; responsiveness from supporting institutions and agencies; participation of communities (men and women) through the whole project cycle; linking technology choice with operation and maintenance; integration of water, sanitation, health and environment; planning with a gender perspective; effective decentralization; communication among all stakeholders; public/private partnership; co-responsibility between community and municipality; and capacity-building at all levels.

Demand for an improved service by the communities is a prerequisite for sustainability. It is an expression of their commitment, and a way to make communities responsible for their choices and future tasks. However, demand should be promoted because communities must be made aware of the different technology options available, and of their financial consequences. The concrete expression of demand varies from one country to another and from one development agency to another. Demand can be manifested in the form of an initial contribution in cash or in kind to the capital costs, or in the form of a written solicitation from an organized community group to the municipality.

Responsiveness of support institutions and agencies is the capacity of municipalities, nongovernmental organizations (NGOs), and other institutions and agencies to respond adequately to the needs and demand of communities. In many countries, municipalities need to be consolidated in their ability to deal with rural communities.

Participation of communities (men and women) throughout the whole project cycle is essential since it is a way to motivate, make responsible and build the capacities of communities in their new tasks and functions.

Linking technology choice with operation and maintenance at the planning stage is the key in the technology selection process. Indeed, communities must be able and willing to operate, maintain, administrate and finance the new service.

Planning with a gender perspective implies that the roles and functions of both men and women are clearly defined for management, operation and maintenance, since these might also highlight the need for specific capacity-building activities.

The decentralization process, which is underway in most developing countries, has a definite impact on the way institutions deal with the provision of water supply services. The main trend is for municipalities to be responsible, while the private sector (formal and informal) can contribute actively in the maintenance of systems.

Communication from central to local level and vice versa, and between private agencies and development agencies can enhance the coordination of activities and implementation of policies. Furthermore, a proper information and monitoring system relies on effective communication channels.

Public/private partnership can have an important role in the operation and maintenance of improved water supply and sanitation services, where the private sector can operate, maintain, and manage the service under contractual agreements.

Co-responsibility between communities and municipalities implies that the tasks, responsibilities and functions of both parties are clearly defined. This is especially true now that municipalities are increasingly being given the legal and constitutional responsibility for the provision of public services. At the same time, community management is being promoted as a key element of sustainability. Efficient dialogue and a clear definition of roles need to be worked out, developed and consolidated.

Capacity-building at all levels is needed, especially in an environment of changing roles and responsibilities induced by the decentralization process.

Unit 4: Linking water, health, sanitation and environmental protection

1. Outline of session

- **Objectives**
  - **To raise awareness on the need to link water, health, sanitation and environmental protection**
  - **To show that adequate operation and maintenance of water supply and sanitation will contribute to health and environmental protection**
- **Methodology**
  1. **Introductory note**
  2. **Video presentation followed by a discussion**

3. Interactive presentation on the links between major health preventive measures and environmental protection

4. Focused discussion on behavioural change

5. Exercise in plenary using a behavioural change matrix

- **Materials**

  √ Overhead transparencies
  √ Flip chart and masking tape
  √ Overhead projector, screen or white wall
  √ Video projector
  √ Video: "Prescription for Health"

- **Handouts**

  √ Copies of all transparencies
  √ Selected extracts from background information

2. Notes for the facilitator

Introductory note

It was mentioned in a previous session that there is a trend to link water supply, health, sanitation and environmental protection activities because an adequate water supply by itself cannot solve all health problems. Proper handling and hygienic use of water, hygienic maintenance of water points and water sources,

protection of the environment, safe sanitation disposal and cleaning of hands all contribute to the improvement of health. The facilitator must therefore focus on the importance of linking water supply, health, sanitation and environmental protection, and help all participants to see the need for such integration.

Video presentation followed by a discussion

A 23-minute video film, "Prescription for Health", was produced by the IDRC (International Development Research Centre), P.O. Box 8500, Ottawa K1G 3H9, Canada, and is suitable for audiences of diverse cultural backgrounds. It was filmed in Bangladesh, Kenya, Philippines, Sri Lanka and Thailand, with extensive animation sequences to illustrate clearly the contamination path. The video promotes personal hygiene and community practices linked to water supply and sanitation, which can help to break the cycle of infection. Produced in collaboration with the World Health Organization and OXFAM, the video is primarily aimed at health care workers and water and sanitation engineers. It is a source of information for planners and policy-makers, and particularly strong in raising awareness.

After viewing the video, the participants are asked by the facilitator to comment on the key messages brought up in the film. Their main ideas are written on the board, together with statements from the video which are added by the facilitator who must be thoroughly familiar with the film. The facilitator then asks the participants how far this type of approach has been or could be utilized in their own working environment, and encourages them to discuss freely based on their personal experiences.

Identification of obstacles that inhibit the link between water supply, health, sanitation and environmental protection is discussed in a plenary session. The aim of this exercise is to show the constraints that must be overcome in order to reach integration. Such issues as no priority, not our mandate, no knowledge about it, poor financial resources, and poor inter-sectoral cooperation might come out during the discussion. The course does not try to solve these problems, but tries to show how O&M activities can contribute to this integration.

Interactive presentation on major preventive measures and environmental protection

Using the overhead sheets provided, the facilitator shows the major preventive measures for reducing the transmission of diseases related to water and sanitation. Some explanations are available in the background information and supporting material.

The topic of environmental protection is dealt with in the same way. In both cases, it is important to show how these issues are related to O&M and its management. After an overhead sheet is presented, the group is asked, "How can a better O&M contribute to this situation?"

Focused discussion on behavioural change

Since hygiene practices and environmental protection activities are linked to specific individual, domestic or collective behaviours, the facilitator initiates a discussion with the group by asking the following questions: "Can you give examples from your professional experience of activities that aimed at changing

behaviour, or specific outcomes which depended on behaviour change?" "Were they successful?" "What made them successful or not successful?" The facilitator then discusses with the group some basic aspects which make behavioural change not always successful (see background information).

Exercise in plenary using a behavioural change matrix

Key criteria for activities to promote behavioural change have been developed in a matrix by UNICEF, which can be presented to the whole group as an exercise in a plenary session. The matrix is given in an exercise sheet.

The facilitator asks the group for examples of behavioural change which all participants are familiar with, such as "Use of chlorine tablets to disinfect water at household level". The facilitator goes through the whole matrix with the participants, analysing the chosen behaviour change, and scores the total number of points. The final result is evaluated according to the ranges given in the exercise.

3. Overhead and exercise sheets: Sheet 1

Prevention of diseases related to water and sanitation

Major preventive measures

1. Safe human excreta disposal*
2. Personal hygiene
3. Domestic hygiene
4. Food hygiene

5. Water hygiene*
6. Safe wastewater disposal and drainage*

*Link with Operation and Maintenance.

Overhead sheet 2

Relationship between infection and preventive measures[1]

[1] From: Boot M, Cairncross S. *Action speaks: the study of hygiene behaviour in water and sanitation projects*. The Hague, IRC (and London School of Hygiene and Tropical Medicine), 1993.

Infection	Safe human excreta disposal*	Personal hygiene*	Domestic hygiene	Food hygiene	Water hygiene*	Drainage*
Diarrhoea Dysentry Typhoid Cholera						
Roundworm (ascariasis) Whipworm (trichuriasis)						
Hookworm						

Beef and pork tapeworms						
Schistosomiasis (bilharzia)						
Guinea worm (dracunculiasis)						
Scabies Ringworm Yaws						
Trachoma Conjunctivitis						
Louse-borne typhus Louse-borne relapsing fever						
Malaria Yellow fever Dengue						
Bancroftian filariasis						

* Can be influenced by adequate operation and maintenance.

Overhead sheet 3

Drinking water source protection[1]

[1] From: Bastemeyer TF, Lee MD. *Drinking water source protection*. The Hague, IRC, 1991.

- Appropriate source selection and intake
- Catchment protection*
- Sanitary surveying of water point*
- Improvement of sanitation practices*
- Physical protection of wells and intakes*
- Soil and water conservation techniques*
- Wastewater treatment*
- Wastewater recycling*
- Artificial recharge
- Reforestation
- Community motivation and awareness*
- Partnership between communities and authorities
- Legislation and enforcement

* Can be influenced by adequate operation and maintenance practices.

Exercise sheet

Behavioural change matrix

Criteria for evaluating the likelihood of behavioural change

(Source: van Wijk C, Murre T, Esrey S. *Motivating for better hygiene and behaviour*. New York, UNICEF - IRC, 1996)

Health impact of behavioural change	Complexity of behavioural change	Direct consequences of behavioural change
0. No impact on health	0. Unrealistic	0. No consequences
1. Minor impact	1. Involves too many actions	1. Minor consequences
2. Some impact	2. Involves many actions	2. Some consequences
3. Significant impact	3. Involves few actions	3. Significant consequences
4. Very significant impact	4. Involves two actions	4. Major consequences
5. Eliminates the problem	5. Involves one action	5. Consequences guaranteed
Frequency of behaviour	**Cost and effort of engaging behavioural change**	**Persistence needed to induce behavioural change**
0. Too cumbersome	0. Unrealistic	0. Unrealistic
1. Must be done hourly	1. Requires important resources and effort	1. Requires compliance for several weeks
2. Must be done once a day	2. Requires significant	2. Compliance for a week
3. May be done every	3. Requires some resources	3. Compliance for several days

few days	and effort	
4. May be done once a week	4. Few resources or effort	4. Compliance for a day
5. May be done occasionally	5. Requires only existing resources	5. Very brief compliance
Compatibility with existing activities	**Observability**	**Similar practices**
0. Totally incompatible	0. Cannot be observed by an outsider	0. Nothing like this is done
1. Significantly incompatible	1. Very difficult to observe	1. Slightly similar
2. Some incompatibility	2. Difficult to observe	2. Existing practice similar
3. Little incompatibility	3. Is observable with attention	3. Several similar practices
4. Easy to incorporate in existing activities	4. Observable	4. Many similar practices
5. Type of activity already widely practised	5. Cannot be missed	5. Similar practices widely existing
For each proposed behavioural change, score 0 to 5 for each of the nine boxes. Aggregate the total score for each behavioural change. If the score is less than 20, it is highly unlikely that the audience will make the change. Different goals must be set. If the score is over 36, it is highly likely that the goal will be achieved.		

4. Background information

4.1 Why is behaviour not changed by conventional hygiene education?[1]

[1] From: van Wijk C, Murre T, Esrey S. *Motivating better hygiene behaviour: importance for public health - Mechanisms of change*. New York, UNICEF - IRC, 1996.

Planners of hygiene programmes and practitioners often believe that it is possible to give universal hygiene messages to the population. Such messages are based on the assumption that the knowledge of health educators is superior to local insights and practices. The fact that people have adapted their lifestyle to local circumstances and developed their insights and knowledge over years of trial and error is overlooked. General hygiene messages can therefore be irrelevant, incomplete or unrealistic.

The methods used to get the information across are often not suitable to create behavioural change. Many health messages are given in the form of lectures at health clinics, talks in meetings and gatherings, and through the mass media (e.g. posters, radio talks, brochures and booklets). Even if the educators succeed in reaching the intended audiences using the media, the people are only "told what to do", and often do not get the chance to relate the message to their own experiences. It is important to realize that people can make sense of new information only in the light of their own experiences, perceptions and cultural backgrounds.

Many health education programmes teach people about water and sanitation-related diseases - what they are, how they are caused, and how they are prevented. But education does not, by itself, reduce the risks of transmitting these

diseases. Only action can do this; knowledge is useful but not sufficient. Reviews of hygiene programmes show that appropriate settings to promote particular changes are rare.

4.2 What motivates people to improve their hygiene?

If general messages and information on disease transmission do not change people's behaviour, what is it that can bring people to take action on the risky practices and conditions in their own environment?

An individual will adopt new behaviour when he or she believes that the practice has clear benefits - for health or other reasons - and considers these benefits as important. Change of behaviour is also considerably influenced by convenience, comfort, and status. The individual will then develop a positive attitude to the change. Positive or negative views on the environment from others can also influence a person's decision to try the new practice. Thus, an individual's attitude and situation will determine if the practice is taken up, and when this is found to be beneficial, it is continued.

What hygiene education programmes can do is to support water and sanitation projects, which are planning to install new facilities for the community's use:

a) by assessing if water, sanitation and hygiene have a high priority among the various groups in the community, and by promoting their understanding of the implications of the existing conditions and proposed technical options for both community and family health;

b) by following up people's use of the newly installed facilities and their

hygiene practices in order to provide feedback to planners who will be better prepared to reduce other disease transmission risks, which prevent the realization of health improvements in the communities concerned.

Certain practices cannot produce results by individual change alone, but require concerted action by larger groups and the whole community. Making choices together, assigning responsibilities, and monitoring action will increase the people's commitment to put into practice the agreed changes. Communal change is only possible when the community members themselves feel there is a problem and jointly undertake action that will permanently improve the conditions and their practices.

When learning, people remember 20% of what they hear, 40% of what they hear and see, and 80% of what they discover for themselves. This calls for a change in the way teaching is carried out - from a didactic to a more participatory and growth-centred education.

Four major factors stimulate people to change their behaviour: 1) facilitation (convenience, making life easier); 2) practical understanding; 3) influence of others; 4) capacity to change.

4.3 Experiences in better water resource management[1]

[1] Extracts from: Bastemeyer T. *Drinking-water source protection*. The Hague, IRC, 1991.

Source selection and siting of intakes

Field experience shows that good source selection and adequate siting of intakes contribute to the reliability of the water supply system. For the selection of groundwater sources, in particular for small point source supplies, procedures could be more systematic, both in terms of locating high-yielding sites and in terms of avoiding sites with a high potential for contamination by seepage from the surface.

For the siting of shallow drilled and hand-dug wells, the risk associated with faecal contamination from on-site sanitation are poorly understood and quantified. Where water supply points are located within or adjacent to settlements, two elements have not been adequately addressed with respect to possible contamination by existing sanitation units and/or waste disposal practices. The first element concerns the risk of contamination of drinking-water sources from waste. The second is the lack of criteria for the establishment of safe distances between water source and possible contamination points.

With increasing population pressures and expansion of human activities into previously undisturbed catchment areas, risk assessment must take into account both current and projected activities within the catchment area.

Catchment protection

More active protection of catchment areas is needed, which involves a systematic appraisal of catchment areas for surface or groundwater sources and the identification of environmental factors related to land use. There is a need for practical experience to develop checklists for small sources to be effectively managed and maintained by local communities.

The groundwater pollution risk is the product of the contaminant load applied to the subsurface by human actions and the natural pollution vulnerability of the aquifer. To protect aquifers, it must be clear which pollutants and pollution sources affect them most. This knowledge forms the basis for delimiting protection zones within which human activities must be regulated.

Protection zones are important for the design, prioritization and distribution of water resources protection measures. The zones can be delimited with respect to the level and nature of the risk, resulting in more coherent and incisive protection strategies. The effectiveness of protection zones depends on the commitment of the local population to observe established protection measures. Protected areas are obviously increasingly vulnerable as population density increases.

Sanitary surveying

Sanitary surveys are a form of risk assessment in which the bacteriological, physical and chemical quality of a water source, the technical quality of the water supply point, the way it will be used by the communities, the surrounding environmental hygiene conditions, and the potential causes for contamination are examined. Their purpose is to minimize the level of risks of on-site contamination by identifying remedial measures which can quickly and easily be undertaken.

Improvement in sanitation

The problem of contamination of the water supply by users through poor sanitation and hygiene is widespread. Use of latrines and other sanitary systems reduces the risk of faecal pollution by excluding contamination of the topsoil or

ground surface so that excreta are not washed into the surface water or transported by animals. The design of latrines should in principle ensure that there is no direct sub-surface link between the excreta and the groundwater supply, which involves taking into consideration the site, soil type and depth, and seasonal and daily water levels.

Physical protection of wells and intakes

Users pollute their water sources due to the lack of awareness about ways and means to ensure adequate physical protection of the water supply point. Community water supply projects, which are engaged in groundwater development through construction of wells, recognize the importance of simple site protection against pollution. The addition of well-aprons, soakway drains, covers and handpumps protect the water's quality by preventing the inflow of contaminated water back into the well.

Soil and water conservation techniques

Soil and water conservation activities can decrease turbidity by preventing sediment transport, increasing groundwater recharge, and decreasing surface flow peaks by increasing infiltration. A full range of erosion control techniques and strategies has been pioneered for developing countries and applied with considerable success.

However, soil erosion has expanded at a faster pace than most national governments have been able to cope with. A large proportion of soil erosion problems resulted from the expansion of shifting cultivation techniques into

marginal areas. Additionally, they result from the settling of previously semi-nomadic people who have little history of terrace building or other traditional forms of soil stabilization.

Wastewater treatment

Both industrial effluent and domestic sewage should be treated to minimize pollution risks. For domestic sewage, different on-site and off-site technical options are available, but they are not always applied. In the developing countries, sewage lagoons and oxidation ditches are among the most economical methods. There is little experience in the use of simple and effective, low-cost treatment technologies for small-scale industrial polluters, especially for small rural agro-industries. There are no feasible treatment possibilities to deal with the many toxic elements originating from industries and the misapplication of fertilizers. Preventive measures against contamination from industrial and agricultural activities are therefore crucial.

Wastewater recycling

Wastewater treatment is complementary to wastewater recycling. As such, sewage waste may only need partial treatment in order to be used on farmland for irrigation or in a range of industrial processes where water quality standards are not critical. Wastewater recycling, if carried out correctly, can be a form of water source protection as well as conservation. The risk of contamination of water sources is decreased through proper recycling and increases the efficient use of the water source. In this way, water is treated by less expensive methods, since treatment requires mainly the removal of coliforms and helminths (e.g.

wastewater treatment ponds).

Artificial recharge

Ground-water resources can be managed in order to decrease water table recession and saltwater intrusion, by artificial recharge. On the small and medium scale, recharge is predominantly performed from infiltration ditches, ponds and basins, retention of river underflow (using sub-surface dams), and through the retention of river floodwater. Sand storage dams can also be used to increase the dimensions of the shallow ground-water reservoir.

Reforestation

Reforestation programmes coupled with anti-erosion, soil and water conservation techniques are considered essential for the improvement of many water source problems. However, at the present time many more trees are cut down than planted.

Community motivation and awareness

Many water pollution problems are due to a lack of awareness of the causes of health problems among communities. The link between water, hygiene and illness is not strongly perceived since water is assumed to be beneficial and cleansing rather than a potential source of infection.

Partnership between communities and government agencies

A reliable and functioning water supply system may greatly contribute to the

protection of water sources, and vice versa. Community-based maintenance and management of water supply systems is a good starting point for a more integrated approach to water source protection and environmental conservation. Although community water management strategies are possible, there must generally be direct links between the community and the water source. Communities must be the users of the water source or derive some other benefit from the protective action such as commercial benefits from tree planting or increased crop production following soil conservation. Conflict of interest between upstream and downstream users is a serious problem worldwide. That is why a sound legal basis for community water supply systems is very important. Government institutions and local authorities should support community efforts to manage and protect their drinking-water sources.

Legislation and enforcement

At the present time, water resource and environmental legislation in most developing countries has evolved over the years in response to specific water management problems, which were associated with economic and demographic growth. The legislation has usually been directed towards controlling the use of water from major rivers or lakes, which are of economic significance, and currently does not provide a good basis for the protection of drinking-water sources.

WHO has listed the following legal issues which require attention:

- regulations are needed to ensure that the source exploited for community water supply is the most favourable in terms of quality, quantity, and

access;

- regulations are needed to ensure health and environmental protection for wastewater use since there are obvious public health hazards;

- legal provisions are required to ensure that potential water sources are adequately protected from the harmful effects of wastewater infiltration;

- legislation and regulations are needed to ensure that the costs of community water supply and sanitation are recovered from all water source users.

Module 2: Situation analysis

Unit 1: Operation and maintenance requirements

1. Outline of session

- **Objectives**

  - **To identify the rural water supply and sanitation technologies which are most frequently used in the participants' projects**

  - **To identify the operation and maintenance requirements of both water supply and sanitation technologies**

  - **To review problems in spare parts availability.**

- **Methodology**

1. Introductory note

2. Focused discussion on rural water supply and sanitation technologies most frequently used in the participants' projects

3. Group assessment of operation and maintenance requirements and problems most frequently encountered

4. Presentation on spare parts availability.

- **Materials**

  √ Overhead transparencies
  √ Flip chart and masking tape
  √ Overhead projector, screen or white wall

- **Handouts**

  √ Copies of all transparencies
  √ Selected extracts from background information
  √ Forms for the exercise

2. Notes for the facilitator

Introductory note

Situation analysis starts by reviewing the main technical activities for the operation and maintenance of rural water supply and sanitation services. It allows

the participants to understand and be familiar with the various technologies presented in the course.

Focused discussion on rural water supply and sanitation technologies

The facilitator asks the participants what types of technologies are being promoted in their rural water supply and sanitation projects. These are listed on the board and, with the aid of the transparencies (see overhead sheets, pages 65-67), compared with the technologies presented in the course.

The course deals with only human excreta disposal systems, which is the basic sanitation option in many projects. This does not mean that other aspects of sanitation, such as wastewater disposal, solid waste disposal, and drainage of surface (rain) water, are not important because they are all important.

All water supply and sanitation project planners should, as if automatically, be able to integrate their basic and simple wastewater disposal services with water supply services. However, the course does not advocate systems which cannot be sustained by rural communities.

Group assessment of basic O&M requirements

The aim of this exercise is to assess the basic O&M activities in a particular system which will be chosen by the groups, including their frequency, human resources and skills, and requirements for tools, equipment, materials and spare parts. The participants are divided into groups corresponding to the main technologies, including sanitation. All participants are asked to fill in a form (see exercise sheet on "Assessment of basic O&M requirements"). Each group then rapidly presents

their work, with an emphasis on the problems encountered which will be considered throughout the course. The present session deals with the problem of spare parts availability.

Interactive presentation on spare parts availability

Problems in the availability of spare parts are often encountered in the operation and maintenance of water supply and sanitation projects. This session reviews the main characteristics of the problem, which must be taken into account in planning for spare parts. The overhead sheets and background information (see below) will be useful in preparing the presentations, in which the participants will describe their experiences. In addition, a spare parts supplier could be invited to share his experience and perceptions during the session.

3. Overhead and exercise sheets: Sheet 1

Water sources for low-cost water supply technologies

Rain water

- Rooftop water harvesting
- Catchment and storage dams

Groundwater

- Spring water captation
- Dug well
- Drilled well

Subsurface harvesting

Surface water

Protected side intake
Bottom river intake
Floating intake

Sump intake

Water-lifting technologies

Rope and bucket: loose, through a pulley, or on a windlass
Bucket pump
Rope pump
Suction plunger handpump
Direct action pump
Deep-well piston pump
Deep-well diaphragm pump
Centrifugal pump
Electrical submersible pump
Axial flow pump

Hydraulic ram

Overhead sheet 2

Power systems

- Human power
- Animal traction
- Windmill
- Photovoltaic systems
- Electric engines

Diesel engines

Water treatment devices

At the household level

- Heating
- Solar disinfection
- Household slow sand filter
- Domestic chlorination

At the community level

- Pot chlorination in well
- Storage and sedimentation
- Upflow roughing filters

Slow sand filtration

Chlorination in piped water supply systems

Overhead sheet 3

Low-cost sanitation technologies

Dry systems

- Basic improved traditional latrine
- Ventilated improved pit latrine
- Double-vault compost latrine

Wet systems

- Pour-flush latrine with leaching pits
- Aqua-privy
- Pour- or full-flush latrine with septic tank

Pit-emptying techniques

- Vacuum tanker
- Vacutug
- Manual latrine pit-emptying technology

Liquid effluent disposal systems

- Soakaway
- Drainage field

- Small-bore sewerage

Exercise sheet

Assessment of basic Operation and Maintenance requirements			
Technology choice (Fill in when applicable)			
Type:	Power system	Distribution system	Water treatment
Major O&M activities	**Frequency**	**Tools, materials, spare parts**	**Skills and human resources**
Conclusion			
Tools, materials, and spare parts needed:			
Skills and human resources needed:			
Main problems:			

Overhead sheet 4

Sustainable provision of spare parts depends on:

1. The demand for spare parts

- Spare parts needs
- Spare parts costs
- Spare parts accessibility

2. The supply of spare parts

- Use of local materials and manufacture
- Marketing and sales points
- Perspective on profits

3. Strategic issues

- Efficient planning
- Quality of spare parts
- Whether to standardize
- Approaches to reduction of spare parts needs
- Appropriate pricing policy
- Private sector involvement

- Capacity-building

4. Background information

4.1 What is sanitation?

Sanitation encompasses the following: 1) human excreta disposal systems, 2) wastewater disposal devices, 3) solid waste disposal, and 4) drainage of surface

(rain) water. This course focuses mainly on human excreta disposal, which is considered to be the basic sanitation option. The other three areas are also important and some comments on them are given below.

Wastewater is either sullage (greywater), which is wastewater from kitchens and bathrooms, or sewage (blackwater), which includes sullage and is settled wastewater containing parts of human excreta, and water-borne waste. Problems are mainly encountered in areas with a high density of houses and people, where the wastewater is liable to flooding if there is no proper drainage, or can be a source of smells, rodents and contamination (see Module 1, Unit 4). Wastewater can contaminate drinking-water supplies through broken pipes or the spread of stagnant water, depending on the absorption capacity of the soil. The problem with water-borne disposal is its high rate of water consumption, regular blockage in the drainage system, and high O&M costs.

Plans for simple wastewater disposal and drainage devices should be made during the initial technical design phase. Proper maintenance of small gutters, drainage devices, or areas surrounding water points is essential, and communities should actively participate to prevent blockages and stagnant water forming around the water points.

Solid waste generally includes household refuse, waste from institutions, industrial waste and hospital waste. Rural areas are mainly concerned with the first two of these, but can be contaminated indirectly by pollution from industrial waste. Populations in developing countries produce different wastes from those in industrialized countries; there is a similar difference in wastes between urban and rural areas. Vegetable waste accounts for, on average, 30% of the total waste in

industrialized countries and 75% in developing countries; the possibilities for composting and recycling depend on the composition. Improper solid waste disposal can present a public health risk, and is often the cause of drainage blocks and aesthetic problems. Unplanned and uncontrolled dumpsites can generate ground and groundwater pollution, as well as lead to air pollution and proliferation of rodents.

Maintenance activities linked to wastewater and solid waste disposal in rural areas are to a large extent a matter of preventive maintenance by the active involvement of users. Behavioural changes in communities to improve the operation and maintenance of basic sanitation systems can be induced by effective awareness campaigns, together with participatory sanitary problem assessment (see Module 1, Unit 4).

4.2 Water supply and sanitation O&M fact sheets

The fact sheets given below are extracted from: *Linking technology choice with operation and maintenance, in the context of low-income water supply and sanitation*, by F. Brikk et al. Published by the Operation and Maintenance Network of the Water Supply and Sanitation Collaborative Council, 1997, and available from WHO headquarters (contact Mr J. Hueb) or from IRC.

O&M FACT SHEET

Rooftop water harvesting

a. Brief description of technology

Rooftop catchment systems gather rainwater caught on the roof of a house, school, etc. using gutters and downpipes (made of local wood, bamboo, galvanized iron or PVC) and lead it to one or more storage containers ranging from simple pots to large ferrocement tanks. If properly designed, a foul flush device or detachable downpipe is fitted for exclusion of the first 20 litres of runoff during a rainstorm, which is mostly contaminated with dust, leaves, insects and bird droppings. Sometimes runoff water is led through a small filter consisting of gravel, sand and charcoal before entering the storage tank. Water may be abstracted from the tank by a tap, handpump or a bucket and rope system.

Initial cost: In Southern Africa, US$ 320 for a system with 11 m galvanized iron gutter, 1.3 m^3 galvanized iron tank, downpiping, tap and filters, excluding transport (Erskine, 1991). Where the roof is not suitable for water harvesting, the cost of improving the roof and gutters will have to be added to the cost of the tank. Such costs were found to vary between about US$ 4 (in Kenya, subsidized) and US$ 12 (in Togo) per m^2 (Lee & Visscher, 1992). Total capital costs for rooftop rainwater catchment systems are usually higher than for other water supply systems.

Yield: Potentially almost 1 litre per horizontal square metre per mm rainfall. The quantities usually are only sufficient for drinking purposes.

Area of use: Most developing countries with one or two rainy seasons (especially in arid and semi-arid zones, with average annual rainfall ranging from 250 to 750 mm) and where other improved water supply systems are difficult to realize.

Construction: Systems are usually produced locally.

b. Description of O&M activities

In case there is no foul flush device, the user or caretaker has to divert away the first 20 litres or so of every rainstorm. Fully automatic foul flush devices are often not very reliable. Water is taken from the storage tank by tapping, pumping, or using a bucket and rope. For reasons of hygiene, the first two methods are preferred. Just before the start of the rainy season, the complete system has to be checked for holes and broken parts and repaired if necessary. Taps or handpumps have to be serviced. During the rainy season the system is checked regularly, and cleaned when dirty and after every dry period of more than a month. Filters should be cleaned every few months, filter sand should be washed at least every six months, and the outside of metal tanks may be painted about once a year. Leaks have to be repaired throughout the year, especially leaking tanks and taps, as they present health risks. Chlorination of the water may be necessary. All operation and maintenance activities can normally be executed by the users of the system. Major repairs, such as a broken roof or tank, can usually be executed by a local craftsman using locally available tools and materials. Maintenance is simple but should be given ample attention.

Organizational aspects

The organization of O&M of communally shared roof or ground tank supplies is considerably more difficult than for privately owned systems. Rooftop harvesting systems at schools, for instance, may suffer water losses from a tap left dripping, and padlocks are often needed to ensure careful control over the supply. Ideally, one person should be responsible for overseeing the regular cleaning and occasional repair of the system, control of water use, etc. Selling the water is an

option to ensure income for O&M and to restrict water use. Where several households have installed a communal system, e.g. where several roofs are connected to one tank, the users may want to establish a water committee to manage O&M activities, which may include collection of fees, control of the caretaker' s work, and control of water use by each family. External agents can play an important role in monitoring the condition of the system and the water quality, in providing access to credit facilities to buy or replace a system, in training of users/caretakers for management and execution of O&M, and training of local craftsmen for larger repairs.

c. O&M requirements

Activity	Frequency	Human resources	Materials and spare parts	Tools and equipment
Clean the system	1 - 3 times per year	Local	Chlorine	Broom, brush, bucket
Divert foul flush	Every storm	Local		
Clean the filters	Twice a year	Local	Sand, charcoal, plastic mesh	
Disinfect the reservoir	Occasionally	Local	Chlorine	Bucket
Repair roof, gutters and piping	Occasionally	Local	Tiles, metal sheet, asbestos cement sheet etc., bamboo or PVC pipes, nails, wire	Hammer, saw, pliers, tin cutter

Repair tap or pump	Occasionally	Local or area	Washers, cupseals etc.	Spanner, screwdriver
Paint outside of metal reservoir	Annually	Local	Anticorrosive paint	Steelbrush, paintbrush
Repair ferrocement reservoir	Occasionally	Local	Cement, sand, gravel, metal mesh, wire	Trowel, bucket, pliers

d. Actors implied and skills required in O&M

Actor	Role	Skills
User	Close taps after taking water, keep the system clean	No special skills
Caretaker	Check functioning, divert first flush, clean the filters and rest of the system, perform small repairs	Basic skills
Water committee	Supervise caretaker, collect fees	Organizational skills
Local craftsman	Repair roof, piping and tank	Basic plumbing and masonry
External support	Check water quality, stimulate and guide local organization, train the users	Microbial analysis, extension work

e. Recurrent costs

Recurrent costs for materials and spare parts are very low. In most cases these

costs are even considered negligible. However, the recurrent costs for personnel - in cash or kind (for caretakers, committee members and craftsmen) will need to be added.

f. Problems, limitations and remarks

Frequent problems. Corrosion of metal roofs, gutters, etc. Failure of functioning of the foul flush devices due to neglect of maintenance. Leaking taps at the reservoir and problems with handpumps. Contamination of uncovered tanks, especially where water is abstracted with a rope and bucket. Tanks may provide a breeding place for mosquitos, which may increase the risk of diseases like malaria.

Limitations. The water may be insufficient to fulfil the drinking-water needs at certain times in the year, making it necessary to develop other sources or go back to traditional sources during these periods. The investment needed for the construction of a tank and suitable roofing is often beyond the financial capacity of households or communities.

Remarks. Tiled or metal roofs give the cleanest water. Thatched roofs yield less water which is more contaminated. The acceptance of rooftop water harvesting as a suitable system may depend on the users' views on the water' s taste.

Spring water captation

a. Brief description of technology

Spring water captation systems abduct and protect groundwater flows at the points where these arrive at the surface to facilitate their abstraction. Spring

water is usually fed from a sand or gravel water-bearing ground formation (aquifer), or a water flow through fissured rock. Where solid or clay layers block the underground flow of water, it is forced upward and can come to the surface. The water may emerge either in the open as a spring, or invisibly as an outflow into a river, stream, lake or the sea. The main parts of a spring water captation are a drain under the lowest natural water level, a protective structure providing stability and a seal to prevent surface water from leaking in. The drain is usually placed in a gravel pack covered with sand and may lead to a conduit or a reservoir. The protective structure may be made of concrete or masonry and the seal is usually made of puddled clay and sometimes plastic. A screened overflow pipe guarantees that the water can flow freely out of the spring at all times. To prevent contamination infiltrating from the surface, a ditch (known as the interceptor drain) diverts surface water away from the spring box and a fence keeps animals out of the spring area. There are many types of spring captations, ranging from a simple headwall with backfill to more complicated structures like tunnel systems for collecting water from a larger area.

Initial cost: Capital costs vary considerably and depend on a large number of factors. In Nepal, a relatively large spring box serving 150 households including facilities for clothes washing was constructed for about US$ 1000 (1989 data, Rienstra 1990), including costs for unskilled labour. In Kenya, minor structures for an average of 110 persons were constructed for US$ 200, including a headwall, backfill, fencing, and labour and transportation costs. Major spring structures for an average of 350 persons cost about US$ 400, including a spring box (1986 data, Nyangeri 1986).

Dimensions:

Yield: From 0.5 m^2 to many square metres, about 0.1 l/s

Yield: From many litres per second to less than 0.1 l/s.

Area of use: In areas where groundwater arrives at the surface, usually at hillsides or mountainsides.

Construction: Spring water captation systems are constructed on-site, often by local craftsmen.

b. Description of O&M activities

Operation

Water should be permitted to flow out freely all the time so that it will not find another way out of the aquifer. Operation may include activities such as opening or closing valves to divert the water to a reservoir, a conduit or a drain. The spring and surroundings must be kept clean.

Maintenance

Prevent contamination (e.g. from open defecation, latrines, cattle-gathering places, use of pesticides, chemicals, etc.) both in the area where the spring water infiltrates into the ground (if possible) and in the immediate surroundings of the spring. Check the surface drains, the animal-proof fence and gate, and repair if necessary. Protect from vegetative growth both in the area where the spring water infiltrates into the ground (if possible) and in the immediate surroundings of the spring (prevent clogging of the aquifer by growth of roots). Check the water flow from the spring box. If there is an increase in turbidity or flow after a rain storm, surface run-off has to be identified and the protection of the spring improved. If the water flow decreases, it has to be suspected that the collection

system is clogged. It may then be necessary to take out the gravel and replace with new gravel or, in case a seep collection system is used, to clean the collection pipes. Regular water samples must be taken and analysed to check for evidence of faecal contamination. Annually, open the washout and remove all accumulated silt. Check all screens; if damaged or blocked, replace with non-rusting materials, e.g. copper or plastic screening, and clean if dirty. After cleaning, make sure to close the washout valve thoroughly and replace and seal the manhole cover. Disinfect the spring box every time a person enters to clean or repair it, or when there is bacteriological contamination. Leaks in the protective seal, undermining of the headwall, and damage caused by erosion or settlement of soil must be repaired.

Organizational aspects

In many cases, springs are communally owned. Users may need to establish an association which can effectively deal with issues such as control and supervision of water use, prevention of contamination of water, execution of O&M activities, financing of O&M, monitoring of water quality and the system' s performance, etc. Proper management may also prevent conflicts over these and other matters. For the execution of O&M tasks at the spring site, a person who lives or farms near the site could be appointed. This person could also be made responsible for water allocation to users at or near the site, and be involved in monitoring activities. His or her authority should be clear and accepted by all users.

c. O&M requirements

Activity	Frequency	Human	Materials and spare	Tools and

		resources	parts	equipment
Clean well surroundings	Weekly	Local		Broom, bucket, hoe, machete
Check turbidity	After each flood	Local		
Check water quantity	Occasionally	Local		Bucket, watch
Repair fence and clean surface drains	Occasionally	Local	Wood, rope, wire	Machete, axe, knife, hoe, spade, pickaxe
Check water quality	Regularly	Area	Laboratory reagents	Laboratory equipment
Wash and disinfect the spring	Annually	Local	Chlorine	Bucket, wrench, brush
Repair piping and valves	Occasionally	Local or area	Spare pipes and valves, cement, sand, gravel	Bucket, trowel, wrench, flat spanners
Repair cracks	Annually	Local	Cement, sand, gravel, clay	Bucket, trowel, hoe, spade, wheelbarrow

d. Actors implied and skills required in O&M

Actor	Role	Skills
User	Use water, report malfunctioning, keep site clean, assist in major repairs	No special skills

Caretaker	Keep site clean, check for damage, perform small repairs	Basic skills
Water committee	Organize bigger repairs, control caretaker’ s work	Organizational skills
Mason	Repair masonry or concrete	Masonry
External support	Check water quality, guide and stimulate local organization	Microbial analysis, extension work

e. Recurrent costs

Recurrent material costs are usually very low. The recurrent personnel costs, in cash or kind (for caretakers, watchmen, labourers, committee members and craftsmen), will need to be added but will also usually be low. Total recurrent costs are usually less than US$ 1 per year per capita, which often includes O&M costs for the water transport system. Several sources report that " O&M costs are minimal and, for this reason, spring water technology is the technology of choice wherever the sites permit it.” However, problems may arise when a sudden large investment is needed for a large repair or replacement of the system.

f. Problems, limitations and remarks

Frequent problems. Erosion or collapse of the spring box due to wrong design, construction errors, large surface runoff flows, and damage caused by people or animals. Leaks in the box or leaking taps and valves. Contamination of the spring water due to cracks in the seal or to people’ s behaviour. Damaged piping because of faulty construction, abuse or corrosion. Improper drainage of surface runoff, outflow and wastewater. Clogged pipes because of siltation or plant roots. Poor

accessibility for water users.

Limitations. Springs may not deliver enough water or become dry during certain seasons of the year. Not all springs produce clean water of acceptable taste. Springs may be sited too far from households or on privately owned land. In some cases, the cost of construction, large repairs or replacements may be beyond the capacity of communities. Some spring water is very corrosive.

Remarks. Usually spring water is of good quality but this should be checked; examples exist where the water was fed from a polluted stream which had gone underground or where the catchment area was contaminated. Unprotected springs are almost always contaminated at the outlet.

Drilled well

a. Brief description of technology

Drilled wells, tubewells or boreholes give access to groundwater in an aquifer and facilitate its abstraction. They differ from dug wells in the small diameter, generally varying between 0.10 m and 0.25 m for the casing, which does not allow a person to enter for cleaning or deepening. The well is usually the most expensive part of a handpump drinking-water supply project. Boreholes can be constructed by machine or by hand-operated equipment and usually consist of three main parts:

- **At ground level, a concrete apron around the borehole with an outlet adapted to the water abstraction method prevents surface water from seeping down the sides of the well, provides a hard standing, and directs**

wastewater away from the well to a drainage channel.

- **Below ground but not in the desired aquifer(s), these parts are usually lined with pipe material (mostly PVC and sometimes galvanized iron) to prevent it from collapsing, especially in unconsolidated formations. In consolidated formations, a lining may not be required.**

- **Below water level in the aquifer sections, the pipe material is slotted to allow groundwater to enter the well. A gravel filter layer surrounding this part facilitates groundwater movement towards the slotted pipes and, at the same time, prevents ground material from entering the well. In consolidated formations this gravel may not be required.**

A proper combination of slot size, gravel filter and aquifer material, and extensive sand pumping before the well is brought into production (well development) can considerably improve long-term performance.

Initial cost:	Capital costs vary considerably and depend on a large number of factors. According to Arlosoroff et al. (1987), the initial cost for a 50 m deep hand-drilled well in the alluvial plains in South Asia could be as low as US$ 200. More recent data state that typical costs for a 50 m drilled well in India were US$ 770 and in Mozambique US$ 10 000 (Wurzel & Rooy, 1993).
Range of depth:	From a few metres to over 200 metres.
Yield:	From less than 0.3 litre to over 10 litres per second.
Expected	Over 25 years.

life:

Area of use: In areas with suitable aquifers.

Construction: In most countries, drilled wells are constructed by public or private sector drilling companies.

b. Description of O&M activities

Operation

Operation of the well itself is usually not required. When the production capacity of the well is lower than the demand, daily monitoring of the water level may be necessary. Abstraction of the water from the well is usually done by the users, often women and children, or by a caretaker.

Maintenance

Apart from cleaning the apron daily and occasionally cleaning the drain and repairing the fence, if there is one, there are hardly any maintenance activities. Rarely, when a well has to be desilted or rehabilitated, all appliances have to be removed and a specialized company will have to come and do the job. There are various rehabilitation techniques such as forced air and water pumping, brushing, and treatment with chemicals. It is very difficult to deepen an existing drilled well.

Organizational aspects

Users may need to establish an organization that can effectively deal with issues such as the control or supervision of water use, prevention of water contamination, execution of O&M activities, financing of O&M, and monitoring of

water quality. Although the number of O&M activities required is limited and they usually cost very little, they should be given ample attention, as many wells have been abandoned because they were contaminated or had collapsed as a result of lack of maintenance.

c. O&M requirements

Activity	Frequency	Human resources	Materials and spare parts	Tools and equipment
Clean well site	Daily	Local		Broom, bucket
Clean drain	Occasionally	Local		Hoe, spade, wheel- barrow
Repair fence	Occasionally	Local	Wood, nails, wire etc.	Saw, machete, axe, hammer, pliers, etc.
Repair apron	Annually	Local	Cement, sand, gravel	Trowel, bucket
Rehabilitate well	Very rarely	National	Gravel, pipe material etc.	Various special equipment

d. Actors implied and skills required in O&M

Actor	Role	Skills
Water user	Use water, keep site clean, assist with major maintenance tasks	No special skills
Caretaker	Monitor water use, keep site clean	Basic skills for cleaning and

		disinfection
Water committee	Supervise caretaker, organize major maintenance, collect fees	Organizational skills
Specialized well company	Rehabilitate the well	Very special skills
External support	Check water quality, stimulate and guide users' organization	Microbial analysis, extension work

e. Recurrent costs

Recurrent material costs are usually low. The recurrent personnel costs, in cash or kind (for caretakers, watchmen, labourers, committee members and craftsmen), will need to be added but will also usually be low. Occasional large maintenance activities such as rehabilitation of the well may require a high investment, which may pose problems if this has to be financed by the community. The life expectancy of a good well is over twenty years but after a few years the yield may diminish drastically and rehabilitation may be necessary. In Ghana (Baumann, 1993), rehabilitation costs were estimated at US$ 750 once every ten years.

f. Problems, limitations and remarks

Frequent problems. Bad water quality or collapse due to corrosion of the galvanized iron lining, poor water inflow because of inadequately developed well, entrance of ground particles in the well because of wrong screens or wrong development, contamination due to wrong apron design or construction or neglect of maintenance, collapsing of borehole where no lining is applied or where the

lining is not strong enough.

Limitations. Well construction depends on geohydrological conditions like presence, depth and yield of aquifers and presence of rock formations above them. Wells constructed at locations which are too far from the users' households, or which are too difficult to reach, will not be sufficiently used or maintained. Wells should not be drilled near places with latrines or where cattle gather and vice versa. The usually recommended minimum distance is 30 metres, although this is no guarantee that contamination will not occur. The investment in labour, cash or kind needed for the construction of an improved dug well may be beyond the capacity of the community. It may be impossible to transport the heavy equipment and materials needed to the drilling site.

Remarks. In many cases, wells are not only used for drinking-water supply but also for irrigation. When assessing the development potential of wells with the community, it is important to place this in a wider context, including all water uses and their effect on water availability.

Rope and bucket: loose, through a pulley or on a windlass

a. Brief description of technology

Mostly used with hand-dug wells. A bucket on a rope is lowered into the water. When hitting the water, the bucket dips and fills itself and is pulled up with the rope. The rope might be held only with the hands, run through a pulley or be wound on a windlass. Sometimes animal traction is used in combination with a pulley. Improved systems use a rope through a pulley and two buckets, one on

each end of the rope. For water depths of less than 10 metres, one can use a windlass with a hose running from the bottom of the bucket to a spout at the side of the well. Even with this system and a protected well, hygiene is poorer than with a bucket pump.

Initial cost:	US$ 6 for a plastic bucket and 5-metre rope to US$ 150 for a windlass, hose and closed superstructure in Liberia (Milkov 1987).
Range of depth:	0 - 15 m (greater depths are possible).
Yield:	0.25 litre per sec at 10 m.
Area of use:	All over the world, mainly in rural areas.
Construction:	Buckets, ropes, pulleys and windlasses are manufactured locally; buckets and ropes also by larger industries.

b. Description of O&M activities

Operation

Lower and raise the bucket by paying out and pulling in the rope or rotating the windlass. One must be careful not to dirty the rope or bucket.

Maintenance

Preventive maintenance consists of greasing the bearings of the windlass or pulley. Small repairs are limited to patching of holes in bucket and hose, reconnecting the bucket hinge and fixing the windlass bearings or handle. All repairs can be done by local people and with tools and materials available in the

community or area. Other repairs and replacements mainly consist of replacing a bucket, hose, rope or part or all of the windlass. Woven nylon ropes may last two years, twined nylon or sisal ropes only last a couple of months. A good quality hose may last over two years and buckets, depending on material and quality, may last a year.

Organizational aspects

When people use their own rope and bucket, no extra organization is required. For community wells, usually a committee organizes the maintenance and cleaning of the well, maintenance of the windlass, etc. Most repairs can be paid with ad hoc fund-raising.

c. O&M requirements

Activity	Frequency	Human resources	Materials and spare parts	Tools and equipment
Grease axles of windlass or pulley	Every two weeks	Local	Grease or oil	Lubricator
Replace bucket	Each year	Local	Bucket, wire	Knife
Replace rope	Every two years	Local	Rope, wire	Knife
Replace hose	Every two years	Local	Hose, wire, rubber straps from tyres	Knife, tongs

d. Actors implied and skills required in O&M

Actor	Role	Skills
User	Lower and lift the bucket Keep site clean Warn in case of malfunctioning	No special skills
Caretaker	Keep site clean, do small repairs	Basic maintenance
Water committee	Organize well cleaning, collect fees	Organizing skills
Local artisan	Repair of bucket, windlass, well cover, etc.	Tinkering, carpentry
Shopkeeper/trader	Sale of rope, bucket, etc.	No special skills
External support	Check water quality, stimulate and guide local organization	Microbial analysis, extension work

e. Recurrent costs

These consist in occasional purchase of rope, bucket, hose, wire, etc. Occasional windlass repair costs are low. Annual per capita costs for rope and bucket in Upper Volta were reported to range from US$ 0.56 to 1.36 (Hofkes, 1983). These costs varied with the depth of the well and family size.

f. Problems and limitations

Frequent problems. Fast deterioration of bad quality rope. Sisal rope only lasts for a few months. Bucket falls into the well. To prevent this, communities can keep a spare bucket available and fit the bucket in a protective cage, for instance like the design described by D. Carty (1990). In windlass with hose systems the hose breaks frequently.

Limitations. Very poor hygiene, especially when the rope and bucket touch the hands or ground. Communal wells often tend to get more contaminated than family-owned wells. Therefore the latter should be aimed for where possible. Only suitable for limited depths, although examples are known of rope and bucket systems exceeding 50 metres.

Direct-action handpump

a. Brief description of technology

Direct-action handpumps are usually made of PVC and other plastics and installed on boreholes of limited depth. The user at the pumpstand directly moves the pump rod in an up-and-down motion, holding a T-bar handle. The plunger at the lower end of the pump rod is located under the groundwater level. On the up-stroke, the plunger lifts water into the rising main and replacement water is drawn into the cylinder through the foot valve.

On the down-stroke, the foot valve closes, and water passes the plunger to be lifted on the next up-stroke. The elimination of the mechanical advantage (which, for example, deep-well handpumps have through a lever or flywheel) restricts the application of direct-action pumps to the depth from which an individual can physically lift the column of water (about 12 m). The mechanical simplicity and the potential for low-cost, lightweight construction makes these pumps well equipped to meet VLOM (Village Level Operation and Maintenance) objectives.

Initial cost: Varying from about US$ 100 to over US$ 900 (1985 prices, Arlosoroff et al., 1987). Models that are particularly suitable for village level O&M cost

	less than US$ 150.
Range of depth:	0- 12 metres.
Yield:	0.25- 0.42 litre per sec at 12 m.
Area of use:	Rural and low-income peri-urban areas where groundwater tables are within 12 m from the surface.
Construction:	Blair, Ethiopia BP50, Malawi Mark V, Nira AF85, Tara, Wavin.

b. Description of O&M activities

Operation

The pump is operated by moving the handle up and down. As the plunger is located under water, no priming is needed. Adults and even children can pump, although if the water table is more than 5 metres it may be difficult for children. Pumpstand and site must be kept clean.

Maintenance

Maintenance of direct-action pumps is relatively simple and can be taught to users or caretakers, sometimes within a few hours. For preventive maintenance, usually only one or two persons are needed. Activities consist in checking pump performance and appearance of the water daily (if the water is cloudy with silt, the borehole must be cleaned). The pump should be taken apart and checked annually. Small repairs are the replacement of worn cupseals and washers, straightening of bent pump rods, and replacement of corroded lock nuts. For major repairs (e.g. broken pump rod or rising main, cracks in welding of metal

parts), more highly skilled persons may be needed.

Organizational aspects

O&M can very well be organized at community level. As maintenance is relatively simple, good organization will result in a reliable service.

c. O&M requirements

Activity	Frequency	Human resources	Materials and spare parts	Tools and equipment
Clean pump and site	Daily	Local		Broom
Check performance	Daily	Local		
Check whole pump	Annually	Local		Spanners, screwdriver
Replace cupseals and washers	Occasionally	Local	Cupseals, washers	Spanners, screwdriver
Replace pump rod and/or pump handle	Occasionally	Local	Pump rod, pump handle	Spanners, wrench
Replace cylinder and/or plunger and/or foot valve	Occasionally	Local or area	Cylinder, plunger, foot valve	Spanners, wrench, screwdriver
Repair rising mains	Occasionally	Local or area	PVC tubing, PVC solvent and sandpaper or galvanized iron tubing, teflon or hemp	Saw and file or two pipe wrenches
Repair pump platform	Annually	Local	Cement, sand, gravel	Bucket

Repair pump platform	Annually	Local	Cement, sand, gravel	Bucket, trowel

d. Actors implied and skills required in O&M

Actor	Role	Skills
User	Pump water Keep site clean Warn in case of malfunctioning	No special skills required
Caretaker	Keep site clean Do small repairs Check pump annually	Basic maintenance skills
Water committee	Organize maintenance collect fees	Basic organizational skills
Local merchant	Sell spare parts	No special skills
Local or area mechanic	Perform more major repairs	Welding
External support	Check water quality Stimulate and guide local organization	Microbial analysis, extension work

e. Recurrent costs

Apart from personnel costs, recurrent costs mainly consist in expenses for spare parts. In Ghana the annual costs recently were found to be US$ 3.35 per capita per year or US$ 0.61 per m^3, based on 15 litres/capita/day, including capital

amortization and other costs at an interest rate of 10% (Baumann 1993a). According to Reynolds (1992), a Tara handpump can be sustained for about US$ 0.10 per user per year.

f. Problems, limitations and remarks

Frequent problems. Worn washers, plungers and footvalve parts. Abrasion of the seal on the PVC cylinder and between the pump rod and rising main (nitrile rubber seals have proven substantially better). Broken or damaged handles.

Limitations. The maximum lift is limited to about 12 m. The forces required at the handle to pump the water may be too high for children, especially when the water table is deeper than 5 m.

Remarks. At least a moderate industrial base is recommended for manufacturing these pumps, because good quality PVC is needed. Some designs have a relatively low discharge (Peter. 1990).

Deep-well piston handpump

a. Brief description of technology

In a deep-well piston handpump, the piston is placed in a cylinder below the water level which is usually in the range of 15 to 45 metres below the ground. The pumping motion by the user at the pumpstand is transferred to the piston by means of a series of connected pumping rods inside the rising main. On the up-stroke, the plunger lifts water into the rising main and replacement water is drawn into the cylinder through the footvalve. On the down-stroke, the footvalve closes,

and water passes the plunger to be lifted on the next up-stroke. The pumping height is limited only by the effort needed to lift water to the surface. Nowadays most cylinders have an open top, which allows the piston and footvalve to be removed through the rising main for servicing and repairs while the rising main and cylinder can stay in place. The pump rods have special connectors allowing for assembly and dismantling with no or only very simple tools. The joints incorporate pump rod centralizers that prevent wear of the rising main. To a large extent improved models can be maintained at village level.

Initial cost:	For well depths of 25- 35 m, prices vary from about US$ 40 for a cylinder, plunger and footvalve set, to be installed under a locally made pump head, to over US$ 2300 for a complete pump with many stainless steel parts (1985 prices, Arlosoroff et al.). Most good pumps cost US$ 300- 500.
Range of depth:	15- 45 metres, depths up to about 100 m are possible
Yield:	0.25- 0.36 litre per sec at 25 m and 0.18- 0.28 litre per sec at 45 m depth
Useful life:	6 to 12 years
Area of use:	Rural and low-income peri-urban areas where groundwater tables are within 100 m, but preferably within 45 m from the surface
Construction:	Afridev/Aquadev, Bestobell Micro, Bush pump, Blair pump, India Mark II and III, Kardia, Tropic (Duba), UPM, Volanta, etc.

b. Description of O&M activities

Operation

Operation of the pump is done by moving a handle up and down or by rotating the handle of a flywheel. This can be done by adults and even children. Handle forces are usually kept within acceptable limits (depending on brand and lifting heights). Pump and site must be kept clean.

Maintenance

Preventive maintenance usually consists in checking pump functioning and cleaning the pump and site daily, greasing weekly, checking all parts of the pump stand monthly, and taking the whole pump apart for a check, cleaning the parts with clean water and painting the pump stand annually. Pump rods that show bad corrosion must be replaced. Under normal conditions, a galvanized steel pump rod needs replacement every five to six years. Rising mains consisting of galvanized iron have to be removed and checked and pipes with badly corroded threads must be replaced. Small repairs are the replacement of bearings, cupseals and washers, straightening bent pumping rods, etc. Major repairs may involve the replacement of the plunger, footvalve, cylinder, pump rods, rising main, pump handle, fulcrum, etc. With open-top cylinder pumps, all preventive maintenance activities can normally be executed by a village pump caretaker. For major repairs and problems, external support may be needed. Closed-top cylinder pumps often need special lifting equipment to pull up the rising main and cylinder for maintenance of parts down in the hole.

Organizational aspects

Most deep well pumps are too expensive for family use and will have to be used at communal level. The price of these pumps also means extra effort in fund-raising.

Communities have to organize themselves in order to maintain the pump in good working condition. Often a caretaker is appointed and a pump committee coordinates activities. External support is often provided by state or nongovernmental organizations but becomes costly. In some cases small private enterprises, paid directly by the communities, are now doing this job very satisfactorily.

c. O&M requirements

Activity	Frequency	Human resources	Materials and spare parts	Tools and equipment
Clean pump and site	Daily	Local		Broom, brush
Grease bearings	Weekly	Local	Grease or oil	Lubricator
Check pump stand parts	Monthly	Local		Spanner
Replace pump stand parts	Occasionally	Local	Nuts and bolts, bearings, pump handle	Spanners, screw-driver
Replace cupseals	Annually or less	Local or area	Cupseals	Spanners, wrench, knife, screwdriver etc.
Redo threads in pump rod or main	Occasionally	Local or area	Oil	Pipe threader, tackle
Replace footvalve, plunger or cylinder	Occasionally	Area	Footvalve, plunger or cylinder	Spanners, wrench
Replace pump rod or	Occasionally	Area	Pump rods or main	Spanners, wrench,

main			tubing	pipe threader
Repair platform	Annually	Local	Gravel sand, cement	Bucket, trowel

d. Actors implied and skills required in O&M

Actor	Role	Skills
User	Pump water Keep site clean Warn in case of malfunctioning	No special skills
Caretaker	Keep site clean Regularly check pump Do small repairs	Basic maintenance
Water committee	Supervise caretaker Collect fees	Organizing skills
Area mechanic	Perform more major repairs	Some special skills, depending on brand
External support	Check water quality, stimulate and guide local organization	Microbial analysis, extension work

e. Recurrent costs

The costs for preventive maintenance may range between US$ 12 and US$ 60 per pump per year for spare parts and materials (based on price indications from several brands). The recurrent personnel costs, in cash or kind (for caretakers, committee members, and, in case larger repairs are needed, mechanics or other

skilled people), will need to be added.

f. Problems, limitations and remarks

Frequent problems. Replacement of plunger seals is the most common repair needed. Problems with local manufacture, centring mostly around quality control, are often reported, especially in African countries. Hook and eye connections of pump rods tend to break more often than conventional connections. Rods also reportedly get disconnected or bend spontaneously sometimes. Especially where groundwater is corrosive, corrosion has been reported to affect the pump rods (if not made of stainless steel), the rising main (if galvanized iron), the cylinder, and the pump head bearing housing and other pump stand parts. Broken or shaky handles, mainly due to worn-out or otherwise affected bearings.

Limitations. The maximum lift differs by brand, varying between about 45 and 100 metres. The forces required to turn the handle of the pump may be high in certain cases, depending on the brand and on the depth of the well.

Remarks. The quality of the material used for the rising main should be as high as possible to reduce the number of repairs needed on this part. Many of these pumps can be produced in developing countries. Rigorous quality control is needed. Piston pumps may be driven by a windmill but often rotary pumps are preferred because of their lower starting torque.

Diesel engine

a. Brief description of technology

Diesel engines are very often used as a stationary power source. The main parts of the engine are the cylinders, pistons, valves, and crankshaft. The number of cylinders may vary from one to more than six. When air is heavily compressed by a piston inside a cylinder and diesel fuel is injected to it, this mixture comes to a controlled explosion that moves the piston. This movement is transferred to the crankshaft and from there it can be put to use, for example to drive a pump or an electricity generator. Valves in the cylinder regulate the inflow of fuel and air and the outflow of exhaust gasses. A high pressure pump forces the diesel fuel into the cylinder at the right moment. Diesel engines differ from petrol engines in that they use a different fuel, do not have spark ignition plugs and work at much higher pressures. Efficiency of diesel engines is higher and they need less maintenance than petrol engines. Engines can differ in size, speed (revolutions per minute), cycle (two-stroke and four-stroke cycles), cooling system (water or air), etc. Generally, low-speed four-stroke engines last longer and high speed two-stroke engines produce more power per kg of engine weight. Water-cooled engines generally need less maintenance than air-cooled engines.

Initial cost:	From US$ 200 per kW for 25 kW engines to US$ 600 per kW for 2 kW engines (1990 data, McGowan and Hodgkin, 1992); installation and other costs not included.
Range of power:	Commonly starting at 2 kW
Life cycle:	Average 20 000 hours of operation ranging from less than 5000 to 50 000 hours, depending on the quality of the engine, installation and O&M.
Area of use:	All over the world, especially for high-power needs and where no grid electricity is available.
Technology:	Kubota, Lister, Petter, Lombardini, Yanmar, etc.

Trademarks: Kubota, Lister-Petter, Lambardini and many others.

b. Description of O&M activities

Operation

The engine must be operated by a trained caretaker. Every engine has its own typical operating instructions. Before starting it, the levels of fuel, oil and cooling water (if not air-cooled) are checked. If these levels are low, extra fuel, oil or water has to be added. During operation, the fuel level, oil pressure, and engine speed are checked and also the functioning of the pump or generator. Some moving parts may need manual lubrication. When the engine is operated at very low speeds, its efficiency is low and carbon builds up rapidly in the engine, increasing the need for servicing. All data on liquid levels and running hours are written down in a log book.

Maintenance

Every day the outside of the engine must be cleaned, and in dusty conditions the air filter must be checked and cleaned. Some parts may need manual lubrication. In moderately dusty conditions, oil-bath air filters are cleaned once a week, dry-paper air filters a little less frequently. The engine is serviced for preventive maintenance according to the number of hours it has run. Every 50 hours, the clutch (if present) must be greased. Every 250 hours, clean all filters (replace if necessary), change oil, check nuts and bolts and exhaust pipe. Every 1500 hours, major service overhaul with decarbonizing, adjusting valve clearance, etc. If the engine is connected to a pump or generator with a V-belt, this will regularly need replacement. Once a year the engine house must be painted and occasionally

repaired. If a generator is present it will have its own maintenance needs. The Table below shows only the most important O&M activities.

Organizational aspects

Diesel engines require a lot of simple maintenance and, if this is done well, they can have a long service life. Therefore training and supervision of the caretaker are important. More complicated maintenance tasks and repairs have to be done by a well-trained mechanic with access to sufficient spare parts. Good organization will guarantee scheduled services at the right times and a quick response in case of breakdown.

c. O&M requirements

Activity	Frequency	Human resources	Materials and spare parts	Tools and equipment
Check liquid levels and add if necessary	Daily	Local	Fuel, engine oil, cooling liquid	Funnels, containers for liquids
Start and stop engine	Daily	Local		
Keep logbook	Daily	Local	Paper, pen	
Check air filter, clean or replace if necessary	Daily or weekly	Local	New dry paper filter, or kerosene and engine oil	Wrench
Check for oil and	Weekly	Local		

fuel leaks				
Tighten nuts and bolts	Weekly	Local		Spanners
Change engine oil	Every 250 hours	Local	Engine oil	Spanners
Clean or replace filters	Regularly	Local	Oil filter, fuel filter	Spanners, special tools
Decarbonize, clean injector nozzles, adjust valves, etc.	Every 500 to 2000 hours	Specialist		Spanners, brass wire brush, special tools
Replace drive belt	Regularly	Local	Drive belt	Spanners
Replace engine parts	Occasionally	Specialist	Nozzles, injectors, gaskets, bearings, fuel pump, etc.	Depending on part to be replaced
Repair engine mounting and housing	Occasionally	Local or area	Cement, sand, gravel, nuts and bolts, nails, galvanized corrugated iron sheets, wood, etc.	Trowel, bucket, hammer, chisel, saw, spanners, etc.

d. Actors implied and skills required in O&M

Actor	Role	Skills
Caretaker	Operate engine, keep logbook, perform minor service, warn in case of irregularities	Special training is needed for basic diesel O&M

Water committee	Supervise caretaker, collect fees, organize major service and repairs	Organizational skills
Area mechanic	Perform major service and repairs	Special training needed
External support	Train caretaker and area mechanics	Training and technical skills

e. Recurrent costs

Where fuel and spare parts are scarce, the costs for these may amount to 50% of the annual system capital cost (McGowan and Hodgkin, 1992).

f. Problems, limitations and remarks

Frequent problems. Excessive wear due to wrong O&M, neglect or misunderstanding. Rapid carbon buildup and low efficiency due to running the engine under full loading. Broken drive belts.

Limitations. Frequent maintenance. High fuel costs and difficulty to get fuel. From time to time a specialist mechanic is needed for service and repairs.

Remarks. Diesel engines are especially suited for high stationary power output. With good maintenance they are dependable energy sources. It is very important to select a brand of good reputation and locally available service and spare parts.

Chlorination in piped water supply systems

a. Brief description of technology

Chlorination is a chemical method for disinfecting water which kills nearly all pathogens and provides a barrier against reinfection. It can be applied as the last stage in a drinking-water treatment process or as the only measure when the water quality is already reasonably good. The most frequently used low technology methods are batch chlorination and flow chlorination.

For batch chlorination a concentrated chlorine solution is added to the water in a reservoir with inlets and outlets closed. The water is stirred and the chlorine is left to react for at least 30 minutes. After that, the outlets can be opened. When the reservoir is empty the outlets are closed, the reservoir is refilled and a new batch is disinfected. This method will not be discussed further in this fact sheet.

Flow chlorinators continuously feed small quantities of weakly concentrated chlorine solution to a flow of fresh water, often at the instream of a clear water reservoir. Usually a small reservoir containing the chlorine solution is placed on top of the water reservoir and the solution is administered close to the point where the fresh water comes in and turbulence guarantees good mixing. A special device like the floating bowl chlorinator enables precise dosage. Sometimes a special electric pump is used for this purpose. For on-site chlorine production, electrical devices can be bought that convert a solution of kitchen salt to a chlorine solution (Oliveira, Tavares and Meyers, 1995).

Chlorine doses must be monitored and adjusted to the water quality and quantity. For this purpose, small test kits are available. Chlorine-producing chemicals must be stored and prepared with care.

Initial cost: A chlorinator and hoses can cost as little as US$ 15. This excludes the cost of the tank for the concentrated solution and the construction costs of a protective shelter.

Yield: Generally 350 to 1400 m^3 of treated water per kg of 70% chlorine compound.

Area of use: Where drinking-water needs extra disinfection and chlorine is available.

Trademarks: Chlorine compounds have many trademarks.

b. Description of O&M activities

Operation

The chlorine tank has to be refilled with a freshly prepared solution once or twice a week. The flow rate has to be checked and adjusted if necessary. Operators must be very careful to avoid contact of chlorine compounds or solutions with eyes or clothes. In some cases, a logbook is kept with data on the amounts of chlorine applied and residual chlorine levels measured. Chlorination can easily be learnt.

Maintenance

Chlorinators regularly have to be adjusted and cleaned of chlorine salts. When hoses get affected by chlorine they have to be replaced. If a steel chlorine tank is used, it must be painted and checked for corrosion annually. Protective gloves and utensils used for the preparation of the chlorine solution occasionally need replacement, and the shelter of the chlorine solution tank needs maintenance.

Organizational aspects

Usually the water committee appoints a caretaker who is trained for the job. The chlorine compound has to be obtained through a merchant or the health department and an adequate supply of chlorine compound must be kept in stock. An external organization like a governmental health or water department will have to provide training for caretakers and monitoring.

c. O&M requirements

Activity	Frequency	Human resources	Materials and spare parts	Tools and equipment
Refill chlorine tank	Once or twice a week	Local	Chlorine compound, water	Spoon, scale, bucket, stirring rod
Adjust and clean chlorinator	Regularly	Local	Water	Measuring cup, stopwatch
Replace hose or chlorinator	Occasionally	Local	Hose, small tubes of plastic, glass etc., plug, bowl	Knife, nail
Paint steel tank	Annually	Local	Latex paint	Steel brush, paint brush
Check and adjust doses	Regularly	Area	Test medium, water sample	Test kit

d. Actors implied and skills required in O&M

Actor	Role	Skills

Caretaker	Refill chlorine tank and prepare solution, clean and adjust chlorinator, perform small repairs	Basic skills
Water committee	Supervise caretaker, collect fees	Organizational skills
Local health worker, shopkeeper or merchant	Provide or sell chlorine compound	No special skills
External support	Check residual chlorine in water and adjust doses, train caretaker	Basic testing and calculation, training skills

e. Recurrent costs

Recurrent costs for chlorine-producing chemicals in the USA are about US$ 7 per kg of available chlorine. In other countries this figure may differ substantially. One kg of available chlorine (1.4 to 4 kg of compound) is needed for disinfection of 500- 2000 m^3 of water. Cost of rubber gloves, hoses and other spare parts is generally low. Apart from this, there will be recurrent costs for the caretaker' s fee, monitoring and training.

f. Problems, limitations and remarks

Frequent problems. Bad quality hoses wear quickly. Some chlorine compounds are very sensitive to storage conditions and rapidly lose strength. If the chlorinator gets clogged or residual chlorine is not monitored, disinfection may not be sufficient.

Limitations. Chlorination does not kill all pathogenic organisms but is generally very effective. In alkaline water, pH above 8, chlorination is less effective. When the water contains a lot of organic matter or suspended material, pretreatment will be needed. High cost and unavailability of the chlorine compound can be serious limitations.

Remarks. Chlorination affects the taste of water and for that reason may be rejected by consumers. On the other hand, sometimes a chlorine taste is appreciated. The taste of chlorine in water is no proof of proper disinfection. Often a chlorine taste is caused by the application of too little chlorine.

Slow sand filtration

a. Brief description of technology

Slow sand filter water purification is a combination of biological, chemical and physical processes occurring when water slowly passes downwards through a bed of sand. Fine particles are filtered out, and in the sand and on top of the filterbed a population of micro-organisms develops which feed on bacteria, viruses and organic matter in the water. The filter reservoirs have drains on the bottom, covered with gravel and the filter sand. An inlet provides for smooth entrance of the raw water and an outlet structure leads the clean water from the drains to the clean water mains. During operation the filter sand is covered with a water layer of 0.3 to 1.0 m. For good functioning there must be a continuous flow in the range of 0.1 to 0.3 m/hour. For community use, filter reservoirs can be made of concrete, bricks, ferrocement etc. At least two filters are needed to provide continuous operation.

It is recommended to combine slow sand filters with a dynamic roughing filter pretreatment unit. When raw water quality is low, adding upflow roughing filters is recommended. Sometimes the water is chlorinated afterwards to prevent recontamination. For small-scale application, see also the fact sheet on household slow sand filter. With good operation and maintenance a slow sand filter produces water virtually free from harmful organisms.

Initial cost:	Data from rural India, in 1983, indicated US$ 60- 130 per m^2 of filter area. In Colombia, this was US$ 105 215 per m^2 in 1987.
Yield:	0.1- 0.3 m/hour or 0.028- 0.083 litres per sec per m^2.
Area of use:	All over the world.
Manufacturers:	Slow sand filters can be built by experienced building contractors or even by communities, with external technical assistance.

b. Description of O&M activities

Operation

Operation of a slow sand filter is crucial to its effectiveness. The flow of water must be maintained in the range of 0.1 0.3 m per hour to provide the organisms in the filter with a stable flow of nutrients and oxygen and give them time to purify the water. After several weeks to a few months the population of micro-organisms gets too dense and starts to clog the filter. Depending on the filter design, flow rates may have to be adjusted accordingly or the layer of supernatant water on the filter will get too high. The caretaker of a slow sand filter keeps a logbook with flow rates and operation and maintenance activities. Slow sand filters can be

operated and even monitored by communities, provided caretakers are trained well. It takes less than one hour a day for a caretaker to check the functioning and adjust the flow rates. Cleaning the site and other activities may take more time.

Maintenance

When flow velocities get too low the filter is drained and the top layer of the sand is scraped off, washed, dried in the sun and stored. After several scrapings the sand is restored, together with new sand to make up for losses during washing. It takes one day for several people to clean a filter unit. Hygienic measures must be taken every time someone enters a filter unit for maintenance or inspection. Valves must be opened and closed every two months to keep them from getting stuck. Any leaks must be repaired immediately. If well-designed and constructed, hardly any repairs of the filter tanks and drainage system will be needed, although valves and metal tubing may need occasional attention. Test kits are available which only require some basic training to monitor water quality.

Organizational aspects

A slow sand filter for community use requires some organization in order to have enough workers for scraping and resanding the filter units. A local caretaker will have to be trained and some other people may need training for water quality testing and to be able to replace the caretaker. It may take some time for people to get to trust that a green and slimy filter is capable of producing safe water. Apart from extra sand, some chlorine and test materials very few external inputs are needed. With proper external assistance, water organizations can become very independent in managing their water treatment.

c. O&M requirements

Activity	Frequency	Human resources	Materials and spare parts	Tools and equipment
Check inflow	Daily	Local		
Regulate flow	Daily	Local		
Keep logbook	Daily	Local	Logbook, pen	
Clean site	Daily	Local	Broom	
Scrape off sand, wash, dry and store	About every six weeks	Local	Water, disinfectant for tools, boots or feet	Wheelbarrow, hoe, rake, spade, rope, bucket, ladder, planks, broom, wash basin
Resand filter	About every 18 months	Local	Recycled and new sand, water, disinfectant for tools, boots or feet	Sieve, wheelbarrow, hoe, rake, spade, rope, bucket, ladder, planks
Repair valve	Occasionally	Local	Washers, spare valve	Spanners, screwdriver, wrench
Replace metal tubing	Occasionally	Local or area	Nipples and accessories, plumbing sealant or teflon, cement, sand	Steel saw, wrench, pipe threader, hammer, chisel, trowel, bucket
Disinfect filter outlets	Occasionally	Local	Chlorine	Bucket, brush
Analyse water	Regularly	Local or	Water sample, test	Test kit

quality		area	media	

d. Actors implied and skills required in O&M

Actor	Role	Skills
Local caretaker	Regulate flow, keep site clean, scraping and resanding	Fair understanding of filter process and hygiene, organizational skills
Water user or paid worker	Assist in scraping and resanding of filter units	No special skills
Water committee	Supervise caretaker, monitor water quality, collect fees, organize scraping and resanding	Organizational skills, basic water quality testing
Local plumber	Repair valves and piping	Basic plumbing
External support	Train caretaker, monitor water quality	Training and microbial testing skills

e. Recurrent costs

The caretaker’ s fee and the cost of additional sand are the main recurrent costs, assuming that the users occasionally do some of the work free of charge.

f. Problems, limitations and remarks

Frequent problems. If flow rates through the filter are too high, water quality drops. Excessive turbidity (>30 NTU) in the raw water can cause the filter to clog rapidly; in this case a prefilter may be needed. When water quality is very bad, may be formed in the lower layers of the filter. If water flow is harmful and badly tasting products like NH_3 and H_2NO_3 interrupted for more than a few hours, beneficial micro-organisms in the filter may die and filter action is disturbed. Smooth vertical surfaces can cause short circuits in the water flow, producing poor quality water.

Limitations. In some regions, sand is expensive or difficult to get. Slow sand filters require a substantial initial investment and dedicated operation and maintenance.

Remarks. After re-sanding a filter it takes a few days to ripen; in this period water quality is lower.

Public standpost

a. Brief description of technology

At a public standpost or tapstand people from several households can take water from one or more taps. Because they are used by many people and are often not so well taken care of, their design and construction must be sturdy compared with domestic connections. The standpost includes a service connection to the supplying water conduit, a supporting column or wall, and one or more 0.5-inch (or 1.25-cm) taps protruding far enough from this column or wall to enable easy filling of the water containers.

The taps can be a globe or a self-closing type. The column or wall may be of wood, brickwork, dry stone masonry, concrete, etc. Some standposts have a regulating valve in the connection to the mains, which can be set and locked to limit maximum flow. A water meter may also be included. A solid stone or concrete slab or apron under the tap and a drainage system must lead spilled water away and prevent the formation of muddy pools. A fence may be needed to keep cattle away. The residual pressure head of the water at the tapstand should preferably be between 10 and 30 metres and should never be under 7 or over 56 metres. The location and design of public standposts have to be determined in close collaboration with the future users.

Initial cost:	In 1995, the cost of a self-closing tap for 0.5 to 1-inch pipes was US$ 12 (UNDP/APSO, 1995). Cheaper taps can be found. Other costs depend largely on the standpost design.
Number of taps:	Usually 1 to 3, or more.
Users per tap:	Maximum 200 people.
Yield:	0.2- 0.4 litres per sec per tap.
Area of use:	Piped public water systems.

b. Description of O&M activities

Operation

Users clean and fill their containers at the tap. Bathing and washing of clothes is usually not permitted at the standpost itself. The tap site has to be cleaned daily and the drain inspected.

Maintenance

The drain must be cleaned at least once a month. Formation of pools must be prevented at all times. Occasionally, a rubber washer or other part of a tap may have to be replaced. The fence may need repair too. Serious cracks in the structure must also be repaired, and when wood rots it must be treated or replaced. Occasionally the tubing may leak or need replacement.

Organizational aspects

A caretaker or tap committee may be appointed to keep the tap functioning and the surroundings clean, and to regulate the amounts of water used. The committee may also collect the fees for water use. Sometimes water vendors fill their tanks at public tapstands at special rates for resale to people living far away.

c. O&M requirements

Activity	Frequency	Human resources	Materials and spare parts	Tools and equipment
Tap water	Daily	Local		Jar, bucket, can, etc.
Clean site	Daily	Local		Broom or brush
Inspect and	Daily	Local		Hoe, spade

clean drain				
Repair or replace valve	Occasionally	Local	Rubber or leather washer, gland seal, Teflon, flax, spare valve	Spanners, screwdriver, pipe wrench
Repair fence	Occasionally	Local	Wood, steel wire, nails	Machete, pliers, hammer
Repair valve stand, apron or drain	Occasionally	Local	Wood, nails, cement, sand, water, etc.	Hammer, saw, trowel, bucket, etc.
Repair piping	Occasionally	Local	Pipe nipples, connectors, elbows etc., oil, Teflon, flax or plumbing putty	Pipe wrench, pipe cutter, saw, file, pipe threader

d. Actors implied and skills required in O&M

Actor	Role	Skills
User	Tap water, keep site clean	No special skills
Caretaker or tap committee	Clean site, perform small repairs, collect fees	Basic skills
Communal water committee	Organize more major repairs, collect fees	Organizing and bookkeeping skills
Mason	Repair tapstand and apron	Masonry
Plumber	Repair piping and taps	Basic plumbing
External support	Monitor hygiene, train committee	Training skills and microbial

	members	testing

e. Recurrent costs

Recurrent costs for a tapstand comprise a few minor repairs to the taps every year and occasional repairs to the pipes, column, wall, apron or drain.

f. Problems, limitations and remarks

Frequent problems. Tampering, insufficient maintenance, and conflicts over use due to bad location of tapstand or unsolved social problems. Poor drainage. Often taps are not closed after use and even left open on purpose to irrigate a nearby plot. Tapstands at the tail end of a piped system often have insufficient water pressure.

Limitations. If people are willing to organize communal use and maintenance, the only limitation is the cost.

Remarks. Special attention should be given to how the water is handled after collection at the tapstand in order to prevent subsequent contamination.

O&M FACT SHEET

Ventilated improved pit latrine

a. Brief description of technology

Ventilated improved pit (VIP) latrines are designed to reduce two problems

frequently encountered by traditional latrine systems - smells and flies or other insects. A VIP latrine differs from a traditional latrine in having a vent pipe covered with a fly screen. Wind blowing across the top of the vent pipe creates a flow of air which sucks out the foul-smelling gases from the pit. As a result, fresh air is drawn into the pit through the drop hole and the superstructure is kept free from smells. The vent pipe also has an important role to play in fly control. Flies are attracted to light and if the latrine is suitably dark inside, they will fly up the vent pipe to the light. They cannot escape because of the fly screen, so they are trapped at the top of the pipe until they dehydrate and die. Female flies, searching for an egg-laying site, are attracted by the odours from the vent pipe but are prevented from flying down the pipe by the fly screen at its top.

VIP latrines can also be constructed with a double pit. The latrine has two shallow pits, each with its own vent pipe but only one superstructure. The cover slab has two drop holes, one over each pit. Only one pit is used at a time. When this becomes full, its drop hole is covered and the second pit is used. After a period of at least one year, the contents of the first pit can be removed safely and used as soil conditioner. The pit can be used again when the second pit has filled up. This alternating cycle can be repeated indefinitely.

Initial cost: Single-pit VIP family latrine: about US$ 70- 400.
Double-pit VIP family latrine: about US$ 200- 600. Prices include the cost of materials (60 80%), transport (5- 30%), and local labour (10- 25%). Prices depend on the pit volume; quality of the lining, slab and superstructure; extent to which locally available materials are used; and the country or region.

Area Rural or peri-urban areas, household and public use.

of
use:

b. Description of O&M activities

Operation

Operation of pit latrines is quite simple and consists in regularly cleaning the slab with water (and a little disinfectant if available) to remove any excreta and urine. The door must always be closed so the superstructure remains dark inside. The drop hole should never be covered as this would impede the airflow. Appropriate anal cleaning materials should be available in or near the latrine. Stones, glass, plastic, rags, and other non-biodegradable materials should not be thrown in the pit as they reduce the effective volume of the pit and hinder mechanical emptying.

Maintenance

Every month the floor slab has to be checked for cracks and the vent pipe and fly screen must be inspected to ensure they are not corroded or damaged. Rainwater should drain away from the latrine. Any damage should be repaired. Repair of the superstructure (especially light leaks) may be necessary too. When the contents of the pit reach the level of 0.5 metre below the slab, a new pit has to be dug and the old pit covered with soil. Another possibility is to empty the pit mechanically. With double-pit systems, the second pit is used when the first is full. The full pit can be emptied safely by hand after a period of a year or longer and is then ready for use again.

Organizational aspects

Where latrines are used by a single household, O&M tasks are implemented by the household itself or by hired workers. If two or more households use the latrine, arrangements for rotation of cleaning tasks have to be made and agreed upon to avoid conflict. Pits can only be emptied manually if their contents have been left to decompose for at least a year. In all other cases, either new pits have to be dug when a pit is full or the pit has to be emptied mechanically. If double-pit latrines are used, the users must fully understand the concept of the system in order to be able to operate it properly. User education has to cover aspects such as the reasons for switching after using only one pit at a time, use of excreta as manure, and the need to leave the full pit for at least a year before emptying. The users also need to know how to switch pits and how to empty the pit, even when they do not do these tasks themselves. Where these tasks are carried out by privately hired labourers, the latter must also be educated in the operational requirements of the system.

c. O&M requirements

Activity	Frequency	Human resources	Materials and spare parts	Tools and equipment
Clean drop hole, seat and superstructure	Daily	Household	Water, soap	Brush, bucket
Inspect floor slab, vent pipe and fly screen	Monthly	Household		
Clean fly screen and vent inside	Every one to six	Household	Water	Twig or long bendable

	months			brush
Repair slab, seat, vent pipe, fly screen or superstructure	Occasionally	Household or local workers	Cement, sand, water, nails local building materials	Bucket or bowl, trowel, saw, hammer, knife
Dig new pit and transfer latrine slab and superstructure (if applicable)	Depending on size and number of users	Household or local workers	Sand, possibly cement, bricks, nails and other local building materials	Shovels, picks, buckets, hammer, saw, etc.
Switch to other pit when pit is full	Depending on size and number of users	Household or local workers		Shovels, buckets, wheelbarrow, etc.
Empty pit (if applicable)	Depending on size and number of users	By hand: household or local workers (not recommended)	By hand: water	By hand: shovel, bucket
		By mechanical means: specialized service	By mechanical means: water, spare parts for machinery	By mechanical means: pit-emptying equipment

d. Actors implied and skills required in O&M

Actor	Role	Skills

User	Use latrine, keep clean, inspect and perform small repairs, empty full pit and switch over, dig new pit and replace latrine	Understanding of hygiene
Local unskilled workers (sweepers/scavengers)	Dig pits, transfer structures, empty full pits in double-pit systems, small repairs, solving small problems	Knowledge about the concept of a double-pit system (when working with such systems), knowing how to solve simple problems.
Local mason	Build and repair or transfer latrines	Basic masonry, latrine building
Health department	Monitor latrines and hygienic behaviour of users, train users	Training skills and knowledge on sanitation

e. Recurrent costs

These costs are usually very low, maximum about US$ 1 to 2 per capita per year, as normally maintenance activities are few (mainly cleaning) and can be done by the households themselves. Even if local labour has to be hired for digging a new pit, the recurrent costs per time unit and user are low although paying in full may pose a problem. The same applies to the cost of mechanical emptying of the pit. Emptying a double VIP latrine can be done by hand, either by the household itself or by hired workers. Sometimes the humus can be sold to farmers.

f. Problems, limitations and remarks

Frequent problems. Bad quality of the floor slab due to inappropriate materials or

improper curing of concrete. Inferior quality fly screens get damaged easily by the effects of solar radiation and foul gases. Improperly sited latrines can get flooded or undermined. Children may be afraid to use the latrine because of the dark or because of fear of falling into the pit. If the superstructure allows too much light to come in, flies will be attracted by the light coming through the squat hole and may fly out into the superstructure; this may jeopardize the whole VIP concept. Odour problems may occur during the night and early morning hours in latrines relying more on solar radiation for the air flow in the vent pipe than on wind speed. Leakages between pits can occur because the dividing wall is not impermeable or the soil is too permeable.

Limitations. In hard soils it may be impossible to dig a proper pit. Pits should preferably not reach groundwater level and latrines must be 15 to 30 metres away from ground and surface water sources. VIP latrines cannot prevent mosquitos from breeding in the pits. Families may not be able to bear the much higher costs for construction of a VIP latrine in comparison to a simple pit latrine.

Remarks. Cultural resistance to handling human waste may prevent some households from emptying their double pits themselves. Usually local workers can be hired to do the job.

Double-vault compost latrine

a. Brief description of technology

The double-vault compost latrine consists of two watertight chambers (vaults) to collect faeces. Urine is collected separately as the contents of the vault have to be

kept relatively dry. Initially, a layer of absorbent organic material is put in the vault and after each use, the faeces is covered with ash (or sawdust, shredded leaves or vegetable matter) to deodorize the faeces, soak up excessive moisture and improve the C/N ratio, which ensures that sufficient nitrogen is retained to make a good fertilizer. When the first vault is three-quarters full, it is completely filled with dry powdered earth and sealed so that the contents can decompose anaerobically. The second vault is used until it is three-quarters full and the first vault is emptied by hand, the contents being used as fertilizer. The vaults have to be large enough to keep faeces for at least a year in order to become pathogen-free. A superstructure is built over both vaults with a squat hole over each vault which can be sealed off. The latrine can be built in any place as there is no risk of pollution from the watertight chambers to the surroundings. Where there is rock or a high watertable, the vaults can be placed above the ground.

Initial cost:	US$ 35- 70 (in 1978 US$) in Guatemala (Winblad & Kilama, 1985). Prices include the cost of materials and local labour, construction with vaults of 0.3 m^3 each above the ground and a movable raised seat.
Area of use:	Areas where people are motivated to handle and use humus or human excreta as a fertilizer and where no water is used for anal cleansing.

b. Description of O&M activities

Operation

Initially some absorbent organic material is put in the empty vault after each use and, whenever available, wood ash and organic material are added. When urine is

collected separately it is often diluted with 3 6 parts of water and utilized as fertilizer. This may cause a health hazard and should be avoided. Adding lime or ash may help, but there is no guarantee that the urine will then be safe. Water used for cleaning should not be allowed to go into the latrine as it will make the contents too wet.

Maintenance

When the vault is three-quarters full, the contents are levelled with a stick, after which dry powdered earth is added till the vault is full. The squat hole is then sealed and the other vault emptied with a spade and bucket, after which it is ready for use. The removed contents can be used safely as a fertilizer. Householders may grow insect-repelling plants like citronella around the latrine.

Organizational aspects

Extensive investigation among potential users is needed to find out if the system is culturally acceptable and if they are motivated and capable of operating and maintaining the system properly. Prolonged support by the agency is needed to ensure that users understand the system and operate it properly.

c. O&M requirements

Activity	Frequency	Human resources	Materials and spare parts	Tools and equipment
Clean toilet and super structure, empty	Daily	Household	Water,	Brush,

urine collection pot			lime, ashes	water container
Add ashes or other organic material	After each defecation and whenever available	Household	Wood ashes and organic material,	Pot to contain the material, small shovel
Inspect floor, superstructure and vaults	Monthly	Household		
Repair floor, superstructure or vaults	When necessary	Household or local	Cement, sand, water, nails, local building materials	Bucket or bowl, trowel, saw, hammer, knife
Close full vault after levelling and adding soil, empty other vault, open its squat hole and add absorbent organic material before starting to use, store humus (or use directly)	Depending on size and number of users	Household or local pit emptier	Water, absorbent organic material	Shovel and bucket
Use humus as fertilizer	When needed	Household or other users	Humus	Shovel, bucket, wheelbarrow

d. Actors implied and skills required in O&M

Actor	Role	Skills

User, householder	Use latrine, remove urine, keep clean, inspect and perform small repairs, empty pit and switch	Understanding of hygiene, understanding of system and its O&M
Local mason	Build and repair latrines	Basic masonry, latrine building skills
Local pit emptier	Empty pit and switch, check system and perform small repairs	Understanding of hygiene, understanding of system and its O&M
External support organization	Investigate applicability, monitor users' O&M and hygienic behaviour and provide feedback, train users and local artisans	Research and surveying skills, training skills, knowledge of the system, organizational skills, communicative skills

e. Recurrent costs

When the system is well designed and constructed and O&M is done properly, the recurrent costs will be limited to the costs of small repairs and emptying of a vault when full. Sometimes the humus can be sold to farmers.

f. Problems, limitations and remarks

Frequent problems. Proper operation needs full understanding of the concept. This is often lacking and, as a result, the contents are left too wet, making the vault malodorous and difficult to empty. Where people are eager to use the contents as fertilizer, they may not allow sufficient time for the excreta to become pathogen-free.

Limitations. Only to be used where people are motivated to use human excreta as

a fertilizer. The system is not appropriate where water is used for anal cleansing.

Remarks. Double-vault latrines have been successfully used in Vietnam and Central America (Guatemala, Honduras, Nicaragua, El Salvador). When tried elsewhere they have usually been unsatisfactory.

Septic tank and aqua-privy

a. Brief description of technology

Septic tanks and aqua-privies have a water-tight settling tank with one or two compartments, to which waste is carried by water flushing down a pipe connected to the toilet. If there is a tank immediately under the latrine, excreta drop directly into the tank through a pipe submerged in the liquid layer (aqua-privy). If the tank is located away from the latrine (septic tank) the toilet usually has a U-trap. The systems do not dispose of wastes; they only help to separate the solid matter from the liquid. Some of the solids float on the surface, where they are known as scum, while others sink to the bottom where they are broken down by bacteria to form a deposit called sludge. The liquid effluent flowing out of the tank is, from a health point of view, as dangerous as raw sewage and remains to be disposed of, normally by soaking into the ground through a soakaway or with a connection to small-bore sewers. The sludge accumulating in the tank must be removed regularly, usually once every 1- 5 years, depending on size, number of users and kind of use. When sullage disposal is also in the tank, a larger capacity is required for both the tank and the liquid effluent disposal system. Connection to small-bore sewers may then be needed. Where high groundwater tables or rocky or impermeable undergrounds occur, this may also be the case. Every tank must have

a ventilation system to allow escape of explosive methane and malodorous gases (generated when bacteria decompose some of the sewage constituents) from the tank. Septic tanks are more expensive than other on-site sanitation systems and require sufficient piped water. Aqua-privies are slightly less expensive and need less water for flushing.

Initial cost: S$ 90- 375, including cost of labour and materials

Area of use: Rural or peri-urban areas where water is available.

Amount of water needed per toilet flushing: About 2 to 5 litres if a pour-flush pan or aqua-privy system is used.

b. Description of O&M activities

Operation

Regular cleaning of the toilet with soap in normal amounts is unlikely to be harmful, but the use of large amounts of detergents or chemicals may disturb the biochemical process in a tank. In aqua-privies the amount of liquid in the tank should be kept high enough to keep the bottom of the drop pipe at least 75 mm below the liquid level. A bucket of water should be poured down the drop pipe daily in order to clear scum (in which flies may breed) from the bottom of the drop pipe and to maintain the water seal. When starting with a new tank, adding some sludge from another tank will ensure the presence of micro-organisms so that the anaerobic digestion process can start directly and more completely.

Maintenance

Routine inspection is necessary to check whether desludging is needed and to ensure that there are no blockages at the inlet or outlet. The tank should be emptied when solids occupy between one-half and two-thirds of the total depth between the water level and the bottom of the tank.

Organizational aspects

Organizational aspects revolve around the reliability of the emptying services, the availability of skilled contractors for construction and repair, and the control of sludge disposal.

c. O&M requirements

Activity	Frequency	Human resources	Materials and spare parts	Tools and equipment
Clean squatting pan or seat and shelter	Daily	Household	Water	Brush, water container
Unblock U-trap when blocked	Occasionally	Household	Water	Flexible brush or other flexible material
Inspect if entry pipe is still submerged (for aqua-privies)	Regularly	Household	Water	Stick
Inspect floor, squatting pan or seat and U-trap	Monthly	Household		
Repair squatting	Occasionally	Household	Cement, sand,	Bucket or bowl, trowel,

Repair squatting pan or seat, U-trap or shelter	Occasionally	Household or local artisan	Cement, sand, water, nails, local building materials	Bucket or bowl, trowel, saw, hammer, knife
Control vents	Annually	Household	Rope or wire, screen material, pipe parts	Scissors or wire- cutting tool, pliers, saw
Empty tank	Every 1- 5 years	Service crew	Water, fuel, lubricants, etc.	Vacuum tanker (large or mini) or MAPET equipment, if possible

d. Actors implied and skills required in O&M

Actor	Role	Skills
User	Flush, keep clean, inspect vents, keep record of emptying dates, control contents in tank and contact municipality or other organization for emptying when necessary	Understanding of hygiene, basic bookkeeping, measuring skills
Sanitation service	Empty tank, control tank and vents, repair if needed	Skills to work with vacuum tanker or MAPET, basic masonry
Agency	Monitor tank performance, and tank emptying by emptying teams, train emptying teams	Training skills, monitoring skills, organizational skills and technical knowledge

e. Recurrent costs

The main cost involved is the emptying of the tank. The frequency of emptying depends on the amount of solids and liquids entering into the tank. The average annual O&M cost per capita measured over 39 countries was US$ 3.09, while in Brazil this cost was only US$ 0.67 (World Bank studies, quoted in Wilson H., 1988 (in 1987 US$).

f. Problems, limitations and remarks

Frequent problems. Many problems are due to inadequate consideration being given to liquid effluent disposal. Large surges of flow entering the tank may cause a temporarily high concentration of suspended solids in the effluent owing to disturbance of the solids which have already settled out. Leaking tanks may cause insect and odour problems in aqua-privies because the water seal is not maintained.

Limitations. Unsuitable for areas where water is scarce, where financial resources are insufficient for construction of the system, or where safe tank emptying cannot be done or afforded. Where not enough space is available for soakaways or drainage fields, small-bore sewers will have to be installed. Aqua-privies only function properly when they are very well designed and constructed and operated.

Remarks. Septic tank additives - such as yeast, bacteria, and enzymes - which are often sold for digesting scum and sludge" and " avoiding expensive pumping" have not proved to be effective.

Drainage field

a. Brief description of technology

Drainage fields consist of gravel-filled underground trenches called leachlines or drainage trenches, into which the liquid effluents coming from a septic tank are led through open-jointed (stoneware) or perforated (PVC) pipes, allowing the effluents to infiltrate into the ground. Initially the infiltration into the ground may be high, but after several years the soil clogs and an equilibrium infiltration rate is reached. If the sewage flow exceeds the equilibrium rate of the soil, eventually the sewage will surface over the drainage field..

Trenches are usually 0.3- 0.5 m wide with a depth of 0.6- 1.0 m below the top of the pipes. They are laid with a 0.2 0.3% gradient and contain 20- 50 mm diameter gravel with 0.3- 0.5 m of soil on top, with a barrier of straw or plastic sheets to prevent soil from washing down. They should be laid in series so that as each trench fills, it overflows to the next one. This ensures that each trench is used either fully or not at all. Trenches should be 2 m apart, or twice the trench depth if this is greater than 1 m. The bottom of a trench should be at least 0.5- 1 m above groundwater, bedrock or impermeable soil, and land slope should not exceed 10%. An equal area of land should be kept in reserve for possible extension or replacement of the drain field if it becomes clogged.

Compared to soakaways, drainage fields are often used where larger quantities of liquid effluents are produced.

Initial cost: No data found.

Area of use: Rural or peri-urban areas where sufficient water and space are available and the soil is permeable.

b. Description of O&M activities

Operation

Hardly any activities for operation are required, except observing if there are overflows and switching to a second drainage field every 6 to 12 months and fixing the dates of switching (if applicable).

Maintenance

Clean the tank outflow and check if it is still in order (if not, it should be cleaned or repaired). Deblocking of the delivery pipe may be necessary occasionally. Diversion boxes have to be cleaned from time to time. Control plant growth to prevent the roots from entering the pipes or trenches.

Organizational aspects

Minor O&M and bookkeeping are organized and executed by households, groups of households or a community organization. The government department needs to monitor the performance of drainage fields and train users (and their organizations), artisans and caretakers on the technical aspects of O&M.

c. O&M requirements

Activity	Frequency	Human resources	Materials and spare parts	Tools and equipment
Control plant	Regularly	Household or		Shovel, bucket, panga,

growth		caretaker		etc.
Switch to other drainage field	Once every 6- 12 months	Household or caretaker	Bricks or other material to block pipes	Tools to open diversion box
Deblock delivery pipe	Occasionally	Household, caretaker or local artisan	Water, piece of pipe, glue	Brush, shovel, long stick or flexible brush, knife, saw
Clean diversion boxes	Every month	Household or caretaker	Water	Shovel, brush
Check outflow of tank and clean	Once a month	Household or caretaker	Water	Brush, tools to open access hole

d. Actors implied and skills required in O&M

Actor	Role	Skills
Household user or local caretaker	Check outflow tank and performance of drainage field and control plant growth	Understanding of hygiene, some technical knowledge of tank and field
Local artisan	Repair parts if broken, remove obstructions in delivery pipes	Basic masonry, piping techniques, knowledge of system techniques and functioning
Agency	Monitor performance of systems, train users, caretakers and local artisans, provide assistance with big problems	Training skills, technical skills for repair and maintenance of drainage fields, monitoring skills

e. Recurrent costs

If the system is well designed, repairs are needed only very occasionally and the recurrent costs are therefore low.

f. Problems, limitations and remarks

Frequent problems. Overflowing leachlines, unpleasant odour, groundwater contamination, and social conflict (over siting of the drainage fields, odour, etc.).

Limitations. Unsuitable where the available space, water or financial resources for construction are insufficient, where the permeability of the soil is poor, or where bedrock or groundwater are at a shallow depth.

Remarks. Pressure can be taken off drainage fields by reducing the amount of water and solids flowing into the solids interceptor tank, e.g. by improved design of toilets which use less water or by preventing sullage from entering the tank.

Small-bore or settled sewerage

a. Brief description of technology

Small-bore sewerage (or settled sewerage) is a sewerage system that is designed to receive only the liquid fraction of household wastewater. The solid components of the waste, which settle, are kept in an interceptor tank (basically a single-compartment septic tank) which needs periodic desludging. Because the sewers only receive the liquid sewage, they are designed differently from conventional

sewers and have the following advantages:

- **the system needs less water because solids are not transported;**
- **excavation costs are reduced because the pipes can be laid at shallow depths and do not need to maintain self-cleansing velocity;**
- **material costs are reduced because the diameter of the pipes can be small (peak flow is attenuated by the interceptor tanks) and there is no need for large manholes;**
- **treatment requirements are reduced because the solids are kept in the interceptor tanks.**

The small-bore sewer system consists of a house connection, an interceptor tank, sewers, cleanouts/manholes, vents, sewage treatment plant, and lift stations (if there is no gravity flow). The system is most appropriate in areas that already have septic tanks but where the soil cannot (or can no longer) absorb the effluent or where densities are such that there is no room for soakaways. It also provides an economical way to upgrade existing sanitation facilities to a level more comparable to conventional sewers.

Initial cost: No recent data available, but the cost of the system in Brotas (Brazil) was calculated to be 78% cheaper than conventional sewerage; in Australia and the USA there were 25- 35% savings on the construction cost, but this excluded the cost of the interceptor tanks.

Area of use: Areas where individual soakaways are not appropriate (soil

conditions or densities), or areas where pour-flush latrines with soakpits can be upgraded to a small-bore sewer system.

b. Description of O&M activities

Operation

The main operational requirement is for the household to ensure that no solids can enter the system and that the interceptor tank functions properly.

Maintenance

Regular removal of the sludge in the interceptor tank. This has to be checked by the local sewerage authority because the system will be at risk if solids can enter. Also, removal of blockages, regular control of sewage pipes, and periodic flushing. The performance of accessories in the pipeline system such as cleanouts, manholes, (possible) lift stations, and ventilation points should be regularly checked and maintained.

Organizational aspects

These are mainly the organization of desludging services for the interceptor tanks. The principal problems related to desludging revolve around responsibility. Normally this lies with the property owners since the interceptor tank is on their property. Residents who are not owners have no incentive to desludge regularly. Desludging costs money and is inconvenient; sludge overflowing in the sewerage system will not directly affect the resident but will affect the communal sewer system downstream. If the sewer system is to work effectively, the responsibility

for tank desludging must fall on the organization which is responsible for maintenance of communal sewers. This organization must therefore bear the responsibility for treatment of the liquid from the sewers and the sludge from the interceptor tanks.

c. O&M requirements

Activity	Frequency	Human resources	Materials and spare parts	Tools and equipment
Clean grease trap	Daily/weekly	Household	Water	
Repairs and removal of blockages	When needed	Local workers or mechanic	Water, specialized materials and spare parts	Rodding tool, mechanic' s tool set
Check inspection chambers, appurtenances such as pumps and controls, vacuum and surge chambers, check valves	At least annually	Household or mechanic	Water	Basic tool set
Inspect street sewers	Regularly	Staff sewerage department	Specialized spare parts and materials	Specialized tools and equipment

d. Actors implied and skills required in O&M

Actor	Role	Skills
Householder	Check appurtenances within plot, assist community organization in maintenance of inspection chambers and common block sewer line	Understanding of system, some technical skills to check appurtenances
Local workers/mechanic	Check on-site appurtenances, perform small repairs, removal of blocks	Mechanical skills
Community organization	Organize regular checking of block sewer, notify agency of problems that cannot be solved, collect sewer charges	Understanding of system and bookkeeping skills, organizational skills, monitoring skills, communicative skills
Agency	Monitor system' s performance; keep regular contacts with community organizations and monitor their performance; train teams, mechanics, organization staff and community organization members, operate and maintain collector sewer, pumping station and treatment plant	Technical skills, administrative skills, organizational skills, monitoring skills, communicative skills, training skills

e. Recurrent costs

The main recurrent cost is the emptying of the interceptor tanks, which varies by

country and city. Other recurrent costs are for occasional flushing of the system, and repairs to maintain the system.

f. Problems, limitations and remarks

Frequent problems. Overflowing interceptor tanks because they have not been desludged in time. Blockages due to illegal connections bypassing the interceptor tank.

Limitations. Basically only suitable where septic tanks or other on-site systems are already in existence. If a new system needs to be installed, the shallow sewer system is more appropriate as it does not need an interceptor tank. The need for regular desludging of the interceptor tank calls for a well-organized sewerage department.

Remarks. The small-bore sewerage system needs a regular lay-out along back lanes or streets and a regular (even if limited) water supply system. These are absent in many low-income urban areas so that this system is not appropriate. So far, positive experiences with the system have all been in developed countries.

4.3 Spare parts provision in general

Instead of being one of the principal items on a check-list for sustainability, spare parts are often considered long after the technical and operational designs of a water supply or sanitation project have been decided. Spare parts provision should therefore be one of the deciding factors in technology selection, and not merely an unplanned consequence.

Spare parts can be defined as all the materials and items needed for the efficient and sustainable operation and maintenance of a water supply or sanitation system. They include:

- **Mechanical, hydraulic, electrical and electronic parts**
- **Tools**
- **Seals and washers**
- **Fuel, lubricants**
- **Paint**
- **Chemicals and other consumables**
- **Parts for essential transport and communication equipment**
- **Stationery**

4.4 Towards sustainable spare parts provision

Spare parts provision should be viewed as much from the demand side as from the supply side. Furthermore, sustainable spare parts provision depends also on strategic issues.

Such elements as the need for spare parts, their cost, and accessibility to spare parts are likely to influence the demand for spare parts. The following items should be considered in analysing this demand.

Need for spare parts

- **Assessment of the spare parts needed for a particular technical option, based on the technical characteristics and experience;**

- **Identification and inventory of the spare parts required, based on an accurate diagnosis of the problems most likely to occur, and their periodicity;**

- **Estimate of the spare parts needed for emergency repairs, accidents, or scheduled replacement;**

- **Variations in the frequency of this need, which communities should be aware of;**

- **Determination of proper timing for initiating repairs or replacement, in addition to the activities needed for simple maintenance of the system;**

- **Proper operation and maintenance, including effective preventive maintenance, in order to decrease the need for spare parts and their frequency;**

- **Interchangeability of some spare parts with other brands or technologies.**

Cost of spare parts

- **Can the cost of spare parts be met according to the tariff in place?**

- **Are the transport costs to obtain the spare parts included in the tariff? If not, how may these be met?**

- **What financial mechanisms are available in case the budget cannot cover the cost of spare parts?**

- **How does the cost of imported spare parts compare with similar parts produced locally or in neighbouring countries?**

- **How significant are exchange rate fluctuations on the cost of spare parts?**

Accessibility to spare parts

- **The distance between the village and the location of the shop which is selling the spare parts could be a factor influencing the demand for spare parts;**

- **This demand can be divided into three categories: 1) *frequently needed* spare parts, for which the sales outlet or mechanic should be in the village or as close as possible to it; 2) *occasionally needed* spare parts (every six months to a year), for which the distance should not be too far; 3) spare parts for *major repairs or replacement*, which may be ordered only from the regional or state capital.**

Factors likely to have an influence on the supply side are the availability and use of local materials and locally manufactured parts, location of marketing and sales points, and the profit perspective. The following items should be reviewed.

Use of local materials and locally manufactured parts

- **Making better use of materials from sustainable local sources;**

- **Having options for recycling and re-use or restoration of worn-out parts;**

- **Improving the reliability of the products (quality control) and the guarantees;**

- **Improving compliance with delivery deadlines through bonuses or other mechanisms, including penalties for delay;**

- **Encouraging local entrepreneurs or cooperatives to undertake the manufacture of spare parts;**

- **Making sure that the parts are guaranteed to remain available over a period of time;**

- **Learning from the experience of local manufacturers in other sectors;**

- **Balancing the proportion of imported spare parts with those manufactured locally;**

- **Offering incentives to local entrepreneurs (e.g. tax breaks, subsidies, preferential consideration against foreign suppliers, etc.).**

Quality of spare parts

- **Type of material used;**
- **Quality of manufacture, quality control;**
- **Interchangeability.**

Marketing and sales points

- **Encouraging local entrepreneurs, mechanics and shops to undertake the distribution and supply of spare parts, making them aware of the market potential and of the three categories of spare parts, as described above under "accessibility";**

- **Installing, where possible, a revolving fund for spare parts which is managed by a cooperative of users or mechanics;**

- **Making sure that the provision of spare parts through donor assistance or government channels is only temporary, and promoting the development of the private sector;**

- **Creating better links between the supplier and the user;**

- **Ensuring stock control, warehousing and sustainable outlet options.**

Perspective on profits

- **Involving local manufacturers, entrepreneurs, mechanics and shops by offering them some kind of benefits or profit (e.g. a defined profit margin, percentage of sales as own income, free stock for first sales, etc.);**

- **Making sure that donor-assisted or heavily subsidized prices do not "kill" the market, which means that market prices should be realistic right from the start in order to keep the system sustainable.**

Strategic issues for improving spare parts provision include efficient planning, whether to standardize or not, approaches to reducing the need for spare parts,

appropriate pricing policy, private sector involvement, and capacity-building.

Efficient planning

- **Planning for spare parts provision should start as early as possible in the project cycle.**

- **During a feasibility study, the project should assess the following: types of spare parts currently available locally or in neighbouring countries; the distribution network; type of equipment used in other projects and regions; the possibility of interchangeability; the possibility of local manufacture (in steel works and plastic works); the cost of spare parts to the customer; the level of import taxes; and national policy regarding spare parts provision.**

- **Implementation of the project should ensure the sustainability of spare parts provision on a long-term basis.**

- **After the construction phase, regular monitoring and evaluation of the equipment will help to determine the right time for repairs and rehabilitation within the economic life-span of the scheme; feed-back to the manufacturers on any weakness in the manufacturing of the equipment can help them.**

Whether to standardize

Several countries have chosen to standardize their choice of technology. There are positive as well as negative aspects which should be carefully considered (see Table below) before making a decision. Whatever the choice, it could be for a

certain number of years only.

FOR STANDARDIZATION	AGAINST STANDARDIZATION
• Wide use of the same item of equipment encourages agents and shopkeepers to store and supply these spare parts because of the "guaranteed demand" • Proliferation of brands and technology makes it difficult to organize spare parts availability • Prices and markets can be more easily researched • Users become familiar with one type of product or technology • Training of personnel can be standardized.	• The chosen technology does not respond totally to the needs and preference of the users • The market is closed for new, innovative and cheaper technologies • Poor incentive for involvement of the private and research sectors • Possible conflict with donor policies on technology choice • Competition between different brands can bring down prices and lead to improvements.

Approaches to reducing the need for spare parts

- **Better design of equipment to make them last longer.**
- **Better engineering to reduce operation and maintenance requirements.**
- **Better use and operation, by instructing the users on how to reduce wear and tear in the equipment.**

- **Introduction of a maintenance "culture" that promotes prevention rather than cure.**

Appropriate pricing policy

- **At the outset, donor assistance often includes subsidized prices for spare parts, which can have a negative effect later on. While this type of pricing by donors may be an incentive to local distributors initially, it raises false expectations and does not help to stabilize the market.**

- **Highly subsidized prices may not be sustainable over a long period.**

- **Pricing policy could include an agreed margin of benefits for the intermediaries up to the final outlet point, with prices which the users can afford and are willing to pay.**

- **Free price policies could open up the market for spare parts and their distribution, but will result in higher prices for consumers initially; however, competition between various brands could lead to a fall in prices.**

- **High taxes on imported foreign equipment for water supply could be reduced.**

- **Appropriate pricing of spare parts should be one of the key elements in the technology selection process.**

Private sector involvement

- **Is there a policy towards private sector incentives and promotion?**

- **Are there manufacturers of spare parts in other sectors, from whom lessons can be learnt and with whom resources and experiences can be shared?**

- **What are the opportunities for interregional cooperation in terms of shared markets, marketing, agreements on prices, or division of specialization?**

- **What are the possibilities for joint ventures with firms and manufacturers in developed countries, which will provide technical, entrepreneurial and managerial training?**

- **Can the links between manufacturers be strengthened?**

- **How can the informal private sector at local level contribute to the manufacture and provision of spare parts?**

Capacity-building

- **Assessment of training needs in the private sector for stock management, as well as manufacture, distribution, supply and use of spare parts.**

- **Opportunities for learning from the experiences in neighbouring countries and from partners.**

Unit 2: Analysis of participation

1. Outline of session

- **Objectives**

  - **To identify all the actors involved in the operation, maintenance and management of rural water supply and sanitation systems**

  - **To identify their roles, interest, problems and degree of participation**

- **Methodology**

  1. Introductory note
  2. Interactive group exercise
  3. Concluding remark

- **Materials**

  √ Overhead transparencies
  √ Flip chart and masking tape
  √ Overhead projector, screen or white wall

- **Handouts**

  √ Background information

2. Notes for the facilitator

Introductory note

The object of operation and maintenance is to deal with people and institutions on technical issues. This session aims to identify all the actors who are directly and indirectly involved in the operation and maintenance of water systems, their roles and interests (interests can be contradictory or complementary between different actors), and their major problems.

The work in this session and the next will involve the whole group. Different seating arrangements should be made, because the participants will not have to take down notes or carry out any special exercises. Tables are not required, and the chairs should be placed in a semi-circle facing a wall. The results of the two sessions, when completed, should be distributed to the participants.

Analysis by participation is an integral part of the OOPP (Objective Oriented Project Planning) analytical method. A full explanation of the methodology is given in the supporting material below. Some elements have been adapted especially for this course.

Before the session, the facilitator puts up sheets of paper (craft paper or flip chart sheets) on the wall and draws the framework of a Table for the participation analysis. Participants will only need their marker pens.

Group exercise on analysis of participation

Once the framework has been explained, the facilitator will proceed in three steps:

Step 1: Ask the group what actors are involved in the operation, maintenance and management of rural water supply and sanitation systems. The analysis can be carried out for either water supply or sanitation services, or both. The choice

depends on the previously identified demand and needs of the group. All contributions are made on cards, on which the name of an actor is written down, and these are placed within the Table on the wall. The participants may assist the facilitator in writing down the names of the actors. Some of the cards can be grouped if necessary.

Step 2: The group is asked to give the main roles of each major actor and follows the same procedure as in Step 1. See background information (below) for further details.

Step 3: The participants are divided into groups corresponding to the major groups of actors (national level, provincial/district level, local level, etc.) that have been identified. They then describe the interests and problems of each group. All the results are written down on the cards which are placed within the Table. Each group then presents its cards and explains the meaning behind each one. Some rules about how to write the statements on the cards are given below:

Rule 1:	**CARDS SHOULD BE WRITTEN WITH CAPITAL LETTERS**
Rule 2:	**CARDS SHOULD BE WRITTEN IN A LEGIBLE WAY**
Rule 3:	**CARDS SHOULD DESCRIBE ONLY ONE IDEA**
Rule 4:	**CARDS SHOULD HAVE NOT MORE THAN THREE LINES**

The next session will describe how to present the statement of problems in an appropriate way. The facilitator should accept the statements given on the cards; however, if their formulation should be unclear, he could ask for clarification or reformulation.

Concluding remark

The facilitator goes over the whole Table, highlighting the main roles, interests and problems that have arisen. The last column ("Present degree of involvement") can be filled in at the same time, following discussions with the group.

The facilitator will point out that this analysis has shown that O&M is concerned with a large number of actors and that it is important to see how all of them can cooperate in an optimal and effective way. The initial identification of problems is the starting point for the next session, which deals with the analysis of constraints.

3. Overhead sheets

There are no overhead sheets because the Table for the analysis of participation should be prepared on a large sheet of paper which is put up on a wall. For details, see below.

4. Background information

An analysis of participation can rapidly show that various actors are involved in the operation and maintenance of rural water supply and sanitation systems. The analysis consists in listing all the actors involved at various levels, highlighting their roles in operation, maintenance and management, their interests, the main constraints each actor is facing, and their degree of involvement, as shown in the Table below.

Actors/group	Role in O&M of	Interest	Problems	Degree of

Actors, group	**Role in sector**	**Interest**	**Problems**	**Degree of involvement***	
	actors				
				Present	Future
National level					
Provincial/district level					
Local and community level					

*** Three degrees: 1, little involvement; 2, medium involvement; 3, major involvement. Future involvement should be filled in after the decentralization policies have been reviewed.**

Roles usually include policy-making for maintenance; sector planning and programming for maintenance; coordination; budget allocations; follow-up and monitoring; normative control; regulation; training; technical assistance; tariff setting; payment of services; day-to-day operation of the system; preventive maintenance; small repairs; major repairs; rehabilitation; manufacture of spare parts; provision of spare parts.

This analysis can be summarized in the Table below, which gives an overview of the degree of involvement of the major actors in the operation and maintenance of water supply and sanitation systems.

	Degree of involvement		
Major actors	**Little**	**Medium**	**Major**
National institutions			

Provincial institutions			
Local authorities			
Community organizations			
Users			
Private sector and NGOs			
External support agencies			

The above analysis can also be done in a more detailed way by analysing the degree of involvement of each actor for each role, as identified in the first Table.

Unit 3: Analysis of constraints

1. Outline of session

- **Objectives**
  - **To further identify problems linked to O&M**
  - **To analyse these problems in a logical way**
  - **To draw a problem tree**
- **Methodology**
  1. **Introductory note**
  2. **Focused discussion**
  3. **Interactive group exercise**

- **Materials**

  √ Overhead transparencies
  √ Flip chart and masking tape
  √ Overhead projector, screen or white wall
  √ Large sheet of paper (craft paper), hung on the wall for the problem tree exercise
  √ Cards of various colours (code is important: for example, yellow for problems)

- **Handouts**

  √ Copies of transparencies, background information

2. Notes for the facilitator

Introductory note

The present session is directly linked to the previous one. The OOPP (Objective Oriented Project Planning) methodology will now be introduced for application in this course (see below, background information and overhead sheets). This adaptation of the original methodology provides a flexible management and analytical tool. The session deals with problem analysis in the context of operation and maintenance of water supply and sanitation systems; other activities will be developed later in the course. It should be noted that the full use of the methodology is not essential, especially in a training session to work on a situation analysis. OOPP is not an end in itself, it is just a tool.

Focused discussion

Before starting with the OOPP methodology, the participants will be asked to indicate the planning tools which are being used in their professional setting. This list of tools will be written on the board by the facilitator, who will ask for comments from the participants.

Interactive group exercise

The group should have the same informal seating arrangements as in the last session. The facilitator will proceed in the following way:

- **Problems which are linked to operation and maintenance of water supply and sanitation systems are formulated. For this exercise, a large group can be divided into smaller subgroups, who will have to prioritize the problems and produce a maximum of seven cards; some of these problems could come from the analysis in the previous session, with others added.**

- **All the subgroups should clearly understand each problem; the facilitator may have to rewrite some of the cards.**

- **All the identified problems are put up on one side of the sheet on the wall in order to leave enough space for the actual analysis.**

- **The analysis starts by asking the participants which of the problems could be direct causes of the main problem for "poor O&M", until all the problems have been examined and linked to form a tree.**

- **The analysis also examines the effects of poor O&M; if some problems have not been highlighted, the group can do so now.**

- **The whole logic of the tree can be checked in terms of cause-effect relationships.**

- **At the end of the analysis, lines should be drawn linking the cards in order to visualize the relationship between problems, thereby building an objective tree.**

This session is highly participatory and the facilitator should be careful to keep good track of the time. The aim is not unanimous agreement on a hypothetical situation, but an acceptable compromise by the group. At this stage, the object is to examine the main problems in order to see how they are interrelated. The participants will have the opportunity to develop this in more detail during their individual assignments later in the course.

3. Overhead sheets: Sheet 1

OOPP
Objective Oriented Project Planning

1. Analytical phase

2. Planning phase

Overhead sheet 2

1. Analytical phase

a. Analysis of participation
b. Analysis of problems
c. Analysis of objectives
d. Analysis of alternatives

2. Planning phase

a. Development of planning matrix
b. Identification of assumptions
c. Identification of activities
d. Formulation of indicators
e. Estimation of costs and human resources needs

f. Time planning

Overhead sheet 3

Problem analysis

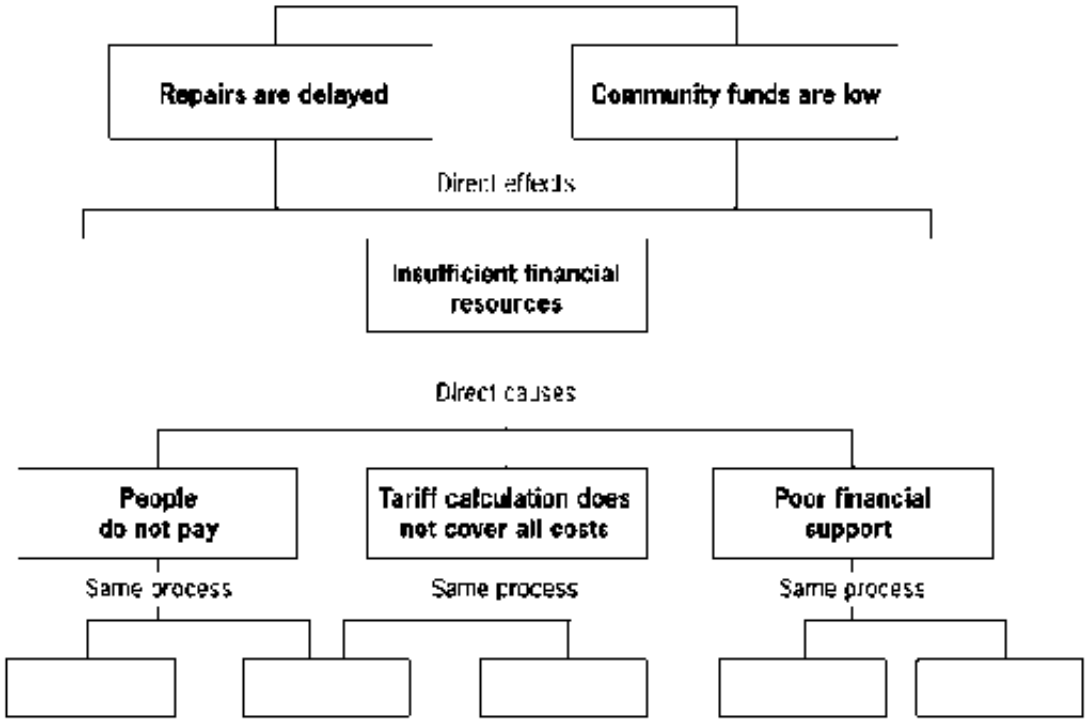
1 Identification and formulation of problems
2 Selection of an essential" problem
3 Identification of the direct causes of this problem
4 Identification of the direct effects of this problem
5 Continuation of the identification of cause-effect relationships

6 Control of global coherence

7 Drawing of lines to create a problem tree

Overhead sheet 4

Cause-effect relationships



Figure

4. Background information

4.1 The importance of problem analysis

One of the first tasks for a manager or a group of persons is to understand and assess the present situation. There are many different ways to go about this - reading reports and studies which have been written on a particular project; holding a series of interviews and meetings, and asking staff about their perceptions on the situation; making field visits in order to visualize the situation; deciding to analyse successes and focus on them only.

Experience has shown that good plans are based on an appropriate understanding of a situation, which is based not only on an analysis of successes, but also of constraints and problems. However, many managers will limit themselves only to the identification of problems, and omit their analysis. Furthermore, there are often as many interpretations of a problem as there are professionals.

Without denying the positive aspects of other working methodologies, this methodology proposes to assess a situation on the basis of a common understanding of the problems. It is simple, participatory, democratic and motivating. It allows a group of professionals at different levels, from different departments or sectors, to reach consensus on the situation, which is vital for the effective implementation of a plan. The logical sequential analysis shows that problems are interrelated and cannot be isolated.

4.2 What is a problem?

According to the Collins Cobuild English Language Dictionary, a problem is *a situation or a state of affairs that causes difficulties for people, so that they try to*

***think of a way to deal with it*.**

People do not always have the same perceptions and vision of a problem, since they belong to different cultures and have different priorities in their working or living environments. However, the above definition helps to focus our vision on what is a problem.

It *causes difficulties for people, so that they try to think of a way to deal with it*. A problem is based on a real, existing situation, which becomes troublesome in a way that one has to react to it. Therefore, a problem is not an interpretation of a situation, it is a fact, a reality. Furthermore, it is significant enough that people do want to react to it, thus avoiding minor troubles which life is usually filled with anyway.

Many people will identify a problem in terms of a desired situation which they do not have, visualizing a problem as an absent solution. For example, some will say that "no equipment", "no vehicle" or "no money" are problems while analysing a situation of long delays for repairs. This could be hiding the fact that there is poor planning, that villages are far away, that tools and equipment are obsolete, that the project is understaffed, that spare parts are not available, etc. However, lack of equipment or poor budget allocations could also be a reality.

In this course, we will consider problems with a negative formulation, since this helps to raise an issue, a challenge to be met. A formulation just stating "spare parts" does not raise an issue, and does not say what is wrong, although spare parts can be a problem. This could be formulated as "poor availability of spare parts", or "high cost of spare parts", etc., depending the situation.

In summary, we will define a problem as:

1. **A real, existing situation**
2. **Significant**
3. **Preferably not an absent solution**
4. **A negative formulation**

4.3 The OOPP methodology

This methodology was first developed in 1983 by the German Organization for Development Cooperation (GTZ). It combines the logical framework tool with new communication techniques (Metaplan) into an analytical and planning tool called Objective Oriented Project Planning (OOPP, or ZOPP in German). This is now being used as a major planning tool by the great majority of agencies involved in development cooperation. Other planning tools are also proposed in this course.

OOPP is based on a logical sequence of reflection, and the team work approach is its essential feature. It uses a strong visualization tool, i.e. cards, in order to see what would otherwise be abstract. The result of the thinking process is accepted by the group. The analytical method is based on the analysis of a logical sequence of cause-effect relationships between various problems as will be exposed later.

OOPP is composed of two phases: an analytical phase and a planning phase.

The analytical phase comprises participation analysis, problem analysis, objective analysis, and an analysis of alternatives.

The planning phase consists in the development of a planning matrix,

determination of assumptions and conditions, determination of activities, formulation of indicators, estimation of financial and human resources needed, and the development of a chronogram (for timing of activities).

What are the advantages of the methodology?

- **Reaches a common understanding of problems**
- **Clarifies cause-effect relationships**
- **Provides clear planning documents**
- **Allows the participation of various staff and professionals, as well as beneficiaries of the project**
- **Establishes a consensus**
- **Easier to implement because of broad acceptance.**

What are the limitations of the methodology?

- **Truth is not only rational and logical; the methodology puts aside all intuition, contradictions and feelings.**
- **Can lead to a simplified "linear" representation of reality.**
- **The whole planning depends on an adequate and accurate problem analysis.**

- **Creative thinking only done for the problem analysis, but gets lost in the mechanical sequences afterwards.**

- **The emphasis on problems can put a shadow on the perception of existing potentials and successes.**

- **Certain groups are not familiar with an abstract and logical analytical sequence of thinking, which can create problems in its application.**

- **Needs a good and experienced facilitator.**

4.4 How to analyse problems

After the problems have been identified and listed by all the participants, the group is asked to select one problem as essential, which will be used to start the analysis. Criteria of selection can be: most pressing problem, or most frequently occurring problem. As an example for illustration, we have chosen the problem of "insufficient financial resources".

From the listed problems, the group then identifies those that are the main causes for this essential problem, and are directly linked to it. It is possible to formulate additional problems if they are not all present yet. It is also possible to reformulate some cards, which appear to be too vague. It is also possible to eliminate cards that appear to be totally out of context. The question to be asked in order to find the direct causes, is WHY?

In a second step, it is now proposed to select from among the list of identified problems, those that can be the effects of the essential problem, and are directly

linked to it. Problems can be added, or eliminated as shown above. The question to be asked in order to find the direct effects, is WHAT are the direct consequences of this essential problem? What will it lead to? This process is then repeated for each cause. What are the causes of this problem? Same applies for the effects, until all the cards have been placed. Lines are then drawn showing the relationship between each card. The final result is a problem tree. There is no perfect problem tree. All problem trees are different, since all groups are different. It just represents the consensus and understanding of a particular situation for a given group, at a given time, in a given context.

Unit 4: Analysis of objectives

1. Outline of session

- **Objectives**
  - **To identify objectives linked to O&M**
  - **To analyse these objectives in a logical way**
  - **To draw a problem tree**
- **Methodology**
  1. **Introductory note**
  2. **Interactive group exercise**
  3. **Concluding remark**
- **Materials**

√ Overhead transparencies
√ Flip chart and masking tape
√ Overhead projector, screen or white wall
√ Large sheet of paper (craft paper), hung on the wall for the problem tree exercise
√ Cards of various colours (code is important: for example, green for problems)

- **Handouts**

√ Copies of transparencies and background information

2. Notes for the facilitator

Introduction

This session is the immediate follow-up of the problem analysis. It looks into the future on the basis of an analysis of the present situation, the problem analysis.

Interactive group exercise

The group exercise is in two parts: 1) construction of the objective tree; 2) selection of a strategy.

1) Using the problem tree, the facilitator asks the participants to restate the negatively formulated problems into objectives which are positive and achievable. Avoid statements of objectives with an ultimate or long-term improvement, but indicate, on the basis of the problem analysis, an improved situation. For example,

do not indicate the problem of lack of funds as plenty of funds, but rather as improved financial situation, etc.

It may be that some problems cannot be changed into objectives, because the project will not be able to solve them, e.g. "corruption". These cards in the exercise will remain as problems, even in the objective tree.

It is important to use cards of two different colours for objectives and problems.

The facilitator, with the help of the participants, can rebuild an objective tree, similar to the structure of the problem tree. However, they will have to look at the means-end relationship (as opposed to cause-effect for problems). It can very well be that the logic is not always the same and that some analyses need to be examined again; also, other objectives may have to be added in order to complete the analysis.

The end product is an objective tree, in which the facilitator can circle the various entities that appear, such as "community", "technical aspects", "institutional support", etc.

2) The selection of a strategy consists in the selection of objectives. It would be impossible for a project to tackle all the objectives which are formulated in the objective tree, mainly for the following reasons:

- **All the objectives are not within the mandate and responsibility of a project.**
- **There are not enough financial and human resources to work on all objectives.**

- **The project has to respond to some priority or urgent issues first.**

The management and staff will therefore have to choose and prioritize in a participatory way. The selection process can be performed in the following way:

- **Identify those objectives which are not within the mandate and the responsibility of the project (in this case, it might be difficult because the project is hypothetical).**

- **Identify key objectives (maximum seven) which can greatly influence the main objective, i.e. "Improved O&M". These objectives should generate a maximum impact for a minimum input of resources, which are limited; it could be that the main objective is not completely resolved, but the chosen objectives will greatly contribute to it.**

Procedure. The facilitator asks the participants to form small groups of three persons. Each group will have the task of identifying a maximum of seven objectives which will contribute to the main objective. They will also have to give a priority to each objective.

After the objectives have been chosen, the facilitator draws the following Table on the board:

Selected objectives	Number of groups who selected this objective	Priority given by the group
1.		
2.		

3.		
4.		
5.		
6.		
7.		

This Table, when filled in, will allow a participatory decision to be made on which objectives to choose. The final selection will correspond to the objectives which obtained the best score, taking into account the priority as well.

Conclusion

The project has now selected precise objectives to work on, which are based on an analysis of a real situation.

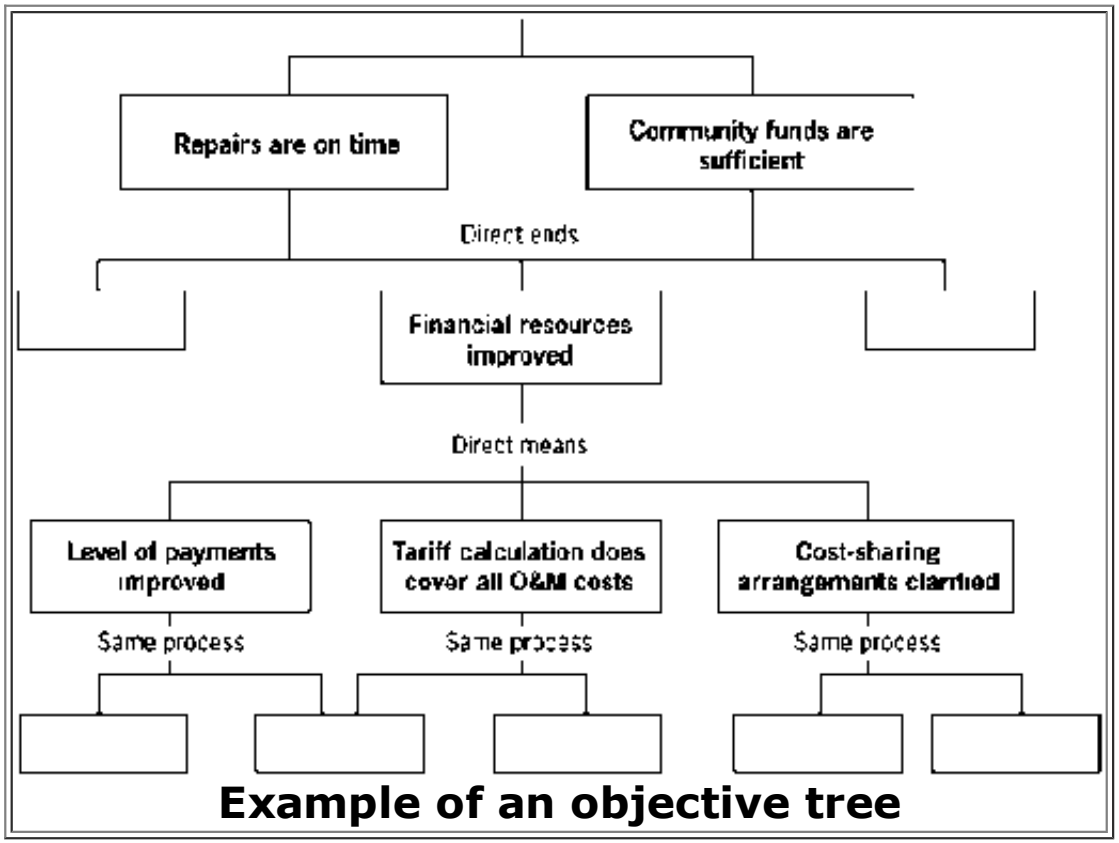
3. Overhead sheets: Sheet 1

How to do an objective tree
Step 1: Reformulate all negative conditions into positive attainable conditions
Step 2: Check whether rewording has led to unrealistic or ethically questionable statements
Step 3: Examine the means ends" relationships, thus derived to assure the validity and completeness of the tree; add cards if necessary
Step 4: Draw lines between all objectives showing relationships and finalize the objective

tree

Step 5: Circle different groups or entities which appear within the objective tree and give them a name

Overhead sheet 2



Example of an objective tree

4. Background information

4.1 Discussion on alternatives: identifying potential alternative solutions

The chief criterion when evaluating and selecting alternatives is whether the

project is realistic and more beneficial than problematic. The following aspects can be significant:

- **Priorities in policy development**
- **Specific conditions in the country**
- **Suitability of the chosen project to the donor agency and the national departments which support it**
- **Availability of funding**
- **Project's experience in the region or sector**
- **Available manpower**
- **Complementary or competitive activities of other projects.**

The choice between alternatives will be determined by cost-benefit analyses, additional analysis of various interest groups, and management discussions and decisions.

Module 3: Towards sustainable operation and maintenance

Unit 1: Linking technology choice with operation and maintenance

1. Outline of session

- **Objectives**

- **To raise awareness on operation and maintenance criteria that influence technology choice**

- **To become familiar with the processes that influence technology choice for community water supply and sanitation facilities**

- **Methodology**

  1. Introductory note
  2. Plenary discussion on criteria
  3. Group exercise on technology selection process
  4. Conclusion

- **Materials**

  √ Overhead transparencies
  √ Overhead projector, screen or white wall
  √ Flip chart and markers

- **Handouts**

  √ Copies of transparencies
  √ Exercise sheet
  √ Extracts from background information

2. Notes for the facilitator

Introductory note

Module 3 deals with the main issues that influence effective operation and maintenance of water supply and sanitation services, including technology choice. The latter is the first determining factor for effective operation and maintenance. Indeed, the type of technology and its selection are likely to have an impact on future operation and maintenance activities. This session highlights the criteria as well as processes that link technology choice with operation and maintenance.

Plenary discussion on criteria

The facilitator draws 10 columns on the board, five for water supply and five for sanitation, which correspond to the following sustainability factors: 1) technical aspects; 2) community aspects; 3) environmental aspects; 4) institutional and legal aspects; 5) other aspects. Past experience has shown that participants like to add financial factors to this list, even though financial factors are implicit in all the other factors. The facilitator asks the participants with respect to each column, "What are the important O&M criteria to consider during the planning stage?", and writes down their answers. If needed, the facilitator can add the information given below (see background information).

Group exercise on technology selection process

The facilitator divides the participants into two groups for 1) water supply technology choice, and 2) sanitation technology choice. Each group receives a set of prepared cards (A4 size, divided into three), describing typical activities involved in the process of technology selection. The cards should be arranged in a logical way. This exercise shows how technical and social factors should be integrated. Each group discusses the best way to arrive at a choice, and presents

the results in a plenary session. The facilitator can use the model given under background information to propose some feasible and realistic alternatives. The cards can be made using the text in the exercise sheets. As participants usually find it useful to keep a record of all the exercises, it is recommended to have secretarial support to record these exercises and distribute a copy to all the participants.

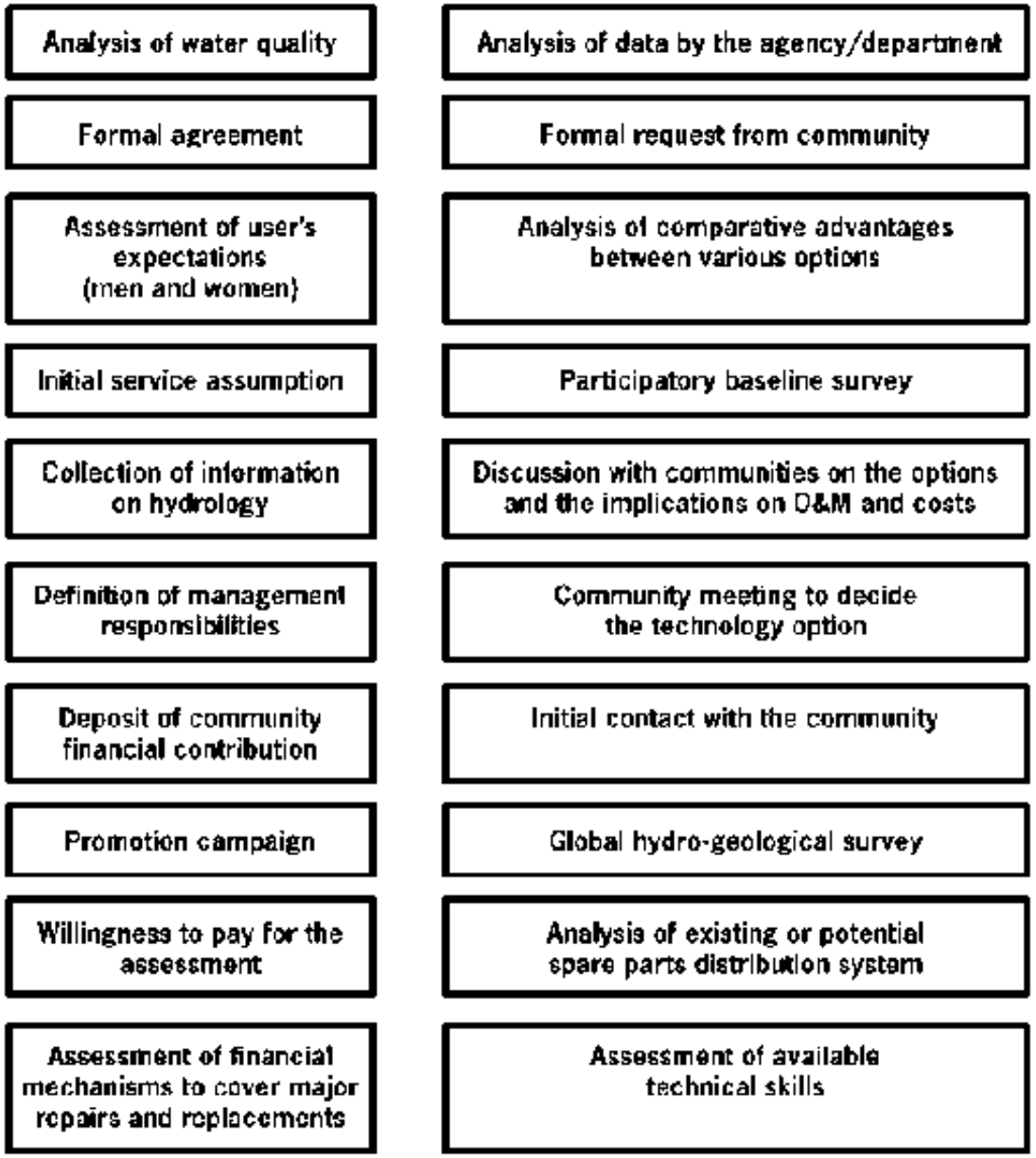
Conclusion

Linking technology choice with operation and maintenance is a key factor for sustainability; the resulting choice depends on the use of appropriate criteria and the selection process.

3. Exercise sheets: Sheet 1

Process of water supply technology choice

The facilitator should prepare beforehand a set of cards as described below, leaving some blank ones for additional activities if needed, and distribute a complete set to the group. The group will have to organize the cards in a logical sequence (some activities can be done in parallel with others). All these activities have a definite direct or indirect impact on future O&M activities.

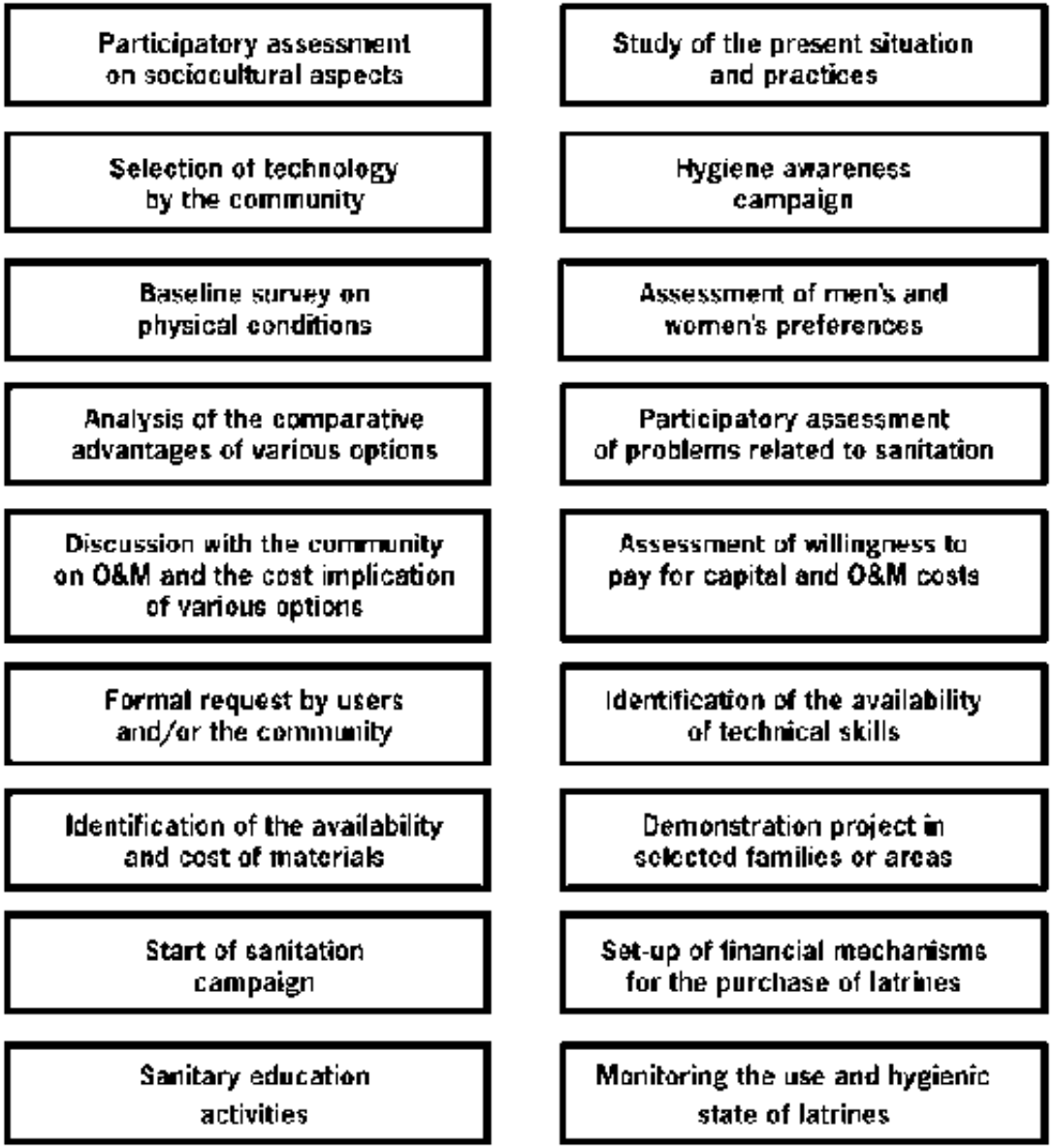


Figure

Exercise sheet 2

Process of sanitation technology choice

The facilitator should prepare beforehand a set of cards as described below, leaving some blank ones for additional activities if needed, and distribute a complete set to the group. The group will have to organize the cards in a logical sequence (some activities can be done in parallel with others). All these activities have a definite direct or indirect impact on future O&M activities.



Figure

4. Background information

4.1 Operation and maintenance specific criteria affecting water supply technology choice

Technical criteria	• Technical standards; quality and longevity of equipment; spare parts needs, costs, availability and accessibility • Dependence on fuel, power, chemicals; cost of O&M activities; cost of fuel and chemicals • Complexity of operation and maintenance procedures: necessity of skilled personnel • Potential for local manufacture, and for standardization • Use of local materials and equipment • Dependence on imported parts • Technical options available on the market • Water demand
Environmental criteria	• Quality of water source • Requirements for water treatment • Necessity for water source protection and wastewater management
Institutional and legal criteria	• Legal framework and national strategy for O&M • Training capacity and follow-up support • Availability of technical assistance to the communities • Capacity of municipalities to dialogue and assist communities • Involvement of the formal (informal) private sector and NGOs • Monitoring capacity • National or local budget allocations for O&M activities • Availability of financial mechanisms to cover replacement and rehabilitation costs

Community criteria	• Responsibility and ownership feeling • Desired service level • Demand for improved service level • Perception of benefits, culture, habits, beliefs • Organized and elected community structure to be responsible for O&M • Managerial capacity • Gender perspective in O&M activities • Technical skills available in the community or within reach of the community • Maintenance culture within the community • Tariff structure • Cost-recovery mechanisms to put in place • Financial management capacity • Ability and willingness to pay

4.2 Operation and maintenance specific criteria affecting sanitation technology selection

Experience has shown that many sanitation projects adopted interventions and technologies that were selected with poor assessment of the demand for sanitation. In these instances, there was hardly any communication between the future users and the project planners, and the social, gender, cultural and religious aspects were not taken into sufficient consideration.

In some cases, environmental factors were not considered in the design, which led to unsafe situations and even the collapse of pit walls. Hygiene education to

change sanitation behaviour was hardly mentioned in the adopted project approaches. Planning for sanitation interventions therefore requires a comprehensive approach covering many aspects. The Table below presents four groups of general and specific criteria which influence sanitation technology choice.

	General criteria	Specific O&M criteria
1. Technical	• Technical standards • Availability of construction materials • Estimated lifetime • Cost of construction • Design preference (substructure, floor slab, squatting or raised seat, superstructure)	• O&M requirements • Ease of access • Use for the decomposed waste
2. Environmental	• Soil texture, stability, permeability • Groundwater level • Control of environmental pollution • Availability of water	• O&M implications for environmental protection • Groundwater contamination
3. Institutional	• Existing national/local strategies • Roles and responsibilities of actors • Training capacity • Availability of subsidies and loans • Availability of masons, carpenters, plumbers, sanitary workers, diggers and persons to empty the pit	• Pit-emptying services (municipal/private) • Sewerage maintenance capacity • Potential

	• Monitoring	involvement of the private sector • National budget allocations for sanitation • Training and sensitization
4. Community	• *Sociocultural aspects:* Taboos, traditional customs, religious rules and regulations, cleansing material, preferred posture, attitude to human faeces, gender-specific requirements • *Motivational aspects:* Convenience, comfort, accessibility, privacy, status and prestige, health, environmental cleanliness, ownership • *Discouraging factors:* Darkness, fear of falling in the hole or the pit collapsing, fear of being seen from the outside, smells, insect nuisance • *Social organization factors:* Traditional role of community leaders, religious leaders, school teachers, community-based health workers • *Other factors:* Population densities, limited space for latrines,	• O&M costs • Training and sensitization • Health awareness and perception of benefits • Presence of environmental sanitation committee • Women's groups • Social mobilization on hygiene and sanitation behaviour

	acceptance of communal latrines	

Upgrading an existing sanitation facility can be the first option for improving the sanitation conditions if it matches the social and cultural preferences of the community, as well as the local economic and technical capacities. If the existing facilities do not meet basic hygiene requirements, then upgrading must be considered. If no sanitation facilities are present, the simplest technology option is to be considered, taking into account the factors mentioned above.

4.3 Technology selection process

The technology selection process will depend on the strategies adopted by the planners and on basic principles which are emerging in the water and sanitation sector. One principle is the need to involve communities right from the start of the selection process. The agencies, the communities and users should therefore work together as partners, and plan their activities based on mutual agreement. The latter is particularly important in contexts where both men and women in the community and among the users are increasingly taking on the responsibilities of operating, maintaining and managing their water supply systems.

Various formulations of the word "technology" can be found in the literature, such as: appropriate technology, progressive technology, alternative technology, intermediate technology, village technology, low-cost technology, labour-intensive technology, self-help technology, and technology with a human face. In this course, we advocate a *sustainable technology*, i.e. a technology that should, as much as possible, match the people's needs, expectations, preferences and cultural habits. It should be convenient, manageable, maintainable and affordable.

Linking operation and maintenance with technology selection covers several aspects, such as technical, environmental, financial, institutional and social aspects, and requires the testing and feasibility study of the O&M system to be put in place. The O&M framework defines all the actors and their roles and organization in O&M, as well as their interrelationships with one another.

Experience shows that the effectiveness of O&M is determined to a considerable extent by non-technical issues. Therefore, the persons involved in assessing and developing O&M should come from a wide range of disciplines - social development, economics, health, management, and engineering. It is important that all of them should function in partnership with the operators and users of the relevant services.

Rehabilitation of defective schemes is an economic alternative to investing in a new project, but that decision should not be made lightly. The rehabilitation option has to be evaluated, as one would a new scheme, by taking into consideration the community's needs, preferences and capacities to sustain whatever is undertaken, as well as the support potential of the water agency. In assessing the scope for rehabilitation, community members and the agency should review the reasons for which the system needs to be rehabilitated, by means of problem analysis, and carefully examine various feasible technologies. Furthermore, rehabilitation should not simply be a matter of replacing defective equipment or repairing damaged infrastructure because the most common cause of failure is organizational. Finally, a word of caution: the community might in some cases get the feeling that O&M does not concern them - believing that when the system is out of order someone will come and put it right!

If a risk analysis is carried out for each water supply option, then an attempt can be made to anticipate factors which may change and affect O&M. This will not be easy, especially in unstable economies, e.g. with high inflation rates and restrictions on imports, where equipment and spare parts are not easily available. However, a comparison of technologies can indicate the degree of risk attached to each option.

4.4 The process of community water supply technology choice

The following steps are proposed:

1. The community requests the agency for support to improve its water supply (demand-driven approach); this could be preceded by promotion and mobilization campaigns. The expectations and preferences of the users (both men and women) and their motivation should be assessed.

2. Initial service-level assessment - what service level is responsible for dealing with environmental issues and the preferences of users (both men and women)? What are the comparative advantages between various options (e.g. standposts and yard connections)? The validity of hydrological, technical and institutional data collected by agencies must be confirmed by local resource persons.

3. Participatory baseline survey, including needs and problem analysis with the community.

- **What reliable water source is available?**

- **Can this source provide the required quantity and quality of water?**
- **What is the treatment needed?**
- **What materials, spares and skills are needed to sustain the desired service level?**
- **What is the most appropriate structure to sustain the desired service level which corresponds to the management capacity of the communities?**
- **What is the capacity of present community organization to manage, operate and maintain an improved water supply system?**
- **What is the involvement of women and men in community activities?**
- **What are the costs (capital and recurrent) of the options considered?**
- **What are the financial resources available and the willingness to pay?**
- **What is the present approach to the application of O&M within the programme or country area?**
- **What are the causes and effects of poor O&M within the area?**

- **Should technology match the available O&M system and capacity (including spare parts distribution), or should the O&M system be adjusted to match the most suitable technology?**

- **What type of support can the communities receive, in terms of technical, financial and capacity-building assistance?**

- **What is the overall impact of the option selected?**

4. Analysis of data by the agency, leading to the possible selection of the most suitable technologies and service levels, including a review and appreciation of all specific O&M criteria.

5. Presentation and discussions with the community of the most sustainable technologies, considering all O&M implications and commitment to long-term management of O&M. Clarifications should be made at the same time on all necessary adjustments of the existing O&M system, with a definition of the responsibilities of the actors involved in the development of the project. Communities should be given enough time to consider the options and the future implications of each one.

6. Formal agreement on technology selection between the community and all partners, once the community has made its informed choice. This agreement can be formalized with a contract, and include a financial contribution (in cash or kind) from the communities.

7. Finalization of planning for implementation.

4.5 The process of low-cost sanitation technology choice

It is assumed that the technology selection process is based on a participatory needs assessment, which is carried out following an expressed demand for improved sanitation facilities. Hygiene awareness and promotion campaigns can result in an increase in the demand for improved facilities. The process of choosing sanitation technology should include at least the following steps:

1. Participatory assessment of problems in the existing human excreta disposal system, as well as in hygiene behaviour, environmental hygiene and human excreta-related diseases. Participatory assessment of the cultural, social and religious influences on the disposal of human excreta and choice of sanitation technology. Participatory assessment of local conditions, convenience, capacities and resources (material resources, human resources and finance).

2. Initial awareness-raising of the community on hygiene and sanitary matters - about the benefits of safe human excreta disposal and appropriate human behaviours linked to sanitation and personal hygiene.

3. Identification of local preferences and capacities for sanitation facilities and possible variations. Matching these preferences with local capacities and environmental conditions including contamination risks, and determining the O&M requirements and other implications of the technology options.

4. Discussions with the community about implementing different sanitation

technology options and their implications in terms of operation and maintenance.

5. Selection of one technology option by the community.

Improvement of sanitation facilities should be accompanied by activities in Information-Education-Communication (IEC) to promote safe sanitation behaviour and proper hygiene. These activities have a longer time horizon than the time required for improvement of physical structures. Schools and other institutions, churches, and social and community groups have an important role to promote proper hygiene and sanitation behaviour. Attention must be paid to selecting the most appropriate technology, design, and site in order to prevent environmental pollution, particularly of water resources and the living environment. Control measures must be carried out to minimize these risks.

Unit 2: Institutional set-up

1. Outline of session

- **Objectives**

  - **To raise awareness about the importance of a proper institutional set-up for operation and maintenance**

  - **To review the consequences of institutional changes, like those induced by decentralization and privatization**

  - **To review possible management options at the local level**

- To raise awareness on the importance of communication

- **Methodology**

1. Introductory note
2. Review of analysis of participation exercise
3. Presentation and discussion on decentralization using a graphic
4. Document analysis on management options
5. Short presentation on various management models
6. Conclusion on the importance of communication

- **Materials**

√ Overhead sheets
√ Overhead projector, screen or white wall
√ Flip chart

- **Handouts**

√ Exercise sheet
√ Copies of transparencies
√ Copies of selected parts of background information

2. Notes for the facilitator

Introductory note

The analysis of participation has shown that many actors are involved in different

ways and degrees in the operation, maintenance and management of rural water supply and sanitation services. This session reviews how the organization of all these actors provides an effective maintenance system. Most developing countries today are undergoing structural and institutional reforms, which have a far-reaching impact on the way maintenance will be organized and on who will be responsible. The session analyses the framework in which the actors evolve, which has links with the next session on community management.

Review of analysis of participation exercise

If the participation analysis exercise proposed in Module 2 has not yet been carried out, it should be done now by referring to the directions given. The review of this exercise consists in determining the degree of involvement and what could happen at this stage, given the problems that have been identified. This review by the whole group can be summarized in the following Table (the shading given below is an example).

	Degree of involvement in O&M		
Major actors	**Slight**	**Medium**	**Major**
National institutions			
Provincial institutions			
Local authorities			
Community organizations			
Users			
Private sector and NGOs			

External support agencies			

Some conclusions can be drawn by the facilitator from this Table, e.g. that some sectors are greatly involved, that the process is still very much "donor-driven", that the small role of the private sector and NGOs could be enhanced in the future, that the users appear not to be sufficiently involved, etc.

Presentation and discussion on decentralization

The various trends affecting the sector especially on sustainability, decentralization, private sector involvement, and new approaches are presented and discussed. The facilitator can first recall the main points of sustainability, which have been stated in Module 1, Unit 3.

Document analysis on management options

The exercise sheets include descriptions of various forms of management options for piped water supply projects. The management of handpumps systems will be reviewed in the next session on community management. The participants will be divided into three groups, corresponding to, for example, the management options proposed in the exercise sheets: 1) Concession to a community association; 2) Direct municipal management; 3) Cooperative association of public administration. Each group will review its management option, and highlight the strengths and weaknesses. The groups will briefly present the results of their work in a plenary session.

Short presentation on various management models for a piped rural water supply

system

The facilitator will review the Table which summarizes these management models (see background information, below).

Final conclusion on the importance of communication between all stakeholders

The facilitator starts a short game. He says to the group: "I will count to three and ask you to clap your hands…. One… two…" (while speaking, the facilitator imitates the clapping of the hands without really clapping). The result is that everyone claps. The facilitator says: "I asked you to clap at three, and everyone claps at two!… Where is the communication? Is this type of situation frequent in our workplace?" Allow time for discussion. The facilitator then uses some of the information contained in the background information to make a concluding presentation on the importance of communication, and on how to set a communication strategy.

3. Overhead and exercise sheets: Sheet 1

After having reviewed the situation analysis done previously, mark the squares with a cross accordingly			
	Degree of involvement in O&M		
Major actors	**Slight**	**Medium**	**Major**
National institutions			
Provincial institutions			
Local authorities			

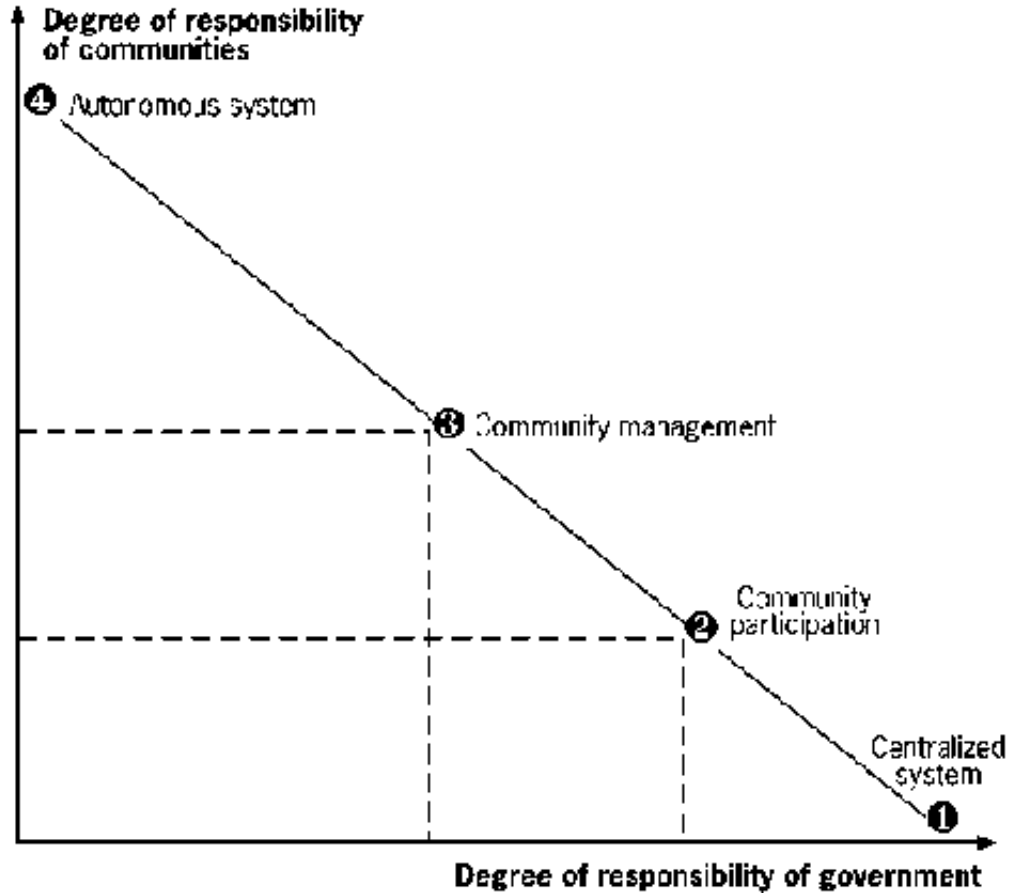
Community organizations			
Users			
Private sector and NGOs			
External support agencies			

Overhead sheet 2

Substitution of responsibilities between government and community in a context of decentralization, with necessary accompanying measures

Accompanying measures:

a. Building the capacity of communities
b. Reinforcing the role of the local authority
c. Promoting NGO/private sector participation
d. Changing the role of government



Figure

Overhead sheet 3

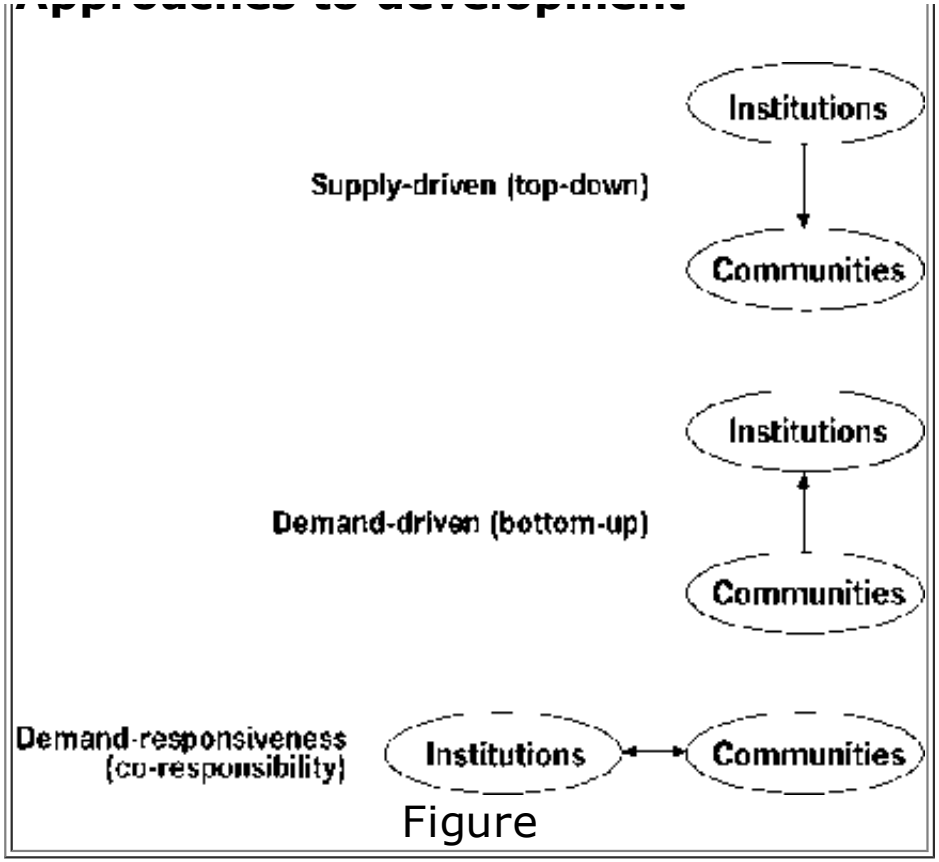
Who constitutes the private sector?

Actors in the private sector	O&M support role
International and national manufacturers	• design and manufacture pumps and other equipment for operation and maintenance at the village level

and suppliers	• supply spare parts and consumables
International and national consultants	• design schemes for community management • develop community/agency-managed O&M systems • provide O&M training
International and national contractors	• rehabilitate and extend schemes for community O&M • on-the-job training of O&M staff during construction
Local contractors	• service and maintenance contracts • major repair work
Small-scale industries	• local manufacture of spare parts and tools
Nongovernmental organizations (NGOs)	• training, raising community awareness • technical assistance
Self-employed artisans in the formal and informal sectors	• local skills for preventive and corrective maintenance and repair work: mechanics, plumbers, builders, masons, blacksmiths, electricians, etc. • operation of facilities
Local shops	• provision of spare parts
Administrators and accountants	• billing, rate collection, auditing of accounts
Banks	• banking facilities for O&M funds • credit facilities for irregular high-cost items and for the expansion or modification of facilities

Overhead sheet 4

Approaches to development



Figure

Overhead sheet 5

A communication planning sequence includes:

- Identification and formulation of key issues to be communicated
- Identification of target audiences
- Research on current knowledge, attitude and practice of each target group around the required future change in behaviour

- Development of messages based on current knowledge and behaviour
- Pre-test messages
- Identification of appropriate communication channels
- Preparation of communication materials
- Pre-test of materials
- Training of communicators
- Development of indicators to assess the impact
- Implementation of communication programme

- Assessment of impact and adjustment of programme design

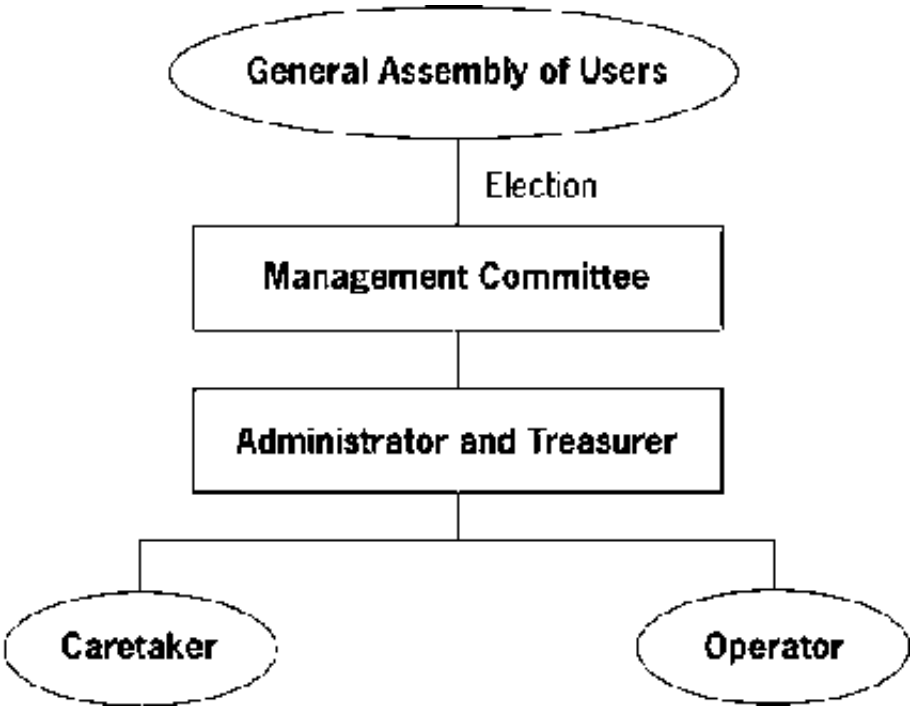
DOCUMENT ANALYSIS 1

Concession to community associations

Briefly highlight the strong and weak points of this management option for rural piped water supply systems

Communities can already count on existing associations, which sometimes have been organized in an informal way. It is important in this case that associations are organized in a formal way, and obtain legal status. They will be established as

non-profit-making associations with the aim of providing a public service, which could give access not only to community resources but also resources coming from the municipality, the province or the central government. The mayor can be a member of the association but has to promote community participation and facilitate access to municipal, provincial and national funding. The community association is organized in the following way:



Figure

The General Assembly adopts decisions and elects the members of the Management Committee of the Association. The Management Committee is composed of a President, a Vice-President, a Treasurer or Administrator, a Secretary, representatives from the users, a representative from the local administration (if decided by the General Assembly, and if the local conditions

allow it). The General Assembly has the responsibility to supervise and control all managerial, technical and financial aspects of the service. The caretaker and operator are responsible for the operation, maintenance and conservation of the whole system; they participate in tariff collection as well. The Association has to be created by a decision of the General Assembly which passes an Act constituting the Committee. The General Assembly must study and approve the Rules and Regulations for the functioning of the organization. The Constituting Act and the Rules, together with a written application, are registered with the Chamber of Commerce. The creation of such an Association will be authorized through an official document of the Municipal Council.

DOCUMENT ANALYSIS 2

Direct municipal management

Briefly highlight the strong and weak points of this management option for rural piped water supply systems

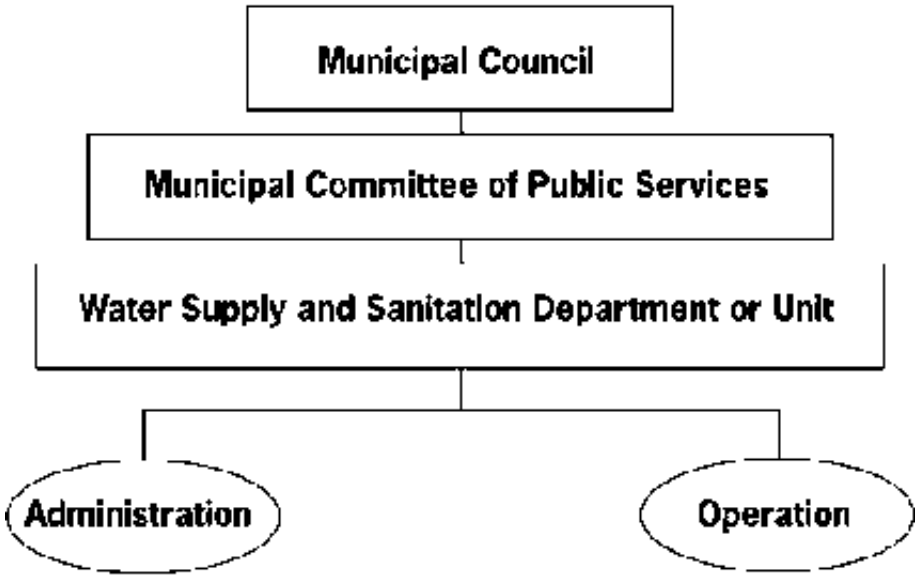
In this management option, the municipality is directly responsible for the administration of the water supply service, through a department or unit which has been created for that purpose. However, several conditions are applicable:

- **direct municipal management will be possible only if the municipality has made a public call for firms to operate, manage and maintain the system, and if no one has proposed its services;**

- **direct municipal management will be possible even if a private or public firm is available, only after a study has shown that the operating cost of**

direct municipal management will be lower than that of the private firm, and the quality of the service to the users will be higher.

It is stipulated that the accounts for the running of the service must be separated from the general accounts of the municipality, and must distinguish between incomes through tariffs and income through subsidies. Direct municipal management is organized in the following way:



Figure

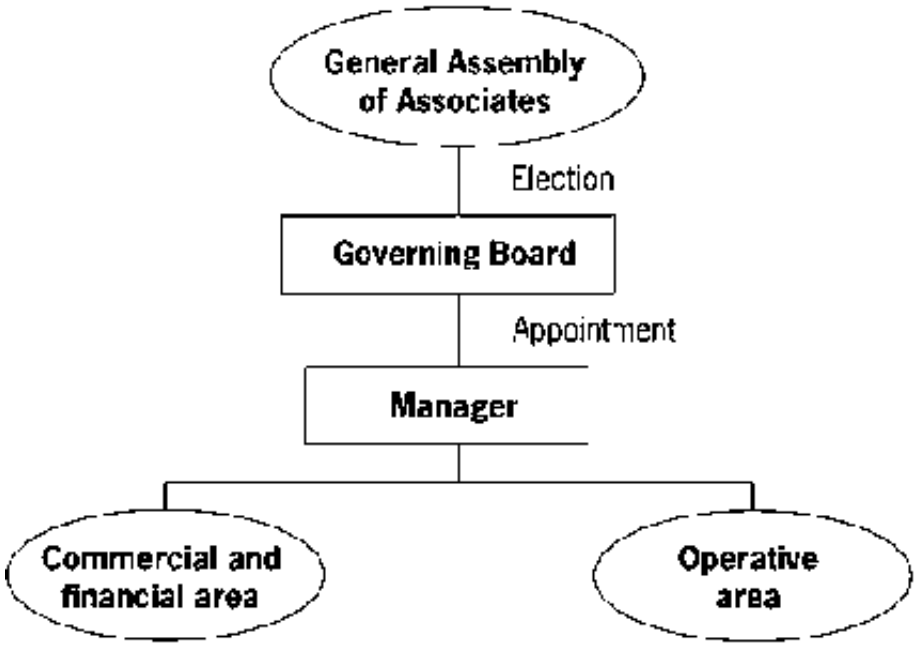
DOCUMENT ANALYSIS 3

Cooperative association of public administration

Briefly highlight the strong and weak points of this management option for rural piped water supply systems

The cooperative association is an organization in private law, which aims at solving a social need through the production and provision of a service. It is composed of associates including: users of the service, representatives of local authorities, representatives of other associations or public/private firms.

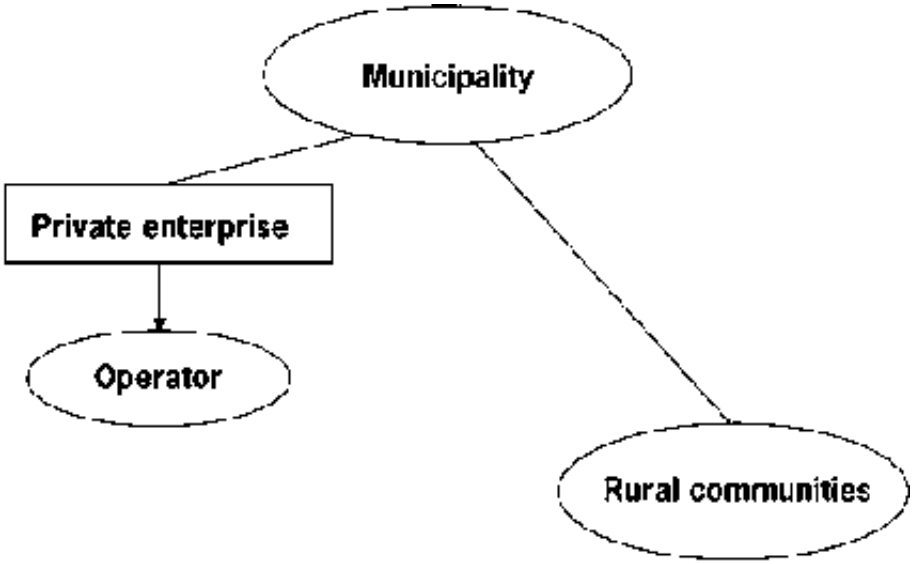
How is a cooperative association created? After an authorization obtained from the Municipal Council, a General Assembly composed of all the associates elects the members of the Governing Board, approves the charter and regulations, establishes policies and programmes, and gives the general orientation. The Governing Board is the permanent body for the management and administration of the cooperative association. It will nominate or remove the manager, determine the profile for the staff, propose the budget for control (which will have to be approved by the General Assembly), and convene the General Assembly. It is composed of a President, Vice-President, a Secretary, and a Controller who are elected for a period of one year. The cooperative association is organized in the following way:



Figure

DOCUMENT ANALYSIS 4

Private management



Figure

The municipality, after constant dialogue with the rural communities, contracts the services of a private firm to manage, operate and maintain the water supply system, with the understanding that the communities will be consulted over all matters that have a financial implication for them. The actual operation is done by an operator who is employed by the private firm. The community, in turn, ensures basic preventive maintenance and the payment of a fee. The firm will have to recover the costs through a tariff system, agreed with the community and the municipality.

The contract with the private firm is renewable, and only concerns management, operation and maintenance. All other activities, such as decisions for extension, rehabilitation and replacements, are the responsibility of the municipality, in consultation with the community.

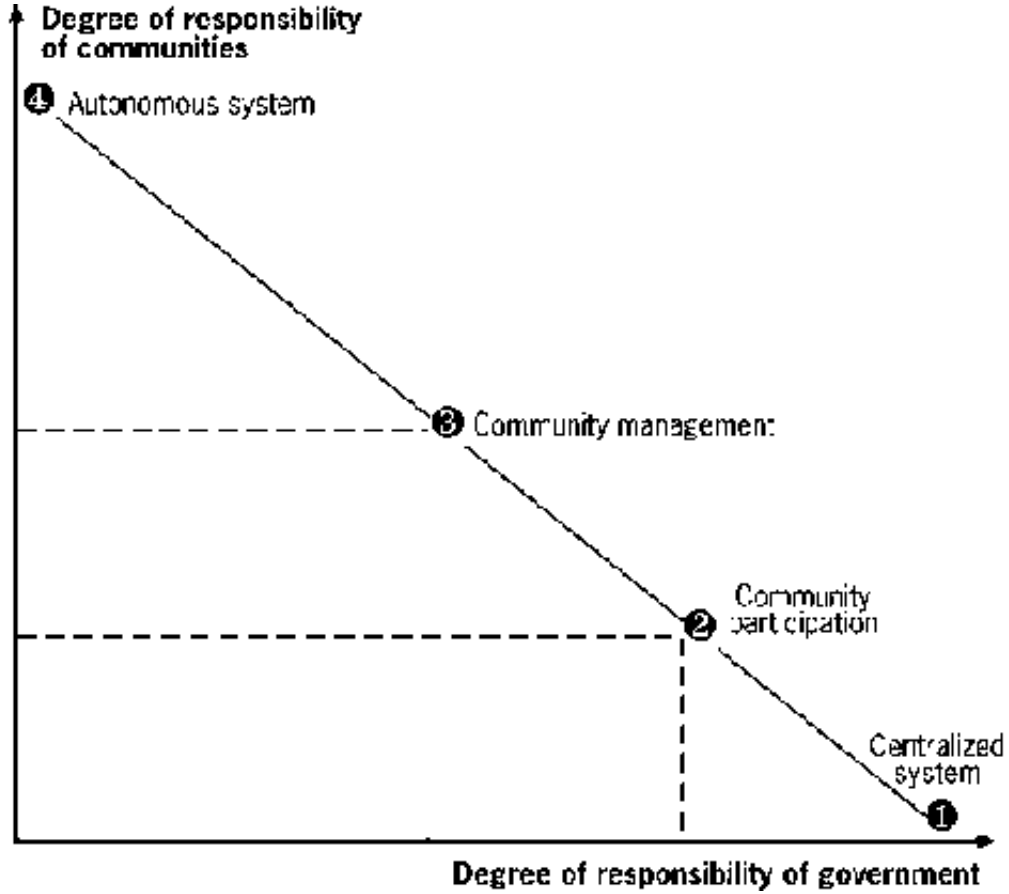
4. Background information

4.1 Institutions are evolving

The concept of sustainability implies making some institutional changes as it highlights the importance of community and user involvement, working in coordination with the local authorities, in the demand, design, management, operation and maintenance of the system. Sustainability also encourages the use of local resources, e.g. artisans and shops, as well as NGO assistance to help develop the local economy.

Several countries are now implementing decentralization policies which have a direct or indirect impact on the water and sanitation sector. The institutional implications, however, vary from one country to another. The main aim for implementing a decentralization process is greater efficiency, effectiveness and sustainability of public services. It is based on the assumption that local institutions can better respond to the needs of the population, and therefore adapt strategies and policies to the local context. Central-level institutions must change their role from provider of services to that of coordinator, facilitator and support. This can be done by: 1) transfer of responsibilities from national to provincial/communal level; 2) "deconcentration" of activities from national to local levels; 3) transfer of various activities to other actors such as NGOs and the private sector.

The graphic describes this decentralization process and its consequences.



Figure

In ❶, the government is responsible for everything and the communities have no legal authority in such a centralized system. This system has proved to be very inefficient, especially with regard to O&M of rural water supply and sanitation systems.

In ❷, the communities have a certain degree of responsibility ranging from participation in labour to payment of services. The government still keeps an important role in the management of the system. This situation, which is now

commonly accepted and implemented in many projects around the world, corresponds to community participation but not community management.

In ③, communities manage their system, but still rely on technical assistance and support. This situation corresponds to community management.

In ④, communities are autonomous; very few communities in the world have been able to sustain their activities in a completely autonomous way.

The main consequence of this process from government to community level is that it increases the financial, operational, technical, and managerial burden at the local level, which communities do not have the capacity to carry. This process must therefore rely on accompanying measures such as:

- **Building the capacity of communities in technical, financial and managerial terms, with awareness of gender questions.**
- **Reinforcing the role of local authorities in coordination with communities, and giving the technical and financial means to do so.**
- **Promoting the participation of local nongovernmental organizations and small private firms (formal and informal) in the provision of services (technical assistance, training, repairs, spare parts provision).**
- **Changing the role of government institutions from provider of services to coordinator and facilitator.**

Accompanying measures:

a. Building the capacity of communities
b. Reinforcing the role of the local authority
c. Promoting NGO/private sector participation
d. Changing the role of government

4.2 Changes in the approach

Water supply and sanitation improvements may also be characterized by being either a supply-driven or a demand-driven approach. In the present case, we shall be promoting a demand-responsive approach.

The supply-driven approach (top-down) is based on pre-selection of the intervention area, with village and technology selection criteria based on policies of replication of successful experiences in other countries or projects. This approach can have serious implications for the sustainability of projects, particularly in terms of community acceptance, functioning, use and O&M costs - the community not being involved in any phase of the project cycle.

In the case of a demand-driven project (bottom-up), the problems and needs are identified with and by the communities. This may be preceded by some awareness-raising by extension workers. The advantages are that the motivation of the community to participate in the planning, implementation and O&M phases will be high, and that community-based management will be better accepted and implemented.

A demand-responsive approach (sharing responsibilities) puts the accent on two

sides - the need to elaborate projects around a demand emerging from the communities, but also on the capacity of the public and private, formal and informal organizations to respond to this demand. As we have seen in the participation analysis, many actors are involved in the operation, maintenance and management of water supply and sanitation systems.

4.3 Summary of various management options

MANAGEMENT OPTIONS	MAIN CHARACTERISTICS
Direct municipal management	
Direct administration	Administration by the municipal service or department, with no autonomous budget. Controlled by the mayor.
Autonomous administration	Administration by the municipal service or department, with autonomous budget and separate services.
Semi-direct municipal management	
Inter-municipal administration	Administration agreements between several municipalities, with a coordination unit controlled by the municipalities, for managing the system.
Direct or autonomous administration with some activities delegated to other firms	Administration by the municipal service, with activities delegated under a contractual service agreement to other firms for a specific task, and a limited period of time.
Delegated management	
Management contract to a	While the municipality remains responsible for the service in

firm or individual	investment and tariff setting, it delegates their management to a firm or an individual, under a remuneration contract.
Special management contract to a firm or an individual	Same as management contract described above, but with a remuneration based on a fixed agreement with the municipality and a percentage of the collected tariffs.
Leasing/renting contractual arrangements with a firm	The municipality establishes a contract with a firm, which will not be responsible for the investments, but only for the operation and maintenance of the system, whose remuneration comes through collected tariffs.
Public administration (cooperative association)	Distinct legal status, and financial autonomy. Controlled by the Assembly of Associates (where the municipality is a member among others), with the authorization of the Municipal Council.
Concession to community associations	Associations created by a General Assembly of users, with the authorization of the Municipal Council. It manages and operates the system.
Concession to a private firm or society	Under a contractual agreement between the firm and the Municipal Council, the firm will fully manage, operate and maintain the system, with complete financial autonomy. The firm will invest with its own resources, at its own risks, but the municipality must approve them.
Private management	
BOOT contractual agreement (Build-Own-	Under a contractual agreement, a private firm is totally responsible for the construction, operation and management

Operate-Transfer). Also possible: BOT (Build-Operate-Transfer); BOO (Build-Own-Operate); Inverse BOOT	of a system, but will transfer it to the municipality at the end of the contract, which is usually long term. For the inverse BOOT, the public authority builds, but the system becomes private at the end of the contract.
Private management with public/private capital	Private company whose shares are public and private; some control is kept at the shareholders' assembly.
Private management	Private company owns the system and is totally responsible.

As described above, the management options consist in a blend of ownership and responsibilities between the public sector and the private or social sector (social sector = associations). This can be graphically represented in the following way:

Towards more ownership or responsibility of the public sector

1. Direct/autonomous administration
2. Inter-municipality administration
3. Direct/autonomous administration with service contracts
4. Administration with (special) management contracts
5. Leasing/renting contract
6. Cooperative associations
7. Concession to a community association
8. Concession to a private firm
9. BOT (Build-Operate-Transfer) contracts
10. BOOT (Build-Own-Operate-Transfer) contracts
11. BOO (Build-Own-Operate) contracts
12. Inverse BOOT contracts

13. Private company with public/private capital
14. Private company

Towards more ownership and responsibility of the private or social sector

4.4 Issues affecting the choice of management models for the operation and maintenance of rural water supply and sanitation systems[1]

[1] **Extracts from: *Management models for the operation and maintenance of rural water supply and sanitation systems*, by Phil Roark. Arlington, VA, WASH Project of the U.S. Agency for International Development, 1993 (WASH Technical Paper No. 71).**

The choice of an O&M management model is influenced by several key issues that are listed below and are discussed in detail: capacity of traditional community organizations; key community skills; health education and community participation; gender-balanced development; complexity of technology; availability of spare parts; standardization and local manufacture of equipment; requirements shared with other sectors; capacity of the private sector; cost recovery mechanisms; ability and willingness to pay; national and regional economies; logistics and transportation; government leadership; strength of government agencies and staff; regional autonomy; policies and legislation; communication and information sharing.

Capacity of traditional community organizations

The community is a focal point in the management of rural WSS (water supply and

sanitation) systems because it has a vested interest in efficient operation and maintenance. By their very nature, communities are structured to provide leadership, conduct social and religious activities, and attend to legal, property, and economic matters affecting their members. The control of traditional water supply sources and waste disposal sites is part of this structure, since all communities have some type of WSS facilities, however primitive these might be.

Some communities have a highly sophisticated set of rules and responsibilities for managing their WSS facilities. For instance, communities located near rivers may not have a rigorous management system, since water is readily available, but communities with limited water supplies usually have strict rules governing individual rights and responsibilities and impose penalties for violations. Similarly, densely populated communities usually have a tighter management system for sanitation facilities than those more sparsely settled.

While the physical environment dictates the need for certain levels of management, so does the character of the society. There are significant differences between societies and their view of management needs for WSS. Some societies have a strong communal approach to meeting their needs; others prefer an individualistic approach. Some are hierarchical while others are more diffuse in structure. These differences must be considered, and, whenever possible, the traditional management system should be empowered. However, certain technologies may require skills which the traditional management system does not have, and new management models may need to be introduced.

Key community skills

Among the key community skills that must be considered in assessing local management capacities are leadership, accounting, and mechanical aptitude. Leadership is required to organize, motivate, and educate the community. Many decisions require a consensus after the issues and alternatives have been clearly explained. For example, the siting of a well or standpipe could be controversial, since one location will be more convenient to some users only. The level of service and fee structures are questions that deserve wide discussion. Many WSS projects rely upon community participation for the construction of facilities. To marshal this work force requires leadership skills. Often communities can draw on their experience in sectors unrelated to WSS, such as building a school.

Accounting and record-keeping skills are necessary for the proper collection and disbursement of funds. Typically, families in a community pay a flat fee or one that is based on the service received. In some cases, fund-raising such as the sale of crops from a communal field is organized for the WSS facility. Community confidence must be ensured by public disclosure of collections and spending and scrupulous accounting. Further, decisions reached at meetings should be placed on record. In some developing countries where literacy levels in rural areas are low, this is not always possible.

Some mechanical skills within the community are necessary. Depending on the technology involved, these can range from simple caretaker skills to repair skills for sophisticated machinery. Deep wells, for example, may be the only option for supplying potable water to a community, but the pumping requirements may be beyond local repair capability. In such cases, the community will provide only caretaker and operational labour and call upon outside assistance for repairs.

Training is one way of upgrading community skills. Of course, there are limits to training adults with a low level of literacy, but for most areas of community need, instruction within these limits can achieve adequate results. Many projects provide WSS management committee members with training in the maintenance and repair of pumping equipment.

Health education and community participation

In addition to technical and management training, the community's understanding of health, hygiene and community participation is important. This understanding may vary considerably from region to region. For a WSS facility to be effective it must not only be functional but also be used. Many properly designed WSS facilities have not been utilized sufficiently or correctly due to ignorance of their health benefits. When poor quality water is more easily available, good quality facilities are often allowed to fall into disrepair. Sometimes clean water at the distribution point is polluted by the user through improper transportation and storage.

Other areas of health awareness, particularly child survival activities, are also important. Widely disseminated information on the benefits of immunization, oral rehydration therapy, breastfeeding, and nutrition will reinforce understanding of the causes and effects of disease and lead to effective use of WSS facilities. Female literacy is a particularly important determinant of community health, since women are the key implementers of health practices. Since WSS projects usually are cited as a priority need among potential beneficiaries, they often serve as a catalyst for the introduction of other health interventions.

Gender-balanced development

Women are primarily responsible for obtaining and using water, but generally have not been given much say in decision-making. The result has been facility designs and management structures that hamper effective use. A gender balance of roles and responsibilities between men and women is therefore important in the design, construction, management, and utilization of WSS systems.

The role of women as decision-makers varies among societies. While there is general progress in increasing their participation, some societies maintain barriers that must be respected in designing management systems.

Complexity of technology

Technologies for rural or periurban water systems range from capped springs that feed gravity distribution systems, to deep wells equipped with electric pumps and a distribution system consisting of a storage tank and pipelines, to household connections. Sanitation systems in rural or periurban areas range from simple latrines to flush toilets with cesspools. Many of these technologies have been in use for decades with only minor changes. However, research has produced many new improvements adapted to the needs of developing countries. For example, handpumps are now designed to be more robust and easier to repair. Drilling rigs for shallow wells have been reduced in size and cost. Pumping systems relying on wind and solar energy have been developed. Low-cost latrines that are sanitary and well ventilated are now easily available.

Given this range of technological choice, the fundamental maxim is that the

technology should be compatible with the beneficiaries' ability to handle it. If repairs are too complex for them, the next tier up must assume this responsibility. Some communities may be able to repair part of a system, such as a pipeline, but not an electrical generator. In this case the responsibility would have to be shared. Generally, it is preferable for the beneficiaries to be primarily responsible for managing the system even if they require outside mechanical assistance.

Availability of spare parts

The availability of spare parts has been a recurring problem for many WSS projects. Some have installed hundreds of handpumps and presumed that market mechanisms would impel local hardware dealers to provide the needed parts. In certain countries government agencies retain this responsibility, in others they import spare parts and rely on a commercial system for distribution. In any case, the laws of supply and demand do not always work as expected. Too often the systems fail because spare parts are simply inaccessible.

Standardization and local manufacture of equipment

The installation of pumps made by several foreign manufacturers has led to a chaotic situation in many countries. Spare parts are often not available and repairers are not familiar with certain pump designs. This situation is largely the result of bilateral aid which restricts procurement to pumps manufactured in the donor country. Some developing countries, in response, have insisted on specifying which pumps they will accept.

Many of these countries are now developing an indigenous capacity for the

manufacture of plastics for pipes and well casing. Local manufacture also eliminates the need for hard currency, which is always in short supply.

Requirements shared with other sectors

Procurement problems often can be eased by considering the requirements that the WSS sector shares with other sectors. The irrigation sector, for example, uses considerable quantities of pumping equipment, pipes, and related materials. The housing sector uses faucets, toilets, pipes, and building materials. The market for equipment in one sector can influence decisions in another sector. Thus, a new irrigation project could determine the type of pump the WSS sector would select for a project in the same region.

Capacity of private sector

The private sector may have a role in the design, construction, maintenance, and repair of WSS facilities. In urban areas there is seldom a question of its capacity; in rural areas its presence may be limited or nonexistent. Some projects have trained repairers to maintain several facilities in a region. Others have presumed that a sufficiently large market will in itself attract repairers to the target area. This generally is true of WSS facilities near urban centres.

If the profits to be made are reasonable, private sector participation is usually assured. Some projects have established prices for services and parts to protect the communities from being cheated. But prices must be fixed with due regard to adequate financial returns in the context of the local economy. Tasks such as well drilling and the construction of storage reservoirs are best contracted to the

private sector. Many projects arrange franchised regional repairers for the equipment installed.

Cost recovery mechanisms

Government policies requiring cost recovery in WSS projects have two objectives: to make the beneficiaries pay for the benefits they enjoy; and to ensure that the beneficiaries gain a sense of ownership and thereby a concern for preserving the facilities. The costs of many rural WSS projects are beyond the means of the communities they serve, and the government or a donor subsidizes all or part of these costs. The philosophy behind this is that state revenues are to be distributed for the national good, and that rural health and living standards are entitled to special attention if this goal is pursued. However, if a project is to be sustainable, the beneficiaries must be able to fully cover all operation and maintenance and replacement costs.

Among the cost recovery mechanisms employed in WSS projects, perhaps the most common is a flat monthly fee levied on each family or household. In arid zones, where water is at a premium and conservation is essential, water typically is sold by the unit volume. When water is pumped by a fuel-driven engine, volume sales are the norm. In areas where cash is not in general use, communal sales of agricultural products are earmarked for the WSS system. Some communities insist on payment from every consumer, while others may provide free water to the very poor. In some notable instances, communities receive funds from richer members who have moved to the city or to foreign countries.

Ability and willingness to pay

The ability to pay is a function of disposable income and depends on the absolute wealth of the wage earners in a household. WSS interventions must be scaled to a level compatible with the ability to pay.

Willingness to pay is a different matter, influencing all expenditures including that for WSS service. Where there is no alternative water choice, the willingness to pay may be quite high, resulting in vastly inflated prices. Thus, water vendors in peri-urban areas often charge several times the price that is paid in the adjacent urban zone. In contrast, improved water supplies may not be used if there are streams nearby and the cost of water from the improved source is considered high. Water quality is often ignored if water can be obtained free from an unimproved source. In societies where women control money, they are often more willing to pay for water than men are, realizing the benefit of a clean and convenient source. For sanitation facilities, convenience and privacy are paramount. Dwellers in dense housing neighbourhoods appear more willing than their rural counterparts to pay for latrines or toilets.

Because of difficulties with payment, many projects require funds to be collected in advance for O&M, and sometimes for construction, as evidence of the community's willingness to participate. In other cases, potential participants are surveyed to determine their willingness to pay. These surveys require the use of appropriate sampling techniques to ensure accurate answers to delicate questions related to personal financial preferences.

National and regional economies

Many developing countries have high rates of inflation, cost of living, and

unemployment, all of which have a significant effect on O&M management. High inflation requires careful attention to budget planning. Many meticulous plans have crumbled because of the loss of buying power by local currencies. Rapidly rising prices of basic commodities also plague certain countries. Fuel prices are often critical for WSS projects that use engines for well drilling or pumping.

Unemployment can create a large labour pool for labour-intensive tasks such as the digging of a pipeline. This lessens the need for expensive machinery and places responsibility in the hands of the beneficiaries. Some communities carry out such tasks without remuneration as their contribution to the project. These tasks should be arranged to coincide with seasonal levels of unemployment, so that they do not interfere with the regular agricultural cycles for planting and harvesting, when everyone is busy.

Some countries have regional pockets with distinctive characteristics that set them apart from the national economy. These may be areas of high poverty which lack natural resources, or they may border a country that has a more developed economy and thus be in a more favourable position to support development projects.

Logistics and transportation

Isolated areas are difficult to reach because of long distances, and bad roads will add to project costs and increase the uncertainties in planning. These matters will require special attention in the logistics of communication and transport of supplies.

Government leadership

The strength of government leadership in the WSS sector is an important factor in selecting a management model. However, it should be noted that most countries are now going through a process of decentralization, which gives a new perspective to the role of the government. This role is changing from a supplier of services to that of sector coordinator and facilitator. Some prudence is necessary, however, in evaluating public pronouncements. It is not uncommon for politicians to develop platforms that call for improvements in the WSS sector. Some governments take a paternalistic attitude to providing for the people's welfare.

Visible and active leadership is needed to bring issues relating to WSS to the forefront. Where government leadership is lacking, more emphasis must necessarily be placed on management approaches adapted to fit local conditions.

Strength of government agencies and staff

Institutional effectiveness is a critical factor in the sector and is influenced particularly by the organizational framework and the quality of the staff. The organizational framework should encompass all the components of the sector from planning and design to operation and maintenance, with support for programmes of health education and community participation. There should be clear lines of authority and responsibility, and when several government agencies are involved, coordinating mechanisms are essential. Often the Ministry of Public Works and the Ministry of Health are each assigned special tasks: the former is responsible for constructing the systems, while the latter is responsible for health education and community surveys. Coordination is crucial but difficult unless there

is a formal organizational agreement and framework. Extension agents are the vital link between the agency and the community. There must be enough of them to cover vast rural areas, and they must have adequate transportation and be skilled in community outreach techniques. Another important requirement for a successful agency is a budget large enough to carry out the mandate, including budget lines for staff salaries, administration, equipment, transportation, and training. Attractive salaries and benefits are necessary for retaining good workers since the private sector often competes for their skills.

Regional autonomy

Many countries have wide regional differences in climate, topography, land use, social and religious customs, economy, and access to services and materials. Climates may range from tropical to arid, requiring significant differences in the approach to WSS projects. Mountainous regions may offer abundant spring development, while flat lands may require deep drilling. Local cultures can differ considerably and can be separated by their beliefs and geographical distances. Some regions may have a relative abundance of natural resources. In large countries travel to outlying areas may be arduous. All these differences are conducive to the creation or strengthening of regional administrations. Decentralization brings power nearer to the beneficiaries. Central control of the WSS sector in countries with significant regional autonomy can be detrimental to development.

Policies and legislation

Without sound policies and legislation, there is little chance for significant WSS

development. Policies must express government goals and objectives, and issues must be clearly defined. Policies governing the following issues are particularly important:

- **the responsibilities of the communities and their ownership of the WSS systems;**
- **technology choices affecting equipment standardization and the procurement of spare parts;**
- **the role of the private sector;**
- **cost recovery mechanisms and fee structures;**
- **the role of government agencies and the scope of their support.**

The application and enforcement of government policies and legislation must be judged by the results. Comparisons between stated goals and actual outputs offer useful insights.

Communication and information sharing

Communication and information sharing spring from a commitment to the process. Objectives can be met only if adequate information is available at all levels from the communities to the central government. All players within the sector should be fully aware of policies, legislation, decrees, administrative decisions, and any other pertinent matters. While the lack of technological hardware sometimes impedes communication with distant points, more often it is a lack of will that is the cause.

Mass communication techniques such as radio messages in local languages have

been successfully used to inform dispersed populations in rural areas. Frequent visits by extension agents to the communities are also an important means of communication, as are audiovisual aids such as posters, bulletins, and videos.

4.5 The importance of communication[1]

[1] Extracts from: *Study of the institutional arrangements for the provision of rural water supply and sanitation services in Mozambique*. Toronto (Canada), Cowater International Inc. (with the National Directorate of Water of Mozambique in Maputo), 1993.

One area often overlooked in planning a water and sanitation programme is the need for a clearly articulated and systematic communication strategy. The inclusion of a planned communication strategy not only recognizes the necessity of communicating with people, it articulates the needs of each stakeholder and helps find a way to bridge the gap between planners, government agencies, the private sector and communities.

Communication can also both complement and, in some cases, substitute for the regulatory work. It can complement because the design and successful implementation of a rural water policy requires a level of dialogue between those who design or implement the policy and those who are addressed by it. It substitutes for other instruments when it motivates people to change their behaviour voluntarily.

Communication is not the same as "telling"; to "communicate" implies a two-way process. A communication strategy must include the opportunity for feedback

from the audience to the sender and back again. When people are allowed to participate in the process of defining and implementing the rules for their own water strategy, the potential for sustainability is accelerated. A corollary to this is the need to "listen", and therefore communication requires "listening". If the messages coming back across the feedback loop are not listened to (and acted upon where appropriate), communication is not taking place.

In order to be effective, a communication strategy must be deliberately and systematically planned. While most programme planners assume that some level of communication will take place, whenever it does, it does so on an ad-hoc basis without necessarily reflecting the communication needs of different groups of people, nor does it facilitate a two-way dialogue between planners and people.

A communication planning sequence can include the following activities:

- **Identification and formulation of key issues to be communicated**
- **Identification of target audiences**
- **Research on current knowledge, attitude and practice of each target group which will help to promote the required future change in behaviour**
- **Development of messages based on current knowledge and behaviour**
- **Pre-test messages Identification of appropriate communication channels**
- **Preparation of communication materials**

- **Pre-test of materials**
- **Training of communicators**
- **Development of indicators to assess impact**
- **Implementation of communication programme**
- **Assessment of impact and adjustment of programme design.**

Unit 3: Community management

1. Outline of session

- **Objectives**
  - **Participants understand the concepts of community participation and community management**
  - **Participants are familiar with the pros and cons of degrees of community involvement in management**
  - **Participants are aware of the resistance to change and how to deal with this when working with communities**
  - **Participants have identified ways to approach the community and facilitate community management**
- **Methodology**

1. Introduction
2. Discussion on: "What is a community?" and "What is management?"
3. Role-play on resistance to change and ways to deal with it
4. Participatory lecture on community management
5. Concluding exercise on the prerequisites for community management

- Materials

  √ Overhead transparencies
  √ Overhead projector, screen or white wall
  √ Flip chart and markers

- Handouts

  √ Copies of transparencies
  √ Exercise sheet
  √ Extracts from background information

2. Notes for the facilitator

Introduction

One major element of the concept of sustainability is community management. This session highlights this element, which will be followed by a session on gender issues and another on how to approach and work with communities.

Discussion on "What is a community?" and "What is community management?"

It is important first to assess the participants' familiarity with community management approaches by having a discussion. The concept of community management contains the word "community". Too often the community is taken for granted. Support and development agencies just assume that the people they support form some kind of a 'common-unity', that is a group of people sharing common values and interests. Too often it is assumed that people living in a specific geographic unit or administrative service area (e.g. a district, a subdistrict or ward, a village, a village quarter, or a group of households sharing a water point) form a homogeneous group. Is this true?

Participants should reflect on this by asking themselves questions like: "Are you a member of a community? Which one? Are you a member of other communities? Which ones?"

Similarly a rural community does not necessarily consist of a homogeneous group of people. Participants can identify typical subgroups within a community (e.g. rich/poor, peasants/cattle owners, women/men, groups using water for different purposes, polluters/nonpolluters, people living in the centre/in the periphery, and highly/poorly educated people).

Support agents should be aware of this and take into account these differences within a 'community' when promoting community-based management.

In the term community management is also the word "management". It is important to make some clear distinction on what is meant by management in "community management". The facilitator therefore asks the participants the question, "What does management mean in community management?", and

highlights the difference between community participation and community management. The overhead sheets and background information provide more information on this matter.

Role-play on resistance to change and ways to deal with it

This exercise has several objectives: a) the receptivity of a community to a water project can be very different; b) as communities are not all the same, it would be wrong to apply only one type of approach to all communities; c) there are appropriate responses to each type of community.

The role-play should be prepared beforehand. It is in fact both a role-play and a presentation, and basically involves two persons: 1) an "engineer", who represents the project assistance, and 2) a "peasant" (preferably a woman), who represents the community. The latter can wear traditional clothing or the traditional headgear of a peasant.

The facilitator prepares in advance some cards, which correspond to the various steps of the role-play/presentation, similar to that shown in the overhead sheet (Resistance to change continuum). On a board should be drawn only the "climbing" steps. The seven steps will be filled in gradually.

Step 1: The community does not see the need for any improvement; there are no problems!

• Cards needed:	**No!**	and	**Awareness-raising**

- **Role-play: The engineer arrives in the community very happy to have something to propose to them. He briefly presents to the "peasant" (who looks quite surprised!) his water supply improvement project. But soon, the peasant manifests her opposition, and says there is no problem with the water they drink, that they have been drinking this water for generations, and that they don't need this project. She throws the engineer out!**

- **Question to the participants: "Is this a common situation?"; "Can you give an example?"**

- **Presentation: The "No!" card is put on the board at the level of the corresponding step of the drawing. The facilitator explains that the best way to approach the community in this situation is to organize "awareness-raising" activities, puts up the "Awareness-raising" card and briefly tells them what this means.**

Step 2: The community sees the problem but it feels that it is not their responsibility

• Cards needed:	**Maybe!**	and	**Mobilization**

- **Role-play: The engineer arrives in the community and explains briefly what the project is about. This time, the peasant says that the project looks interesting but it is not their responsibility; they pay enough taxes to the government and it is up to the government and the project staff to take this responsibility. Again the peasant throws the engineer out!**

- **Question to the participants: "Is this a common situation?"; "Can you give an example?"**

- **Presentation: The "Maybe!" card is put on the board at the level of the corresponding step of the drawing. The facilitator explains that the best way to approach the community in this case is to organize mobilization activities, puts up the "Mobilization" card and briefly tells them what this means.**

Step 3: The community sees that there is a problem but has doubts about the proposed project

• Cards needed:	**Doubts!**	and	**Information**

- **Role-play: The engineer again arrives in the community. The peasant recognizes him and says that they now see that there is a problem in their community concerning safe water supply, and that they accept that they will have to take some part of the responsibility. But they have strong doubts about the proposed solution, and they don't understand why this is proposed.**

- **Question to the participants: "Is this a common situation?"; "Can you give an example?"**

- **Presentation: The "Doubts!" card is put on the board at the level of the corresponding step of the drawing. The facilitator explains that the best way to approach the community in such cases is to organize participatory**

information activities, puts up the "Information" card and briefly describes what this means.

Step 4: The community sees that there is a problem but is afraid of the changes that it might bring

• Cards needed:	**Afraid**	and	**Demonstration**

- **Role-play: The engineer arrives in the community, and the peasant seems somewhat reluctant to accept the project, because they are afraid of all the implications that it will have, especially the changes in the community's present habits. The peasant thanks the engineer, and says that sometime in the future they will accept it.**

- **Question to the participants: "Is this a common situation?"; "Can you give an example?"**

- **Presentation: The "Afraid" card is put on the board at the level of the corresponding step of the drawing. The facilitator explains that the best way to approach the community in such a case is to organize demonstration activities, puts up the "Demonstration" card and briefly explains what this means.**

Step 5: The community sees the problem and is willing to take responsibility, and feels somehow that the option is appropriate to their situation, but they don't know enough about it yet

• Cards needed:	**What?**	and	**Training**

• Cards needed: **What?** and **Training**

• Role-play: This time, when the engineer enters the community the peasant is much more welcoming and tells him that they like the project but feel that they need to know more. The engineer then sits down with the peasant in order to organize the timing of the training events.

• Question to the participants: "Is this a common situation?"; "Can you give an example?"

• Presentation: The "What?" card is put on the board at the level of the corresponding step of the drawing. The facilitator explains that the best way to approach the community in this case is to organize training activities, puts up the "Training" card and explains briefly what this means.

Step 6: The community is ready for a change, accepts the responsibility, and requests that the project be implemented

• Cards needed: **Yes!** and **Implementation**

• Role-play: The community warmly welcomes the engineer with simulation of a party, and is ready to move ahead with the project. Some mention should be made about the contribution the community has agreed to make, in terms of cash or labour, as well as in terms of responsibilities.

• Question to the participants: "Is this a common situation?"; "Can you give an example?"

- **Presentation: The "Yes!" card is put on the board at the level of the corresponding step of the drawing. The facilitator explains that the best way to approach the community in this case is to organize the implementation of the project, puts up the "Implementation" card and briefly explains what this means.**

Step 7: The community has been involved in the implementation of the project and is willing to demonstrate to other communities the benefits of such a project

• Cards needed:	**Yes, and...**	and	**Duplication**

- **Role-play: The engineer and the peasant are seen discussing how successful the project has been. The peasant says that if other communities around them have the same problem, she would be willing to collaborate with the engineer to demonstrate to them the positive benefits of the project.**

- **Question to the participants: "Is this a common situation?"; "Can you give an example?"**

- **Presentation: The "Yes, and..." card is put on the board at the level of the corresponding step of the drawing. The facilitator explains that the best way to approach the community in this case is to organize the duplication of the project, puts up the "Duplication" card and briefly explains what this means.**

Participatory lecture on community management

The facilitator then proceeds with an interactive presentation, using the following overhead sheets:

- **Why involve communities in the management, operation and maintenance of rural water supply and sanitation?**

  - **Goals of community management**
  - **Characteristics of community management**
  - **Forms of community management**
  - **Typical tasks of a water committee**
  - **Composition and legal status of a water committee.**

Concluding exercise on the prerequisites for community management

The facilitator asks the group, "What are the main elements which should be looked at in order to reach sustainable community management?" The facilitator writes down their answers on the board, using as a reference the list provided in the overhead sheet.

3. Overhead sheets: Sheet 1

What is a community?

- Is a community a group of people sharing common values and interests?
- A community can be heterogeneous in various aspects
- A community does not necessarily live in one contiguous geographic area
- People can be a member of a number of communities
- A 'community' can also consist of groups of people with divergent values and interests:

rich/poor
peasants/cattle-raisers
women/men
people using water for different purposes
polluters/nonpolluters
people living in the centre/in the periphery

highly educated/low educated

Overhead sheet 2

What is management?

- **Planning**
  Development of a strategy, objectives, and results to be reached - with what resources and in what time?

- **Organization**
  Distribution of responsibilities and tasks

- **Decision-making**
  Taking decisions on regular activities, as mandated

- **Coordination**
  Harmonization of contacts between various actors, and communication

- **Control**

Supervision and enforcement

- **Monitoring**

Regular check and problem-solving

Overhead sheet 3

What is community management?

Social management
(all aspects linked to the organization of the community)

Technical management
(all aspects linked to O&M technical activities)

Financial management
(accounting, tariff setting and all aspects of O&M cost recovery)

Overhead sheet 4

(adapted from Community Water Supply and Sanitation Conference material, May 1998, Washington, DC, World Bank-UNDP)

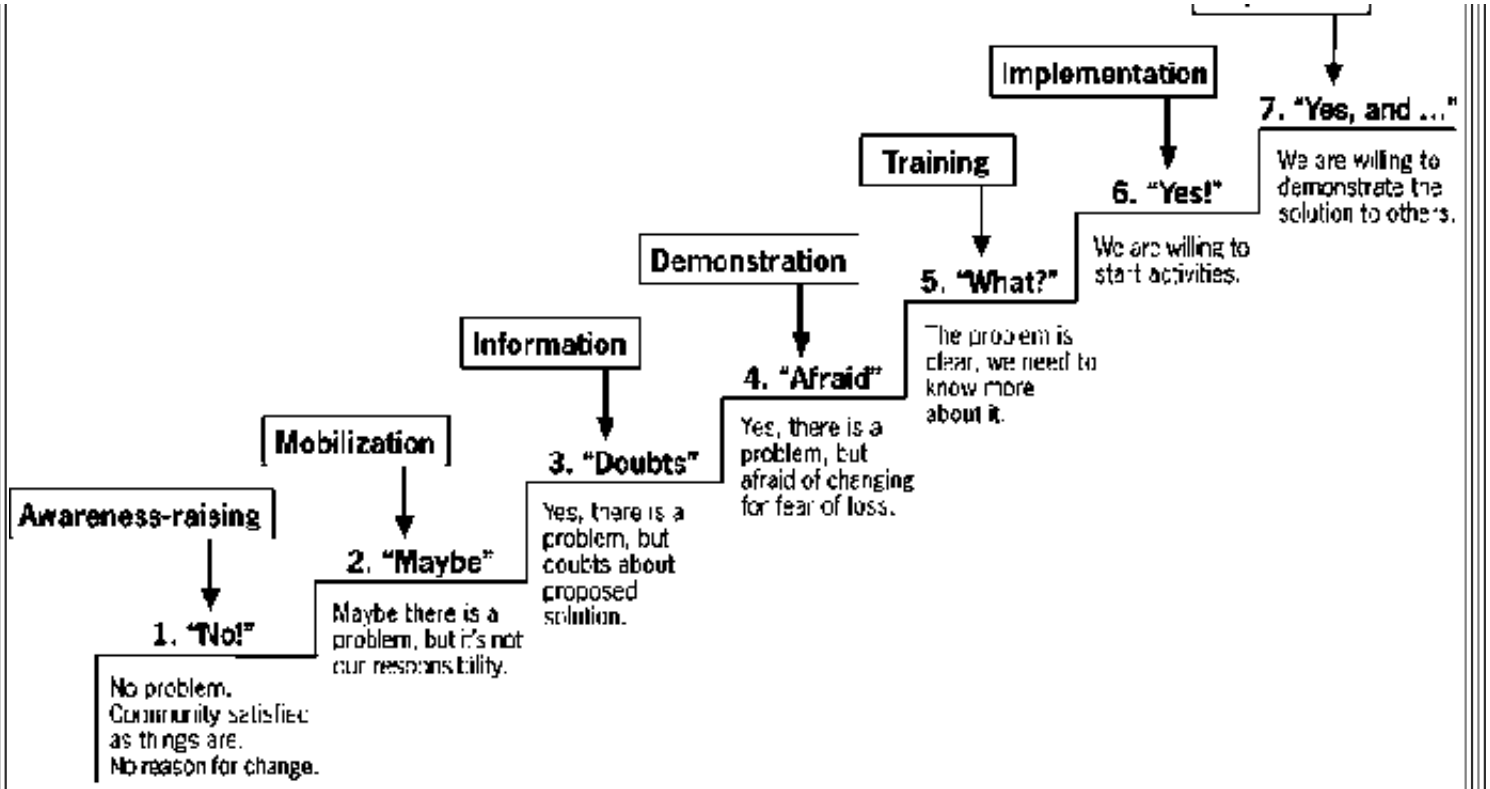
What is the difference between community participation and community management?

Participation as	Participation as 'cost-	Participation done	Responsibility in 'decision-

a form of 'cheap labour'	sharing'	as a 'contractual arrangement'	making'
Community's contribution • Free construction labour • Free local raw materials	**Community's contribution** • Token contribution in cash or in kind towards maintenance	**Community's contribution** • Volunteers in committee • Volunteer as caretaker • Commitment by leaders • Contributions	**Community's contribution** • Community fully in charge with possible subsidies for capital investments; part of running costs/support
Community's involvement Only carrying out work	**Community's involvement** Only some community members	**Community's involvement** Not all community members; contract can be commented on	**Community's involvement** All community members, including women
Role of "outsiders" Idea, planning and design	**Role of "outsiders"** Decide on contribution level	**Role of "outsiders"** Develop ideas and contract	**Role of "outsiders"** Facilitation, advice
Aim/Benefit Lower cost	**Aim/Benefit** Lower cost Cost recovery	**Aim/Benefit** Minimal local management infrastructure (local	**Aim/Benefit** Genuine commitment and support from whole community through

		leadership, local committee, local maintenance volunteer)	participatory community education and involvement in decision-making from the start
Assumption Pride will lead to maintenance	**Assumption** Contribution indicates service is valued and shows commitment	**Assumption** Legitimizes the project; local management; technology transfer through contract	**Assumption** Long-term benefits and increased use and sustainability justify high investment (staff, time, costs)
Limitation Not a community priority Contribution not voluntary Use and maintenance may vanish	**Limitation** Commitment only from some Not all involved, e.g. women, the users; system rejected if major breakdowns occur	**Limitation** Not all villagers may be involved in the decision. Contract not fully understood. Selection of committee and caretaker too hasty; willingness to pay can be poor after some time	**Limitation** Requires highly trained and motivated staff; Difficult, time-consuming, expensive

Overhead sheet 5



Ways to approach a community

Adapted from SARAR: Resistance to change continuum

Overhead sheet 6

Why involve communities in the management, operation and maintenance of RWSS?

- Building on existing local knowledge and management capacities
- All social groups feel concerned and can participate

- Addressing the true needs of community members
- Solutions acceptable to community members
- Solutions adapted to community capacities
- Increased community commitment to improve the situation
- Better understanding of the causes and effects of problems
- Empowering the community and reducing dependency
- Increased sense of ownership and responsibility
- Increased self-consciousness and confidence in own capacities
- Direct interest to have a system well maintained
- Possible improvement of willingness to pay
- Reduced overall and government costs

- Improved reliability and sustainability of systems

Overhead sheet 7

Goals of community management

- Improved reliability and sustainability of the system
- More appropriate choice of technology and service levels
- Reducing investment and operation costs for both the support agencies (government) and the communities
- Increased confidence and problem-solving capacities for further development

activities

- Promoting gender-sensitive solutions
- Contributing to democratization and equity in the development process

- Increased health and socioeconomic well-being

Overhead sheet 8

Characteristics of community management

Community is responsible for:

- Maintenance and repair
- Local management and organization
- Financing

Community decides on:

- Technology choice
- Service level
- Form of local organization
- Local rules and regulations on use
- Financing mechanisms
- Sanctions

Community controls:

- Ownership of the system
- Outcome of decisions

- Quality of work done and functioning of the system

Overhead sheet 9

Forms of community management

The forms of community management vary according to the size of the community, the technology used, the local context, and national legislation. Basically, community management operates through a Committee whose members are elected by a General Assembly of users. The following forms can be found:

- **Tap or Neighbourhood Committee**

  Responsible for operating and maintaining a specific water point.

- **Water Committee**

  Responsible for all activities (managerial, operational, technical and financial) of a particular scheme, which covers a larger area than a neighborhood and possibly the whole community.

- **Village Association**

- Responsible for all development activities concerning the village, and includes overseeing water and sanitation.

- **"Coordinating" Water Committee**

Responsible for managerial and financial matters and coordination of several smaller committees (tap/standpost or neighbourhood committees), which retain responsibility for operation, maintenance and collection of fees.

- **Water Committee contracting a private body**

Responsible for general management and control, but contracts a private body (an individual, a mechanic, a group of artisans, or a firm) to operate and maintain the system.

- **Delegated responsibility by local authority**

Ownership and decision-making are held by the local authority, while the water committee operates and manages the system.

- **Inter-community Federation of Committees**

When several communities share the same pipe source or water source, each community has a water committee to operate and maintain its own water point and collect fees, part of which goes to an Association or Federation of Committees for maintenance of the whole system (pipes, source).

Overhead sheet 10

Typical tasks of a Water Committee

1. Represents the community in contacts with support agencies
2. Coordinates with other community institutions and decision-making bodies
3. Ensures efficient and effective overall management of systems:

    - takes up assigned roles and tasks
    - ensures equity
    - organizes contributions
    - organizes effective O&M
    - ensures accurate financial management
    - promotes hygienic and effective use of facilities
    - holds regular committee meetings
    - ensures good communication at all levels
    - provides information and feedback

- collects information.

Overhead sheet 11

Composition and legal status of a Water Committee

The composition of a Water Committee will vary according to its management and operational mandate.

Generally it is composed of a President, Vice-President, Treasurer and several representatives of the users, with a balance between posts occupied by men and by women. If the community is directly responsible for the technical operation and maintenance of the system, the Committee also includes the operator and/or caretaker.

In many countries, the Water Committee does not have proper legal status. This makes it vulnerable in situations with material, financial, contractual or legal problems. The following types of legal status are found:

- **The Municipality officially registers the Water Committee**

  If it has been elected by a General Assembly of users, a "constituting" Act must be produced by the Assembly

- **The Water Committee is registered with the Chamber of Commerce as a non-profit-making Association**

- **The Water Committee is registered with the Chamber of Commerce as an Association with an economic interest**

  It can then operate as a concession or under contractual arrangements with local authorities

- **The Water Committee operates under the legal mandate of a Development Association**

Overhead sheet 12

Prerequisites for community management

- Demand to improve the system
- Policy and legal framework for promoting community management
- Effective external support, if required
- Information on system options, as well as on cost and technical implications of each system, must be available to the community
- Technology options must be selected with the communities, and adapted to the community's capacities and needs
- The community understands the implications of choice in terms of responsibilities and tasks The community is willing to pay
- The community has decision-making power
- The community has access to required capacity-building support

- There should be a policy framework to permit and support community management

4. Background information[1]

[1] Most of this background information has been extracted from: *"Putting Community Management in Place" - Four years of experience with*

***improving water management in rural communities - Community Managers for Tomorrow*. Document N.1, IRC, 1998.**

4.1 The concept of community management

Community management has different connotations in the literature. This was also the case with community participation, the definition of which already in 1982 ranged from the provision of free community labour inputs in government projects, to autonomous self-reliant development. Despite or perhaps because of the unclear definition, community management of water supply and sanitation systems has increasingly been seen as a fundamental option for sustainable development. Community management of services, backed by measures to strengthen local institutions in implementing and sustaining water and sanitation programmes, was one of the guiding principles adopted in the New Delhi Consultation in 1990 and reconfirmed in Agenda 21.

Why is it believed that community management of water supply and sanitation systems will be any more successful in achieving sustainable coverage than the top-down approaches from the past? Experience in many developing countries shows that even very good water agencies cannot successfully operate and maintain a network of widely dispersed water systems without the full involvement and commitment of the users. Despite the best endeavours of central agencies, the overstretching of staff, transport and budgets has led to breakdowns in the system, dissatisfied consumers and demoralized agency personnel. Many governments are becoming convinced that centralized systems cannot deliver the required services for the sector. This resulted in a strong push towards decentralization which started in the late 1980s.

Hopes are now high with respect to community management, because it is believed that this approach seeks to make the best use of the available resources in the community with some support from government agencies. It puts the people in charge of their own water systems in a flexible partnership with the supporting agencies. Communities take on more tasks and responsibilities, and relieve the agencies of all routine management and maintenance duties. This frees the agency's resources, which can be used to reach more people. Successful community management is claimed to build community confidence and stimulate wider development efforts. It is also stressed that there is still a lot to learn.

Much of this learning is at the level of the agencies and institutions, which often hold the purse strings and so can dictate the course of development. Increasingly, governments and institutions are trying to adopt a more integrated and demand-responsive approach. This is stimulated by the growing pressure to focus on sustainable functioning and effective use of water supply and sanitation systems. Another reason why government agencies are searching for alternatives and are amenable to participatory approaches is that, over the past two decades, blueprints of development strategies have been shown to be ineffective in meeting the basic needs of large numbers of marginalized, vulnerable people. Thus public sector agencies are showing a growing interest in participatory approaches that involve the community in their attempt to do more with fewer financial resources. They are developing, for example, links with NGOs that used similar types of approaches.

In this context, it is surprising that agencies do not have internal mechanisms to learn from their experience with communities, to learn how to work with them, and to share this among their staff. What is needed is an approach to learning that

allows the development of new methodologies and promotes change in the prevailing attitudes, behaviours, norms, skills and procedures within the agencies.

Not only do the agency staff have to learn to work with the communities and overcome the top-down approach from the past, but the communities also must come to grips with working with the agency staff in a horizontal relationship. In the future, the push for change will be more radical, with increasing decentralization and with communities who will bear a larger share of the cost. Then the paradigm shift from communities participating in agency projects to agencies participating in community projects will become even more important.

According to Franz Gahwiller of SKAT (Swiss Centre for Development Cooperation in Technology and Management), "... we usually do not allow for the required time to initiate a process of change. Such a process may take years and years, but we want the communities to manage their systems as soon as possible. Moreover, the societal environment for such processes of change needs to be democratic."

4.2 Some findings from the field

In 1995 a participatory action research (PAR) project on community management for rural water supply was initiated by IRC together with partner organizations in six countries (Cameroon, Colombia, Guatemala, Kenya, Nepal and Pakistan). Local research teams worked closely with community members in 24 communities to better understand community management and to explore possible improvements. The essence of this project is to help communities to gain a better understanding of the problems they face and to let them become a key factor in problem-solving. "The knowledge we gain from this 'research' is much more valuable than gifts. It

is something we keep for life" (villager from Nkoundja, Cameroon). Community members thus become catalysts and in beginning to understand and discuss their problems, they create the space to allow a range of actors to participate and express their views.

A first assessment of the situation in the six countries indicates that:

- **In each country, community management of completed rural water supply systems is the accepted national policy, but implementation is not universal and each agency has its own procedures.**

- **None of the governments so far treats communities as future managers in the sense that they can make their own choices from a range of options, each with their own pros and cons. Nor do they train communities for all community management aspects. Training is focused on technical tasks and book-keeping, and is mostly given to men.**

- **Experience with existing community managed water supply systems varies. In Cameroon, 438 projects that were built and managed by the community showed a breakdown rate of 9%, whereas many others built without community involvement are no longer operational. Other reports indicate that a number of community managed systems do not function well, partly for technical and ecological reasons, and partly because of poor administration and lack of management training and back-up support.**

- **A considerable number of community members are not served because of poor water distribution and poor network management. Several of these**

persons contributed to the construction of the system in cash or kind, but do not obtain the benefits.

- **Although existing systems have technical, managerial and socioeconomic problems, the communities only mention the technical problems. The other problems are revealed only after further probing and discussion.**

- **Record-keeping of finances and of agreements made in meetings is very limited and erodes the confidence of the community members. There is a similar weakness in communication and information-sharing which are mainly in the hands of the local leadership.**

- **Many ESAs (external support agencies) stipulate preconditions for future management, usually the formation of a water committee with some women represented. However, little is done in developing management tools or management training.**

Another participatory evaluation of 40 community managed water systems in Ecuador revealed that the systems do provide water but are in need of both technical improvements and better management.

On the positive side, the above-mentioned PAR project already shows that working in a horizontal way with the communities and helping them to clarify their problems is a very powerful tool for change. Communities in Kenya, for example, were initially timid but are now enthusiastic about the management of the water system, and are undertaking tasks in a transparent way. An overall picture is emerging that communities are capable of managing their water supply

systems, but they need back-up support. The agencies also clearly need support. Strategies and tools for enhancing management capacity in communities are developed and tested in the project, which now offers a flexible support approach, called Participatory Action Development for community management. This approach aims at responding to the concrete needs of communities related to the management tasks and skills in their public services, and at finding solutions to problems and conflicts in the management of rural water supply by communities.

4.3 "Revisiting" community management

Instead of trying to refine the existing definitions of community management or add another version, there seems to be an easier way to increase our understanding of what it encompasses. Community management deals with two dimensions: communities and management, and the relation between them.

Communities are groups of people with common but also conflicting interests and ideas and different socioeconomic and cultural backgrounds. The identity of the people in the communities is shaped by their history and their socioeconomic and environmental conditions. Some of them, often the economically better off, may be better informed and know more about the world, but on the other hand, may have certain interests in keeping the status quo and therefore may not be willing to solve certain problems. Women may have different interests from men and their views may not have been heard in the past, or their position may make it difficult to achieve changes on their own. Men, women and children have different needs, different access to resources, and different areas in which they can take decisions. Yet, all of them have equal rights to contribute to and benefit from development activities, thus making it necessary to strike a gender balance in programme

activities, problem identification, conflict resolution, and joint management of common interests.

The water supply system may be one such common interest, but at the same time can be a major source of conflict. This brings us to the dimension of management. Management is a concept which is very much being developed and is changing to entail sharing of responsibilities in new ways. It is becoming more focused on learning, creating an enabling environment, and building trust, and places strong emphasis on communication and holistic approaches. A collective learning process starts with dialogue, or an open exchange of ideas in the group. This permits the participants to discover their potential and perspectives. This dialogue differs from the more common discussion, which has its roots with 'percussion' and 'concussion', literally a heaving of ideas back and forth in a winner-takes-all competition. Team learning develops the skills of groups of people to look beyond individual perspectives. It requires a positive learning environment. This is not easy, particularly in a politicized environment such as the water and sanitation sector. Not only are good facilitation and a variety of techniques required, but also leadership training for group members and a review of the historical developments with the community. Equally important is the need to review, with the sector staff, the social missions of their institutions and their own aspirations. This requires building confidence and trust, helping them to become self-confident and gain self-esteem. A guide to this process was already provided in ancient China (c. 700 BC):

> **"Go to the people, live among them, learn from them, love them, start with what they know, build on what they have. But of the best leaders when their task is accomplished, their work is done, the people will remark: We**

have done it ourselves!"

The community is not the only actor, but can benefit from partnerships with water sector institutions and the private sector. There is no blueprint on what the inputs of different actors can be in the different project stages, but what may be expected is that the role of the government or NGOs who were initially the project leaders will reduce over time, and the role of the community water enterprise (water committee, users' association, private enterprise, etc.) will increase. The different actors or their representatives thus have to come to an agreement on what the specific contributions and responsibilities will be over a period of time. This they can only do on the basis of informed decision-making which particularly addresses the expected service level, and the long-term management of the system which is still the weakest issue today. The discussion may include possible future extensions of the system, not in great detail, but the basic concept should be clear.

4.4 Some concluding remarks about community management

Although a paradigm shift seems to be emerging, the principal challenges to put community management into mainstream practice are still huge. Currently in most countries, community management of rural water supply systems is the accepted national policy. However, there is still a considerable gap between policy and practice. In fact, communities are not treated as future managers in the sense that they can make their own choices from a range of options. Nor do they get the opportunity to learn the required management skills.

This and the lack of back-up support for problems going beyond the community

level are important reasons for the sub-standard performance of many systems. This will continue to be the case unless the managerial aspects are better taken in hand and practical management tools are developed together with communities. Management skills also include handling of conflicts because communities consist of people who do not necessarily share the same interests and values. Often conflicting interests exist both within the community and between the community and outsiders.

Gradually we see agencies starting to participate in the development endeavour of the communities instead of the community participating in the agency's projects. This paradigm shift, however, will only materialize if new learning approaches and participatory methods are adopted in challenging institutional settings where community knowledge and institutional knowledge are equally valued and people start to respect each other's views.

The partnership approach, for agencies, means that new coherent strategies and methods are needed to further build management capacity in the communities, and through dialogues with them. This also implies that agencies need to make the necessary adjustments and strengthen their own capacity to provide effective support to the communities.

Also institutional change is needed which allows for harnessing the partnership between communities, governments, NGOs and the private sector. The relationship should be transparent, based on mutual understanding and appreciation of the different 'social' missions of the institutions.

For a community to share management responsibilities to a greater degree, stake-

holders should be allowed to learn about the system in all its aspects. Support strategies should create sufficient learning opportunities and start a process of dialogue for all involved. The challenge is how to make possible this continuous process, knowing that 'each place, each culture, each experience requires its own approach'.

Unit 4: Gender awareness

1. Outline of session

- **Objectives**

  - **To clarify the concept of gender and its importance in water supply and sanitation projects**

  - **To raise awareness on how to develop and apply a gender approach for operation and maintenance**

- **Methodology**

  1. Introduction
  2. Exercise on the concept of gender
  3. Focused discussion on the relevance of a gender approach
  4. Interactive presentation on developing an O&M project with a gender approach
  5. Group exercise on development of a gender approach

- **Materials**

- √ Overhead transparencies
- √ Overhead projector, screen or white wall
- √ Cards (thick paper)
- √ Flip chart

- **Handouts**

- √ Exercise sheets
- √ Copies of transparencies and background information

2. Notes for the facilitator

Introduction

The purpose of this session is to bring into the open the differences between women and men, and to find solutions to problems of inequality based on mutual understanding. It involves identifying gender differences and seeing how they led to inequalities of power, which created obstacles for women's full participation in the management of water supply and sanitation programmes.

Some participants may be a little resistant in accepting gender equality because it goes against their own attitudes towards men or women. One suggestion for overcoming this resistance is to highlight examples in our daily lives where this issue has evolved within the last decade or two.

Exercise on the concept of gender

The facilitator distributes one red card (representing men) and one blue card

(representing women) to each participant, and asks a series of questions relating to O&M activities (see overhead sheet). For each activity, the group should indicate with the cards whether they think men or women are more likely to be involved in this activity.

At the end of the exercise, the facilitator asks the group to reflect on the issues and to comment on any differences between men and women they observed (e.g. difference in access to and control of resources, decision-making, working, etc.). The facilitator will then help the group to make a definition of what gender is.

Focused discussion on the relevance of a gender approach

The facilitator asks the group, "Why is a gender approach relevant?" Their answers will be written on the board. Disagreements may arise during the discussion, and the facilitator should try to let the participants express their views, while keeping control of the time. See overhead sheet for some suggestions on this matter.

Interactive presentation on developing an O&M project with a gender approach

The facilitator can use the information contained in the overhead sheets or in the background information (see below) for an interactive presentation, but may find it opportune to invite a gender specialist to present his or her experiences in developing a project with a gender perspective.

Group exercise on development of a gender approach

The participants should be divided into three small groups to deal with: a) a

sanitation project; b) a handpump project; c) a small piped system (or other project). Each subgroup is asked to develop the main points which are critical for the project, with the aim of having sustainable operation and maintenance within the gender perspective. The results are shared and discussed in a plenary session. Experience has shown that the participants like to keep a record of the work they have been doing, so it is important to organize secretarial support to help with this.

3. Overhead sheets: Sheet 1

Exercise: Gender specificity

For each question, the participants respond by raising a red card (men) or a blue card (women). If important differences arise within the group, the facilitator should discuss the matter and ask for comments.

- Who makes the rules and regulations concerning the use of the water point?
- Who ensures that these rules are observed by all users?
- Who keeps the water point and the surrounding area, including the drain, in a good and clean condition?
- Who carries out immediate repairs to any small damage or leaks to prevent major failures and more costly repairs?
- Who is responsible for regular maintenance (lubrication, cleaning of mechanical parts)?

- Who reports any major failures immediately to those who are responsible for big repairs?
- Who collects and keeps the money safely, while recording all income and expenditures?
- Who makes the necessary payments for maintenance and upkeep of the water point?
- Who reports to the community on how the money has been spent?
- Who takes decisions within the Water Committee?
- Who contributes to the construction of the water supply system?
- Who contributes to the construction of a latrine?
- Who maintains the latrines?
- Who transports and stores the water?

- Who educates the children on proper hygiene behaviour?

Overhead sheet 2

What is gender?

Figure

- Sex relates to the biological difference between a man and a woman
- Gender relates to the social difference between a man and a woman
- Gender does not relate only to women, but to both women and men

- The gender approach optimizes the roles and responsibilities of both men and women

Overhead sheet 3

What is the relevance of a gender approach?

- Users form an heterogeneous group
- Women have a keen and direct interest in water supply, sanitation and hygiene
- Women stay in the community
- Men and women, by sharing the responsibilities, decision-making and problem-solving, contribute to a higher efficiency of the system

- Women transfer behaviour patterns to their children
- The gender approach generates wider and more specific participation of the community in the project cycle
- The gender approach contributes to the development of women

- The gender approach contributes to sustainability.

Overhead sheet 4

Planning with a gender perspective

1. Participatory diagnosis of:

- the existing water supply and sanitation services within the community
- health status by gender
- work division in households
- accessibility, use and control of water
- problems and constraints
- technical expertise among men and women
- the cultural elements and beliefs linked to water and sanitation
- social participation in decision-making.

2. Consolidation of community organizations

- constitution of mixed committees

- active promotion of women in the committee
- discussion with the committee on problems relating to participation and decision-making in a gender perspective
- revision of the election process of community members in the committee.

3. Appropriate selection of technology

- technology adapted to the needs of men and women (washing, etc.)
- technology using the knowledge and skills of both men and women
- technology that can be maintained by men and women.

4. Operation and maintenance

- training for both men and women

- active and organized role in preventive maintenance.

4. Background information[1]

[1] Most of this background information has been extracted from: *Gender in water resources management, water supply and sanitation - Roles and realities revisited*, by Christine van Wijk-Sijbesma. The Hague, IRC, 1998 (Technical Paper Series No. 33-E).

4.1 Definitions

What is gender and what is a gender balance? Contrary to what is still stated in the literature, gender does not relate only to women, but to both women and men. As the Institute of Development Studies of the University of Sussex puts it, "The gender-based approach is distinct in that it focuses on women and men, rather than considering women in isolation." In particular, a gender approach pays attention to:

- **differences between women's and men's interests, even within the same household, and how they are manifested;**
- **the conventions and traditions determining men's and women's position in the family, community and society at large, whereby women are usually dominated by men;**
- **differences among women and among men, based on age, wealth, ethnic background and other factors;**
- **the way gender roles and relations change, often quite rapidly, as a result of economic forces, migration for work, and other social trends.**

4.2 Historical background

The fact that a gender approach is still often taken to mean only changes affecting women, and not men, goes back to four decades ago. The first expression of concern for women and their involvement in development emerged in the 1960s. Women were recognized as a disadvantaged group, for whom special women's components had to be developed. In general projects, such as water supply, women were seen mainly as the beneficiaries of the proposed improvements.

In the late 1970s and early 1980s, women began to be recognized as actors and managers in their own right, and it was demonstrated that involving women in planning, construction and management of, e.g. water supply and sanitation services, brought benefits for general development, for the projects, for the households, and for the women themselves.

In the second half of the 1980s and early 1990s it became clear that the effective involvement of women requires them to unite and develop strength and self-reliance. This enables them to give direction to their lives and circumstances and encourages men to look upon women's participation not as competition, but as a natural right - the right for women to deal with and make decisions on material and non-material resources which are crucial to their lives. While women are the ones who do the physical work of transporting, digging, cleaning and caretaking, they have no say in the control of the resources on which their livelihood depends.

Carolyn Moser (1989) described four stages in the evolution of development programmes: the welfare approach, the equity or anti-poverty approach, the efficiency approach, and the empowerment approach. The *welfare approach* focuses exclusively on women's reproductive roles. It identifies women exclusively as mothers, wives and housewives. It sees the problem and its solution in the women themselves: if the women change their domestic behaviour, better hygiene, health, nutrition, etc. will follow.

In contrast, the *anti-poverty* and *efficiency approaches* point out that besides being mothers, wives and housewives, women are also economic producers and actors in the public realm. During colonial and neo-colonial times these roles were not recognized and the position of women was low. This resulted in a loss of

status, as well as a loss of income, and reduced the efficiency of projects.

The *empowerment approach* seeks to identify power, not in terms of domination, which carries the assumption that a gain for women implies a loss for men, but rather in terms of the rights of women, and of men, to make their choices in life and to influence the direction of change. The approach challenges women to seek a new self-consciousness and new positions in their countries' legal and civil codes, economies, institutions and management systems.

4.3 Elements for a gender analysis

For the formulation, assessment and review of policies, projects and programmes and documents, such as the present literature review, the following six questions may form the basis for the analysis of gender in water resources development and management:

1. In what way are men and women using the resource and for what purpose(s)?

2. How are the contributions to the development and management of water resources (e.g. in labour, time, payments, and in kind) divided between men and women?

3. Who makes the decisions and who controls their implementation at the various levels?

4. Who commands the project or programme resources, such as jobs and training?

5. Who gets the benefits and has control over these benefits, such as status, water, products produced with this water, and income resulting from these products, and who makes the decisions on how this income is used?

6. How are these attributes distributed among women and among men of different wealth, ages, and religious and ethnic divisions? In other words, do some women and men benefit more than others?

A gender approach analyses current gender divisions and strives for an equitable balance between men and women of different ages and marital and socioeconomic status, in terms of the following indicators:

- **access to information**
- **amount of physical work**
- **division of contributions in time and cash**
- **degree of decision-making**
- **access to resources and benefits: water, training, jobs, income**
- **control over these resources and the benefits from them.**

4.4 Ways to overcome constraints to women's participation

Activity	**Mechanism**
Project initiation	Programmes establish contacts with male leaders to get their understanding and support for the participation of women.
Information	Programmes use information channels and materials that also reach

and dialogue	women.
Meetings	Programmes encourage women to participate and to speak at project meetings by:
	• fixing a time and place convenient for women and men • informing women about the meeting and inviting them to attend • making appropriate seating arrangements (not women at the back) • facilitating women to speak (use of vernacular language, discussion breaks, choosing a spokeswoman, etc.) • having a separate meeting with women, where necessary.
Planning	Linking water and sanitation projects with economic and educational development programmes.
Decision-making	Programmes enable women to participate in the following:
	• appointment of caretakers and mechanics • appointment of committee members • design and location of facilities • local management arrangements • local financing system.
Representation	Women choose their own representatives based on trust, easy contact, leadership capacity, and feasibility (time and family permitting).
Management	Programmes build on women's traditional tasks, skills and knowledge for the following new roles in management (without in any way excluding men):
	• management of water, waste and soil use • maintenance and repair of water points

	• hygiene education with other women • construction of latrines and monitoring maintenance and use • management of funds.
Training	Training women for technical and managerial tasks. Making programme staff and management aware of the reasons for equal participation and offering training to both women and men.

4.5 Gender and operation and maintenance

As a result of decentralization to the lowest appropriate level, many of the operation, maintenance and repair tasks are now delegated to the communities. Owing to the strong influence of gender perceptions and relations, these tasks have been regarded as purely technical and a male prerogative.

Opinions that women cannot perform maintenance and repair tasks seem to be based more on stereotyped gender concepts than on any real inability. Confronting such gender stereotypes, Wijk (1985) quotes nine publications which demonstrate that women may well make better maintenance and repair workers than men. The reasons advanced are the direct concern and personal interest of women in their water supply; their regular visits to distribution points; the compatibility of preventive maintenance and user education with women's gender-specific tasks; the easier communication between female maintenance staff and female users; women's greater sensitivity to social pressure from other women to do a good job; the importance of health aspects; the lower career orientation and labour mobility of women; and training of women in modern technology in recognition of their age-old skills in management of their domestic water systems.

Recognizing the value of a gender approach, most programmes now involve

women in local maintenance. Here a distinction must be made between voluntary maintenance jobs ('caretaking') and paid jobs (mechanics or similar functions). The following patterns have been observed: a) both women and men are caretakers and both do the same work; b) a man and a woman work as a caretaking team; c) only women are caretakers, while the men have the paid jobs of mechanic, etc.; and d) both women and men are given paid jobs as mechanics, etc.

The more common situation is that women become voluntary caretakers of the waterpoints in their neighbourhoods. As such they have mainly environmental and preventive tasks: keeping the sites clean and dry, avoiding water pollution and wastage, reducing misuse and vandalism, especially from children, diagnosing and reporting problems. The work is mainly physical. Training, if given, tends to focus on health and hygiene, rather than on technical know-how for early diagnosis and preventive maintenance.

In the last decade, women have had better opportunities to be trained for maintenance jobs that go beyond cleaning and reporting, and to be paid. In particular, women handpump mechanics have become more prevalent. The effects of maintenance by women on the one hand, and by men on the other, on the condition and performance of the water system and on the workers themselves have not yet been extensively investigated.

4.6 Gender and management

In the past it was rare to see women working with men in organizing and managing their domestic water supply services. This is now rapidly changing.

Female members of local management organizations are the result of appointments by local leaders or interventions by programme agencies. Alternatively, they have been chosen by the men and women in the communities themselves. It is reported that women are more effective than men.

Female participation in management has produced many effects on the women and men in the community. Recognition of women's management tasks and training for new tasks and skills have increased their status and self-confidence. Women in Visayayas in the Philippines reported that their proposals on the time of meetings and on designs for water supply and latrines are increasingly treated with respect. They now believe that they can really contribute something for the good of the community and be 'partners in progress' and not 'for decorative purposes only'. Some believe they are no longer subordinate to the men. Male and female leaders welcome the role of women in development based on women's total capacities, though sometimes this is limited to traditional female roles.

Some agencies promote the management of water supplies exclusively by women and do not address male responsibilities and tasks. Sometimes, project agencies pay so much attention to women's as compared to men's involvement that the service comes to be seen as a women's project, for which only the women are responsible. In such cases, the projects cause women to carry the burden of a community water supply from which male household members also profit, regardless of the women's higher workload and fewer resources. The decision to do it alone may, however, stem from necessity or choice.

Unit 5: Cost recovery

1. Outline of session

- **Objectives**

  - **To review the key principles which influence sustainable cost recovery**

  - **To familiarize participants with financial arrangements, willingness to pay and financial management issues**

- **Methodology**

  1. Introduction
  2. Lecture on the seven key principles of cost recovery
  3. Exercise on financial arrangements
  4. Working in pairs and discussion on willingness to pay
  5. Group exercise on sound financial management

- **Materials**

  √ Overhead transparencies
  √ Overhead projector, screen or white wall
  √ Flip chart and markers
  √ Coloured cards (thick paper)

- **Handouts**

  √ Exercise sheets
  √ Copies of transparencies and background information

2. Notes for the facilitator

Introduction

This session highlights the main principles that lead to sustainable cost recovery, which must be followed for the sustainable operation and maintenance of water supply and sanitation services. The participants are asked whether cost recovery has been a problem in their projects and, if so, to give examples.

The seven key principles influencing sustainable cost recovery

The facilitator, using the background information and overhead sheet, should describe the seven key principles of sustainable cost recovery in a short presentation.

Exercise on financial arrangements

Please refer to the overhead sheets (pages 193, 194). Each participant is given three cards (thick paper) of different colours: yellow to represent the central government, green to represent the municipality, and blue to represent the community. Other colours can be added, if necessary. The facilitator puts up the overhead sheets and asks the participants to assign the operational and financial responsibility for each task by showing the appropriate card. If important differences or disagreements arise, the facilitator should discuss and clarify the positions. The facilitator should, at the end of the exercise, highlight the need to put into practice (e.g. with a contract) this division of responsibilities.

Working in pairs on willingness to pay

The participants group themselves in pairs, and each pair discusses (for 10 minutes) the factors that influence the users' willingness to pay. The facilitator then invites individual comments to be given freely, and makes clear any points that are not well understood by the group. All opinions are written down by the facilitator who completes the list with information provided in the overhead sheet and in background information.

Group exercise on sound financial management

The facilitator divides the participants into two groups for an exercise on 1) water supply (handpumps) and 2) water supply (piped system). Each group is given the exercise sheet on sound financial management and asked to fill in the Table. The results are presented in plenary and discussed. The facilitator can use the information contained in background information.

3. Overhead and exercise sheets: Sheet 1

Seven key principles to sustainable cost recovery

1. Identifying the cost implications of the project's characteristics and the environment
2. Maximizing the willingness to pay
3. Clarifying financial responsibilities
4. Optimizing operation and maintenance costs
5. Setting an appropriate and equitable tariff structure
6. Developing an effective financial management system

7. Organizing access to alternative financial sources.

Exercise 1

Each participant is given three cards of different colours: yellow to represent the central government; green to represent the municipality; and blue to represent the community. (Other colours can be added, if necessary). The facilitator projects an overhead sheet, asking participants to assign the operational and financial responsibility for each task by voting with the cards. If there are important differences, the facilitator should start a discussion to clarify the positions.

O&M of borehole, diesel pump, storage and standpost system: who is responsible?

(adapted from WASH Technical Report No. 93)

O&M tasks	Operational responsibility	Financial responsibility
Operate the engine daily, safely and efficiently		
Perform regular checks and adjustments (fuel, oil, filters, belts, etc.)		
Regularly replace the engine oil, filters and pump oil, if applicable		
Perform regular checks and adjustments on the alternator, starter, radiator, valves and injectors		
Periodically carry out a complete overhaul of the engine		

Periodically carry out a complete overhaul of the engine, pumps and associated equipment		
Check all pipelines, tanks, and valves for leaks and breaks, and repair them		
Monitor standpost use to encourage proper use		
Check all standposts for leaks, wear and tear, and repair if needed		
Flush all pipes periodically		
Clean the standpost concrete aprons and drainage area, and repair if needed		
Test the water for microbiological contamination; if present, locate and correct the source; disinfect		
Measure the water output periodically at the well head and standpost. Assess leakage and initiate leak detection and repairs		
Carry out rehabilitation of the engine/pump		
Record all operation and maintenance activities in the log book		
Check the stocks of fuel and oil, ensuring proper storage and security. Maintain a special fuel log		
Check the stocks of parts, tools, and supplies		
Establish historical records of all engines, pumps and other equipment		
Develop schedules for preventive maintenance and		

Develop schedules for preventive maintenance and monitoring		
Conduct effective vehicle maintenance		

Exercise 2

O&M administrative and support activities for most water supply systems: who is responsible?

(adapted from WASH Technical Report No. 93)

Administrative and support tasks	Operational responsibility	Financial responsibility
Conduct technical and socioeconomic participatory studies		
Analyse O&M tasks for use in planning and budgeting		
Prepare annual budgets and long-term financial estimates		
Select and appoint operators/contractors for O&M		
Develop and evaluate technical and management training for water system operators		
Provide ongoing technical training for operators		
Delegate task responsibilities, supervise and pay salaries		
Keep archives, inventories and log books		
Develop and evaluate financial and management training		

Develop and organize financial and management training for community managers		
Provide ongoing financial and management training for community managers		
Collect water fees and manage revenues		
Make payments for purchases, loans and other obligations		
Respond to users' complaints		
Organize and conduct general meetings for discussions, elections, etc.		
Develop information and materials on hygiene education		
Organize community contributions for upgrading or extending the system		
Report urgent problems to the government agency		
Provide technical and management support to community managers		
Collect, analyse and monitor the results, and conduct follow-up support or training, if necessary		

Overhead sheet 2

Factors influencing willingness to pay

- Demand and participation from communities
- Service level

- Service standard
- Perceived benefits
- Relationship to production
- Level of income
- Price of water
- Relative costs
- Opportunity cost of time
- Characteristics of existing sources
- Reputation of service agency
- Community cohesion
- Policy environment
- Sociocultural factors
- Perception of ownership and responsibility
- Transparency of financial management Institutional support.

Exercise 3

Sound financial management

Financial management issues	Possible options
What costs to budget for?	
What sources of income to use?	
How to collect the money?	
When to collect the money?	
Who collects the money?	

Where to keep the money?	
How to register movements of expenditures and incomes?	
How to pay the mechanic or caretaker?	
Who administers the funds?	
What are the funds used for?	
Who orders payments?	
What type of financial control?	
How to monitor?	
What to do with bad payers? *This question should also be asked when public administrations do not pay.*	

4. Background information

"Lack of money" is often claimed to be a principal constraint to providing water and sanitation services. In many cases, the problem is not only the lack of money but also mismanagement of resources and a reluctance to pay for the service.

Some explanation is needed of the terms "efficiency", "effectiveness" and "equity". Financial management should be *efficient* in the same way that the ratio between inputs (revenues) and outputs (expenditures) should be satisfactory. *Effectiveness* measures the contribution of a project towards its objectives and results, and therefore cost-effectiveness measures the costs involved in order to reach a particular objective or result. *Equity* measures how the costs and benefits

are distributed among beneficiaries, and how they are sustained over a prolonged period of time.

The present trend to decentralize operational, managerial and financial responsibilities at local level has dramatically increased the need to design and plan for water supply services which the communities can sustain financially. The effectiveness and credibility of both government sector strategies and development cooperation policies can be at stake if this issue is not addressed urgently.

"Water is an economic and social good, and this *service* has to be paid for, since it has costs". Although this statement is now admitted by many countries, in a number of rural areas water is still considered to be nature's gift or a free service provided by the government. It is therefore necessary to convince rural populations that a water supply *service* has costs. In addition, certain financial issues have to be addressed early in the project design, such as: Should all costs be covered? Who is financially responsible? How to organize financial arrangements?

In the light of major current trends and past trials, an efficient, effective, equitable and sustainable plan for cost recovery of a community water supply service is based on seven key factors which are mutually dependent:

1. **Identifying the cost implications of the project**
2. **Maximizing the willingness to pay**
3. **Clarifying the financial responsibilities**
4. **Optimizing operating and maintenance costs**

5. Setting an appropriate and equitable tariff structure
6. Developing an effective financial management system
7. Organizing access to alternative financial sources.

4.1 Identifying the implications of the project and the environment on cost recovery

The way the project has been set up, and its institutional and legal characteristics are elements that can have a direct implication on cost recovery, particularly with regard to the following:

- Technology selection
- Community aspects
- Management options
- Policies at local, regional and national levels
- Support to the community and/or the municipality
- Economic environment.

Technology selection

Appropriate technology selection is a key factor in sustainable cost recovery. The ratio between capital and recurrent costs can be the determining factor, in the way that a technology with higher capital costs could be chosen because of lower O&M costs. There- fore, when communities select a technology for their water and sanitation service with external support, they must have clear information about the costs and charges. Communities should be aware of the financial implications of choosing a particular technology.

Community aspects

The demand by, and the participation of the community are key elements that influence the community's willingness to assume financial responsibility for the system. However, the issue of paying charges should also be examined. Other matters for consideration include the availability of materials and spare parts within the community; whether skil-ful artisans work in or close to the community and the price of their interventions; how the community is organized and how responsibilities are distributed between men and women.

Management options

The management system chosen for O&M can directly influence the way cost recovery will be organized. For instance, the water supply system can be managed by a village water committee, an inter-village association, a private person or firm operating under a contractual arrangement, the municipality operating directly or indirectly with its own staff or through community committees, or by a private organization. Each of these will have different interests and capacities, and will determine the rules for managing the finances accordingly.

Policies at local, regional and national levels

In some countries, the national sector's policy is to increase the share of private capital, which requires total recovery of the costs within the framework of the law. Tariffs set at national level can include subsidies for poorer people. In other countries, the government policy is for the community and the municipality to arrange the tariff structures and the level of cost recovery. The municipality, being

the level nearest to the community, has the possibility of creating its own regulations and tariffs for public services like water supply and sanitation.

Support to the community or the municipality

In many cases, the communities will need training in book-keeping and financial management, and may have to discuss with the local authorities when major problems arise. They may need support from professionals coming from the private sector.

Economic environment

Some countries are now going through an important economic crisis with inflation, exchange rate fluctuations and other problems, which are likely to have an impact on any kind of cost recovery mechanism.

4.2 Maximizing the willingness to pay (WTP)

Factors influencing WTP

Willingness to pay, as an expression of the community's demand, is a strong prerequisite for the financial sustainability of a water supply system. WTP, which is a useful yardstick for assessing project feasibility, depends on a number of factors which are presented in the Table below.

COMMUNITY FACTORS
Demand and participation of communities A project which is initiated on a community's request and demand, and in which the

community has been involved from the beginning, is less likely to have problems with WTP.

Level of income

Income and WTP are related. However, it can happen that abilities to pay and WTP are not correlated. Indeed, water is such an essential good, that poor communities are sometimes paying a higher price.

Community cohesion

In rural areas in particular, cost recovery may be managed through voluntary contributions to a common fund. Cohesion within the community is essential, but cannot be taken for granted. Lack of trust or conflicts between members may reduce cooperation, irrespective of felt needs, and may also affect collection systems and tariffs.

Sociocultural factors

Sociocultural practices and traditions may influence WTP, particularly in certain locations. For example, where water is considered a sacred 'gift from God', there may be resistance to payment.

Perception of ownership and responsibility

Ownership or a high degree of community involvement in water supply services may facilitate WTP, because to be in control instils pride, encourages responsibility, and may result in increased WTP for the service. Also to be taken into account are a history of government involvement in water service provision and ineffective consultations in the past.

SERVICE FACTORS

Service level and standard

Communities are looking for a service that will respond to their desire for comfort and convenience. There is also evidence to suggest that low-income groups are prepared to

pay significant amounts for basic service levels.

Price

The price level is likely to affect consumers' willingness to pay for an improved service, as against continuing with the existing supplies. A balance is required between establishing a price that both covers the costs and relates to what people are prepared to pay.

Relative costs

Consumers may compare the cost of a service to other services, e.g. schooling or power supplies as benchmarks for measuring the relative costs of water supply. If the relative costs are too high for water supply, WTP may be reduced.

Reputation of service agency

The credibility of a service agency will affect WTP. The service agency (public, private, or community institution) must be able to deliver the expected service.

Transparency of financial management

Transparency may be closely linked to the reputation of the service agency or local management organization and is often a matter of trust. Where user contributions are clearly accounted for, consumers will be motivated to continue these payments and WTP will not be affected.

FACTORS LINKED TO THE BENEFITS FROM IMPROVED SERVICE

Perceived benefits

WTP is dependent on the benefits to be gained; the extent to which these are perceived by consumers is important. Agencies and communities may not share the same perception of benefits; variations also exist within communities, often linked to who stands to gain more. An awareness of these subtle differences in consumer preferences is central to developing a sustainable programme.

Relationship to production

Relationship to production Where water use can be linked to productive activities or income-generating activities, e.g. garden irrigation or livestock watering, WTP is likely to be elevated. Again, the improved supply must be able to deliver this advantage to a greater extent than it did before.
Opportunity cost of time This is the value attached to time, compared to its next best use, e.g. productive activities. The value attached to this time may influence WTP and the extent to which the improved source of supply may save time. The value attached to time may be perceived differently within communities, and within households (i.e. between men and women). The time spent daily and the physical effort in collecting water can influence the WTP.
Characteristics of existing sources Where users consider their existing sources as acceptable, they are unlikely to be willing to pay for an improved service. Variables including perceived quality, reliability of supply, and distance from home will influence the WTP for an improved supply.
INSTITUTIONAL FACTORS
Policy environment Policies of providing water in rural areas free of charge, or well below cost, may influence WTP since consumers may equate water services with public assistance. Although these policies are being revised, new policies may not be clearly communicated and applied consistently.

Adapted from P. Evans, *Paying the piper*. The Hague, IRC International Water and Sanitation Centre, 1992 (IRC Occasional Paper No. 18).

As can be seen in the above Table, WTP may have a strong affinity with a range of

cultural, social and institutional factors that complicate the efforts to measure it. Decision-making by consumers may not follow rational economic norms and consumers may reveal their own, location-specific preferences in source selection.

Measuring the willingness to pay

Indirect measures

The above-mentioned factors can be assessed by means of socioeconomic surveys or monitored throughout a project. They will provide some trends in the willingness to pay, but are not always totally correlated.

Direct measures

One way to measure the willingness to pay at the start of a project is to assess the direct financial contribution of communities for the construction and investment of a water supply service or sanitation facility. This contribution could diminish over time. However, measuring WTP by the amount of money that people are paying for the construction and investment of a water supply system is not suitable because the community may be willing but unable to pay. Another direct way of measuring WTP is to calculate the percentage of payments received, to the total payments due. The lower the percentage, the lower the WTP. In this case, the results do not give any information about the reasons why people decide to contribute or not (high or low WTP). Direct measures have this problem.

Hypothetical behaviour studies

An alternative approach to estimation of benefits is to ask users what would be

their choice of service available at a specified price. This is called the *contingent valuation* (CV) method, since user responses are contingent, or dependent, on predetermined conditions. Traditional water-demand models are used to estimate the benefits via a demand function for the supply from market data, and to derive from it an individual's maximum willingness to pay. Price and demand elasticity ratios can be determined. Lack of available data and non-rational economic behaviours in rural areas are severe constraints to this approach.

The *bidding game* method is a negotiation between the interviewer and respondent, moving within a range of potential prices for a water supply improvement until bidding settles at a final value. The summation of WTP bids for all the households served by a project is an estimate of the total benefits of a project and can be compared with the costs of the project to decide whether the investment is justified. Probability models derived from the bidding game describe the probability that a particular family will use a new water source. This method causes some problems because responses could be influenced in some way by the interviewer. The answers about WTP are always around the first price mentioned or starting point of the survey. The *referendum* method is more suitable because people act as they do in a market place (with a given price, they decide whether to buy or not).

Actual behaviour study

Actual behaviour studies assess the present payment behaviour of consumers, such as cash payment to vendors (which could indicate a good level of WTP), direct cost savings, indirect cost savings (calories, time, money). Time spent for collecting water and the effort and hardship to collect the water are often used as

a measure of WTP. One problem is that the actual behaviour assessment requires a long period of study because it is difficult to know what people will do, and it requires considerable expertise.

Optimizing the relationship with users/consumers

Optimizing WTP requires a strong link with users and consumers. The link between users and the water enterprise (or water committee) relies on a proper information flow on both sides. Consumers have the right to know about the quality of service (pressure, quantity, tariffs structures, adjusting tariffs, financial aspects, contracts, etc.); and the enterprise (or water committee) has the obligation to resolve the user's complaints and keep them informed. The following questions are related to optimizing the relationship between users and the water enterprise:

- **Does the enterprise have a mechanism to deal with consumer's complaints?**
- **Does the enterprise give complete information to users about the water service?**
- **How does the enterprise get to know the users' opinions about the level of service?**
- **Does the enterprise have indicators to measure the quality of the service provided to users? How are these indicators used?**

4.3 Clarifying financial responsibilities

Who is responsible?

There is a tendency today to ask communities to contribute to the initial investment costs, as a way of strengthening their financial responsibility and future willingness to pay. This contribution can represent 5-20% of the total investment costs, which are composed of financial contributions as well as labour and available local materials. Cost-sharing can be arranged between the community and the local/national government agency in order to cover the full cost. This arrangement will have to be formalized in a contract in which all parties have obligations. Financial responsibilities are very often linked with operational responsibilities, as shown in the Table below:[1]

[1] Adapted from: S. Fry. *Helping communities manage their finance - a manual for extension personnel working in rural or peri-urban communities*. Arlington, VA, WASH Project of the U.S. Agency for International Development, 1993 (WASH Technical Report No. 93).

O&M OF HANDPUMPS: WHO IS RESPONSIBLE?

(adapted from WASH Report No. 93)

O&M tasks	Operational responsibility	Financial responsibility
Monitor handpump use and encourage proper use	Community	Community
Check all nuts and bolts, and tighten if necessary	Community	Community
Check and adjust pump handle and stuffing box	Community	Community

Check and adjust pump handle and stuffing box	Community	Community
Grease or oil all hinge pins, bearings, or sliding parts	Community	Community
Clean the pump, well head, concrete apron, and drainage area	Community	Community
Check well head, concrete apron, drainage area, repair cracks	Community	Community
Measure output per stroke and compare with expected output	Community	Community
Disassemble the pump, check drop pipe, cylinder, leathers, and foot valve. Check corrosion and wear. Repair or replace if necessary.	Community and local mechanic	Community
Conduct other well, handpump or apron repairs if necessary	Community and local mechanic	Community
Repaint handpump periodically, as necessary	Community	Community
Conduct water test for microbiological contamination	Government	Government
In case of contamination, locate and correct source of contamination, and disinfect	Mechanic or government agency	Community and government
Conduct water-level check and well-yield test. Adjust cylinder setting if necessary	Government agency	Government
Record all operation and maintenance activities in notebook	Community	Community
Manage a stock of spare parts, tools and supplies on	Community, local mechanic, private	

site		sector and government
Replace entire handpump when fully worn	Local mechanic, private sector or government agency	Community and government

O&M OF GRAVITY DISTRIBUTION SYSTEM: WHO IS RESPONSIBLE?

(adapted from WASH Report No. 93)

O&M tasks	Operational responsibility	Financial responsibility
Ensure protection of spring	Community	Community
Check spring box for leaks and cracks, and repair if necessary	Community	Community
Check all pipelines and valves for leaks or breaks, and repair	Community and private contractor	Community
Monitor standpost use to encourage proper use	Community	Community
Check all standposts for leaks, wear and tear, and make repairs	Community and private contractor	Community
Flush all pipelines periodically	Community	Community
Clean standpost concrete apron(s) and drainage area(s)	Community	Community
Check standpost concrete and drainage area,	Community	Community

and repair if needed		
Conduct repairs on spring box, lines, and standpost if necessary	Community and private contractor	Community or government
Conduct water test for microbiological contamination	Government	Government
In case of contamination, locate and correct the problem and disinfect lines	Private contractor or government	Community and government
Measure water output periodically, at spring and standpost, and assess leakage	Community and private contractor/government	Community and government
In case of high leakage, initiate leak detection and repair	Community and private contractor/government	Community and government
Record all operations and maintenance activities in log book	Community	Community
Manage a stock of parts, tools, and supplies	Community, local mechanic, private sector and government	
Rehabilitate spring box/pipelines/standposts	Local mechanic, private sector, government	Community and government

O&M OF BOREHOLE, DIESEL PUMP, STORAGE AND STANDPOST SYSTEM: WHO IS RESPONSIBLE?

(adapted from WASH Report No. 93)

O&M tasks	Operational responsibility	Financial responsibility
Operate engine daily, safely and efficiently	Community	Community

Perform regular checks and adjustments (fuel, oil, filters, belts)	Community	Community
Regularly replace engine oil, filters and pump oil if applicable	Community	Community
Perform regular checks and adjustments on alternator, starter, radiator, valves and injectors	Community, private contractor, government agency	Community or government
Periodically conduct complete overhaul of engine, pumps and associated equipment	Community, private contractor, agency	Community or government
Check all pipelines, tanks, valves for leaks/breaks, and repair	Community	Community
Monitor standpost use to encourage proper use	Community	Community
Check all standposts for leaks, wear and tear, and repair if needed	Community	Community
Flush all pipes periodically	Community	Community
Clean standpost concrete aprons and drainage area, and repair	Community	Community
Conduct water test for microbiological contamination; locate and correct source of contamination; disinfect	Government	Government
Measure water output periodically, at well head and standpost. Assess leakage and initiate leak detection, and repair if needed	Community, contractor	Community and government

Conduct well engine/pump rehabilitation	Contractor and government	Community and government
Record all operation and maintenance activities in log book	Community	Community
Manage a stock of fuel and oil, ensuring proper storage and security Maintain special fuel log	Community	Community
Manage stock of parts, tools, and supplies	Community, local mechanic, private sector and government	
Establish historical records of all engines, pumps, etc.	Government	Government
Develop schedules for preventive maintenance and monitoring	Community and government	Community and government
Conduct effective vehicle maintenance	Government	Government

O&M ADMINISTRATIVE & SUPPORT ACTIVITIES FOR MOST WATER SUPPLY SYSTEMS: WHO IS RESPONSIBLE?

(adapted from WASH Report No. 93)

Administrative and support tasks	**Operational responsibility**	**Financial responsibility**
Conduct technical and socioeconomic participatory	Government and	Government

studies	community	
Analyse O&M tasks for use in planning and budgeting	Government and community	Government
Prepare annual budgets and long-term financial estimates	Community and government	Community and the government
Select and appoint operators/contractors for O&M	Community and technical adviser	Community
Develop and evaluate technical and management training for water system operators	Government and community	Government
Provide ongoing technical training for operators	Government and community	Government and the community
Delegate task responsibilities, supervise and pay salaries	Community	Community
Keep archives, inventories and log books	Community	Community
Develop and evaluate financial and management training for community managers	Government and community	Government and community
Provide ongoing financial and management training for community managers	Government and Community	Government and community
Collect water fees and manage revenues	Community	Community
Make payments for purchases, loans and other obligations	Community	Community
Respond to users' complaints	Community	Community
Organize and conduct general meetings for	Community	Community

discussions, elections, etc.		
Develop information and materials on hygiene education	Government and community	Government
Organize community contributions for upgrading or extending the system	Community	Community
Report urgent problems to government agency	Community	Community
Provide technical and management support to community managers	Private sector or government	Private sector or government
Collect, analyse, monitor results, and conduct follow-up support or training if necessary	Community and government	Community and government

4.4 Optimizing operation and maintenance costs

Costs need to be identified, estimated and analysed, and communities should be informed about them in order to be fully aware of the implications in choosing a particular technology.

What are the costs?

Investment costs (Capital)

- **Pre-feasibility study, project design, social work**
- **Equipment, materials, parts and tools**
- **Construction costs**

- **Human resource development, training**

- **Institutional capacity building**

- **Sometimes capital costs include the metering and connection costs and the return of the investment**

Recurrent costs (operation and maintenance)*

***Recurrent expenditures comprise *fixed* costs such as annualized financing costs or water source protection fees, and variable recurrent costs according to output and other factors such as physical conditions.**

- **Materials (consumable chemicals, energy, tools, spare parts and equipment)**

- **Works personnel (operation, maintenance, routine preventive maintenance, routine repairs, unanticipated repairs, construction for minor rehabilitation)**

- **Management personnel (planning, supervision, financial management, administration, monitoring)**

- **Follow-up (training support, technical assistance, institutional strengthening, monitoring and evaluation)**

- **Financial costs (interest, amortization, depreciation, exchange rate variations, inflation)**

- **Environmental costs (water source protection and conservation, wastewater treatment)**

- **Other costs (transport, services paid to a private contractor) (unaccounted-for water, both due to leakage in system and bad administration, and vandalism; they become a cost to the community if not prevented)**

Future investment costs

- **Construction for major rehabilitation, replacement, extension**

How to estimate O&M costs

There are usually no difficulties in estimating investment costs. However, the case is different for recurrent costs. Using the experience from other similar projects, although useful, can be misleading because the recurrent costs vary widely from one project to another, in terms of what has been included in their calculation. Basic recurrent costs can be measured in the following way:

Basic recurrent costs estimation

1. List all O&M activities needed, and their frequency.

2. According to each activity, list all human resources, materials, spare parts, energy, tools and equipment required.

3. Estimate the quantity or volume needed for each requirement.

4. Define the activity cost.

5. Sum up all costs of all activities.

This basic recurrent costs estimation does not include such elements as depreciation, replacement costs, initial capital reimbursement, training costs, environmental protection costs, etc. Depending on the strategy and policy of the project, these additional costs may have to be added.

Minimizing costs

An important aspect of costs analysis is how to optimize or reduce O&M costs. Costs can be significantly reduced in the following ways:

- **choosing a technology with inexpensive spare parts and/or inexpensive operating costs**
- **reducing the transport costs to go and buy spare parts and chemicals (making spare parts more accessible and available)**
- **reducing dependence on chemical use (alternative water treatment technology for instance, such as multi-stage filtration system)**
- **reducing dependence on fuel or electric consumption (solar energy, gravity)**
- **firmly installing a maintenance culture within the community and professional staff**

- **organizing preventive maintenance activities where users are also involved**

- **installing systematic leakage control**

- **applying economies of scale for larger systems (reduces costs for the consumer)**

- **applying a control for unaccounted-for water (because of both leakage and bad management)**

- **installing proper administrative and financial control mechanisms.**

Identifying the benefits of water supply projects

Benefits associated with a project intervention refer to a wide range of outcomes like:

1. *Health*: reduction in water-washed diseases, reduction in water-borne diseases, fewer days of work and school lost due to illness, less money spent on medical care.

2. *Social*: may stimulate the community to take up other, unrelated projects in environmental health, time gains, position of women.

3. *Economic and financial*: cash saving (new system replaces water vending and delivers water at the lowest cost), improvements in agriculture, external sources attracted into the village.

4. *Institutional*: institutions will be created or strengthened by reorganization of agency structures.

4.5 Setting an appropriate and equitable tariff structure

Strategies for costs recovery

Optimum allocation of resources

Tariffs are used primarily to recover costs and achieve financial sustainability, but also for efficient allocation of scarce sector resources, equitable income and benefits distribution, and fiscal viability.

Equity

Designing a tariff requires that one keeps in mind equity, affordability and willingness to pay. Equity in the sense that all members of the community, rich/poor, men/women, have equal access to the benefits of the improved water supply service. O&M costs can only be recovered from users if they are both able and willing to pay for a water supply. It is generally admitted that people should not have to pay more than 3-5% of their income for water and sanitation services (affordability criteria). A higher percentage of income expended on water will mean other important needs may not be fully met. Great care is therefore required when setting users' tariffs and contributions.

Regulation of demand

Water tariffs can be designed to regulate the demand for water, based on the

assumption that consumers have rational behaviour, and that the higher the price, the lower the consumption (called price elasticity). However, this "rational" behaviour is possible when there are substitutes, or alternative goods for water. What is the alternative to water? Certainly not Coca-Cola or beer. Price elasticity is very low in low-income areas, meaning that people will need to acquire water whatever the price. However, in higher income areas, price elasticity can be higher, and consumption patterns can be influenced by price differentiation.

OVERVIEW OF VARIOUS COST ANALYSIS TOOLS AND OF THEIR RELEVANCE TO COMMUNITY-BASED FINANCIAL MANAGEMENT

Cost analysis tools	Applications in the project cycle	Complexity
Cost recording Registration of expenditures in books. If costs are grouped by category, it is possible to do more accurate analysis.	Monitoring	Simple
Cost comparisons Comparing the costs, e.g. of facilities, life-span of materials, construction, different project alternatives.	Planning - Monitoring - Evaluation	Simple
Cost-benefit analysis Expressed as a ratio of costs versus the outcomes in terms of benefits, quantified in monetary terms. This can be difficult to calculate, especially when trying to quantify benefits such as health improvements.	Planning - Evaluation	Very complex
Cost-effectiveness analysis	Implementation	Complex

Cost-effectiveness analysis Expressed as the ratio of the costs (quantified) versus the effects (not necessarily quantified in monetary terms). The definition of effectiveness and effects can be difficult and is often subjective.	Implementation - Monitoring - Evaluation	Complex
Cost utility analysis Expressed as the ratio of costs versus outcomes (not necessarily in monetary terms), while the outcomes are ranked. This is similar to the perceived cost-benefit analysis (ratio) where the group of users, often divided into men and women, rich/poor, or different ethnic groups, identify the level of benefits and costs for themselves from a system or project. From their own perspective, they answer the question: Are the benefits greater than the costs?	Planning - Evaluation	Complex
Least cost analysis Uses estimation methods to measure the costs of an alternative or different possible outcome.	Planning	Complex
Marginal cost analysis Deals with the cost of additional outputs or inputs in a project or programme. Marginal refers to additional to what is already done. A typical question is: Will the additional inputs result in sufficient additional outputs?	Planning	Complex
Sensitivity analysis Deals with estimating the expected outcome of the project according to different scenarios.	Planning	Moderately complex

Agreements on costs to be recovered

While setting up a tariff structure, one should specify what costs need to be covered, since some costs might be covered by other financial mechanisms (see below), or determine which other organizations and institutions are responsible. Should wastewater treatment and sanitation be included in the tariff? Should the tariff only cover short-term O&M costs? Should the tariff cover the estimated unaccounted-for water? The answer to these questions will depend on the policies and strategies of the government and the arrangements between the community and the municipality for costs recovery.

Who manages the tariffs?

It is also important to specify to whom the tariff will be paid, as it can be paid to a water committee, an operator, or to the local authority. Or is water vending the most appropriate option to be considered? Water re-vending might double or triple the original price, as happens in some low-income urban areas where there are no other alternatives to safe drinking-water supply than water sold by re-vendors. Setting up a tariff should be done with and by the community, as it will allow the community to bear the full responsibility of applying the decisions made and as it will be better accepted since the community knows why this tariff was fixed as it is. However, project and support staff should assist the community in the calculation of financial feasibility of a tariff design and user charges. It is inevitable that overtime tariff levels and structure have to be revised as a result of demand patterns, changing costs structure, inflation, and the need for increased funds for major expansion. Delays in adjustments can have serious consequences for financial sustainability. It is therefore appropriate to review the tariff levels

and structure at least once a year for piped schemes and once every two years for others. However, water rates are often a local political issue, and political considerations may overrule financial balances.

Gender considerations

Gender differences and inequalities affect water resource management:

- **access and control over resources (men and women have unequal access and control over water and other resources including land, time and credit);**
- **household responsibilities (women shoulder more work than men in the home, including managing domestic water supplies);**
- **productive use of water;**
- **priorities for development and management of water resources;**
- **bargaining power and decision-making (including participation in community-based organizations and governing structures).**

User classification

User class designations will depend on the complexity of the service provided and on any special administrative or legal requirements. Each utility decides on the number and designation of user classes, but almost every utility will have the following categories: a) residential; b) commercial; c) industrial; d) institutional;

e) government; f) wholesale.

Should water be metered or not?

For water metering	Against water metering
Regular income	High installation costs
Equity	Meters need maintenance and repairs
Reduction of water waste	Vandalism
Only one parameter: cost per m^3	Long delays in payment
Technical control of the system	Heavy administrative procedures for billing
Accounting made easier	Needs personnel for meter reading

Options for charges

There are different options for regular charges: non-metered flat rates; non-metered graded rates, block rates, metered rates, and mixed system rates.[1]

> **[1] Adapted from: C. van Wijk. *What price water?* The Hague, IRC International Water and Sanitation Centre, 1989 (IRC Occasional Paper Series No. 10).**

Non-metered flat rates

In a flat rate system, each user household pays a fixed amount of money, regardless of the volume of water used. In its simplest form, the total amount of

money needed for the upkeep of the improved water supply system is divided equally over the number of households using the system. Payment may be per month, per season, or per year, depending on what is most convenient for the users of the service. Flat rates are easy to organize with private taps or group connections. In these cases it is clear who is the user and who is not. Families, who live at a distance or who have their own water source may object having to pay the same amount as those who live close to the tap. Adjustments should be made accordingly. Major disadvantages of non-metered flat rates are: a) they are not equitable in the sense that low-income households pay the same amount as the better-off, whatever the consumption; and b) they do not discourage waste of water. They are, however, easy to administer.

Non-metered graded rates

Users and households are classified into several categories, based on estimated differences in water use and income. The advantage of non-metered graded rates is that they take into account the consumption level and payment capacity of users, and therefore could reach a more equitable tariff structure. It is also a way to account for rough estimations of consumption volume, without investing in a metering system. The introduction of graded rates is easiest when clear and valid indicators of water use and income level can be found (land, herds, size of house). An alternative system to graded rates is to raise a levy on cash crops on top of already existing rates, which will be used for the maintenance of the water supply system. However, disputes may arise over the basis for grading, as some people may feel they have not been favoured.

Block rates

Apart from a basic rate which is fixed with reference to affordability by the poor, other consumers are charged according to the volume consumed, e.g. 0-10 m^3; 10-20 m^3, etc. It is sometimes argued that the block rates should be declining because of possible economies of scale. It is doubtful, however, that there are such significant economies of scale per consumer basis. Considering the growth in services needed in developing countries, the most appropriate policy is an increasing block structure, with progressively increasing tariffs.

Metered rates

While graded rates based on social and financial indicators have the advantage that they avoid the introduction of complex metered connections, water meters enable the charges to be made according to the actual volume consumed. If properly enforced, metering induces users to avoid wasting water, which may help reduce long-term costs or unaccounted-for water losses. Individual household meters are not only expensive to install, they also need to be read regularly, which adds to the work of the administration. Staff will have to read the meters, send out bills and accept payments. Metering therefore requires sufficient administrative and management capacities. The added cost of installing and operating meters, as well as billing and collection may outweigh the benefits of the system, notably in rural areas. In practice, often a proxy is used, such as pipe diameter, number of connections, or the container size (where purchased from vendors). A major constraint to user participation in piped systems with metered connections is the high connection fee which water agencies charge to individual households wishing to install a private tap. One way to alleviate this problem is to spread the connection fee over a period of time, which can then be included with the monthly

water bill.

Mixed system

Another option to cover the recurrent costs of a community water scheme is to combine paid private connections with free public standposts. When there are enough private connections, it becomes possible for their payments to cover the cost of public taps for the lowest income groups. However, households which can afford to take a house connection may not always do so, when there are enough free standposts. There should be increasing public awareness about this system, with information to promote private tap connections.

Establishing a tariff

Defining the scope of a tariff

***Definitions*[1]**

[1] Adapted from course material: *Gestion para la sostenbilidad en programas de agua potable y saneamiento* [Management for sustainability of water supply and sanitation programmes]. CINARA and IRC, unpublished material, 1994-97.

Operation, maintenance and administration costs = functioning costs (f. c.)
Approximation of replacement and extension costs = 25% of functioning costs
Funds for the recovery of investment costs = RIC

Minimum tariff = $\frac{\text{Functioning costs per month}}{\text{Number of households}}$

When such a tariff is chosen, it is important to consider with the community how to cover the other costs. Various options are possible.

$$\text{Real cost tariff} = \frac{\text{Functioning costs + repl. \& ext. costs}}{\text{Number of households}} = \frac{(1.25 \times \text{f.c.})/\text{month}}{\text{No. of households}}$$

$$\text{Total cost tariff} = \frac{(1.25 \times \text{f.c.}) + \text{recovery of invest. costs}}{\text{Number of households}} = \frac{(1.25 \times \text{f.c.}) + \text{RIC}}{\text{No. of households}}$$

$$\text{Efficient tariff} = \frac{(1.25 \times \text{f.c.}) + \text{RIC} + \text{depreciation (including provision for risks and inflation)}}{\text{Number of households}}$$

Example of tariff setting for a piped scheme in a rural area

The system serves 600 families with an average of 5 persons per family. Pumped piped system with a simple chlorinator. Treatment costs could be reduced by using a multi-stage filtration technique. It is proposed to recover all costs, and to constitute a fund that will help to cover major repairs or replacements. The system includes:

Equipment	Life cycle (LC)	Yearly O&M costs, as % of the initial investment cost	Initial investment cost in pesos (IV)
Drilled well	20	1%	Already in place
Distribution pipes (PVC)	15	2%	50,000
Reservoir	25	1%	110,000

Reservoir	25	1%	110,000
Supply pipes (PVC)	15	1%	60,000
Distribution network	15	1%	50,000
Chlorinator	10	1%	10,000
Electro-mechanical equipment	15	5%	160,000
Special parts	15	1%	10,000
		Total	**450,000**

Facts:

Engine: 41 HP, functioning 12 hours per day, debit 10 l.p.s.
Lubricants: 2 litres/month, price $ 14.00 per litre
Sodium hypochlorite: 0.5 mg/litre, price $ 9.00 per kg
Price of energy

From 1 to 5000 KW	$ 0.14601/KW
From 5001 to 15,000 KW	$ 0.17455/KW
From 15,001 to 35,000 KW	$ 0.19267/KW
Additional KW	$ 0.21394

Daily salary of operator: $ 30.00

Daily salary of assistant: $ 22.00

Daily salary of accountant: $ 35.00

1 HP = 0.746 KW

Tariff setting

Cost item	Formula	Calculation	Result in pesos (rounded)
Amortization per month	Σ (IV/LC)/12	[50,000/15 + 110,000/25 + 60,000/15 + 50,000/15 + 12,000/10+ 160,000/15]/12	900
Energy costs per month	[HP × 0.746] × hours per day × 30 days × price per KW	41 × 0.746 × 12 × 30 (5,000 × 0.14601) + (6,011 × 0.17455)	11,011 1,780
Lubricants costs/month	2 litres/month × price/litre	2 × 14	28
Treatment costs/month	[Debit × 3,600s. × hours per day × 30 days]/[0.5 mg/lit. × 1,000,000] × costs per kg	[10 × 3,600 × 12 × 30]/[0.5 × 1,000,000] × 9	233
Personnel costs/month	Salary/day × 30 days	(30 + 22 + 35.00) × 30	2,610
Maintenance costs	Σ (IV × maintenance %)/12	[50,000 × 2% + 110,000 × 1% + 60,000 × 1% +	942

		50,000 × 1% + 10,000 × 1% + 160,000 × 5%]/12	
Total O&M costs/month	Sum of all above costs (amortization + energy + lubricants + treatment + personnel + maintenance)	(900 + 1,780 + 28 + 233 + 2,160 + 942)	6,043
Contingency fund	10% of the monthly O&M costs	6,043 × 10%	604
Total costs per month	Sum O&M costs + contingency costs	6,043 + 570	6,647
Tariff/family/month	**Total costs per month/No. families**	**6,647/600**	**11.07**

In this case, the tariff will be 11.7 pesos (or 12 pesos) per month per capita. It should be noted that these costs are only based on an average month. It can be that for certain months, the costs will be higher than for other months. All unspent funds should be saved for the future. The same methodology can be applied for handpumps, although much more simple. A decision has to be made beforehand on how to recover investment and replacement costs, as well as unforeseen costs. In this case, the decision was made to include amortization and a contingency fund.

Through volumetric and efficiency pricing

A more precise way of signalling the true cost of supply to consumers is pricing based on volumetric use. Marginal cost (MC) or efficiency pricing measures the

cost of each additional (marginal) unit of water to a household. It is most clearly seen in volumetric prices measured by household meters. A rational consumer response would be to demand additional water only as long as their demand or willingness to pay exceeded the marginal cost of supply. When the average cost schedule begins to rise over a period of time, each incremental or marginal unit of water supply becomes increasingly more costly to produce. Over the longer term, the marginal cost price will yield more revenue than the average cost price, and indeed is at a maximum where it intersects the demand curve.

4.6 Developing an effective financial management system

Basic aspects of a financial management system

Many communities and, in certain remote areas, also municipalities lack skills in financial management which would allow them to organize, implement and control a cost recovery system in an efficient way. The Tables below summarize the basic aspects of a financial management system which has to be implemented by a Water Committee, and the possible options:

Budgeting

Financial management issues	Possible options
What cost to budget for?	• Remuneration • Tools and spare parts • Small repairs only • All repairs • Extension, rehabilitation

	• Fuel, power supply, etc. • Depreciation • Etc.
What sources of income to use?	• Regular user payments (monthly, sale per unit) • Village funds • Voluntary contributions • Credit schemes • Government subsidy
How to pay the mechanic or caretaker?	• Per job • Per month (fix + % of sales) • Per year after harvest • In cash/kind

Organization of financial flows

Financial management issues	Possible options
How to collect the money?	• Billing • Collection at water point • Fund-raising when breakdown • Taking money from a fund
When to collect the money?	• Per service provided • Monthly • After harvest • Beginning of financial year
Who collects the money?	• Caretaker

	• Operator • User group • Village Water Committee • Community leaders
Where to keep the money?	• In a safe • In the village account • In a bank account • In a development fund

Financial administration

Financial management issues	Possible options
How to register movements of expenditures and incomes?	• Log book • Daily journal • Book-keeping • Bank statements
Who administers the funds?	• Committee Treasurer (man or woman) • A village accountant • Bank accountant
What are funds used for?	• Payment of expenditures related to O&M of water point • Generating bank interest • Use for other development projects
Who orders payments?	• Operator • Treasurer

	• Water Committee • Village leaders • Assembly of users

Financial control and monitoring

Financial management issues	Possible options
What type of financial control?	Receipts from book-keeping Regular meetings of Water Committee Double signature for disbursement of funds Feedback to users Checking with meter reading Checking with bank statements Registered auditors
How to monitor?	Use of log book Make a quarterly review and overview of the situation on expenditures, incomes, and % of people who do not pay
What to do with bad payers? *This problem is particularly crucial for "influential" members of society and public institutions*	Analysis of reasons for non-payment Improvement of service Improvement of relationship with the users Campaign on benefits of good payers Rescheduling of debt Sanctions

4.7 Organizing access to alternative financial sources

It is important to plan and decide on financial mechanisms that would cover all costs, if these cannot be covered by user's fees, and especially when there are big repairs or replacements to pay for. Access to alternative sources of financing is therefore important. These sources include having access to credit facilities, establishing a fund, subsidies, and cost-sharing arrangements with the authorities. The following Table gives an overview of different financing mechanisms other than tariffs and rates.

Tapping on finances within communities

Voluntary funds

Found in communities with seasonal income and a tradition for fund-raising to help construction and big repairs. People can contribute according to their ability to pay, but the contributions may not be linked to water use and are difficult to control.

General community revenue

Found in communities with their own sources of income, which pays for construction and extensions. There may be disputes on the priorities in utilizing these resources.

Revolving funds

Starting capital may come from a government donation or by the issue of shares to individual households. On the basis of this capital, loans are given to individual households or groups. Upon repayment, new loans are given to other members or

groups.

Private or cooperative funds

Cooperative funds

Water supply is initiated and financed through a production cooperative or village revolving fund, which pays for construction and expansion.

Water vending

Through water kiosks, concession sales, coin-operated taps, water carrying systems or community-based distribution systems. Users buy water from these distribution points. The distributors pay a fee to the main water supplier.

Private sector involvement

The private sector can invest some of its own capital in a water scheme. However, it will look for something in return which can justify its investment, such as future contracts or ownership.

Subsidies from local/national government

Taxation (municipal resources)

Municipalities can collect the necessary funds through local taxes. Payment can be linked to income level, but charges may not reflect the level of water consumption. This option presents limited scope for community involvement in decision-making

and financial system management.

Cross-subsidy

One way to make the service equitable and affordable for all is to subsidize the poor by imposing surcharges on high-income consumers. Another example of a cross-subsidy is between sectors within the same community or municipality.

Government subsidies

The central government and local authorities allocate part of their budget to operation and maintenance activities. Subsidies can also be given to reduce the price of spare parts and chemicals, and to make technical personnel available free to communities on request.

Credit - loan mechanisms

Loan through a bank

A bank allocates a loan to a Water Committee. However, most banks have a poor small credit policy for rural communities. Communities cannot always produce the necessary guarantees. The Grameen Bank, in Bangladesh, is proposing a new bank approach to respond to the needs of the rural areas.

Micro-credit schemes

Communities organize, through local associations, micro-credit schemes where individuals and groups can borrow money with a predetermined and agreed rate

of interest. These schemes are adapted to community needs and realities, but there is a limit to their lending capacity.

Social and development funds

Many developing countries have created special funds which give access to money for social and development purposes, with an interest rate which can be much lower than that in the financial market. However, access to these funds is open only to local authorities and municipalities, and not necessarily to communities. It is therefore important that communities and municipalities work in partnership. Access to these funds can be eased through the payment of a regular fee, which will provide the possibility of obtaining a loan in case of necessity.

Grants

Donations (twin villages)

Donations can come through individuals (former inhabitants of a village who now live in a city or abroad). In some cases, villages are twinned with other villages and cities in other countries, and grants have been allocated through this mechanism in the past.

Unit 6: Monitoring for effectiveness

1. Outline of session

- **Objectives**

- **To distinguish between:**

  a) monitoring and evaluation
  b) monitoring for efficiency and monitoring for effectiveness

- **To raise awareness on the principles of participatory monitoring**
- **To review data collection methods**
- **To review indicators and practice methodology for defining indicators**

- **Methodology**

  1. Introduction
  2. Game on definitions
  3. Interactive presentation on monitoring principles and monitoring system
  4. Review of data collection methodology
  5. Demonstration in plenary of methodology for defining indicators and a monitoring system
  6. Group exercises on indicators and monitoring system
  7. Conclusion

- **Materials**

  √ Overhead transparencies
  √ Overhead projector, screen or white wall
  √ Flip chart and markers
  √ Coloured cards (thick paper)
  √ Graphic

- **Handouts**

  √ Exercise sheets
  √ Copies of transparencies and background information

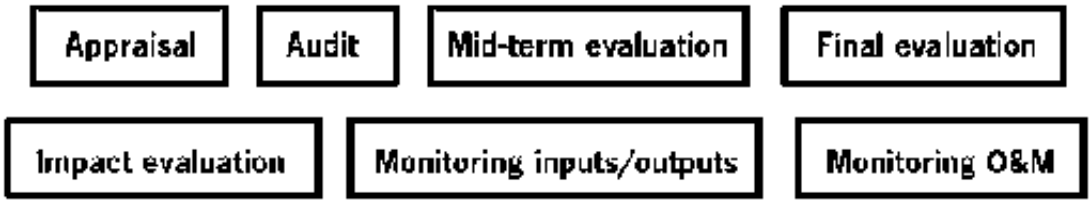
2. Notes for the facilitator

Introduction

Monitoring is a key factor for sustainable operation and maintenance. However, it is seldom practised in an efficient way, if at all. Monitoring is mostly practised during the construction phase in order to control progress and expenditures, and rarely after this phase. This session deals with monitoring operation and maintenance after the construction phase. It could be useful at this stage to ask the participants for their experience in monitoring, and about the problems they faced during monitoring.

Game on definitions

The facilitator recalls the importance of having a clear understanding of the differences between monitoring, evaluation, audit, and appraisal. It is proposed to use the graphic of the project cycle. The facilitator prepares, in advance, a graphic of the project cycle on the board without writing down all the various elements linked to monitoring, audit, evaluation and appraisal. He will also prepare the following cards:



Figure

The facilitator explains that the object of the game is to place the cards in the appropriate place in the project cycle, and to try to define for each card: 1) What is it? 2) What is it for? 3) How is it done? 4) When is it done?

For this purpose the facilitator prepares a Table with 8 columns and 5 rows on a large sheet, as shown below:

	Appraisal	Audit	Mid-term evaluation	Final evaluation	Impact evaluation	Monitoring input/output	Monitoring O&M
What is it?							
What is it for?							
How is it done?							
When is it done?							

Finally, the facilitator distributes an A4 paper with the main key words which will help the participants to fill in the Table.

The game. The facilitator starts with the first card "appraisal", and asks someone in the group to come and place it on the graphic, drawing an arrow if necessary (see overhead sheet). The group then helps the participant in responding to each question, using the key words provided in the A4 paper. If the participants want to add words, they should feel free to do so, as long as they explain to the group why. The other cards are treated and defined in the same way.

Hints. The facilitator ends the game by explaining that this course is concerned with monitoring for O&M, i.e. monitoring for effectiveness, as opposed to monitoring for efficiency which is about monitoring inputs/outputs. Definitions included in the background information could help the facilitator when preparing for this session.

Interactive presentation on monitoring principles and monitoring system

It is proposed to start with the key principles of monitoring, as described in the overhead sheet, and for each point clarify with an example either from the group or from the facilitator.

It is then proposed to have an explanation of information flows as shown in the overhead sheets, showing clearly who profits from the monitoring system, who will take action, and what is the time lapse between an incident and the actual solving of the problem. The facilitator should end the discussion on information flows by asking the participants which information allows for greater effectiveness.

The overhead sheet on "seven steps for planning a monitoring system" provides

an overview on how to develop a plan for a monitoring system. The group will then focus on two main aspects: a) sources of information for collecting data, and especially b) determination of indicators.

Review of data collection methodology

The facilitator distributes copies of "Sources of information" (pages 221, 222) to all the participants, then asks them to pair up and review the document. The aim of the exercise is to highlight the tools and methodology which the participants are familiar with or which need some further clarification. An initial clarification can start with each pair of participants discussing for 15 minutes. They are then asked which tools they know and which ones need some clarification. The clarification can be done by any of the participants as well as by the facilitator. It is essential for the facilitator to have an understanding of the tools presented, even though he or she might not have practised them all.

Demonstration of the determination of indicators

The facilitator starts by considering the definition of an indicator, and then proceeds with the methodology, explaining the format:

Theme	Characteristics	Variables	Selection

See background information and a demonstration of the use of this methodology.

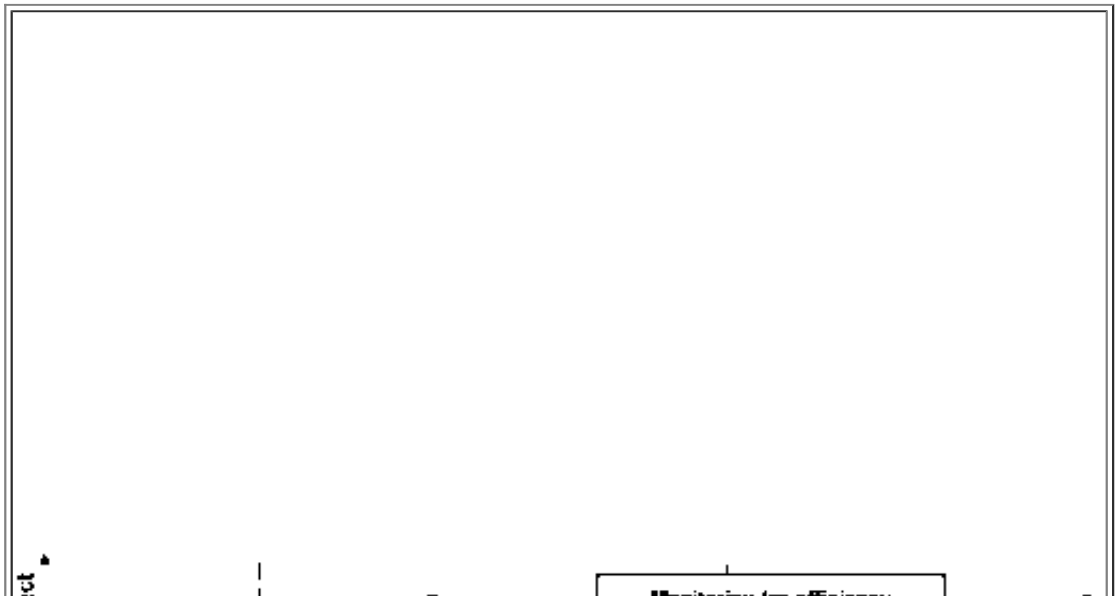
Group exercises on indicators and monitoring system

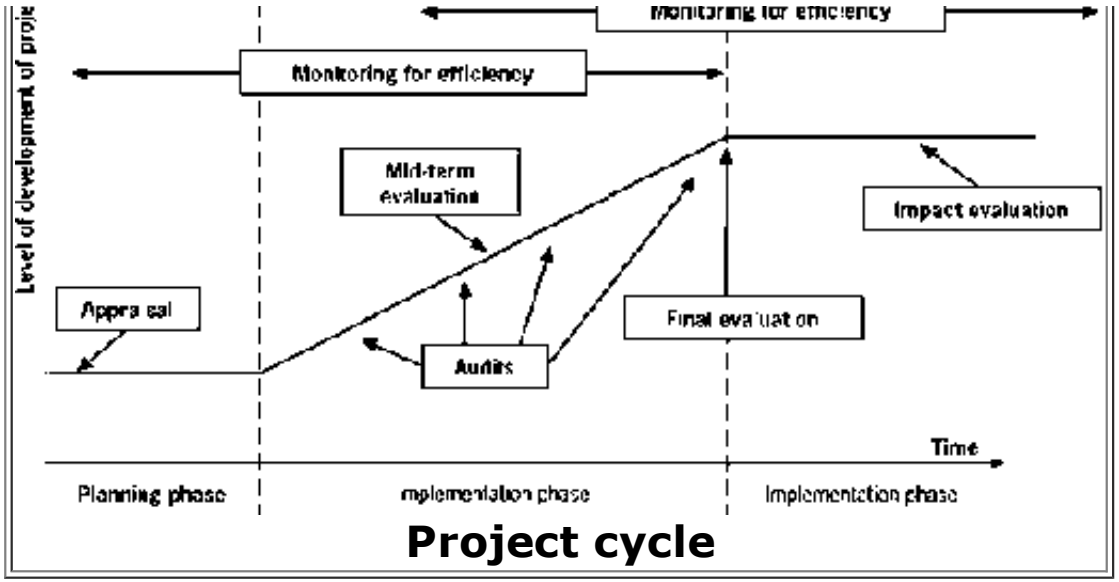
The participants are divided into small groups of four to five and are asked to select one of the key objectives from the objective tree. They will then determine a series of indicators using the above format for selecting indicators and then proceed to setting up a monitoring system. Each group can present the result of its work.

Conclusion

At the end of this session the facilitator will hand over a series of indicators, which have been developed in several projects, as references.

3. Overhead and exercise sheets: Sheet 1





Project cycle

Exercise sheet 1

Game on definitions

Select the most appropriate definition for each term to be defined (some definitions can be used twice or redefined if needed), in order to fill in the Table which is proposed in the notes for the facilitator.

Issue	Possible definition
What is it?	• Assessment of a situation • Occasional assessment of the development of a project • Continuous review of activities • Occasional analysis and use of resources • Continuous and systematic review of functioning of system • Occasional assessment and analysis of the effects of the project • Occasional assessment of the achievement of objectives

What is it for?	• To take decisions on improvement of project performance • To revise the objectives of the project • To control achievement of targets and results • To control the performance and efficiency of the project • To control the achievement of objectives • To control use of resources • To design future activities • To prepare a second phase of a project
How is it done?	• Auto-evaluations, internal process • External process • Field studies and participatory investigation • Analysis of project reports • Inherent management tool • Participatory process involving communities and other actors • Check of book-keeping and accounts
When is it done?	• After project implementation (one year or more) • During the whole implementation of the project, starting at the planning phase • During the life of the project (after implementation, but it could start earlier) • Sometime during project implementation • Before the project starts (planning stage) • Half-way during implementation • Some time before finalizing implementation of the project

Overhead sheet 2

Key principles of monitoring[1]

[1] Adapted from unpublished course material: K. Shordt. *Monitoring for effectiveness*. The Hague, IRC, 1997/98.

- Monitoring should be based and planned on a solid knowledge of objectives and activities
- Information should be used (solve a problem, answer a question, improve the project, adapt activities)
- Monitoring information should be collected and acted upon at the lowest level possible
- Monitoring should be focused and simple (limit number of indicators, length and cost of data collection)
- Monitoring should be based on a careful definition of indicators (they should really be adapted to the project)
- Monitoring should combine qualitative and quantitative information
- Monitoring should ensure checks and balances, (validity and reliability of information)
- Monitoring should become an in-built integrated activity and not a separate activity

Overhead sheet 3

Information flow

Centralized

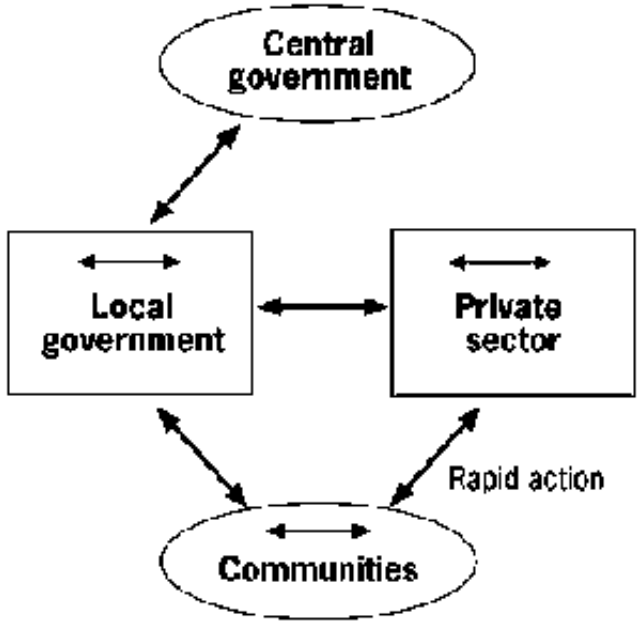
Information is collected, and feedback is poor.

There can be very long delays in taking appropriate action. Collection is often done by a special team, which can be costly.

Figure

Participatory and integrated government

Information flows to the actors who have a direct interest in it, and who can take action. Monitoring is part of regular activities of each group. Costs are reduced, and efficiency increased.



Figure

Exercise sheet 2

Sources of information

Sources	Advantages/disadvantages
Book-keeping records, accounts, audit Used to monitor purchase, payments, contracts Data in books need to be compared with vouchers, purchase orders and receipts	**Advantages:** fast and already in use **Disadvantages:** limited information, information needs to be processed and aggregated, not always easily available
Log books	**Advantages:** already in common use in project

Log books Used to keep record of travels Usually more about total distance than number and type of villages visited	activities **Disadvantages:** limited information
Check-lists Used to measure conformity to standard Needs to be formulated in concrete, unambiguous words; needs pre-testing	**Advantages:** quick and easy to use **Disadvantages:** rough, inflexible, list of items not always appropriate
Community minutes Used to keep records of community meetings Needs to be done thoroughly	**Advantages:** provides information on attendance and periodicity of meetings **Disadvantages:** information limited to issues dealt with in the meeting
Monitoring sheets Used to check issues which change over a period of time Needs to made user-friendly	**Advantages:** shows progress over time, can be used for many purposes **Disadvantages:** can be misused or under-analysed
Periodic reports Used by project staff to report on progress of activities Data collected according to project format	**Advantages:** good source of information while the project is on **Disadvantages:** information analysed and processed according to project objectives
Direct observation Used to appreciate general conditions of setting or to appreciate behavioural change	**Advantages:** direct information and good training tool **Disadvantages:** results often disregarded, not enough statistical weight

Needs to be structured and organized	
Semi-structured interviews Used for short interviews Needs preparation of informal questions beforehand	**Advantages:** when done in depth, good information **Disadvantages:** needs trained interviewer, qualitative information often not used
Focused group discussions Used for discussions in segment groups, or discussions on a specific theme Needs to be prepared beforehand	**Advantages:** possibility to analyse problems and solutions in depth **Disadvantages:** needs skills and training to succeed, not always conclusive
Questionnaires, survey Used to collect specific information Needs to be kept short; needs pre-testing	**Advantages:** specific, precise, cheap and fast way to collect data **Disadvantages:** often poor quality, to be used with caution
Workshops Used to gather community members or other stakeholders Needs to be well structured and organized; needs facilitation	**Advantages:** useful to specify or modify information **Disadvantages:** information might need to be validated
Stratified sampling Using above methods, by level of service, type of facility, socioeconomic level, user/non-user	**Advantages:** improves quality of data **Disadvantages:** sometimes inconclusive, results not always used
Ranking; pocket chart voting Used for quantifying preferences Can easily be adapted to local	**Advantages:** gives valid data, good educational tool **Disadvantages:** needs experience on how to use

circumstances	it, needs time
Venn diagram Used to learn about relationships among various groups, institutions	**Advantages:** Good probe of performance of various partners **Disadvantages:** subjective
Mapping Useful to correlate variables, and to analyse problems within the community	**Advantages:** excellent for planning, education and advocacy **Disadvantages:** complex to analyse if done on a large scale

Overhead sheet 4

Seven steps for planning a monitoring system[1]

[1] Adapted from unpublished course material: K. Shordt. *Monitoring for effectiveness*. The Hague, IRC, 1997/98.

1. Identify key issues, concerns, questions or demands which will become the focus of monitoring
2. Determine indicators
3. Determine strategies for collecting, analysing and reporting data
4. Determine the use of the information and how action will be taken
5. Determine information flow, checks and verification of information
6. Test monitoring system

7. Provide training or orientation to groups involved

Overhead sheet 5

Matrix for setting up a monitoring system

Issues to be monitored	Indicators	Collection of data			Use of data		
		Source of information	Who collects?	Periodicity	How does the information flow?	Who analyses?	Who takes action?

Overhead sheet 6

Characteristics of an indicator

- Definition of a quality (what?)
- Definition of a measure (how much?)
- Definition of a target group (who?)
- Definition of a time horizon (when?)
- Definition of a place (where?)

Example: All water points will be located within a radius of 200 metres of at least 8 settlements, by December 2000, in the region of Kebri.

In addition, an indicator must be:

- **Relevant**

(the indicator measures what is needed, and it is related to the objectives)

- **Sensitive**
(the indicator responds to variations and changes)

- **Simple**
(the community and other actors are able to understand it; and the data will be easy to act upon; limitation of number of indicators)

- **Feasible**

(easy to collect information; possible to act upon; not costly)

Exercise sheet 3

Determination of indicators (1)

Issue	Characteristics	Variables	Selection
Issue to be monitored What do I want to know? What is the result I am expecting?	List of the major relevant characteristics of the issue to be monitored This corresponds to a description of the	For each characteristic, determination of quantifiable variables. In some cases it can be qualitative variables	Selection of variables, according to the following set of criteria: • relevance

	issue		• sensitivity • simplicity • feasibility

Once the indicators are selected, understood and accepted by the various stakeholders, they need to be quantified and tested.

Overhead sheet 7

Determination of indicators (2): an example from a small piped system

Issue	Characteristics	Variables	Selection
Community management improved	Efficient service	- No. of hours of functioning/day - % of public taps functioning - Delay between damage and repair - Billed water/Produced water	• No. of hours of functioning per day • Frequency of meetings and attendance (men/women) • Composition of Committee (men/women) • % of users not paying
	Community organization active	- Frequency of meetings - No. of participants/total population	

	Costs recovered	- Expenditures/Income - % of users not paying - Costs per month/monthly tariff - Periodicity of payments - Balance in bank account	
	Participation of community	- No. of decisions taken in General Assembly - No. of women with responsibilities/No. of posts with responsibilities - Rotation of leadership - Presence of community in meetings	
	Technical and managerial capacity	- No. of training workshops/year - No. and type of participants in the workshops - Level of knowledge	

4. Background information

4.1 Monitoring in perspective[1]

[1] Adapted from: IRC unpublished course material, *Monitoring for effectiveness*. The Hague, IRC, 1997/98.

Until recently, monitoring and evaluation were focused on finance, implementation and construction targets and were viewed as the routine collection of data in project operations. In general, evaluation assesses the development of a project for the purpose of making decisions on funding and drawing useful lessons. In 1983, the World Health Organization developed the Minimum Evaluation Procedure (MEP) which focused on the functioning and utilization of water and sanitation facilities and on hygiene education. The MEP emphasizes cheap, simple and quick methods. It developed 17 measurable indicators and added a new dimension to monitoring and evaluation by focusing on the project's functioning and utilization of outputs. Gradually, issues such as relevance, efficiency, effectiveness and sustainability were added.

Since then, there have been several significant developments in monitoring and evaluation, e.g. more groups and actors are concerned with monitoring activities; there is an interest in monitoring behavioural change; the process of monitoring has changed from a central "monolithic" type to participatory monitoring; monitoring should become integrated in regular activities; and there is an emphasis on the timely use of the results of monitoring.

4.2 Definitions

- **Appraisal**

What is it?	Assessment of a situation
What is it for?	Design or implementation of future activities
How is it	Field studies; participatory appraisals

How is it done?	Field studies, participatory appraisals
When is it done?	Planning phase of a project

- **Audit**

What is it?	Occasional analysis of use of resources (inputs)
What is it for?	Control of use of resources and achievement of results
How is it done?	Check of expenditures and income, using accounts/books
When is it done?	End of fiscal year or end of project phase

- **Monitoring**

What is it?	Continuous and systematic review of activities, processes, use of inputs, and realization of outputs
What is it for?	Control of achievement of targets and results fixed by a plan (performance, efficiency) and decisions about activities Control of achievement of objectives (effectiveness)
How is it done?	Integrated and inherent management tool, through determination of indicators, collection/analysis of data Monitoring efficiency: through project activity reports Monitoring effectiveness: participatory process

When is it done?	Monitoring efficiency: during project planning and project implementation Monitoring effectiveness: at end of project implementation and during project life

- **Evaluation**

What is it?	Occasional assessment of the development of a project
What is it for?	To take decisions on improvement of project performance, or modifications of project activities and objectives, or continuation or end of project
How is it done?	Auto-evaluations, external evaluations, participatory evaluations
When is it done?	Mid-term evaluations, final evaluations, impact evaluations (after project implementation)

4.3 Indicators

An indicator is a variable which can be measured (quantity) or appreciated (quality or trend), and which can show changes in a given phenomenon and the achievement of a result or an objective.

An indicator has several characteristics including:

- **Definition of a quality (what?)**
- **Definition of a measure (how much?)**
- **Definition of a target group (who?)**
- **Definition of a time horizon (when?)**

- **Definition of a place (where?)**

Example: All water points will be located within a radius of 200 metres of at least 8 settlements, by December 2000, in the region of Kebri.

In addition, an indicator must be:

- **Relevant (it measures what is needed, and is related to the objectives)**
- **Sensitive (it responds to variations and changes)**
- **Simple (the community and other actors can understand it; the data will be easy to act upon; there is a limit to the number of indicators)**
- **Feasible (information can be collected easily, not costly).**

These last four specific characteristics can serve as selection criteria for the determination of indicators.

There are several ways to determine indicators. In many cases, indicators are selected from a document and applied to a project without knowing if they correspond exactly to what is needed and if they are appropriate.

It is possible to determine indicators which correspond exactly to what the project or the community wants to measure. The following steps are recommended:

Step 1: Clarification of the issue to be monitored

The issue to be monitored normally corresponds to one of the results or objectives which the project is trying to reach. It has to respond to a question: What do I want to know?

Step 2: Description of characteristics

An inventory is made of the major relevant characteristics which correspond to the issue to be monitored. In some ways, it is the same as describing the issue.

Step 3: Identification of variables

For each characteristic, one will try to identify quantifiable variables (time, percentage, ratio, price). It can be that the variable is more of a qualitative nature.

Step 4: Selection of indicators

Variables are then analysed through a selection process, with the following criteria (as seen above): relevance, sensitivity, simplicity, feasibility.

The determination of indicators can be carried out with the community, or with other stakeholders who have a direct interest in monitoring. The indicators are then formulated and tested. The test could reveal that the indicator is too difficult to measure, or that it does not have much relevance.

At community level, very simple and basic indicators can be formulated, which concern the functioning and use of the system, as well as its management. The

community has a direct interest in monitoring, since it is the community that has to act and will benefit from an efficient system.

4.4 Examples of indicators

Example from the MEP (Minimum Evaluation Procedure) of WHO

1. Measuring functioning of systems

Indicators for water supply:

- **Water quantity (litres/person/day)**
- **Water quality (*E. coli*, concentration of fluorides and other chemicals)**
- **Reliability (frequency and duration of breakdowns)**
- **Convenience (distance)**

Indicators for sanitation:

- **Proportion of households having an improved latrine**
- **Hygienic state of latrines (% of clean latrines/number visited)**
- **Reliability of installations (qualitative: % in good state/number visited)**

Indicators for hygiene:

- **Understanding the language of the messages (% of people speaking the language)**

- **Understanding the content of the messages (proportions of those with**

good, medium, low understanding)

- **Access to the messages (number of people reached by TV or radio, etc.)**

2. Measuring use of systems

Indicators for water supply:

- **Proportion of households using the system**
- **Volume of water used, by destination**

Indicators for sanitation:

- **Proportion of users using the improved latrines**

Indicators for hygiene:

- **Behaviour in terms of water**
- **Cleaning of hands after defecation**
- **Knowledge of oral rehydration**

Example from: D. Narayan. *Participatory evaluation: tools for managing change*. Washington, DC, World Bank, 1993 (World Bank Technical Paper No. 207)

1. Sustainability

Reliability of the system:

- **Quality of water at source**

- **Number of facilities in working order**

- **Adequate maintenance (low frequency of breakdowns, quick repairs, low downtime of facilities)**

Human capacity development:

- **Management abilities (who decides? men/women)**

- **Knowledge and skills (understanding by men/women for improvement of the system; proportion of technical skills available)**

- **Confidence (rating scales on self-perception, leadership, initiative and sense of efficacy)**

Local institutional capacity:

- **Autonomy (who defines the rules? who controls the finances?)**

- **Supportive leadership (style of management, working methodology)**

- **Systems for learning and problem-solving (systems in place to resolve conflict, and corrective actions)**

Cost-sharing and unit costs:

- **Community contribution**
- **Agency contribution Unit costs**

Collaboration among organizations:

- **Planning (collaboration, participatory planning)**
- **Activities (collaboration)**

2. Effective use

Optimal use:

- **Number and characteristics of users**
- **Quantity of water used (all purposes)**
- **Time taken to use facilities**
- **Management of water resources (protection)**

Hygienic use:

- **Water quality at home**
- **Water transport and storage practices**
- **Home practices to improve water quality**
- **Site and home cleanliness**
- **Personal hygiene practices**

Consistent use:

- **Pattern of daily use**
- **Pattern of seasonal use**

3. Replicability

Community's ability to expand the services:

- **Additional water or latrine facilities built**
- **Number of upgraded facilities**
- **New development activities initiated**

Transferability of agency strategies:

- **Proportion and role of specialized personnel**
- **Established institutional framework**
- **Budget size and sheltering**
- **Documented administrative or implementation procedures**
- **Other special conditions**

Example from: A. Cotton. *Tools for the assessment of operation and maintenance status of water supplies*. WHO and O&M Working Group of the Water Supply and Sanitation Collaborative Council (in preparation)

- Management system:	System in existence and being followed
- Functioning supply points:	$\frac{\text{Number in working order}}{\text{Total number}} \times 100$
- Reliability	$\frac{\text{Functioning time}}{\text{Total elapsed time}} \times 100$
- Spare parts accessibility:	Mean time for arrival of identified spares/materials
- Cost:	Average O&M cost per user

- Operating revenue: $\frac{\text{Operating revenue}}{\text{Population served}} \times 100$
- Cost recovery: $\frac{\text{Receipts + subsidies}}{\text{Average O\&M costs}} \times 100$
- VLOM personnel: $\frac{\text{No. of systems with functioning committees}}{\text{Total number of systems}}$
- Supply continuity: $\frac{\text{Average number of hours of daily supply}}{24}$
- Flow rating: $\frac{\text{Present discharge}}{\text{Discharge at handing over of scheme}}$
- Pressure rating: $\frac{\text{Present pressure}}{\text{Discharge at handing over of scheme}}$
- Water quality: % samples > target number of *E. coli* per 100 ml
- Training (VLOM): No. of VLOM (village-level O&M) personnel (men and women) trained per community
- Materials and spare parts: No. of repairs not done due to lack of spare parts
  No. of orders of materials not fulfilled
  No. of items out of stock
  No. of spare part requisitions per water supply/year

Example from: *Technology transfer in water supply and sanitation - A learning experience from Colombia*. The Hague, IRC/CINARA, 1997 (Technical Paper 32-E).

Indicators for the evaluation of water supply systems

Theme	Indicator	Desired level
1. Coverage	$\frac{\text{No. of connected households}}{\text{Total no. of households}}$	100%

2. Available quantity	$\frac{\text{Max. flow in the system}}{\text{Min. flow in the source}}$	<50%
2.1 Production	$\frac{\text{Actual flow in the system}}{\text{Design flow}}$	<100%
2.2 Quantity of use	$\frac{\text{Supply quantity per user}}{\text{Design capacity per user}}$	<100%
3. Continuity	Number of supply hours per day	24 hours
3.1 Continuity in the source	Reduction over time	No reduction
4. Quality	Turbidity Residual chlorine in distribution net	<5 NTU 0.3-0.6 mg/l
5. Use of other water sources	$\frac{\text{No. of persons using other sources}}{\text{No. of persons interviewed}}$	0%
5.1 Efficient water use	$\frac{\text{No. of houses with leaking taps}}{\text{No. of houses visited}}$	0%
6. Management capacity	$\frac{\text{No. of indebted users}}{\text{Total no. of users}}$	<5%
	Supervision of the operator	Yes
6.1 O&M capacity	Trained operator with work tools	Yes
6.2 Representation of women	$\frac{\text{No. of trained women in the committee}}{\text{No. of trained committee members}}$	50%
7. Cost	$\frac{\text{Monthly revenue}}{\text{Monthly expenditures}}$	>1
7.1 Tariffs	$\frac{\text{Monthly tariff}}{\text{Monthly family income}}$	<3%

Unit 7: Working and planning with communities

1. Outline of session

- **Objectives**

  - ☐ **To review the tools and processes for working with communities**
  - ☐ **To identify the most appropriate tools for different phases of the project cycle**

- **Methodology**

  1. Introductory note
  2. Focused discussion and interactive presentation
  3. Review of tools
  4. Exercise linking tools with the project cycle

- **Materials**

  √ **Overhead transparencies**
  √ **Overhead projector, screen or white wall**
  √ **Flip chart and markers**

- **Handouts**

  √ **Copies of transparencies and background information**
  √ **Exercise sheet**

2. Notes for the facilitator

Introduction

Community participation and community management are increasingly being accepted in developing countries, but there is very often a lack of expertise on how to apply and implement them. This session reviews the basic approach and attitudes for promoting and developing community management, based on lessons summarized by IRC after a four-year investigation on the role of communities in six countries in the management of their water supply systems. The session also gives an overview of the various tools for working and planning with communities. To describe the tools in detail and to practise using them would require another 1-2 weeks. Finally, the participants will select the tools and processes which are most appropriate to different phases of the project cycle.

Focused discussion and interactive presentation

The facilitator asks the group about their experiences in working and planning with communities, and then gives some good and not so successful examples. Overhead sheets, together with background information on processes and approaches, are provided.

Review of tools

An overview of the tools is given in the overhead sheets (pages 240-242), which can be distributed to the group. The participants, in pairs, will review all the tools for about 15 minutes, identifying those which they know from the others. Each pair will then briefly describe their experiences and indicate the tools they know nothing about.

The facilitator should be acquainted with all the tools described below. If possible, a social worker could be invited to describe his or her work in applying these tools, and the participants could comment on the tools which they have used. The facilitator could test selected tools in the class. Common tools for such tests are Social mapping, Venn diagram, Pocket chart (see overhead sheets and background information).

Exercise linking tools with the project cycle

The participants, working in pairs, will be asked to propose which tool is suitable for what type of situation in the project cycle. In the meantime, the facilitator prepares on the board a graphic describing the project cycle. After the pairs have finished their preparation (15 minutes), they will be asked to indicate where each tool is to be placed in the project cycle and for what it can be used best (see background information).

3. Overhead sheets: Sheet 1

Limiting factors for the participation of the community

- Poor credibility
- Lack of self-confidence
- Resistance to change
- Fear of the financial consequences which a new project would bring
- Pessimism as a result of having had to accept the present situation for so long
- Lack of experience in dealing with institutions
- Poor knowledge of problem-solving and planning methodologies

- Nervousness to speak in public

- Fear of intervening in the presence of an outsider

Overhead sheet 2

Limiting factors for the participation of local authorities

- Not knowing how to integrate the social aspects with the technical aspects
- Lack of communication channels between the municipality and the community
- Poor perception of community problems
- No priority for rural communities
- Lack of knowledge on participatory planning
- Insufficient staff trained for rural water supply and sanitation
- Infrequent visits to the community

- Dominating attitude

Overhead sheet 3

How to stimulate community management

- **Involvement of communities in the project cycle**

Involve the users from the very start of the project cycle:

Users in the driving seat - Awareness - Diagnosis - Planning - Prioritizing - Experimentation - Monitoring repeatedly (providing training where needed) - Follow-up

Approach

Responding to demand
Partnership between the authorities and the community
Changing from implementer to facilitator
Coordinated, multisectoral, integrated approach
Decentralization: going closer to the customer
Making use of local knowledge and management skills
Speaking the language and knowing the culture
Working with a participatory approach

Attitudes

Build trust
Patience (give enough time)
Listen and observe
Promote dialogue among all actors
Be aware of gender issues
Provide feedback
Be able to work with participatory techniques

Overhead sheet 4

Seven steps to community planning[1]

Seven steps to community planning[1]

[1] From: *PHAST step-by-step guide: A participatory approach for the control of diarrhoeal disease*. PHAST (Participatory Hygiene and Sanitation Transformation), SIDA, UNDP-World Bank, WHO, Geneva, 1998.

1. Problem identification
2. Problem analysis
3. Planning for solutions
4. Selecting options
5. Planning for activities
6. Planning for monitoring and evaluation
7. Participatory evaluation

Overhead sheet 5

Overview of tools for planning and working with the community

Working and planning tools	Brief description	Advantages/disadvantages
PRA (Participatory Rural Appraisal)	Process used in development programmes to help rural communities to organize their knowledge, identify and prioritize local development needs, and develop long-term action plans; consists in preliminary visits, participatory data collection exercises, participatory analysis	**Advantages:** full participation of communities right from the start; plans reflect a field reality; establishment of good working relationships and communication lines between authorities and the community

	and planning	**Disadvantages:** one has to be familiar with participatory techniques; takes time
Mind mapping	Thought processes are brought together in a spontaneous, associative way, resulting in a "map" of landmarks which are classified and organized into a branching arrangement	**Advantages:** open, expandable; good for vision development, very versatile **Disadvantages:** global overview, emphasizes linear relationships
SWOT (Successes Weaknesses Opportunities Threats)	Simple, flexible, versatile working tool for situation analysis in groups; it records the positive and negative experiences of participants, as well as their assessment of obstacles and potentials in a given situation	**Advantages:** easy, can be understood in an intercultural setting; no special materials needed **Disadvantages:** does not offer concrete solutions, only possibilities
Brainstorming	Group puts forward as many suggestions as possible about a set theme; the ideas are sorted, analysed, evaluated, and classified under "Immediately feasible" or "Needs further development"	**Advantages:** easy, quick; stimulates intuitive and spontaneous thinking **Disadvantages:** few suggestions are actually used; effort needed is often underestimated
Scenario-writing	Design of alternative views for the future, labelled as "probable", "optimistic" and	**Advantages:** suitable for complex, long-term problems;

	"pessimistic" options; start with a situation analysis, then prognosis analysis and the programme phase	widens the planning horizons **Disadvantages:** time-intensive; needs good information base
OOPP (Objective Oriented Project Planning)	Systematic planning method based on teamwork and visualization, and logical analysis; it includes an analysis of participation, problems analysis, objective analysis, choice of alternatives, and a project planning matrix	**Advantages:** promotes mutual understanding of problems; clarifies cause-and-effect relationships; enables participation of professionals together with beneficiaries; only parts of it can be used, such as problem analysis **Disadvantages:** Reality only accessible through rational thinking; requires a good facilitator
Morphological box	Systematic search for alternative solutions. Possible solutions are broken down into elements and the most important characteristic of each element is identified. All these are arranged in a "morphological" box. Combinations of various elements are made by drawing lines to link them	**Advantages:** suitable for clearly defined problems where combinations and variations are important **Disadvantages:** less suitable for problems which require a high degree of analysis
Utility value analysis	The situation is presented with various alternatives. Criteria are developed for	**Advantages:** qualitative and quantitative assessment of a

	the acceptance of the project. Each criterion is weighted (W), e.g. 1 to 10, with an alternative for each criterion (A). The utility value will be W × A. A final comparative evaluation is carried out for decision-making	situation, versatile in its application **Disadvantages:** assessment and weighting figures should be documented; can be difficult for communities to understand
Task chart	Used for organizing work procedures, including the staff's functions	**Advantages:** organizational chart, good basis for job description **Disadvantages:** only operational plan, depends on previous analysis
Bar chart (Gantt chart)	Used for the chronological planning of tasks, with individual working steps listed on an activity axis	**Advantages:** graphic and simple **Disadvantages:** relies on previous analysis, interconnections difficult
Flow chart	Description of sequence of activities and a structured process in the form of an algorithm	**Advantages:** simple and easy, suitable for routine planning **Disadvantages:** relies on previous analysis, suitable for a single process
Action research	The above tools can be used, including a review of experiences in the field in a participatory way and over a period of	**Advantages:** close to reality, integrates social change dimension, learning by

	time	experience **Disadvantages:** time-consuming, needs acceptance of participatory results
Mapping of community	Drawing of a simple map of the community, developed by both women's and men's groups, showing boundaries, water sources, housing infrastructure, roads, etc.	**Advantages:** provides a vision of the community by the community, and updates information **Disadvantages:** more an information collection tool than a planning tool
Village history	This results from discussions with the communities and shows, on a time line, the local, national and international events which are important for the community	**Advantages:** provides information about the community's past experience and problems **Disadvantages:** needs several sources of information for validity
Transect walk	This results from a walk with community members and describes the natural environment and areas of use, with particular problems or possible opportunities	**Advantages:** direct information on surroundings observed and shared with community members **Disadvantages:** requires subsequent further analysis
Trend lines	Provides a brief summary of trends on specific issues (health, water availability,	**Advantages:** graphic, visual **Disadvantages:** provides only

	etc.), as a result of small group discussions	very general, global information
Problem ranking	Shows key problems identified by the community, with the order of priority for having them solved	**Advantages:** participatory analysis of values and priorities **Disadvantages:** does not analyse the causes
Venn diagram	Represents groups or institutions in the form of circles (the bigger the circle, the bigger the role). The positions of the circles relative to one another show the type of relationship between the groups and the institutions	**Advantages:** good visualization and understanding of how groups relate to one another **Disadvantages:** subjective and provides only limited information
Pocket chart (voting)	Voting on drawings representing specific situations or alternatives	**Advantages:** democratic, expresses desires **Disadvantages:** requires materials and experience

4. Background information

4.1 In general

Working and planning with communities

One of the first tasks for a manager or a managerial group with community responsibilities is to understand and assess the present situation. This can be

done in different ways, e.g. by reading reports and studies on particular projects, holding a series of professional staff meetings to get the staff's perceptions, and making field visits to see the situation.

Experience has shown that a good plan is based on a participatory assessment or evaluation of the situation, which reflects the realities in the field and can be a way of involving communities, right from the start, in their future responsibilities. People do not always have the same perceptions and views, because they may belong to different cultures or have different priorities in their working or living environments. Participatory planning is based on a common understanding of the problem, and is simple, democratic and motivating. It allows professionals at different levels, from different departments or sectors, as well as community members and users to reach a common consensus on a situation.

Several working tools can be used for this participatory approach. The overhead sheets provide an overview of some of these tools, and additional information can be found in the supporting documents. However, a methodology is proposed below, based on four years' experience with communities in six countries on their role in the management of water supply services.

4.2 The Participatory Action Development (PAD) approach[1]

[1] **Extracts from: M. Lammerink et al. *Facilitating community discovery: getting to know about community management*. The Hague, IRC, 1998 (Community Managers for Tomorrow Series, No. 4).**

Participatory Action Development (PAD) is a methodology for improving

community management of rural water supplies, in which all the actors involved contribute both to the creative thinking that goes into the undertaking, and to the action that is the subject of the development work. PAD aims to learn from the past and to find solutions to concrete problems and conflicts in the management of rural water supplies by communities. At the same time, PAD can help organizations to discover how they can best support communities in their efforts to improve the management of rural water supplies.

The methodology also aims to respond to the urgent need of communities to improve their skills for managing public services, thus operationalizing what is known as the 'demand responsive approach'. The key characteristics of this approach, developed during the Community Water Supply and Sanitation Conference in May 1998 (organized by the World Bank/UNDP-World Bank Water and Sanitation Program), are presented in the box below.

Key characteristics of the demand-responsive approach

(a) Community members can make informed choices about: whether to participate in the project; technological and service level options based on their willingness to pay and on the principle that more expensive systems cost more; when and how their services are delivered; how funds are managed and accounted for; and how their services are operated and maintained.

(b) The government plays a facilitating role, sets clear national policies and strategies, encourages broad stakeholder consultations, and facilitates capacity-building and learning.

(c) An enabling environment is created for the participation of a wide range of providers of goods, services and technical assistance to communities, including the private sector and NGOs.

(d) An adequate flow of information is provided to the community, and procedures are adopted that will facilitate collective decisions within the community and between the community and other actors (social intermediation).

Source: Community Water Supply and Sanitation Conference, World Bank/UNDP-World Bank Water and Sanitation Program, Washington DC, USA, May 1998.

PAD enables communities, together with the staff of the support organization, to participate throughout the development process, starting from the initial design of an intervention, through data gathering and analysis, to the presentation of the final results and discussion of the implications of their actions. Communities are actively engaged in the quest for information and ideas to guide their future actions.

It is not always possible or necessary to work closely with an entire community. A small group can be formed to work as direct partners with the staff in the support organization, and to provide feedback to the whole community when required. Members of the small group are both community members and local development workers, so that dialogue between the professionals in the support organization and the people at the grassroots level is a key feature of the process. PAD is a learning process for community members and the staff in the support

organization, enabling both sides to learn from their experiences in a socially desirable action.

PAD offers an effective and powerful strategy for carrying out the type of interdisciplinary work that is needed to assist communities to take the lead in their own development. It is a real demand-responsive approach, resulting in improved community management of rural water supplies. It also allows for a better understanding of the strengths and weaknesses of community management, because through the methods and tools used, it takes a holistic view of management practices and problems. PAD can be rapidly adjusted to local conditions in different countries. In particular, by providing feedback to the community it can stay close to reality.

The PAD methodology places strong emphasis on methods for assessment of participatory and gender-sensitive appraisal and needs. It uses both qualitative and quantitative methods for collecting data on system performance and service, such as distribution, breakdown rates, costing, demographics, local organization, and the socioeconomic characteristics of served and unserved households. In doing so, PAD builds on earlier appraisal methodologies such as Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA).

PAD involves three major phases:

- ***Diagnosing*: the staff prepare for the job, communities are selected, and problems and problem-solving strategies are identified.**
- ***Experimenting*: problem-solving strategies, methods and tools are tested**

and evaluated.

- ***Sustaining the process*: the findings are shared and disseminated, and the work that needs to be done to sustain the development process is planned and coordinated.**

4.3 Diagnosis[1]

[1] Extracts from: M. Lammerink et al. *Facilitating community discovery*, op. cit.

Getting prepared for PAD

The support organization must first prepare itself for the application of PAD. To identify what needs to be done to get prepared, the support organization must ask a number of questions, such as: Does PAD fit within the mandate of our organization? Is our organization sufficiently flexible to cope with support requirements which may vary in terms of the time required, the necessary resources and the intensity of support? Can we put together a multidisciplinary and gender-balanced support team which will allow us to address social as well as technical issues, and men as well as women? Do the staff have previous experience with PAD? Are they capable of facilitating development processes rather than merely implementing water and sanitation projects? Do the team members trust each other sufficiently to be able to collaborate and learn from each other? What do we know about community management experiences elsewhere in the country? The composition and the experiences of staff within the organization will determine the extent to which efforts are to be undertaken in

order to 'get prepared' for PAD. In choosing to apply a PAD approach, the organization will move away from merely implementing water supply and sanitation projects, to facilitating development processes.

Training the support team

Planning and training workshops should be part of the preparatory phase. During such workshops the project team of the support organization can exchange the preliminary findings from the country assessment, agree on an analytical framework, develop a common support approach, develop a methodology and criteria for the selection of project communities, and identify appropriate participatory and gender-specific methods and tools for carrying out the performance and situation assessments with community members. Learning to work with such participatory methods and tools for community diagnosis, and to creatively use a basket of tools should also be part of these workshops. Implementation plans, including indications of how gender aspects will be addressed, can be prepared and the team can draft material to brief the support organization on the approach and its implications.

The planning and training workshops can be facilitated by staff from organizations with experience with the PAD approach who can offer training activities and facilities. Such organizations exist in at least six countries in Asia, Latin America and Africa, and they are growing in number.

Selecting the communities

Part of the task of the planning and training workshop is to develop a

methodology and a set of criteria for the selection of communities to work with. First, it must be decided whether to select only the communities that requested support, or also include those with whom the support organization finds it important to work. It is certainly preferable to work with communities who have asked for support, but some more remote communities may be unaware that they too could apply. Support organizations may therefore have to take the initiative in approaching the latter.

Some of the criteria for selecting communities with whom to apply the PAD approach may be similar to those used for general community selection. These criteria include: whether the people have expressed a need for improvement, the accessibility of the community, the people's willingness to invest time and effort in a project applying the PAD approach, the level of equity and equality within the community, and the outcomes of previous management efforts in that community. In accordance with their own development philosophy, support organizations may also include criteria such as geographical location, socioeconomic conditions, presence of underprivileged groups within the community, and political stability.

4.4 The process of community diagnosis

The question of whether a community diagnosis is to be carried out in a participatory way can be looked at from two perspectives: pragmatic and ethical. Pragmatic considerations include how much time is available for the diagnosis, the skills of the staff, how many communities are to be included, as well as the type of information and how detailed and reliable that information needs to be. Ethical considerations include whether the community members want a diagnosis; if so, who will decide which areas should be explored, who will make the observations,

who will conduct interviews and with whom, and who will determine how the information will be used?

Community diagnosis seeks to gather information which will be used as the basis for planning and implementing development activities, and to prepare the people for action. The assessment will include issues such as the roles of men and women in local management, the effects of gender on the efficiency and use of water supplies, environmental concerns such as water source protection and watershed management, and issues of cost recovery and community-based financial management. The outcome of a community diagnosis gives some insight into problems with a negative effect on the management of the water supply system, provides local knowledge and resources available to improve the existing situation, and indicates strategies to resolve these problems. Community diagnosis has a number of distinguishing elements:

- **building and maintaining rapport;**
- **establishing a local PAD team;**
- **collecting general and factual information;**
- **determining the range of topics of interest for further exploration;**
- **screening indigenous knowledge and existing management practices for possible application in water supply management;**
- **collecting detailed information on identified topics: problems, potentials and available resources;**

- **prioritizing problems, identifying the root causes of problems, and establishing selection criteria;**

- **identifying and selecting potential solutions and possible problem-solving strategies;**

- **providing feedback to the community.**

Although community diagnosis is often seen as a step in development, with a clear beginning and an end, experience has shown that it is a continuous, repeated process since newly revealed facts trigger new questions that require investigation. Once action to improve a problem situation has begun, the community will probably run into unexplored areas that require further investigation.

4.5 Tools - Fact sheets

Participatory Rural Appraisal (PRA) - Mind mapping - Successes-Weaknesses-Opportunities-Threats (SWOT) - Creativity workshop - Scenario writing - Morphological box - Utility value analysis - Task chart - Bar chart (Gantt chart) - Flow charts - Historical line - Mapping - Venn Diagram - Community walk - Pocket chart - Priority ranking.

FACT SHEET

Participatory Rural Appraisal (PRA)[1]

[1] Reference document: McCracken/Pretty/Conway. *Introduction to RRA for agricultural development*. IIED, 3 Endsleigh Street, London WC1H 0DD, England (1988). In: *Cooperation planning - A working aid for beginners and for more experienced planners*. Swiss Development Cooperation, Evaluation Service, CH-3003 Berne, Switzerland (1993).

Application possibilities in the planning cycle

Vision	Possibilities for change	Way, approach	Concept, strategy	Operational plan	Plan adjustments	Monitoring, evaluation
••	•••	••	-	-	•	••

- least appropriate; • some appropriateness; •• appropriate; ••• very appropriate.

Similar/related approaches

Rapid Rural Appraisal (RRA); Farmers First; Participative Learning Methods (PALM); Approach Development; Action Research

Brief description

The PRA approach enables a rapid and inexpensive assessment of the most important features of the living conditions of an urban or rural population. The assessment is done primarily by an interdisciplinary team (including at least one sociologist) and takes place in the field. PRA is designed as an ongoing learning process for both local as well as external participants. A conscious attempt is

made to avoid misrepresentations with regard to staff selection, timing, season, route, etc. Tailor-made tools, some of which are developed locally at the time, are used, such as: a) semi-structured interviews, b) historical profile, c) ranking of values, d) seasonal charts, e) pocket chart, f) participatory problem analysis, g) joint field visits, f) direct observations.

Advantages

- **Related to both problems and potentials**
- **Promotes competence and reinforces independence**
- **Appropriate for rural setting**
- **Compares and takes into account different opinions**
- **Evaluates local know-how and technology together with the communities**
- **Builds trust and understanding within the community**
- **No special methodological knowledge required by local participants**
- **Tools can be applied in a flexible fashion (encourages creativity).**

Limitations

- **Leads to a considerable amount of collected information (not always used)**
- **Raises expectations in the community**
- **Findings need to be elaborated further for practical implementation**
- **Situation-specific and thus difficult to compare from one place to another**
- **Can require a lot of time**
- **Requires knowledge of participatory techniques, openness.**

FACT SHEET

Mind mapping[1]

[1] Reference document: Buzan T. *Kopftraining, Anleitung zum Kreativen Denken*. Munich (1990). In: *Cooperation planning - A working aid for beginners and for more experienced planners*. Swiss Development Cooperation, Evaluation Service, CH-3003 Berne, Switzerland (1993).

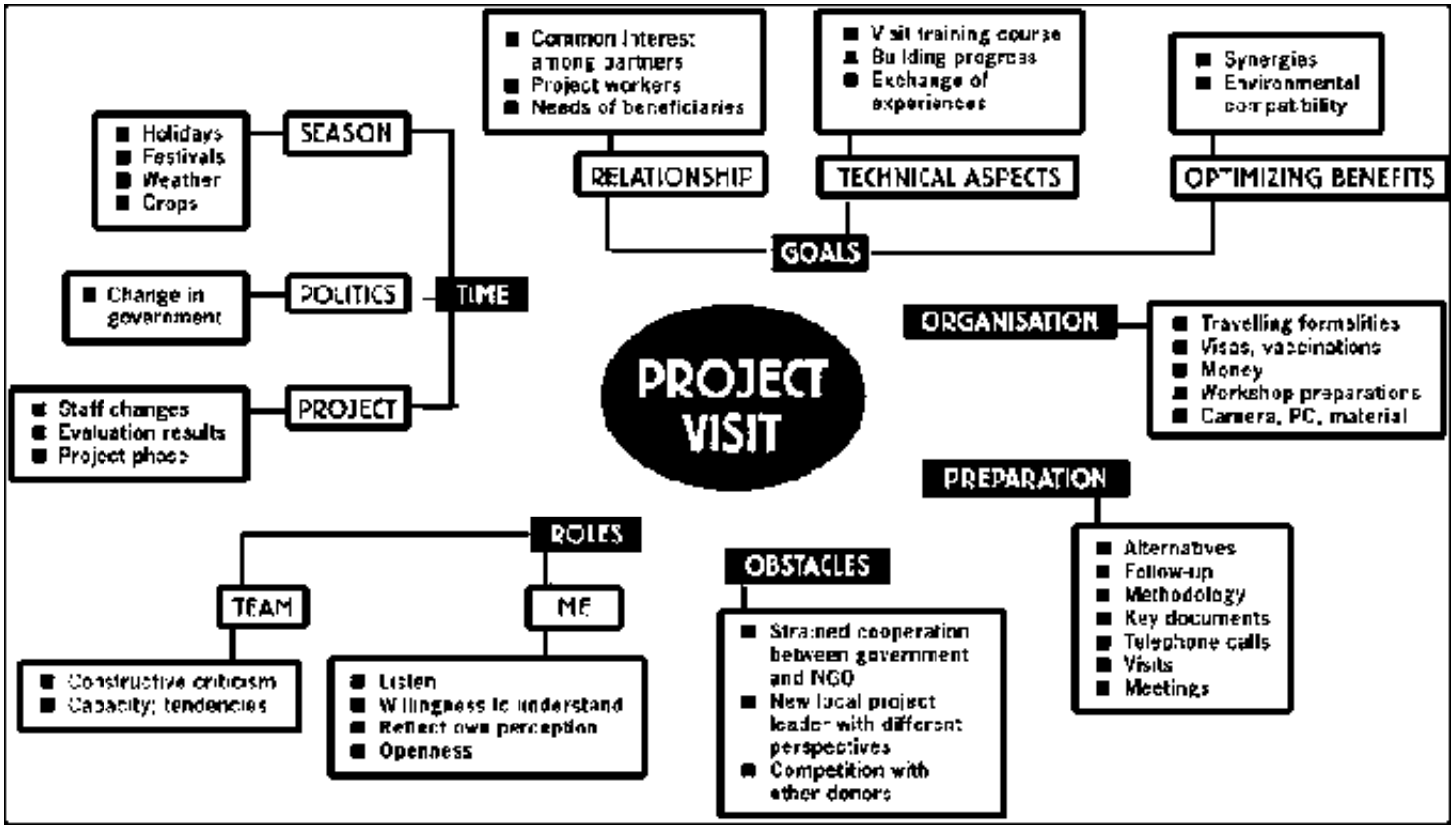
Application possibilities in the planning cycle

Vision	Possibilities for change	Way, approach	Concept, strategy	Operational plan	Plan adjustments	Monitoring, evaluation
•••	•	-	•	-	-	-

- least appropriate; • some appropriateness; •• appropriate; ••• very appropriate.

Brief description

Mind mapping facilitates the overview on a central theme. Thought processes are brought together in a spontaneous-associative way and identified with key words or symbols. In this way a chosen theme is assessed from different perspectives and a "map of landmarks" emerges. The landmarks are classified and organized into a branching arrangement, thus enabling classification into further branches.



Project Visit

Advantages

- **Open, expandable**
- **Provides an overview at a glance**
- **Very versatile.**

Limitations

- **Rough analysis and overview**
- **Emphasizes linear relationships.**

FACT SHEET

Successes - Weaknesses - Opportunities - Threats (SWOT)[1]

[1] Adapted from: *Cooperation planning - A working aid for beginners and for more experienced planners*. Swiss Development Cooperation, Evaluation Service, CH-3003 Berne, Switzerland (1993).

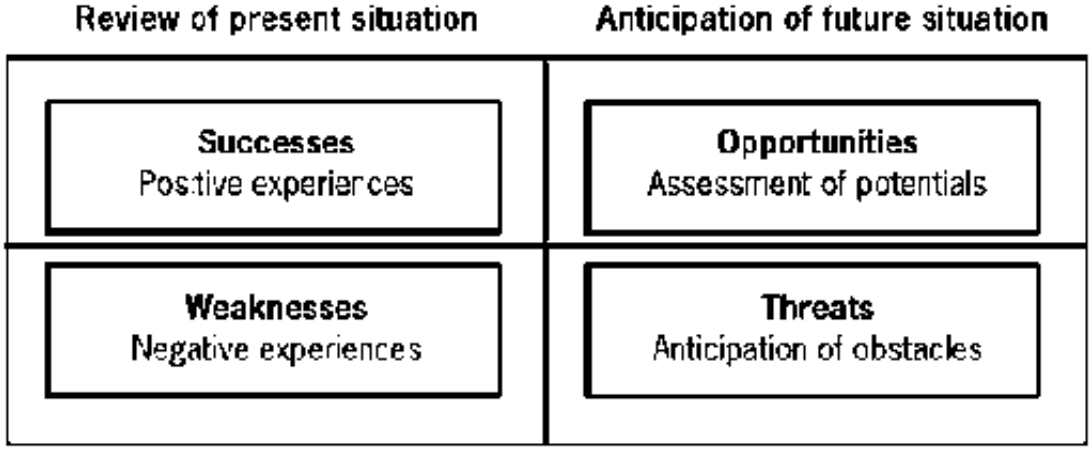
Application possibilities in the planning cycle

Vision	Possibilities for change	Way, approach	Concept, strategy	Operational plan	Plan adjustments	Monitoring, evaluation
•••	-	•	•	-	•••	•

- least appropriate; • some appropriateness; •• appropriate; ••• very appropriate.

Brief description

SWOT is a simple, flexible and versatile working tool for situational analysis in groups. It has the advantage that it can easily be understood in an intercultural setting. It records the positive and negative experiences (successes and weaknesses) of the present situation, as well as anticipates the future opportunities and obstacles (threats) that are most likely to arise in a given situation.



Figure

Advantages

- **Simple (partners can quickly apply the method themselves)**
- **The joint review provides clarity on different opinions**
- **Enables the participation of socially weaker parties on an equal basis**
- **No special material is needed.**

Limitations

- **SWOT does not offer any solutions; it merely serves to provide clarification and to structure opinions**

- **The moderator (facilitator) should have basic knowledge of visualization methods.**

FACT SHEET

Creativity workshop[1]

[1] Adapted from: *Cooperation planning - A working aid for beginners and for more experienced planners*. Swiss Development Cooperation, Evaluation Service, CH-3003 Berne, Switzerland (1993).

Application possibilities in the planning cycle

Vision	Possibilities for change	Way, approach	Concept, strategy	Operational plan	Plan adjustments	Monitoring, evaluation
•	•••	•••	-	•••	•	•

- least appropriate; • some appropriateness; •• appropriate; ••• very appropriate.

Brief description

This workshop method provides an organizational framework for the participatory examination of problem situations and joint problem-solving. The participants are divided into large groups and the workshop takes place in five steps over one or two working days. The five steps consist of the following:

1. Preparatory phase: Tuning in; setting a pleasant atmosphere; participants get to know each other, exchange motives; needs and goals are formulated, procedures and working techniques determined (visualization with sheets of paper or cards).

2. Criticism phase: Problems are presented, criticism expressed; exaggeration is allowed; selection of themes from the critical contributions, re-formulation of critical themes into goals.

3. Utopian phase: Build a creative atmosphere; criticism is not allowed; present dreams, utopian visions and ideal solutions without thinking of the limitations set by reality (brainstorming); selection of the most interesting visions.

4. Realization phase: The results are examined and studied more closely; priorities are set; select a proposal; first steps for an implementation plan are decided upon.

5. Permanent workshop (in smaller core groups): The proposal chosen in the realization phase is expanded and refined; project designs emerge; only designs which are feasible with regard to subject and reality (opposition, constraints, resource requirements, etc.) are considered; project goal is set.

Advantages

- **Procedures are democratically determined by the participants**
- **Exaggeration is not limited, but encouraged so as to trigger creative associations**
- **The concept combines a playful approach with analysis.**

Limitations

- **Workshop leaders must be experienced and well versed in a repertoire of possible working techniques so that specific results can be achieved; each phase requires clear and specific rules; in order to avoid both euphoria and resignation, it must be made clear at the beginning which criteria will be used to evaluate and prioritize the criticism and utopian suggestions; this method is not suitable for socially differentiated groups.**

FACT SHEET

Scenario writing[1]

[1] Adapted from: *Cooperation planning - A working aid for beginners and for more experienced planners*. Swiss Development Cooperation, Evaluation Service, CH-3003 Berne, Switzerland (1993).

Application possibilities in the planning cycle

Vision	Possibilities for change	Way, approach	Concept, strategy	Operational plan	Plan adjustments	Monitoring, evaluation
•	•••	-	-	-	-	-

- least appropriate; • some appropriateness; •• appropriate; ••• very appropriate.

Brief description

Scenario techniques are used in the design of alternative views for the future.

They are particularly suitable for dealing with long-term problems whose solutions depend on many variables (e.g. energy issues, development of transportation, promotion of training, etc.).

In the case of difficult questions, the drawing up of scenarios undergoes numerous steps. Firstly, the task is defined in simplified terms and the scope of investigation is set. Then the environment and its influencing factors are assessed with regard to possible future developments: the anticipated history is written in advance.

As a rule, "probable", "optimistic" and "pessimistic" alternatives are drawn up, which form the possible scenarios in the search for specific solutions. The sequence of steps is not strictly predetermined. Different planning and working techniques may be used according to their suitability.

Suggested steps:

- **Situation analysis: delineation of problems, relationship with the environment, initial situation**
- **Prognosis phase: alternative trends, possible future events, situational crossroads, selection criteria**
- **Programme phase: development of scenarios, alternative strategies, programmes.**

Advantages

- **Suitable for complex, long-term problems**
- **Widens the planning horizon**
- **Promotes development-oriented thinking.**

Limitations

- **Time-intensive**
- **Demanding with regard to information requirements and interdisciplinary proficiency**
- **Open to manipulation.**

FACT SHEET

Morphological box[1]

[1] Adapted from: *Cooperation planning - A working aid for beginners and for more experienced planners*. Swiss Development Cooperation, Evaluation Service, CH-3003 Berne, Switzerland (1993).

Application possibilities in the planning cycle

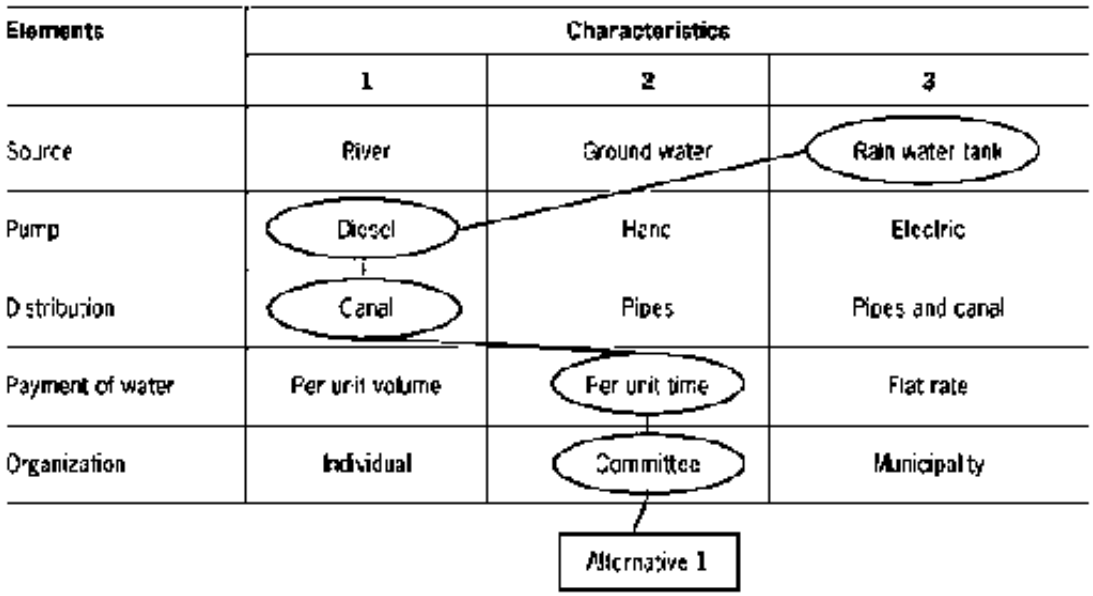
Vision	Possibilities for change	Way, approach	Concept, strategy	Operational plan	Plan adjustments	Monitoring, evaluation
-	-	•••	-	-	-	-

- least appropriate; • some appropriateness; •• appropriate; ••• very appropriate.

Brief description

The morphological box enables the systematic search for alternative solutions for a clearly defined problem. Possible solutions are broken up into elements and the most important characteristics of each element are identified (possibly by brainstorming). These elements and their characteristics are then arranged in a morphological box. This facilitates assessing and combining solutions and their characteristics until the most suitable variation(s) is found.

Example: Plot irrigation



Figure

Advantages

- **Suitable for clearly defined problems where an overview of solution**

combinations and variations is important.

Limitations

- **Less suitable for complex problems requiring a high degree of analysis**
- **Assessment of alternatives may need much effort and time.**

FACT SHEET

Utility value analysis[1]

[1] Reference document: Voelkner J. *Planungsmethoden in Verwaltung und Wirtschaft*. Regensburg-Berlin-Bonn (1992), in: *Cooperation planning - A working aid for beginners and for more experienced planners*. Swiss Development Cooperation, Evaluation Service, CH-3003 Berne, Switzerland (1993).

Application possibilities in the planning cycle

Vision	Possibilities for change	Way, approach	Concept, strategy	Operational plan	Plan adjustments	Monitoring, evaluation
-	-	•••	-	-	-	-

- least appropriate; • some appropriateness; •• appropriate; ••• very appropriate.

Brief description

Utility value analysis enables the evaluation, assessment and selection of different options for introducing change. This involves decision-making which depends on factors which are both quantitative and objective, as well as qualitative and subjective. By using utility value analysis, the situation is presented in a transparent way and the evaluation criteria of all the participants are clearly disclosed. Utility value analysis involves the following steps:

1. **Setting limits to the task (objectives, situation analysis, identification of shortcomings)**
2. **Presentation of alternative solutions**
3. **Development of assessment criteria**
4. **Weighing of each criteria (P)**
5. **Assessment of alternatives, (E; criteria E varies from 1 to 10)**
6. **Calculation of the utility value (E × P)**
7. **Comparative evaluation (horizontal, individual criteria; vertical, overall impression) and decision-making.**

Example: Choosing the site for the project office of a development project

Assessment criteria	**Weighing**	**Solution 1** (outside project zone)		**Solution 2** (in project area)	
	P	E	E × P	E	E × P

Accessibility for villagers	30	3	90	10	300
Travelling effort for staff	15	3	45	7	105
Premises	10	5	50	2	20
Partner contacts	20	6	120	3	60
Policy agreements	10	5	50	1	10
Attractiveness	15	6	90	3	45
Total	**100**		**445**		**540**

Advantages

- **Complex problem formulations are made accessible to all participants**
- **Human and intuitive components of assessments are emphasized at the same level as objectives**
- **The risk of wrong decisions by individuals is reduced**
- **Criteria and their weighing can be used as a monitoring basis.**

Limitations

- **Assessment and weighing figures should be documented so that they are comprehensible to outsiders. If important decision-makers are not present, the results have less value.**

FACT SHEET

Task chart[1]

[1] From: *Cooperation planning - A working aid for beginners and for more experienced planners*. Swiss Development Cooperation, Evaluation Service, CH-3003 Berne, Switzerland (1993).

Application possibilities in the planning cycle

Vision	Possibilities for change	Way, approach	Concept, strategy	Operational plan	Plan adjustments	Monitoring, evaluation
-	-	-	-	•••	-	-

- least appropriate; • some appropriateness; •• appropriate; ••• very appropriate.

Brief description

Task charts are used to organize work procedures. The functions of the staff at every step are indicated diagrammatically in the chart. In its simplest form, the compiling of an annual report can be depicted as follows:

Tasks Activities	Project leader	Planning Consultant	Section Head	Technical assistant	Administrator	Community
Review experiences	**Plan./ Dec.**	**Plan./ Dec.**	Plan./ **Impl.**	Impl.	- Impl.	Dec./
Organization	Dec.	**Dec./**	Impl.	Impl.	Info.	-

Arrange Report		**Impl.**				
Editing	**Plan./** Impl.	Plan./ Impl.	**Impl.**	Impl.	Impl./ Contr.	-
Approval	**Coord.**	-	Coord.	-	-	-

Plan. = planning Dec. = decision-making Impl. = implementation
Contr. = control Info. = information Coord. = coordination

Bold letters indicate the main responsibility; ordinary letters indicate lesser responsibility or co-responsibility.

Advantages

- **The organizational sequence becomes transparent**
- **Encourages allocation of responsibility**
- **Provides a good basis for job descriptions.**

Limitations

- **Graphical over-simplification**

FACT SHEET

Bar chart (Gantt chart)[1]

[1] From: *Cooperation planning - A working aid for beginners and for more experienced planners*. Swiss Development Cooperation, Evaluation Service, CH-3003 Berne, Switzerland (1993).

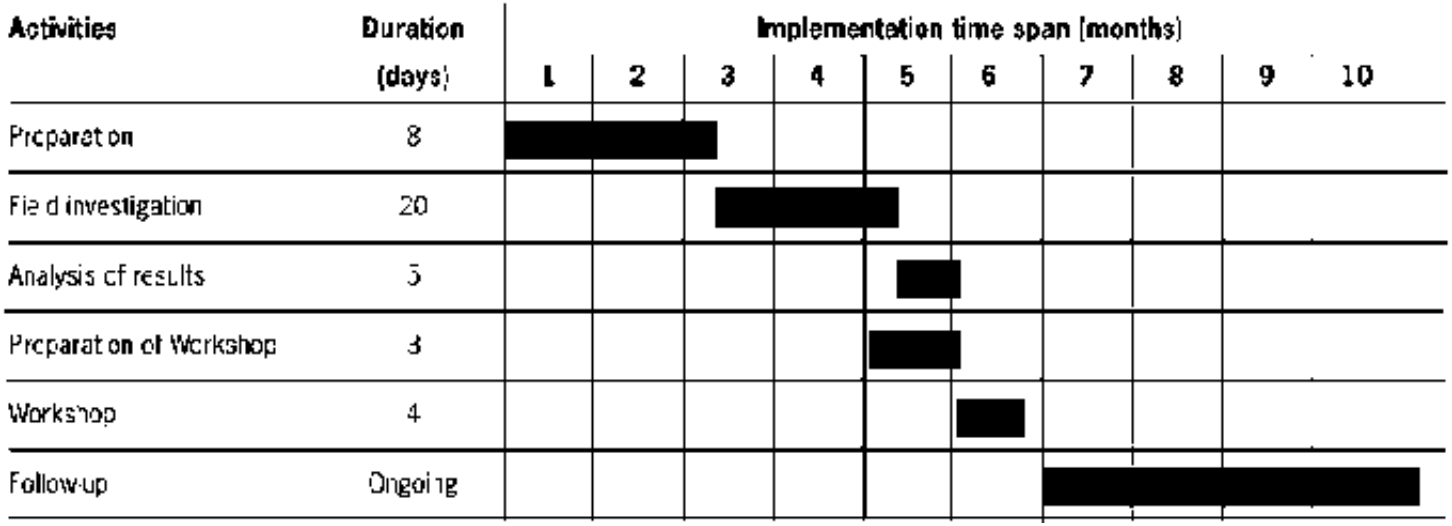
Application possibilities in the planning cycle

Vision	Possibilities for change	Way, approach	Concept, strategy	Operational plan	Plan adjustments	Monitoring, evaluation
-	-	-	•	•••	•	-

- least appropriate; • some appropriateness; •• appropriate; ••• very appropriate.

Brief description

Gantt bar charts are used for the chronological planning of tasks. Individual working steps are listed on the activity axis of the chart. The duration of the activities is indicated on the time axis by bars.



Example: Programme evaluation

Advantages

- **Graphic and simple**
- **Wide selection of PC programmes.**

Limitations

- **Updating can be difficult**
- **Interconnections between activities may not be easily recognizable.**

FACT SHEET

Flow charts[1]

[1] **From:** ***Cooperation planning - A working aid for beginners and for more***

***experienced planners*. Swiss Development Cooperation, Evaluation Service, CH-3003 Berne, Switzerland (1993).**

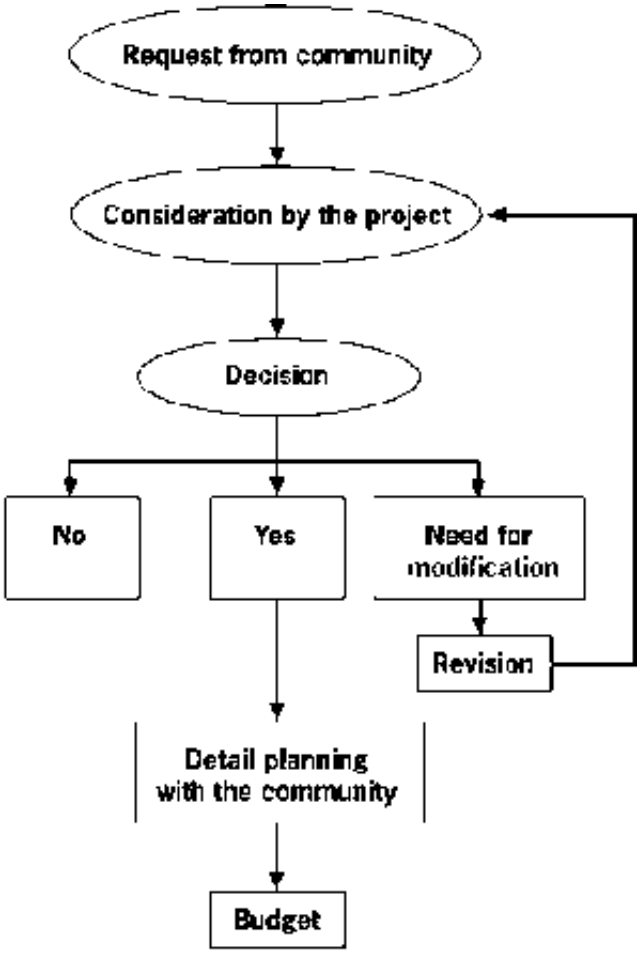
Application possibilities in the planning cycle

Vision	Possibilities for change	Way, approach	Concept, strategy	Operational plan	Plan adjustments	Monitoring, evaluation
-	-	-	•	•••	-	-

- least appropriate; • some appropriateness; •• appropriate; ••• very appropriate.

Brief description

The sequence of the activities of a process is structured in a transparent way in a flow chart. The steps of each activity are represented by symbols such as "Start", "Develop", "Check", "Decision", etc.



Example: Request to rehabilitate water supply system

Advantages

- **Simple, easily learnt**
- **Suitable for planning and control of routine tasks.**

Limitations

- **Suitable only for specific processes**
- **Unsuitable for time-related planning.**

FACT SHEET

Historical line

Application possibilities in the planning cycle

Vision	Possibilities for change	Way, approach	Concept, strategy	Operational plan	Plan adjustments	Monitoring, evaluation
•••	•	-	-	-	-	••

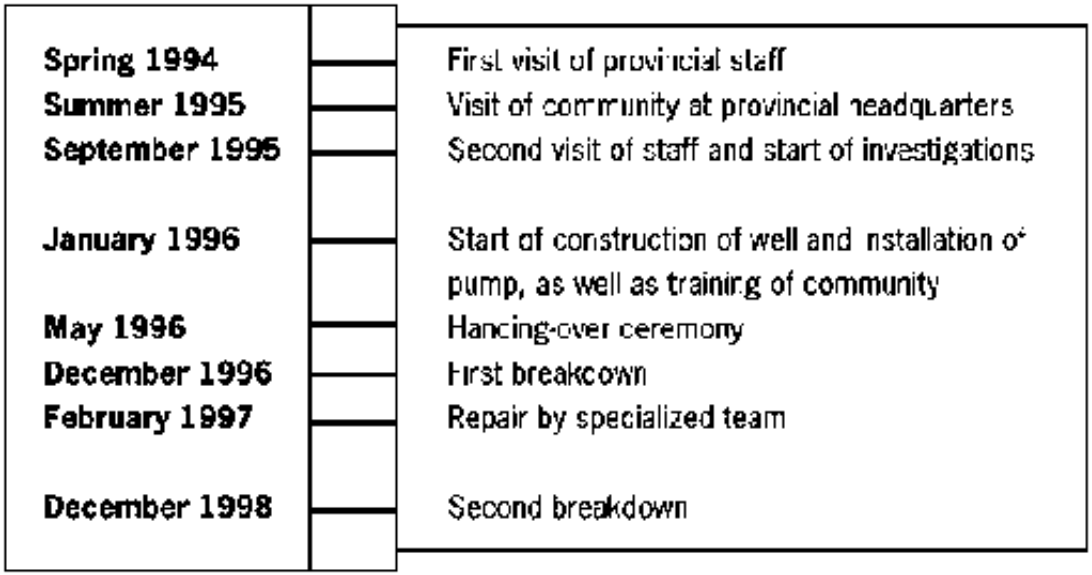
- least appropriate; • some appropriateness; •• appropriate; ••• very appropriate.

Brief description

This tool consists in collecting the most important historical events and facts of the community in a chronological way. It is especially used to highlight the history of the community, the life of community organizations, the history of water supply, and the chronology of a project.

It is carried out through a series of questions on a specific theme and a pre-established check-list which is discussed with the community. One could use a large sheet of paper, or a board which is divided vertically into two parts: the left part to record time, and the right for recording the events or facts.

Example



Figure

Advantages

- **Helps to get a common understanding of a series of events and their relationship in time**
- **Very good for starting a problem analysis together with the community**
- **Simple and easy to use.**

Limitations

- **Provides mainly a chronological vision of events. Communities do not always have a precise sense of time. Questions have to be well prepared before starting the exercise. Allow all members to express themselves.**

FACT SHEET

Mapping

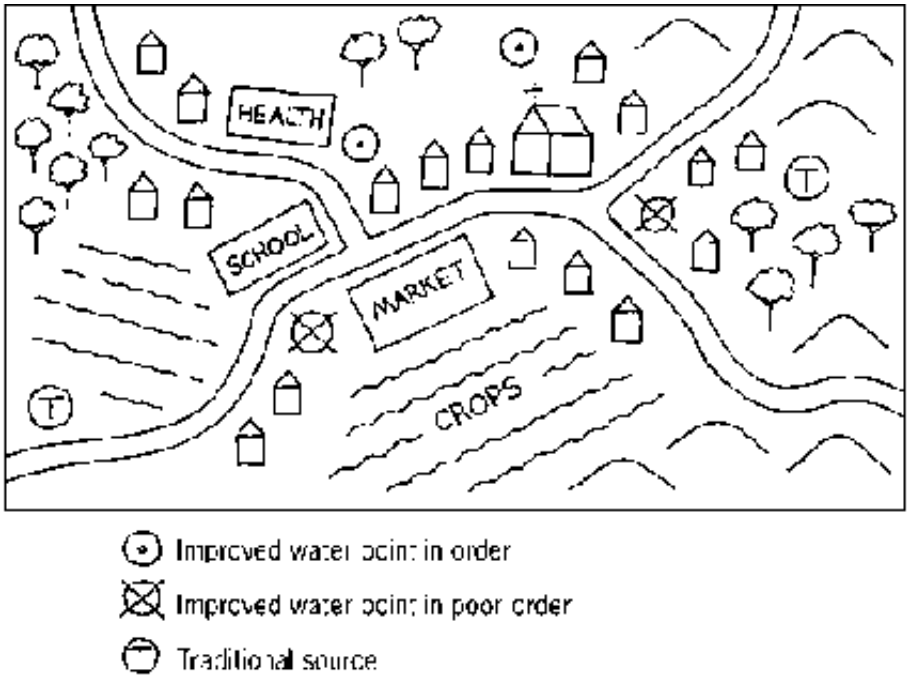
Application possibilities in the planning cycle

Vision	Possibilities for change	Way, approach	Concept, strategy	Operational plan	Plan adjustments	Monitoring, evaluation
•••	•	-	-	-	-	•••

- least appropriate; • some appropriateness; •• appropriate; ••• very appropriate.

Brief description

The purpose of mapping is to gather information about a community by having its members create their own village map. It is also used to record information about existing problems and to perceive the value given by community members to certain situations. Community members could draw the map on a sheet of paper, a board or even the soil, and highlight the following points: main location of settlements and distribution of population including main topography; identification of health centre, schools, shops, market, church (or other place of worship); location of water points, zones of infection, or problems with the water source and distribution; location of latrines or garbage disposal; specification of points which have continuous or seasonal variations in the type of water, or in functioning; location of the population with the lowest willingness to pay; identification of the economic activities of men and women.



Figure

Advantages

- **Provides a common understanding about a village setting and its problems**
- **Is very participatory and communities enjoy this work**
- **Simple and easy to understand.**

Limitations

- **Information might need to be validated in terms of geographical precision**
- **Tool needs to be complemented by a problem analysis**
- **Requires time.**

FACT SHEET

Venn Diagram

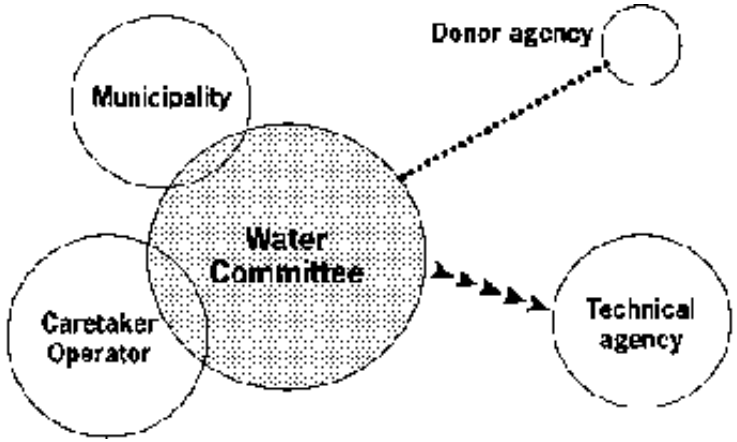
Application possibilities in the planning cycle

Vision	Possibilities for change	Way, approach	Concept, strategy	Operational plan	Plan adjustments	Monitoring, evaluation
•••	•	-	-	-	-	•••

- least appropriate; • some appropriateness; •• appropriate; ••• very appropriate.

Brief description

The Venn Diagram is a graphic representation which provides a global vision of institutional and social relationships within and outside a community. It uses circles to represent institutions or groups of people. The size of the circles represents the importance of the role of these institutions or groups of people (small circle = little importance; medium circle = medium importance; large circle = major importance). The distance between the circles indicates the relationship between institutions and groups of people (intersection = collaboration, coordination; touching circles = contacts; circles apart = distant relationships which increase with the distance between circles). An additional qualification can be given by lines or arrows between the circles (➤➤➤= conflict; •••••• = intermittent relationships, etc.).



Figure

Advantages

- **Provides a rapid and concrete vision of interrelationships and importance of various actors**
- **Shows potential problems, and constitutes a basis for further analysis**
- **Should be carried out with different groups at different times.**

Limitations

- **Very subjective; the results will vary considerably if carried out by community members, or by the agency**

- **Information resulting from the discussion must also be recorded.**

FACT SHEET

Community walk

Application possibilities in the planning cycle

Vision	Possibilities for change	Way, approach	Concept, strategy	Operational plan	Plan adjustments	Monitoring, evaluation
•••	•	-	-	-	-	•••

- least appropriate; • some appropriateness; •• appropriate; ••• very appropriate.

Brief description

A community walk consists in observing community conditions in order to appreciate a situation or to see if goals have been met, while walking through a community. A community walk can also consist in small visits to families, with informal discussions about water supply, sanitation, and hygiene, while appreciating the general in-house situation. The community walk should be done in small groups, as large groups attract too much attention. Each group records what it sees, and should be planned at the time of the day when water and sanitation activities are most relevant. Here is a list of major relevant points to be observed:

- **General environmental condition**
- **Type and state of settlements**
- **State and functioning of water source, distribution and supply**
- **Cleanliness around water points**
- **Hygiene practices for the transport and storage of water**
- **State and functioning of private and public latrines**

- **Evacuation of used water**
- **Garbage disposal**

Advantages

- **Direct observation and contact with reality for project staff.**

Limitations

- **Needs time**

- **Information collected should be well organized, otherwise there is a risk that the information will not be used**

- **All information should be recorded in writing, because not everything can be remembered.**

FACT SHEET

Pocket chart

Application possibilities in the planning cycle

Vision	Possibilities for change	Way, approach	Concept, strategy	Operational plan	Plan adjustments	Monitoring, evaluation
•••	•	-	-	-	-	•••

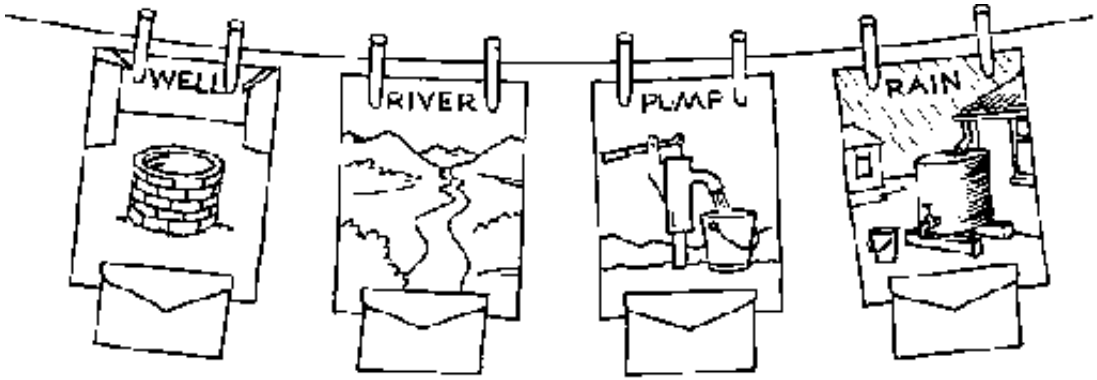
- least appropriate; • some appropriateness; •• appropriate; ••• very

appropriate.

Brief description

The pocket chart is a very effective method to collect information about people's perceptions, habits, desires and will. It provides quantitatively valid information by a system of voting, and further allows holding discussions with community members. The method can be divided into three phases - Phase one: preparation of the tools and explanation to the community. Phase two: vote. Phase three: discussions.

Simple version



Figure

Drawings are prepared in advance, preferably by local artists, to which are attached envelopes. In the case of water supply, each drawing represents a possible water supply option (or sanitation option or hygiene behaviour, etc. for other cases). Women are given small pieces of pink (or red) paper (or round stones), while men are given pieces of blue paper. The facilitator asks the group a

first question: "Where do you collect water regularly now?" Community members go and vote, by putting their piece of paper in the selected envelop. Voting should preferably be done separately, as one person can influence another. Results are then shared with the group, and discussions are held, asking the community about their comments and explanations on the results. A second question could be: "Where would you like to go to get your water?" and follows the same procedure.

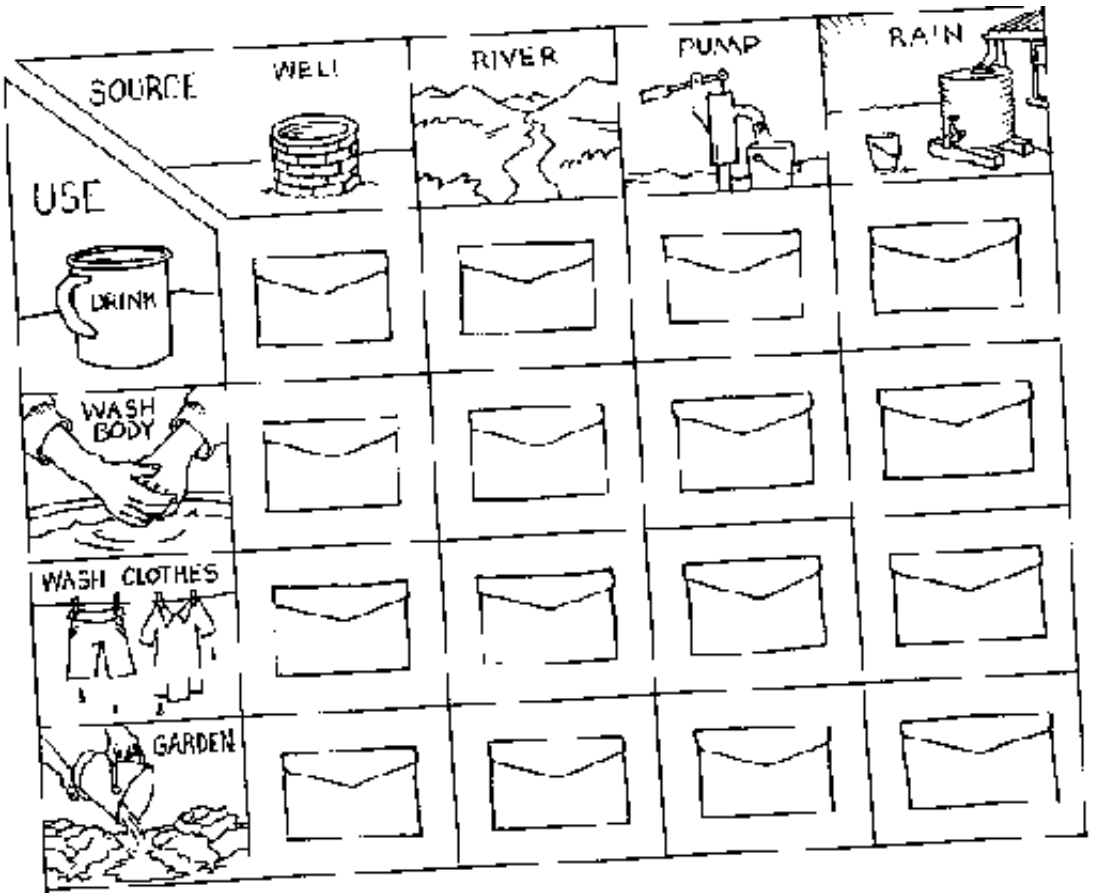
Advantages

- **Provides statistical information**
- **Very participatory tool; problems can be discussed immediately.**

Limitations

- **Acquaintance with the method**
- **Community members may not be able to identify themselves with the drawings.**

Matrix version



Figure

A matrix is prepared on a large piece of paper, with drawings made locally. Community members are given four small pieces of coloured paper (as above). The facilitator can ask: "Where does the water you drink come from? Where does the water you wash your body with come from? Where does the water you wash your clothes with come from? Where does the water you water your garden with come from?" The results must be shared and discussed. Another series of questions can be linked to the water source, the community's plans for its use in the future, and for what purpose.

Advantages

- Same as above

Limitations

- Same as above. Also, limitations in the understanding of certain communities about the use of the matrix. The matrix might seem complicated with too many envelopes. If the situation arises, it is possible to ask community members to vote row by row.

FACT SHEET

Priority ranking

Application possibilities in the planning cycle

Vision	Possibilities for change	Way, approach	Concept, strategy	Operational plan	Plan adjustments	Monitoring, evaluation
•••	•	-	•	-	-	•••

- least appropriate; • some appropriateness; •• appropriate; ••• very appropriate.

Brief description

In a number of circumstances, choices have to be made, or priorities have to be defined and set. This tool is a decision-making tool, which uses a matrix format.

A set of issues, which can be activities or problems, are clearly defined. Then, for example, participants are asked to choose individually (or in small groups) three issues out of the total and to prioritize them according to criteria which were previously approved. Choosing in groups can help to discuss the issues more in detail before prioritizing them. The table below shows two possible ways to determine a priority: (a) through percentage, (b) through mean average.

Example: Determination of priorities on use of water for water improvement project (n = 10 people or groups participating)

Possible use of water	No. of people or groups who chose this use (x)	% of people/groups who selected this issue (x/n %)	Priority given to this use (y)	Mean average for priority given (y/n)
Drinking	10	100	1,2,1,2,1,1,1,2,1,1	1.3
Cooking	9	90	2,1,2,3,2,3,2,3,2,4	2.4
Washing body	5	50	4,5,2,3,4,3,3,3,4,5	3.6
Washing clothes	6	60	4,4,5,3,2,4,3,5,4,4	3.8
Cleaning the environment	2	20	5,5,5,5,5,5,5,5,4,5	4.9
Gardening	7	70	2,3,2,3,2,3,2,3,2,3	2.5

Brewery	3	30	5,4,5,4,5,5,5,5,4,5,	4.7
Other (to be specified)	2	20	4,5,5,5,5,5,5,4,5,5	4.8

According to the percentage and the mean average, the first three priorities selected are: drinking, cooking and gardening. If there is any doubt, the matter should be discussed within the group.

Advantages

- **Helps to make a decision democratically**
- **Concrete and can be quantified.**

Limitations

- **Participants may not agree on criteria for selection and prioritization**
- **Use of matrix could be complex in certain communities.**

Unit 8: Field visit

1. Outline of session

- **Objectives**

  - **To assess the operation and maintenance status of water supply and sanitation facilities within a community**

- **To analyse the field visit results**

- **Methodology**

  1. Field visit
  2. Analysis in the classroom

- **Materials**

  √ Transport for the visit
  √ A small notebook for each participant
  √ Suitable clothing for field work
  √ Flip chart and markers for class work

- **Handouts**

  √ Information about the community
  √ Exercise sheet

2. Notes for the facilitator

Preparation

The purpose of the field visit is to give the participants an opportunity to look at the operation and maintenance arrangements in a particular community. The actual programme will depend on the distance to be travelled for the visit, the size of the local community and the extent of their cooperation with the organizers of the course. The participants may have to be divided into small groups to work

more efficiently and to reduce inconveniences to the community.

The communities should be contacted well in advance to fix the date and timing of the visit and to ensure that the local committee and some users will be ready to receive the participants. The community should be fully briefed on the visit and its objectives and given details of the programme that will be followed. Arrangements have to be made for transport and refreshments during the visit.

If a community is large enough to accept the full group, then only one community need be contacted for the visit. But if the group of participants is very large, it may be necessary to allocate smaller groups to different communities. In this case, more effort and time will be needed to make the preparations so that all the visits will be well organized. The participants in the small groups will have the chance of comparing the different communities visited in the same locality. This exercise may reveal different aspects of O&M, which will be of value to the participants.

The visits should be made in the morning. This will be followed by a general meeting in the afternoon where all the groups will meet the district staff of the government agency responsible for water and sanitation. The participants will be able to meet separately the users, local operators and caretakers, community leaders and government staff. Within each community visited, the participants in their groups will observe and interview each of the above actors, if possible on their own, to avoid influencing each other's responses.

Choosing a morning visit will increase the value of the field visit as a whole. This is because many of the activities associated with rural water supply take place early in the morning. For example, women traditionally collect water before or at

sunrise. And operators open the valves, start the pumps, dose the tanks with chlorine, etc. at the start of the day in order to have sufficient water for early collection. The next peak of water collection may be in the late afternoon/early evening, which will be too late for the field visit. Arrangements have to be made to ensure an early arrival in the community or communities selected for the visit, so that participants should prepare themselves for an early start!

Proposed programme for the field visit

1. Arrival to start the field visit

2. Discussion for 1 ½ hours with the representatives of the Water Committee

3. Visit to a water supply treatment plant or pumps, and meeting with the caretaker and operator (1 hour)

4. Division in smaller groups (by geographical area, for example)

5. Each group goes for a walk within the community, making general observations (environmental sanitation), visiting users in their homes, asking them questions about the water supply, visiting the latrines and observing their state of hygiene (1 hour).

Analysis of the field results

Once back in the classroom on the same day, or the next day, each small group will do a SWOT analysis, and then report back in a plenary session. The final

results can be sent to the community with a letter of thanks.

3. Exercise sheets: Exercise sheet 1

Check-list for field visit

1. Environmental aspects

Protection and preservation of the water source and water point
Quantity and quality of the water
Wastewater management
Environmental sanitation

2. Community aspects

Structure and functioning of the community organization
Participation of women
Ownership feeling
Satisfaction of users
Management capacity of the committee
Technical capacity within the community

3. Technical aspects

Complexity of operation and maintenance of the system
Spare parts availability
Training received by the operator
Dependency on chemicals and fuel

Preventive maintenance
Tools
Water quality control

4. Institutional factors

Technical assistance
Monitoring and follow-up
Relationship with the municipality and other actors

5. Financial factors

Tariff, and what does the tariff cover?
How are other costs financed?
Non-payments, and sanctions
Willingness to pay
Financial management
Use of funds

6. Processes

How was the project introduced?
How did the community participate?

7. Observations

Domestic hygiene and hygienic state of latrines

Environmental sanitation in general

Exercise sheet 2

Field visit analysis Field visit results will be analysed by the SWOT (**S**uccesses - **W**eaknesses - **O**pportunities - **T**hreats) method. **1. Analysis of the present situation**	
What are the **successes** in terms of operation and maintenance (see check-list)?	What are the **weaknesses** in terms of operation and maintenance (see check-list)?

2. Analysis of the future situation	
On the basis of the successes and weaknesses of the present situation, what are the **opportunities**/potentialities to improve the O&M situation?	On the basis of the present situation, and the general context, what are the possible **threats** or obstacles which the community will have to face?

4. Background information

4.1 Recording observations

It is not possible to remember everything, especially when making observations in a short period of time. The observations during a field visit should therefore be

recorded in a notebook. The recording of observations lessens the pressure to make an interpretation before all the facts are known. Observations should be recorded first, interpretations can be made later.

The person making the observation can influence the situation being observed. For example, participants must often be aware that their presence in the village influences the behaviour of the people. The fact that the field visit was organized in advance may lead the community to make a special effort to clean the well surroundings. As visitors attract attention, people may act to satisfy the visitor rather than in their natural manner. Participants should remember this when making their observations and drawing conclusions.

4.2 Interviews

Two types of interviews can be used in information collection.

Free interviews

In a free interview, the topic is introduced but the discussion and subject details are left to the respondent to decide. In this way the interviewer gets a good idea of what the respondent thinks is important, not what the interviewer has decided is important. However, the interviewer has to be a good listener and questioner. Questions have to motivate the respondent and must be followed by carefully worded further questions, which do not reflect any bias the interviewer may have. This type of interview is for field workers who have considerable experience in their work and in interviewing.

Focused interviews

For a focused interview, a list of items is prepared and the respondent is asked to provide information on each one. A checklist will help to ensure that all items are covered and that the interviewer is not diverted away from the essential information required.

In the course of a focused interview it may happen that the respondent may give information or want to discuss an issue which is not on the list. It is important to give respondents the opportunity to contribute their own thoughts; this can be done at the end of the interview after going through the checklist first.

In the short time of an interview, it may not be possible to collect accurate quantitative data. Questions requiring answers on the numbers of this or that may be included in a focused interview, but the participants should be realistic about the answers they will get. They should not expect that community members and caretakers will be able to give quantitative information immediately. As records may be private, the participants should ask to see any log books and record sheets only if the people seem willing to show them.

Participants should be careful in choosing the persons they interview. They may ask a user how often the system breaks down and the caretaker about any difficulties in maintenance activities. It is sometimes instructive to put the same questions to different persons. For example, to the question, "How often has the system broken down?", the caretaker's answer may give the impression of a job well done, while the user's answer may highlight the problems in the hope of getting an improvement.

Aids to effective interviewing

The following suggestions will help the interviewer in the collection of information:

- **Prepare a checklist. As with focused interviews, prepare a checklist of items relating to the information required. The list does not have to be detailed but serves as a guide. Use key words as a way to remember the main points and particularly important pieces of information.**

- **Introduce yourself. Participants may feel under pressure to gather as much information as they can in a short period of time. They should not rush in with a long list of questions, but first introduce themselves and briefly explain the object of the field visit. It is important to allay the community's fears and indicate how the information will be used. If there is a feeling, for example, that the answers may result in higher water bills, the community's attitude will naturally be cautious.**

- **Move from general to specific. It is recommended to start with more general questions and then move to specific questions. General questions help to set the context for the more specific questions. This will help to avoid misunderstandings about the purpose of the interview.**

Module 4: Planning

Unit 1: Planning tools

1. Outline of session

- **Objectives**

- To review existing planning tools
- To get acquainted with the planning phase of the OOPP (Objective Oriented Project Planning)
- To develop a planning matrix

- **Methodology**

1. Introductory note
2. Focused discussion on existing planning tools
3. Presentation on the OOPP planning matrix
4. Group exercise on development of the planning matrix

- **Materials**

√ Overhead transparencies
√ Flip chart and masking tape
√ Overhead projector, screen or white wall
√ Large sheet of (craft) paper for drawing the planning matrix
√ Cards (thick paper) for filling in the matrix

- **Handouts**

√ Copies of all transparencies

2. Notes for the facilitator

Introductory note

This fourth module deals with planning issues and introduces a planning methodology derived from the OOPP (Objective Oriented Project Planning), as mentioned in Module 2. Participants will be required to carry out individual or group work based on their own situations and on what they have learnt so far in the course.

Focused discussion on existing planning tools

The facilitator asks the participants to describe the planning tools they use in their work and writes the main points on the flip chart. This session could, if needed, utilize some of the ideas learnt in the session on working and planning with communities (Module 3, Unit 7). Indeed some of the tools, which were extensively described, can be used at this stage if necessary.

Presentation on the OOPP planning matrix

The facilitator describes the various sequences of the second part of the OOPP methodology using the overhead sheets. The planning matrix is linked with the work done with the objective tree.

Group exercise on development of the planning matrix

The facilitator recalls the results obtained earlier with the objective tree and the strategic objectives selected, and prepares the following on the large sheet of paper on the wall; this is an adapted version of the original OOPP or ZOPP (see overhead sheets, below).

The facilitator asks the participants to select the main objective, which comes

from the objective tree, as one of the higher main objectives. The group should then determine the overall objective of the programme or project, its contribution to sustainability, improved health status, etc.

The results correspond to the priority objectives, which were identified in the strategy selection earlier in the course, right after the construction of the objective tree. The suppositions can also be derived from the tree, as objectives which are more difficult to reach or as objectives which are critical; some other suppositions include political will, access to financial resources, coordination between actors, etc. It is actually quite easy to build a planning matrix, once a preliminary analysis has been done. The main components are derived directly from the objective tree.

The facilitator then divides the participants into small groups (the number of groups will depend on the number of results identified), each group having the task of identifying the main activities (maximum of seven) which will lead to the result. They will also be asked to determine the indicators and the means of verification for each indicator. The groups present their results in a plenary session by pinning or sticking the corresponding cards on the matrix (on the wall). The facilitator should encourage the participants to comment on and propose other activities if needed.

3. Overhead sheets: Sheet 1

Planning phase
A. Elaboration of the planning matrix

B. Identification of important suppositions
C. Identification of activities which will lead to the results
D. Formulation of indicators
E. Determination of resources
F. Checking of the matrix sequence
G. Elaboration of a time schedule

Overhead sheet 2

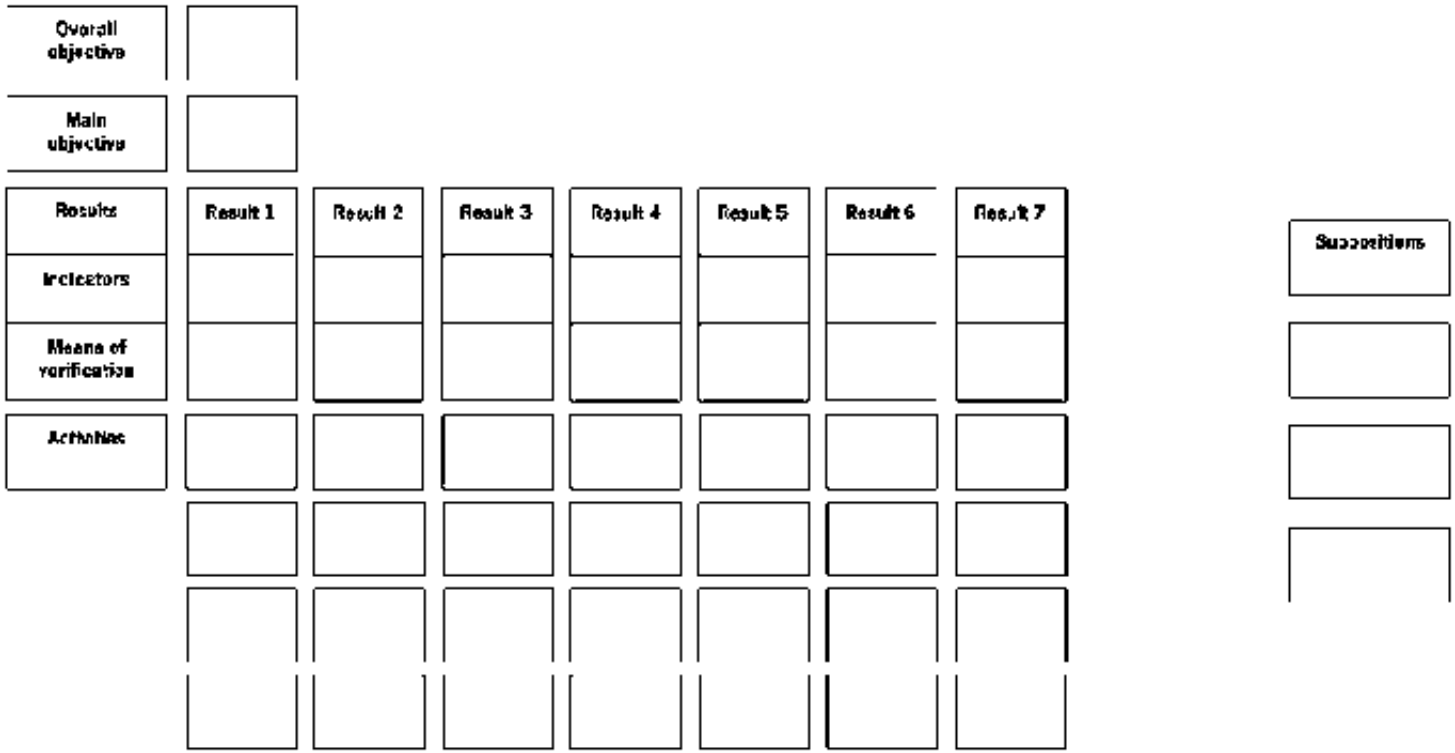
0 Elaboration of the planning matrix

1. Selection of the main objective from the objective tree

2. Selection of the overall objective (top part of the objective tree)

3. Identification of the main results that will contribute to the main objective (from the strategic analysis). The results must be independent.

4. Construction of the structure of the matrix



Figure

Resources needed: human, financial, equipment

Overhead sheet 3

1 Identification of important suppositions

1. Identify conditions for the development of the project

2. Identify conditions for the sustainability of the main objective

3. Evaluate the probability of reaching the results, without project intervention

4. Write down the conditions or suppositions in the matrix

Overhead sheet 4

2 Identification of activities which will lead to the achievement of the results

1. Identify some of the objectives in the objective tree which can be reformulated as activities

2. Identify other activities which will lead to the result

3. Prioritize activities and place them below the result to be achieved

4. If the project is ongoing:

- Check if the activities can be included in the project

- If this is not possible, some other results may need to be identified

Overhead sheet 5

3 Determination of indicators

(See session on monitoring)

1. Formulate indicators for each result to be reached (responding to the following characteristics: What? How much? When? Who? Where?)

2. Identify the means of verification, including external information sources

3. Place the indicators under each result in the matrix

Overhead sheet 6

4 Determination of resources

1. Determine the human, financial and technical resources which are necessary to develop the activities

2. Determine the costs for each of the needed resources

Overhead sheet 7

5 Check the sequence of the matrix

1. Check if the results are sufficient to reach the objective

2. Check if the activities are sufficient in order to reach the results, and the formulation of the indicators

3. Determine possible ways to overcome conditions and suppositions, as well as possible resistances to change, and the ways to resolve them

Overhead sheet 8

6 Elaboration of the time schedule

1. Elaboration of a general time plan for the duration of the programme or project, with the major activities (long term)

2. Elaboration of an action plan (short term) of immediate activities for the next six months, which are necessary to start the programme and project

Unit 2: Individual assignments

1. Outline of session

- **Objectives**
  - ☐ **To identify themes for individual assignments**
  - ☐ **To develop the problem and objective trees**
  - ☐ **To develop a planning matrix**
- **Methodology**
  - **1. Introductory note**
  - **2. Choosing the themes for the individual assignments**
  - **3. Individual work with coaching**
- **Materials**
  - √ **Overhead transparencies**
  - √ **Flip chart and masking tape**

√ Overhead projector, screen or white wall

√ Material for the participants (white sheets, and small coloured cards for making the trees and planning matrix)

- **Handouts**

√ Copies of all transparencies

2. Notes for the facilitator

Introductory note

This session covers ground from several previous ones, and its purpose is to apply all that has been learnt into projects which the participants will develop by themselves, with some assistance from the facilitator. It is an essential feature of the course that it allows each participant to develop, with guidance, a project proposal which focuses on the problem of operation and maintenance.

Choosing the themes for the individual assignments

Already on the previous day, the facilitator should have asked the participants to propose themes for their project assignments, because they may need time to think about it. The following criteria will guide the selection:

- **The theme should be about any of the issues related to operation and maintenance, as presented in the course.**

- **The theme is chosen from one's own professional experience.**
- **The theme should be phrased as a problem.**
- **The problem should be formulated as precisely as possible, thus avoiding general statements.**
- **The problem should, directly or indirectly, be part of the participant's project.**
- **The findings of the individual assignment should be able to influence, directly or indirectly, the problem situation.**

Each identified theme and problem is written on a card. If some participants are unable to select a theme, they are asked to describe their professional work and any problems, and the facilitator helps them to formulate the problem, following the above-mentioned criteria. If they so desire, participants from the same project or department could work together on a single assignment.

Individual work with coaching

The participants are asked to analyse their problem and draw a problem tree, similar to the objective tree and planning matrix, using the given materials (paper, small cards and tape). As this work needs concentration and time, the facilitator tries to create a good working atmosphere and enough space for each participant to develop his or her own project. It could be useful to display on the wall the sheets describing the assignments.

The individual assignments need personal guidance and assistance, or "coaching" by the facilitator. Coaching does not mean watching, controlling, or telling the participants what to do. It requires the facilitator to spend some time with the participants, guiding them in their work, helping them to broaden their thinking, reminding them about the working procedure and methodologies, and stimulating them. As one person alone could not possibly coach a big group, it is absolutely necessary to have a course assistant who is acquainted with the OOPP methodology to help with the coaching. Participants who work fast could also be asked to help others. Experience has shown that some participants have difficulties in analysing their problem in a logical way. It is essential, in such cases, to go over the methodology and also propose some "short cuts", e.g. grouping identified problems by entity (technical, institutional, financing, community, legal, etc.). An analysis is made within each entity, keeping in mind that these entities have a direct impact on the main problem.

3. Overhead sheet

Criteria for the identification of themes for individual assignments

- The theme should be about an issue related to management, operation and maintenance.
- The theme is chosen from one's own professional work.
- The theme should be phrased as a problem.
- The problem should be formulated as precisely as possible, avoiding general statements.

• The problem should be part of the project in which the participant is working, directly or indirectly.

• The findings in the assignments should be able to influence, directly or indirectly, the solving of the problem.

Unit 3: Final presentations

1. Outline of session

- **Objectives**
  - **To show the presentation techniques**
  - **To develop individual presentations**
  - **To offer the presentations and receive feedback from the audience**
- **Methodology**
  1. **Introductory note**
  2. **Small lecture on presentation techniques**
  3. **Preparation of individual presentations**
  4. **Presentations**
- **Materials**

  √ **Overhead transparencies**

  √ **Flip chart and masking tape**

√ Overhead projector, screen or white wall

√ Material for the participants (white sheets, cards, markers, transparencies, possibly computers, Powerpoint)

- **Handouts**

√ Copies of all transparencies

2. Notes for the facilitator

Introductory note

This is the final part of the course, where the participants present the results of their work before a panel of colleagues and receive feedback, suggestions and recommendations. It is also the opportunity to brush up some of the presentation skills, which are useful in their professional work. Communication is essential in promoting one's work. A project can have the most perfect design, but a professional must also be able to communicate to his team and colleagues its main elements and objectives. Communication helps to make the project come alive.

Small lecture on presentation techniques

The facilitator reminds the participants about the basic principles on presentation techniques and gives advice and some hints on how to organize their presentation in an effective way, using the overhead sheets and background information (see below).

Preparation of individual presentations

The participants' presentations should reflect as much as possible the main elements of their individual assignments. Material can be prepared using transparencies, sheets, markers, and possibly a computer. The facilitator should remind the participants that they will have 15 minutes for each presentation and 15 minutes to answer questions and for discussion.

Presentations

Rigorous time control is essential. If there are many presentations, they could be grouped by similar themes, and two or three could be given one after the other. Questions and discussion can then follow for all of them together.

Some hints to keep good control of time are given below:

- **Prepare in advance a detailed programme. This is given to the participants only just before the presentations, so that everyone comes fully prepared without knowing who will be the first one to start.**
- **Ask one of the participants to help you keep track of time.**
- **Show a yellow card when there are three minutes left, and a red card when it is time to conclude.**
- **Keep watch on the focus of the discussions.**
- **Follow the programme you prepared, as far as possible.**

3. Overhead sheet

Proposed structure for a presentation

Introduction	Content of presentation			Conclusion
	Problem analysis	**Objectives/possible solutions**	**Plan of action**	
• Greetings • Introduction of who you are and what you do • Introduction of the topic and its interest • Background of topic • Various parts of the presentation	• Main problems which are linked with the topic • Arguments for the analysis • Description with examples	• Main objectives or possible solutions to resolve the problem • Explanation for choosing the strategy	• Description of the main activities which are planned to solve the situation • Possible obstacles which the project could be facing, and how to resolve them	• Rapid review of the main points of the content of the presentation • Key messages for the audience to remember after the presentation • Start of discussion, with a question or a comment

4. Background information[1]

[1] Adapted from: *Presentacin de conferencias* by Diana Margarita Valquez, CINARA/IRC course material 1995, Cali, Colombia.

4.1 Communication versus information

Communication should not be mistaken for information. The person who informs puts across a series of ideas, experiences and concepts to a public who cannot respond. In this case, the public is invisible, receiving the information through a mass media tool, without any kind of personal relationship.

On the other hand, a person who communicates has the immediate possibility of exchanging ideas, experiences and concepts with the audience. Communication is very important in the process of project development, since there is not a single situation which can be resolved by only one actor; a project needs exchange and relationships between a variety of persons and actors.

4.2 Preparing a conference

Sufficient time should be given for preparing the conference, keeping in mind:

- **The time allowed for the conference**
- **The target audience**
- **The topic of the presentation**
- **The objectives of the presentation.**

Short conferences are the most difficult ones to prepare, because the presentation has to be comprehensive, clear and get to the point rapidly. It also takes some time to relate to the audience.

For small groups of 5–6 persons, the presentation can be in the form of a conversation; the audiovisual material can be limited to graphics or simple drawings. One should keep in mind that time should be allowed for possibly frequent interventions by the audience.

Presentations to groups of 10–30 persons are more common. It is important always to have unimpeded visibility between the participants and the lecturer, because this contributes to better communication. The seating in the room can be arranged in advance to make the audience feel at ease.

4.3 Physical expression

Good communication does not arise spontaneously, but is the result of interacting to changes of attitudes in the audience. The lecturer uses the audiovisual material as well as his or her body as a communication tool, such as for example:

- **The tone of the voice and diction must be clear.**
- **The space between the lecturer and the audience is important, because it can make or break the level of communication; someone who always stands far from the front of the audience, or always by the flipchart or the blackboard, cannot communicate well.**
- **The hands help to emphasize what is spoken. It may be annoying to see a lecturer with his or her hands in the pockets all the time.**
- **Abrupt movements can break the concentration of the audience. By being calm and constant, a lecturer facilitates integration with the audience.**

- **The art of pedagogy gives importance to the face. The lecturer should always be turned to face the audience, without fixing on only one person.**

4.4 Structure of the presentation

A well structured presentation increases its effectiveness. Indeed, it would be unjust to ask the audience to make the effort of organizing your lecture in their minds.

The presentation is organized according to a format which can be found in the overhead sheet, and is divided into:

1. *Introduction*, in which the lecturer greets the participants, introduces him/herself, and presents the subject and its interest.

2. *Development of content*, which has three parts:

- *An analysis of the problems*, showing the main problems which are linked with the topic, with some examples.

- *An analysis of the possible solutions* to overcome the problems, with some examples and an explanation about what would be the best strategy and why.

- *An action plan*, presenting the main activities to be implemented.

3. *Conclusion*: a brief overview of the main points, key messages concerning the subject which the audience should remember, and a few

remarks to facilitate the discussion.

4.5 Use of audiovisual material

The use of audiovisual material is highly recommended, and is meant mainly to assist your presentation by raising the major ideas and key words. It is important to spend some time before a presentation to become familiar with the equipment, and to look for assistance if needed.

Flip charts

- Can be filled in during the presentation, as a means of highlighting the main ideas.

- Can be prepared before the presentation with drawings or text; it is possible to refer to previous sheets, if needed.

- Can be used to keep records of discussions.

- Cannot be used for an audience larger than 30 persons.

- If sheets are prepared in advance, first make a plan on a small sheet, indicating what is going to be on the large sheet; use concise language, which will be further developed verbally; on each sheet develop one major idea; letters should have a height of at least 3 cm; it is advised to use dark colours, as it is difficult to read yellow, orange or red from far away; you can make small annotations on the sheet in pencil to help you remember what to say; when you don't use the flip chart, put up a blank sheet in

order to avoid distraction.

OOPP material

It is strongly advised to avoid presenting the problem and objective trees, which have been made in a small format during the individual assignments, because a) it is almost impossible to read what is written on the cards; and b) the audience does not have the time to go through the whole process of analytical thinking which the lecturer (or participant giving the presentation) has made. Instead, select some major elements and ideas, and prepare larger cards which can be read from a distance.

Overhead transparencies

- Can be used to make a synthesis of ideas and to present to the audience their logical sequence.

- Can be used to present specific data.

- Can be used to keep the attention of the audience.

Should be avoided:

- Use of too much writing on a transparency, which will distract the audience from what you are saying.

- Writing with letters of small size.

- Photocopies from a textbook or a report, which is often difficult to read from a distance.

- Use of too many transparencies.

4.6 Discussion

A presentation is generally followed by a discussion. There are various forms of responses from an audience: questions for clarification, comments and recommendations, criticisms, silence.

Questions for clarification should be anticipated in advance if possible, because the audience may ask for explanations of specific elements or about the context. However, it is possible that you may not know the answer to the question; in such a case, you can put the question to the audience and ask another participant to respond, or say that you have noted the question for further clarification at a later stage.

Comments and recommendations are welcome, but they can sometimes be out of context; it is important to keep the focus on the topic. Key recommendations should be noted down. Critical comments are normal, and should also be anticipated. The lecturer should not try to defend his or her views, but calmly present the reasons for this choice. If arguments arise in an uncomfortable way, you can propose having a discussion on this topic at a later stage.

Silence in the audience is sometimes heavy to bear after a lecturer's presentation. One can put questions to the audience. If the silence persists, it is usually because the question was not well understood, or out of context. The question should then

be rephrased.

Good luck !