Environmental Management – A Trainer's Handbook

Table of Contents

Environmental Management – A Trainer's Handbook **1**
Preface 1
Part 1. Training Course Structure 2
1.1 Introduction 2
1.2 Structure of the Manual 3
1.3 Course Objectives 3
1.4 Target Group and Structure of the Training Course 4
1.5 Training Approach 4
1.6 Overall Training Course Schedule 5
Part 2. Module Description 6
Module 1: Training Course Introduction 6
Module 2: The Information Market: Exchanging Professional Experience 8
Module 3: Introduction to Environmental Management 10
Module 4: Environmental Monitoring 21
Module 5: Methods of Environmental Assessment 28
Module 6: Planning Instruments of Environmental Management 32
Module 7: Environmental Economics and Industrial Environmental Management 38
Module 8: Environmental Communication 49
Module 9: Environmental Information Management 70
Module 10: Environmental Management: An Exercise for the Development of an Environmental Management Plan 105
Part 3. Hints for Facilitation* 108
Part 4. Annex 110
Further Reading 1: Selected Articles 110
Further Reading 2: Books 118
Glossary of Terms 123
List of Acronyms 129
DSE in Brief 130
DSE Addresses 131

Environmental Management – A Trainer's Handbook

Hinrich Mercker, Barbara Unger,
Alan Walsch (eds.)
Berlin 2000

Please note new contact address

Inwent
Internationale Weiterbildung und Entwicklung gGmbH (former CDG and DSE)
Abteilung Umweltpolitik und Umweltmanagement
Lützowufer 6–9
10785 Berlin

Hinrich Mercker
Abteilungsleiter

Phone: xx49–30–25482–101

Fax: xx49–30–25482–103

E–Mail:
hinrich.mercker@inwent.org

http://www.inwent.org

Imprint

Editors: Hinrich Mercker, Barbara Linger, Alan Walsch (eds.)

Text and Language Editing: Dr. Barbara Schakau

Modules 1, 3–7, 10:
Dr. Helmut Städter, Dr. Barbara Schakau, Mariana McGill

Module 2
PARTICIP GmbH

Module 8:
Manfred Oepen

Module 9:
Dieter Bohnet

Cover photo: Ronald Haas, Berlin
Concept and Layout: eyes–open.de, Sabine Dittrich/Ronald Haas, Berlin

Berlin 2000
Dok 1827a

Preface

The Trainers' Handbook for Training in Environmental Management presented here builds on the development of concepts and structures around and after the UNCED Conference of Rio 1992. After the so called Earth Summit, most countries intensified their efforts in building an efficient environmental administration. As Agenda 21 stresses the need for personnel and institutional capacity building in the environmental sphere, DSE as one of Germany's international cooperation agencies with the mandate in the field of advanced training took up this challenge.

Our environment is a closely interlinked system. It must be understood as a network of individual components which have a strong influence on each other. Changing one parameter of this system in an attempt to improve

a particular situation means introducing changes to the whole system leading in their turn to subsequent changes, sometimes with negative results. The negative results present themselves as the many environmental problems we encounter today. In order to find solutions for existing environmental problems or prevent new problems, environmental management systems should be applied. This means that solving environmental problems requires the application of various instruments at the same time, and a broad cooperation of the actors concerned. Providing institutions and their professional staff with the skills and knowledge required to use these instruments has been a focus of DSE's Environmental Management Section.

Since 1993, training needs of several countries have been identified and long−term working cooperations have been struck in the field of training in environmental management. From these rich experiences, a set of modules has evolved and continously been refined. We are pleased to provide these modules to trainers, facilitators and programme designers in an updated and newly reversed version.

Our experiences in advanced training for professionals have supported our view that traditional teaching methods will not do the job: most of us do not learn from top−down teaching, but through learning by doing while integrating our own experience, social, economic or cultural background. This manual, therefore, is designed for participatory training courses, following the approach that “Each participant is a resource person, and each resource person is a participant”. We have found Mobile Visualization an extremely useful tool for these type of training events.

This manual would not have been possible without the interaction with our long−term partners in different parts of the world, and experts from both Germany and counterpart countries which have accompanied these partnerships. But it also reflects our working approach within the Environmental Management Section of DSE.

Our thanks go to the Federal Ministry of Economic Cooperation and Development (BMZ) for funding this manual.

In particular we would like to thank Mr. Lutz Hoettler for initiating this handbook and Ms. Barbara Schakau for her text editing support.

Berlin, 2000
Hinrich Mercker, Barbara Linger and Alan Walsch

Part 1. Training Course Structure

1.1 Introduction

This training course attempts to bridge the gap between technical, economic, administrative concepts and the practical implementation of environmental management by introducing relevant aspects and by presenting lessons learned through past and present experiences.

The training course is also meant to contribute to Capacity Development in Environment (CDE) in the partner countries. The global action programme for sustainable development in industrialised and developing countries adopted in Rio in 1992, AGENDA 21, stresses in Chapter 37 the particular need for personnel and institutional capacity−building in the environmental sphere. AGENDA 21 appeals to the industrialised nations to support the developing countries in this process of Capacity Development in Environment.

As was shown by several case studies (Jänicke & Weidner, 1997), capacity−building for the environment depends mainly on human and material resources, scientific, technological and administrative knowledge, open political access and policy integration, public awareness and the strength and competence of environmental organisations. In many industrialised countries, capacity building in environmental policy started in the early 1960s or early 1970s with the creation of specialised government institutions which can be considered as one of the necessary conditions for formulating and implementing environmental policy. By now, environmental institutions have been established in many developing countries and have developed−depending on the country − various styles of environmental policies which have been implemented with differing degrees of success. But the case studies carried out by Jänicke & Weidner (1997) demonstrated that existing environmental capacity still needs to be strengthened. That is especially valid for developing countries but also for more advanced countries, as there most solutions have been of a predominantly technological character (e.g. end−of pipe treatment of air and water pollution, waste collection, nature conservation, some control of toxic substances etc). Thus, training in environmental management

provided for the personnel of any environmental institution should further the capacity of this institution for environmental policy development and implementation.

Furthermore, the DSE is committed to incorporate the concept of gender into all facets of its programmes. This training course is intended to support one of the principles of the DSE gender guidelines (DSE) stating that the qualification of woman specialists and executives in administration and management will help eliminate discrimination at work and to increasingly taking the needs, interests and viewpoints of women into account in decision−making processes.

Jänicke, M. & H. Weidner (Eds.), 1997. National Environmental Policies. A comparative Study of Capacity−Building. Springer, Berlin. DSE, 1999. Gender in DSE Programme Activities. DSE, Berlin.

1.2 Structure of the Manual

This manual is designed as a working instrument for trainers and facilitators. In the first part, the objectives of the course are presented, followed by a schedule of the overall course and by a description of each module and its detailed schedule. The module schedule contains a condensed summary of the contents of the module and is meant as a checklist for the facilitator before and during the course. The time indicated for each part of the module is an average time span based on experience, and can vary according to the composition and dynamics of each respective group.

Each module contains the following sections:

- module objectives;
- schedule;
- a description of the procedures, of teaching methods used, topics dealt with, resources or materials, hand outs/transparencies and examples or exercises used.

Additionally, an essay describing the major aspects of the work of a facilitator and a scientific glossary are included in this manual, as well as a reference list with suggestions for further reading, e.g. books and articles. The articles are available at the DSE (ZÖV, Section 51, Environmental Management) and can be ordered.

Symbols used in this book


Modules description, background information, annex


Schedules


Transparencies and handouts


Exercises

1.3 Course Objectives

Participants will learn the basic principles, methods and techniques of environmental management. They should acquire the ability to develop environmental planning tools as part of the development process in order to contribute to the protection of natural resources and the environment in their own country.

Emphasis will be placed on the complexity and dynamics of environmental systems with their interacting components. Knowledge of environmental components and their interaction with society, social and cultural development will be described as being vital for the development of an environmental management plan for any given region.

Participants will be introduced to key steps necessary for the development of an environmental management plan including the analysis of the specific conditions of a region, the determination of appropriate objectives,

implementation and control techniques, environmental quality goals, and planning measures. Furthermore, “Green Economics” will be presented and the importance of environmental management for sectors such as industry will be a topic of discussion. The necessity for appropriate environmental communication for the implementation of environmental management activities will be described where emphasis is put upon the involvement of all implicated groups of society. Participants will gain insight into the development of an environmental information system and how to create a network in order to use environmental data in effective ways.

1.4 Target Group and Structure of the Training Course

The training course is mainly meant for staff members, experts and heads of the environmental organisations, ministries, and relevant environmental institutions in developing countries, as well as for representatives of environmentally active NGOs from the respective countries.

The training course has been planned as a ten day course, but it is also possible to shorten the course if time is limited and to select fewer modules according to teaching objectives and needs.

The time frame of the training course consists of six hours per day. According to modern didactic experience, these six hours are divided into two morning and two afternoon sessions. Each session has a duration of 90 minutes. The number of course trainers and facilitators can range from one to three per course according to the requirements. Also, for special topics external resource persons should be asked to lecture and work with the group in their respective areas of expertise. The size of the group should be between ten to twenty participants.

1.5 Training Approach

The training approach used in this course follows two basic principles:

- **Participation**
- **Interactive learning**

The **participatory training approach** means that course participants are actively involved in all training activities: as far as possible, participants identify their learning needs and express their objectives. They discuss how the event should be conducted and can select appropriate methods. In addition, they continuously evaluate the learning process and assume responsibility for the results.

Interactive learning means that there is a lively exchange of views, ideas, and experiences. The task of the resource person is then limited to presenting analytical concepts and background information. The guiding principle should be that each participant is a resource person and each resource person is a participant.

Some of the prerequisites for interactive learning are:

- **Dialogue**

Well–developed communication skills are a prerequisite for solving complex problems involving many people. A dialogue is needed to exchange different views and reach mutual understanding and consensus with everybody involved. An encounter such as a training course offers a good opportunity to practice these skills.

- **Facilitation**

The training team consists of a trainer, a facilitator and resource persons. The facilitator provides the methodological framework, the rules and techniques (for example the METAPLAN Method), encourages participants to contribute their own knowledge and working experiences and supports the group in its efforts to manage the learning process themselves.

In some cases the trainer and facilitator may be the same person, although a separation of tasks is advisable.

- **Visualisation**

This is a very important component of this training approach. Most of the contributions to the training session are written down on cards in key words and then pinned on to pinboards. Visualisation serves as a supplement to the spoken word and it provides a record of the current presentation or discussion that has been going on. Visualisation also increases participants' capacity to absorb information because the eye is a better recipient and transmitter of information to the brain than the ear. Furthermore, it allows those who would be too hesitant to speak in front of the group to express their views. Finally, it can be used to produce a documentation of the training course.

1.6 Overall Training Course Schedule

Unit	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Morning 90 min	**M 1 Training Course Introduction:** participants and team introduction	**M 2/cont.** Presentation of results in mini–plenaries	**M 3/cont.** Introduction to building environmental institutions, development of an environmental management plan	**M 5 Methods of Environmental Assessment** Introduction to: REA & PRA	**M 6/cont.** EIA cont.	**M 7/cont.** Introduction t environmenta economics an market–base instruments
90 min	**M 1/cont.** Course objectives, working approach, participants' expectations & apprehensions	**M 2/cont.** Presentation in the plenary	**M 4 Environmental Monitoring** Models and methods of environmental monitoring	**M 5/Cont.** Introduction to PEA, Exercise	**M 6/cont.** Landscape planning, urban planning, protected areas and biodiversity protection	**M 7/cont.** Cont. market–base instruments, Environmenta Managemen Systems
Afternoon 90 min	**M 1/cont.** (30') Workshop evaluation **M 2** (60') **Information Market:** Introduction to methods	**M 2/cont.** Presentation in the plenary, summing up	**M 4/cont.** Biological and industrial monitoring, participatory monitoring	**M 5/cont.** (60') Exercise **M 6** (30') **Planning Instruments of Environmental Management**	**M 6/cont.** Exercises	**M 7/cont.** Cont. Environmenta Managemen Systems (eco–auditing ISO 9000 ISO 14000
90 min	**M 2/cont.** Individual preparation + EWG (= Evening Working Group: Preparation of individual displays by participants for the Information Market)	**M 3 Introduction to Environmental Management** Introduction to ecology, sustainable development, environmental policy	**M 4/cont.** Exercises	**M 6/cont.** Environmental quality goals & standards, Environmental Impact Assessment (EIA)	**M 7 Marked – based Instruments of Environmental Management** Conflict situation: ecology v. economy	**M 7/cont.** Life–cycle analysis, eco–labelling marketing, product design, liabilit

M = Module

EWG = Evening Working Group: Preparation of individual displays by participants for the Information Market

Part 2. Module Description

Module 1: Training Course Introduction

Objectives

Part I:

The training team and participants introduce themselves and state their expectations and fears with regard to the course.

Part II:

The facilitator presents the objectives and contents of the course, and the methods used, e.g. visualisation (with METAPLAN) and participation.

Schedule (Time frame: 210 min)

Time	Contents	Methods	Materials/Resources	Objectives/Remarks
90'	Mutual introduction of participants and team	One–to–one interviews and presentation of each other	Sheets of brown paper, 1 pinboard per 4–6 participants, pens	Participants and team get to know each another
30'	Presentation of objectives and contents of the training course	Presentation, discussion	Prepared pinboard	Programme and possible adjustments are discussed
40'	Introduction of working approach and methodology, (e.g. METAPLAN method)	Input	1 prepared pinboard: “Suggestions for writing”	Participants learn to use the visualisation technique and become familiar with the participatory working method
35'	Participants' expectations and “fears”	Collection and clustering of ideas on cards	2 pinboards, cards (3–4 cards for each participant), pens	Expectations and apprehensions of participants with regard to all aspects of the training course are discussed
15'	Presentation of workshop and continuous evaluation, selection of the first evaluation (feedback) committee	Presentation, discussion	Prepared pinboard	Introduction of continuous evaluation & steering of the training course

Description of the Procedure

Mutual Introduction of Team and Participants

The training course begins with the mutual introduction and presentation of the participants and the training team.

Participants and the tutorial team (trainer/facilitator and resource persons) form pairs for mutual interviews followed by presentations. Members of the team choose a participant as a partner. Each pair receives a sheet of brown paper and felt pens to write down the information they discover about their partner during the interview.

Suggestions for questions to ask during the interview:

- name
- professional education
- institution
- field of activities/responsibilities
- years of professional experience
- some personal remarks

The pairs are given about fifteen minutes to interview each other using the above suggestions as guidelines. The information acquired is to be written on the sheet of brown paper. For more fun, each person is asked to draw a portrait of her/his interviewed partner; another option is taking Polaroid pictures of the participants and glue them to the sheet. The interview is followed by a mutual introduction, whereby the information sheet is pinned up on the board. The person being introduced sits on a chair in front of the pinboard, visible to everybody, while his/her partner reads out the information s/he has acquired about the person being presented.

Presentation of Objectives and Contents of the Course

The training course objectives and contents are presented by the facilitator. The contents include the modules and topics to be covered in the training course as planned by the organisers. Participants should recognise that the organisation of the course is oriented sequentially towards the development of an environmental management system.

The sequence of an environmental management system can be described as follows:

- 1. Environmental monitoring/control

- 2. Development of objectives & standards, environmental planning/implementation, Environmental Impact Assessment (EIA)

- 3. Development of environmental management instruments: Environmental economics, market–based instruments

- 4. Implementation of measures

- 5. Monitoring and evaluation as progress control

- 6. Environmental communication

- 7. Information management

Introduction to the METAPLAN Method

The METAPLAN Method is introduced to participants, and the principles of visualisation and participation are presented and discussed. Using “Suggestions for Writing” (on cards on a prepared pinboard or as a handout), the use of cards to visualise on–going processes and results in the group is explained.

Expectations and Fears of the Participants With Regard to the Training Course

Participants express their expectations and fears with regard to the course by writing them down in the form of key words on the METAPLAN cards (maximum of four cards per participant to be used either for expectations or fears). The cards are then collected by the facilitator, read individually to the group and clustered on the pinboards by similar content. The results can be discussed and the facilitator can comment on possible amendments on certain points.

Working Procedure

In order to create a common ground for co−operative work, certain principles are presented, discussed and agreed upon, including a procedure for continuous evaluation of the training course. One possibility is the feedback committee, which is a changing group of participants who each morning gives a report on the quality of the course syllabus of the previous day. Also at the end of each day, participants are asked to note their mood at the end of the day on a so−called mood barometer. Each morning the facilitators should discuss briefly the results of the feedback committee and the mood barometer with the participants and see whether certain changes are necessary and can be made.

Besides the daily evaluation by the feedback committees, participants should be ask to undertake an additional evaluation at the end of the first week, and an overall evaluation of the entire course after completion of the last exercise (Module 10).

Module 2: The Information Market: Exchanging Professional Experience

Objectives

The participants have exchanged their professional experiences, interests and working situations. Insights gained from this exchange can be used by the facilitator or trainer to discuss modifications to the course syllabus as far as possible according to specific interests in the particular group.

Schedule (Time frame: 420 min)

Time	Contents	Methods	Materials/Resources	Objectives/Remarks
45'	Elaboration of terms of references for the working context	Open discussion and key word collection in the plenary	One pinboard, cards, transparencies 1&2	Participants decide on their own priorities, i.e. what they want to know from their colleagues
30'	Explanation of procedure, composition of mini−plenaries	Presentation to the plenary	One to two pinboards, cards	Participants are informed about the procedure of the information market.
75'	Individual preparation of working context presentation	Individual work, visualisation	One pinboard, sufficient visualisation material	
60'	1st Round: Information Market: Presentation of results within the mini−plenaries	Input, discussion within small groups	Three to four group rooms	Participants have the opportunity to become familiar with the visual material, to share experiences within a small group, and to adjust their presentation charts
60'	2nd Round: Information Market	Information Market	One big room, chairs	Participants may select information, discuss with their colleagues according to their interests
60'	3rd Round: Information Market	Information Market	One big room, chairs	
60'	4th Round: Information Market	Information Market	One big room, chairs	

30'	Summing–up	Plenary, discussion	One pinboard	Compiling of main aspects, common issues and differences

Description of the Procedure

Step 1. Introduction to the procedure and clarification of terms of reference for the presentation.

Step 2. Individual presentation

Participants are divided into three or four groups (five to eight people in each group, so–called mini–plenary) according to the similarity of their professional situations.

Each group is given a separate room to work in. Within their groups, participants work individually and prepare their reports which they visualise on one pinboard only.

Step 3. Round 1: Mini–plenaries

In the mini–plenaries, each group member presents her or his visualised report. Each participant is given about fifteen minutes to make her or his presentation. Time is given afterwards to undertake final adjustments to the presentations according to the suggestions of the other mini–plenary members.

Step 4. Round 2, 3 and 4: Information Market

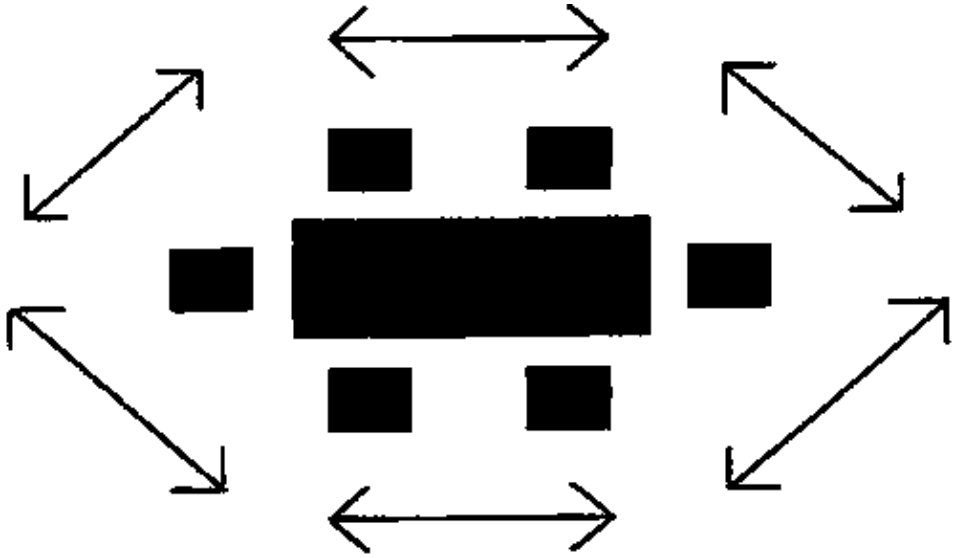
Each group (mini–plenary) displays its pinboards to the plenary in a circle and the remaining participants go “window shopping”. If a customer is interested in detailed information, the “shopkeeper” accommodates these desires. Each group/round should last for about sixty minutes. Altogether there are two to three rounds depending on the number of mini–plenaries, so that the members of each mini–plenary have the opportunity to be “shopkeeper” as well as “buyers”.

Background Information for the Trainer/Facilitator

The Information Market is a method based on the idea of a free market, on buying and selling: the participants who exhibit their pinboards “sell” their information to the rest of the group members who function as “buyers” The “buyers” go from one board to another, read the information presented and ask questions about the topics they are interested in, and the sellers respond. The basic principle behind this method is to give everyone a chance to choose freely (to buy) the information she or he wants.

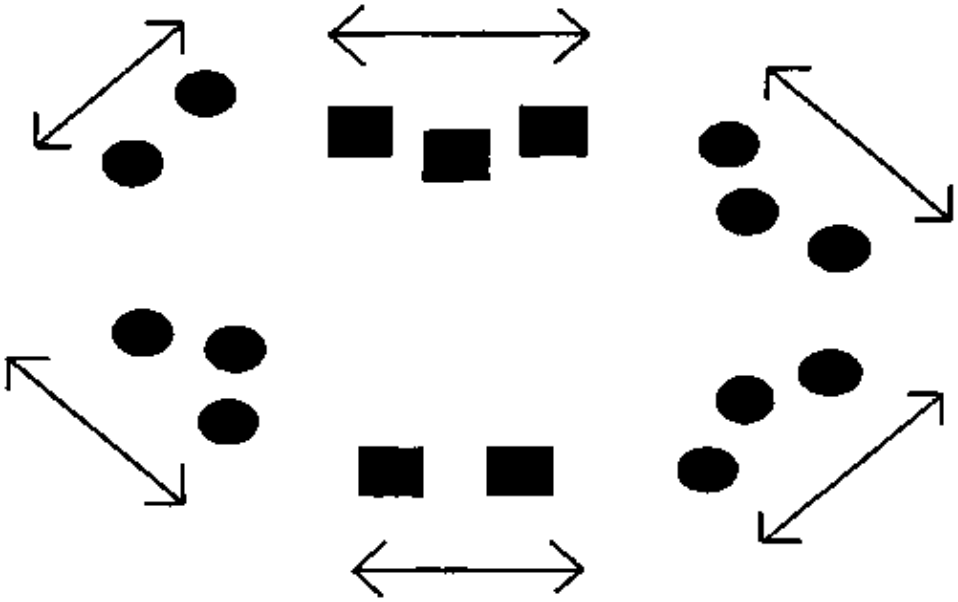
The Information Market can be conducted in several rounds with different mini–groups selling their information on each round. Between the rounds, time is provided to present additional materials (slides, posters, videos, etc.) brought along by participants.

This is a good idea because the Information Market is quite an exhausting exercise, if participants are interacting intensively.



Transparency T2–1: Presentation & Discussion in Mini–plenaries

Participants (6–8 per mini–plenary)



Transparency T2–2: Information Market in the Plenary

Source: PARTICIP GmbH, 1995

Module 3: Introduction to Environmental Management

Objectives

Participants are introduced to the basic principles and techniques of environmental management. The institutional framework for environmental management and environmental legislation is discussed.

Schedule (Time frame: 180 min)

Time	Contents	Methods	Materials/Resources	Objectives/Remarks
60'	Introduction to environment,	Input, brainstorming	Flip chart, transparencies	Describing the basic principles of ecology and sustainable

	ecosystems and sustainable development			development as a basis for further work
30'	Environmental Policy: The three basic principles – Principle of Precautionary Action, – Polluter–Pays Principle, – Co–operation Principle	Input	Flip chart, transparency	Description of how to design an effective framework for environmental management
30'	Building environmental institutions	Input, group discussion	Flip chart, boards, cards, transparencies	A brief presentation of structures and functions of environmental institutions
60'	The development of an environmental management plan on a step–by–step basis	Input with discussion	Transparency: "Why and How to prepare an environmental management plan"	The introduction of an environmental management plan will provide participants with an overall framework into which they can integrate the following course content

Description of the Procedure

The participants are asked which ideas they have about the term "environment" and to present them graphically by drawing on boards in groups. Then, the trainer/facilitator elaborates this concept and answers the question "why is environmental management important for sustainable development?"

This is followed by an introduction to environmental policy and administration. Basic principles for designing an effective framework for environmental management will be considered and the necessity of the integrative character of environmental programmes is explained. This includes the consideration of parameters from natural and social sciences, economic and organisational techniques.

As an example the principles of the German environmental policy are presented:

- Principle of Precautionary Action
- Polluter–Pays Principle
- Co–operation Principle

An introduction to building environmental institutions will be given with examples from Germany and other selected countries.

The basic steps for the development of an environmental management plan including instruments of environmental management will be presented.

Background Information for the Trainer/Facilitator

The Concept of Environment and Sustainable Development

The environment is the sum of all living conditions (physical, chemical, biological, and socio–economic) which surround and influence an organism, a community or a population. This definition of the term environment indicates that it does not relate exclusively to human beings but includes ecosystems as well. Ecosystems are functional units consisting of organisms (biological communities) and their non–sentient environmental surroundings (biotopes). Biological communities and their biotopes are inseparable and act upon each other. The different ecosystems of water and land compose the ecosphere – a very complex and dynamic system

with highly interdependent components. Humans are part of the ecosphere and although they have developed the capability of influencing and altering natural systems, they are still dependent on the functioning of its life−support systems for their survival.

All life on earth is dependent on the planet's land, water and air, and the overall quality of the environment influences all aspects of human activities, e.g. health and welfare, employment and recreation, settlements, industry and agriculture. But human activity, especially during the last two decades, has altered the planet's environment significantly. This impact has become so serious during the last forty years that many natural ecosystems have been changed to the extent that there is considerable risk of irreversible damage to these ecosystems.

In response to the increasing deterioration of the environment, environmental planning and management systems have been implemented in many industrialised countries. At present, environmental management strategies become more important parts of the policy and decision−making process of developing countries, where environmental concerns are increasingly incorporated into the development process.

Development is a multidimensional concept, originally encompassing only economic, political, cultural and social aspects of human society. Through the development process, humans interact with and affect the natural environment. Therefore, the state of the environment determines the path of development. Making environmental issues and management an integral part of the development should result in making development sustainable. Sustainable development is a policy that meets the needs of people today without destroying the resources that will be needed in the future. It is a policy based on long−range planning and the re cognition that, to maintain access to the resources that make the everyday human lives possible, the limits of those resources must be recognised.

Natural resources include the renewable elements of the ecosphere such as water, and terrestrial and aquatic biomass, non−renewable elements, such as land in general, minerals, metals and fossil fuels, and semi−renewable elements such as soil quality and the assimilative capacity of the environment.

The dependency of humans on the life−support systems of the ecosphere has provided valid reasons for the protection and conservation of the environment, and the concept of sustainable development describes the actions necessary for environmental protection.

Environmental management is a set of practical tools with which the concept of sustainable development can be translated into action. Environmental protection as part of a sustainable development strategy needs to be incorporated in a socio−economic context in which national priorities (such as poverty alleviation, public participation, job creation and others) can be pursued concomitant with environmental strategies.

Prerequisites and Principles of Environmental Management

Appropriate environmental management is achieved when resources are used efficiently for the benefit of human development and when they are preserved because of their important role in sustaining ecosystems. Inappropriate environmental management occurs when resources are misused by requiring too many inputs to produce outputs, by over−exploiting or wasting resources or by not conserving those resources that form the basis for the functioning of local and global ecosystems. For implementing successfully environmental management, certain prerequisites have to be fulfilled such as strengthening the awareness of the public, government, and the economic sector with regard to environmental issues, formulating environmental policies with quality goals and standards, the development of the relevant environmental legislation, regulatory measures, administration and institutions, and incorporating environmental management into the development process.

The greater the awareness among all sectors of society of environmental problems and of the opportunities sustainable development offers, the more successful the development and implementation of environmental policies and strategies will be.

Box B3−1 The Role of Various Societal Groups in Environmental Protection

Stakeholders and their contribution to environmental policy

Political Institutions

Defining problems, policy formulation, development of legal framework, decisions with regard to environmental principles, set−up of environmental management instruments.

Administrative Institutions

Decision−making with regard to factual environmental issues, responsible for environmental management.

Courts

Supervision of the legality of acts.

Environmental Organisations (NGOs)

Contributing to defining problems, control function, environmental information and communication.

Communication Media

Contributing to problem definition, control function, information.

Economical Institution

Financing and organising economic development, using (environmental) technologies, decision−making about the environmental management of production processes.

Scientifical Institution

Basis of technology development, defining potential dangers, knowledge of nature and ecological interdependencies.

Consumer

Consumer decisions and behaviour.

Voter

Legitimating political decisions.

Box M3−1 indicates the possible role of societal sectors in environmental protection. If systems for decision−making in particular countries tend to separate economic, social and environmental factors at the policy, planning and management levels, then the division of the decision−making process not only influences the actions of all groups in society, including governments, industry and individuals, but also has important implications for the efficiency and sustainability of development.

An adjustment or even reshaping of the relevant structures for decision−making may be necessary to integrate environmental concerns and development with economic and political decision−making. In recent years, some governments have begun to make significant changes to institutional structures in order to facilitate a more systematic consideration of the environment. When decisions are made on economic, social, fiscal, energy, agricultural, transportation, trade and other policies, environmental considerations should be taken into account. Additionally, the consequences these policies will have for the environment have to be included in the decision−making process. New forms of dialogue are also being sought to achieve better integration of national and local governments, industry, science, environmental groups (Non−Governmental Organisations−NGOs) and the general public in the process of developing effective approaches to environment and development.

Appropriate environmental legislation and competent environmental administrations and institutions, as well as regulative measures are necessary for the execution of good environmental management practice. Regulative measures can take the command−and−control and/or the incentive−based approach. The latter includes market−based instruments such as taxes, fees and user−charges, tradable permits and licences, or economic incentives. Different regulative measures should be used in a combined policy, which must be developed to suit the conditions in the different countries.

Furthermore, national environmental policies need to be formulated in a way that they relate to and support national socio−economic goals. The key to understanding sustain−able policy formulation are environmental cross−links. For example, demographic, sociological and agricultural policies must be co−ordinated in order to achieve sustain−able agriculture. Environmental policies should also contain environmental quality goals and standards which can be used as guidelines for development projects.

Environmental quality goals determine desired states of the environment (the protection level) to be achieved, if possible, within a set period of time. Environmental quality goals have scientific and socio−ethical elements. They are always of a process−like nature because they are temporary objectives and need to be re−defined or re−evaluated after certain periods of time. Environmental quality goals can either be defined for certain protection objects (e.g. habitat protection) or be related to specific environmental media.

Environmental standards characterise a definite value to be reached or maintained in accordance with a specified environmental quality goal. These standards are used in practical environmental protection. They are also a means for monitoring the necessity or efficiency of environmental protection measures. Examples for environmental standards are emission values for air pollutants.

Components of Environmental Management

Environmental management represents not only a set of tools that can identify existing or potential environmental problems, but also a set of more dynamic, action−oriented tools that assist in formulating, implementing and monitoring strategies to protect, enhance and preserve the environment.

Environmental management has several different components:

- appropriate environmental legislation, policies and strategies (in connection with the governing sector of society),

- appropriate organisation and financing,

- determination of management tools and procedures,

- environmental planning (e.g. Environmental Impact Assessment, the development of quality standards) and implementation,

- monitoring and control,

- the development of a comprehensive environmental database as a basis for decision−making and policy formulation, and the undertaking of ecological studies and compiling of environmental inventories.

For environmental management to be successful, environmental issues have to become part of the economic process, e.g. environmental impacts have to be considered in accounting, and market−based instruments need to support environmentally sound production, consumption and disposal.

The following are some of the specific tasks facing environmental management:

- the assessment of impacts and environmental consequences, as well as the evaluation of the results of alternative policies or suggestions for different courses of action, each with an adequate representation of economic and social costs and benefits.

- the equal distribution of resources, resolution of conflicts and allocation of environmental resources in the different sectors of society over space and time.

- responsibility for the implementation of policies, the direction, control and management of development activities with the aim of optimising the use of environmental resources to ensure sustainability.

- the monitoring and evaluation of the environmental consequences of policy implementation according to the objectives of sustainable development.

• the development of adequate mechanisms of feedback to any of the above described activities to be able to initiate corrective actions if necessary.

Constraints on Environmental Management Practice

Several impediments to the execution of the above described tasks may exist depending on the specific situations prevalent in the various countries.

The assessment of environmental impacts is made more difficult by an inadequate environmental database, a lack of environmental inventories or insufficient information on the state of natural resources. Where insufficient information is available, it is helpful to encourage good communication with the public, as first–hand knowledge can often be obtained from local sources such as indigenous user groups. Particularly women in developing countries usually have a very in–depth knowledge of the state and the limitations of local natural resources and ecosystems because of their important role in food production and providing for family needs. Their knowledge and experiences are therefore a valuable source of environmental information.

Furthermore, accurate impact assessment requires sufficient capacities for its execution, in terms of trained personnel, and technical, administrative, and financial capacities. An inadequate understanding of the application of a “cost–benefit” analysis, and of the valuation of environmental resources, inadequate consideration of relevant ecological regions, and insufficiently researched and tested impact indicators for certain regions are also detrimental to the assessment of environmental impacts. Constraints of an ethnic or religious nature may also feature in some countries.

An inadequate understanding of the ecological, social and economic cross–linking of impacts, and of space allocation equity issues is detrimental to considerations of distributional equity.

A lack of institutional capacities for management, co–ordination and control of environmental impacts is an impediment to good policy implementation. Detrimental to the task of environmental monitoring and evaluation are poor monitoring networks, a lack of transparency of whether the goals of investors are compliant with the policies of countries, as well as insufficient participation by social groups and environmental organisations in decision–making.

The Complexity of Environmental Problems

In general, appropriate environmental management requires that decisions be based on reliable and accurate information about the cross–links between the environment and other sectors, and an understanding of the complexity of environmental damage. Usually several factors are involved in causing particular damage. All causal factors – where known – have to be taken into account to combat efficiently any particular damage or problem. This means that a successful environmental strategy has to rely considerably on the co–operation not only of different experts, but also on the co–ordination of administrative and technical instruments.

For example, a successful environmental strategy to increase food productivity would require experts in agriculture, aquaculture, irrigation, land management, farmers' organisations and economics; financial resources to secure the expertise and implement activities envisaged; and an appropriate policy framework and institutional support, including the harmonisation of agricultural and irrigation subsidies and other policies that regulate the use of inputs such as chemical pesticides and fertilisers.

Regulation Measures

The implementation of an environmental management system requires the creation of a basic regulatory framework. These regulations could include the following:

• environmental quality standards (see also Module 6) based on health and environmental criteria are used to create baseline limiting values for pollutant concentrations in specific environmental media (e.g. air, water, soil). In some developing countries, even comparatively low standards may be beyond their capacities to attain in the near future. In this case, it would be better to work with realistic interim goals than without any standards at all, or with standards that could only be achieved after a long period of time.

• directly regulatory methods such as maximum permissible emission or effluent levels for specific sources or categories of sources are at the heart of most government environmental regulatory programmes. These are frequently expressed in terms of emissions per unit of

output or input. The minimisation of the introduction costs of such regulations may require imposing regulations on large polluters first because they are more economically capable of fulfilling the requirements of pollution control. Stricter standards should be introduced earlier for new facilities than for existing ones, since designing those standards into the facilities from the outset is more cost–effective than retrofitting existing plants and equipment. Newly industrialising countries with high investment rates stand to benefit most from pollution control technologies built into new plants and equipment. Built–in pollution control technologies are generally more cost–effective than “end–of–pipe” solutions.

• a polluting facility should ideally be viewed as an integrated unit and regulated as such, calculating the sum of pollutants from all processes in the polluting facility. This “bubble” concept permits certain trade–offs to be made within the facility. If it is especially difficult to reduce pollution from one process, reductions elsewhere may be able to compensate. This approach is relatively new in the United States and other developed countries.

• further regulatory measures are the already mentioned market–based instruments (see Module 7), and Environmental Impact Assessment (EIA) (see Module 6).

Public Participation

Public participation in environmental protection is an important factor for the success of environmental policies. Public behaviour can be influenced in several ways. The least desirable method, because it is difficult to implement, involves coercive measures (such as raising taxes on oil products to reduce energy costs). Positive inducements (e.g. subsidies) are a preferred mechanism, but cannot often be realised because of insufficient public funds. The third method which might be the most appropriate in many cases comprises education and participative decision–making.

Being aware of public responses to environmental projects should be an important goal of public policy. Many formal evaluations of development policy now include opinion surveys, and there are occasional efforts to measure public response in behavioural terms. Public participation programmes can also include public hearings and public information sessions. It has also to be taken into consideration that the public is heterogenic (gender, age, etc.) and that some sectors make themselves heard, whereas other actors do not or cannot make themselves heard.

An active public participation programme should have the following aims:

• providing the public with information on environmental problems, goals and proposed activities;

• developing a strong relationship between the environmental management unit and the general public;

• assisting the environmental management unit in identifying environmental problems and needs, potential solutions and relevant local values;

• assisting the environmental agency in identifying relevant alternatives and mitigation measures to certain proposed activities;

• ensuring feedback from the public to the environmental management unit with regard to the significance – of impacts, the evaluation of alternatives and the value of non–quantifiable environmental amenities;

• resolving possible conflicts through information sessions, negotiation, and mediation to avoid costly and unnecessary litigation.

The Needs for Integrated Environmental Management Programmes

Environmental management must be promoted through well–prepared programmes of development activities that offer attractive solutions to environmental problems. The key to preparing cost–effective and implementable integrated environmental management programmes is a combination of appropriate technical skills, economic and institutional expertise and skilful management. These elements are indispensable to obtain a clear diagnosis of the most important problems, generating potential solutions and designing the

most appropriate management plans for the local context.

Environmental management programmes cannot be put into action without being placed within the context of an appropriate policy and implementation framework. To a large extent, environmental management implies re–focusing policies and implementation mechanisms so that environmental problems can be identified and controlled on a continuous basis in relation to development needs.

Environmental management plans and more focused policy measures make great demands on institutional capacity, decision–making and information management. It is necessary to co–ordinate the process of finding cost–effective solutions to environmental and natural resource problems involving institutional capacities. This includes improved decision–making procedures, information management, communication and more highly trained staff.

Building Environmental Institutions

Based on the experience gained in building environmental institutions in the countries of Western Europe, Peter Knoepfel (1995) described nine principles which help ensure the efficient working of environmental management bodies:

1. keep monitoring separate from administration

2. structure the environmental authority on a component–by component basis

3. built a responsive administrative structure focussed on emission

4. link activities relating to different components of the environment (intra – policy – co–operation)

5. networking between environmental authorities and those dealing with other policies relevant to the environment (inter – policy – co–operation)

6. networking of structures by means of established procedures

7. separation of programme planning from execution

8. implementation on a regional basis

9. staff training

As an example of a system of environmental institutions and organisations, the structure and function of environmental administration in Germany will be described (see Transparency M3–4).

Source:

Knoepfel, P., 1995. Approaches to an Effective Framework for Environmental Management.

Hucke, J., 1995. Implementation Problems of Environmental Policy. Both in: Carius, A. Hötttler, L. & H. Mercker (eds.).

Environmental Management in Kenya, Uganda and Zimbabwe. DSE, Berlin: 45–72 & 105–126.

Exercise E3–1 Definition of the Term "Environment"

The subject of this training course is "Environmental Management". The key elements of environmental management will be presented to you in the course. But before you get involved in this subject further, it is worth thinking about what we mean when we talk about the "environment". You should have a clear concept about the object under observation, the "**environment**".

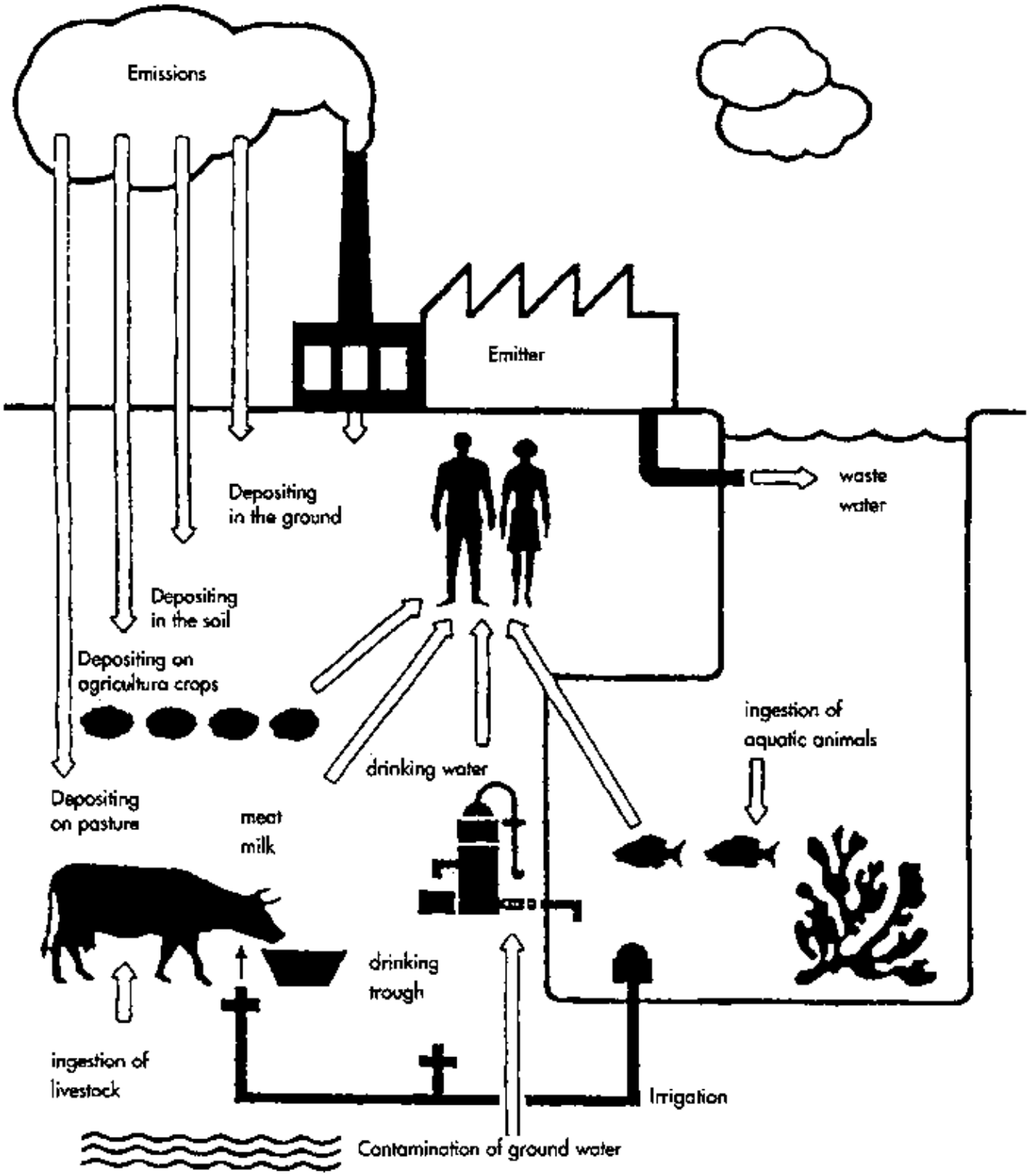
For this purpose, please illustrate the term “environment” on a flip chart sheet. Imagine that you have to explain this term to somebody who cannot read, so avoid using words in your illustration. The rules for this exercise are:

- the exercise is done in groups (five to six people in each),
- each group has ten minutes to finish the task,
- one person in each group is selected for the presentation of the term “environment”,
- the presentation should take a maximum of five minutes.

Information for the Trainer/Facilitator

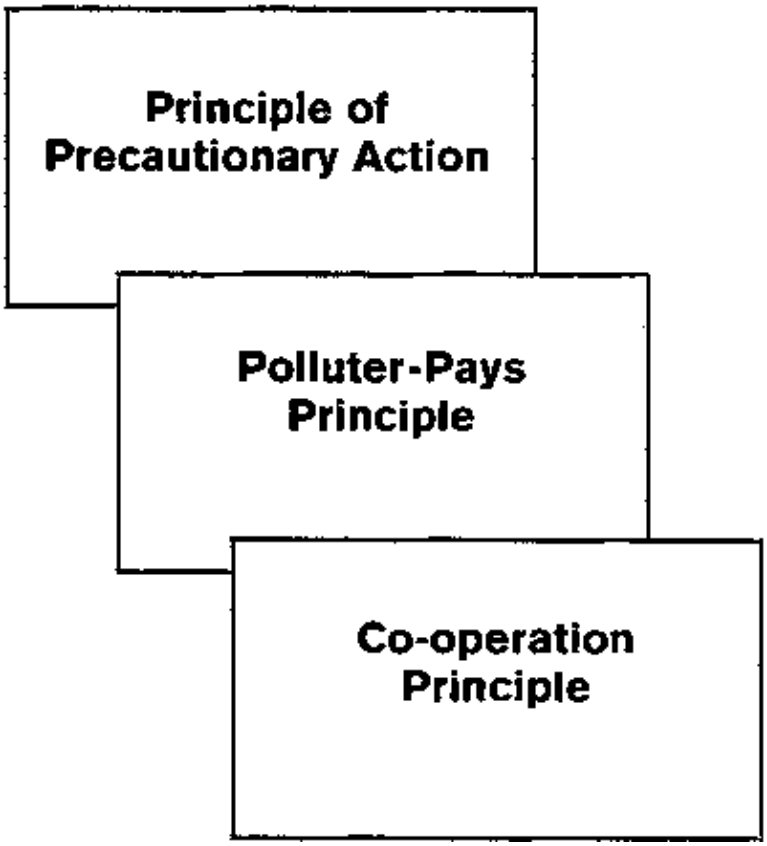
The trainer/facilitator should motivate participants to take an active part in the discussion about the term “environment”. Key words related to the description of the environment should be taken from the group presentation and used as an attempt to define this term. As a guide for the trainer/facilitator, the following definition of the term “environment” could be used as basis for the orientation during the discussion:

“The environment is the sum of all living conditions (physical, chemical, biological, and socio–economic) which surround and influence an organism, a community or a population.”

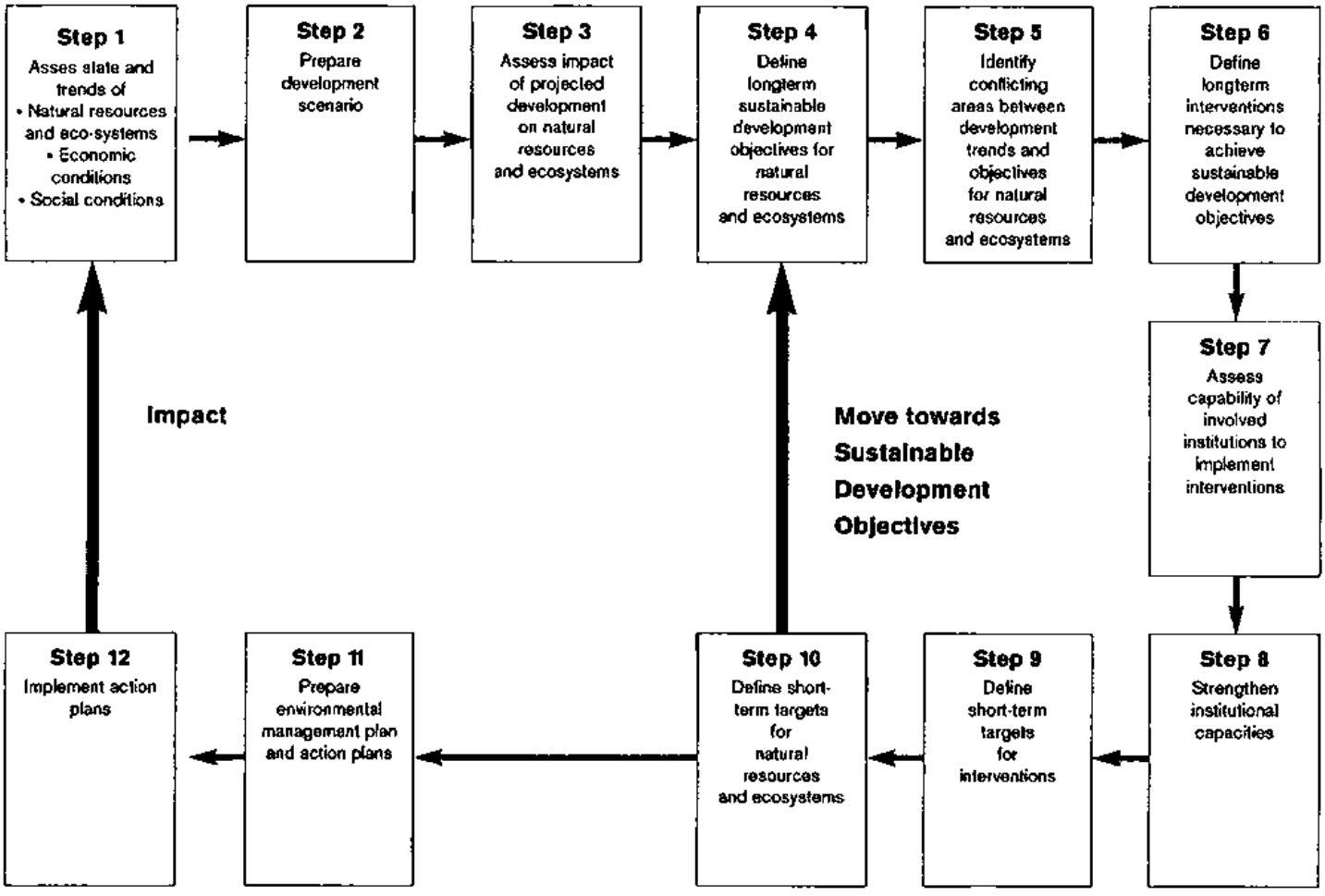


Transparency T3–1 Flow Patterns of Substances in the Ecosphere

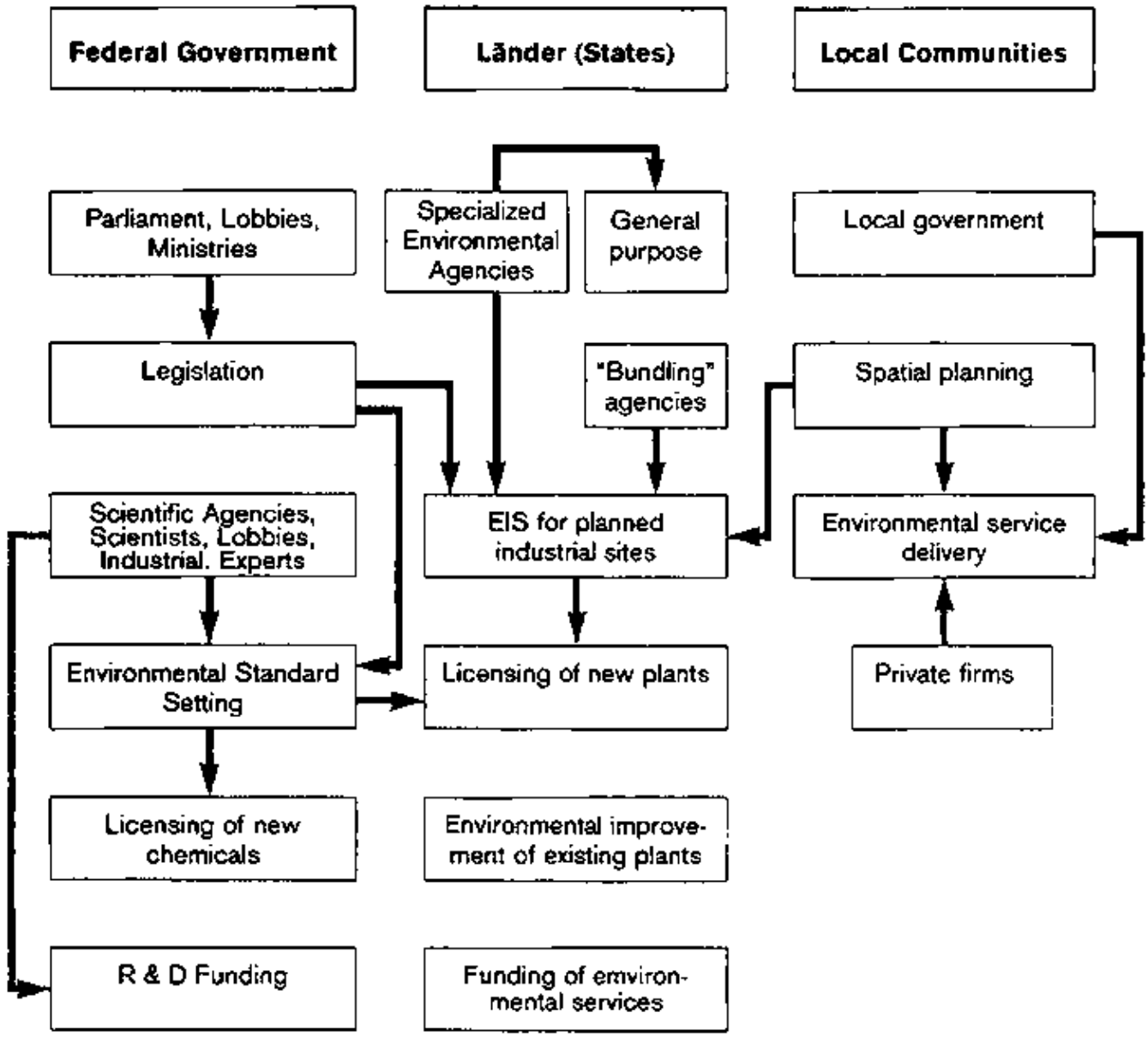
Source: Schedler, 1992 (Translation)



Transparency T3–2 The Basic Principles of Environmental Policy



Transparency T3–3 Why and How to Prepare an Environmental Management Plan



Transparency T3–4 Structures and Functions of Environmental Administration in Germany

Source: Carius, A., Höttler, L. and Mercker, H. (eds.), 1995.
Environmental Management in Kenya, Tanzania, Uganda and Zimbabwe

Module 4: Environmental Monitoring

Objectives

The participants are introduced to environmental monitoring as a prerequisite and component of environmental management.

Schedule (Time frame: 270 min)

Time	Contents	Methods	Materials/Resources	Objectives/Remarks
90'	Introduction to environmental monitoring, sectoral &	Input, discussion	Transparency, copies for the participants, flip chart	A general overview of environmental monitoring is given

	cross−sectoral monitoring			
90'	Introduction to industrial monitoring, biological and participatory monitoring	Input, discussion	Transparencies, flip chart, pinboards and cards	Examples of special systems of environmental monitoring are presented
90'	Exercise: monitoring activities	Group work, METAPLAN	Pinboards, cards, rooms for working groups	To familiarise participants with methods of environmental monitoring

Description of the Procedure

A short outline explains that environmental monitoring serves to survey the actual state of the environment, to record types and rates of environmental changes in ecosystems and as an instrument to control continuously emissions from different emission sources. The principles, results and problems of sector−orientated environmental monitoring are discussed and the monitoring of the quality of environmental media will be presented.

These environmental media include:

- observation of air quality (on different spatial levels) and recording of relevant data;
- observation of the surface and underground bodies of water, and recording of relevant data;
- observation of the soil (sectoral presentation: industry, agriculture),
- monitoring of traffic, noise, wastes, radioactivity.

In the next phase, monitoring systems and programmes are introduced and observation levels, areas, measuring points and technical auxiliary materials will be presented. Participants should recognise which parameter of the sectoral environmental monitoring system should be considered and which methods and approaches exist to undertake the task.

The following themes will be introduced:

- observation programmes, sample areas, measuring points;
- sampling methods;
- registers of harmful substances which should contain data on the correlation between exposure to harmful substances and their effects;
- indicators for detecting environmental change, emissions − and deposition − bio−indicators;
- technical auxiliary materials.

Monitoring programmes should include:

- measurements of emissions and deposits,
- measurements of contaminants in soils, vegetation, ground and surface waters, sediments, drinking water and in biological samples,
- analysing cross−effects of different contaminants,
- studies of biological indicators,
- analysing the effects of contaminants on materials,

• recording and storing the data, e.g. using an environmental information system.

For each monitoring programme, the following should also be considered:

• the monitoring objective,
• regulatory and safety requirements,
• the difficulties, reliabilities and costs of particular methods,
• the scale of the sampling area,
• short versus long−term requirements.

Cross−sectoral environmental monitoring and the tasks it aims to achieve will be presented as follows, where integrated environmental observation should:

• measure the state of the ecosphere continuously and systematically,
• show the occurring damages and catch them in their early stages,
• analyse and interpret the possible impacts,
• initiate mitigation measures, and
• inform the public.

A system for environmental monitoring should contain the following key elements:

• collection and storage of information from environmental measurement net works and relevant statistical studies,

• implementation of a network of representative permanent observation/sampling areas to detect changes in the most important ecosystems,

• building up of ecological sample bases to detect long−term effects and damages.

The different levels on which an environmental monitoring system needs to be implemented to be able to register the complexity of impacts and changes in ecosystems under study, will be explained. The aim of a monitoring system should be to provide continuous long−term information on temporal and spatial variation so that natural effects might be distinguished from human−induced effects, and thus establish a basis for environmental management decisions.

Models for environmental monitoring

• large spatial models are introduced as a basis for deductive evidence.
• limited spatial models are introduced as a basis for inductive evidence.

Observation areas, surfaces and means will be introduced together with standard scales to give an overview (in graphical form) of space and scales in environmental monitoring. Observation possibilities and programmes, as well as data sources and methods are related to the object under observation. This is valid for the complete range of environmental observations from satellite recording to small stationary measuring stations or bioindicators.

It will be shown how inductive data can be derived from the observation of small spatial units, biocoenoses or populations; and how the combination of these data of the ecosystems under study can be combined to create deductive data.

Box B4−1 Presentation of Options for Environmental Observation

Area of Observation	Observation Methods
Global (countries, continents)	Models, satellites
Country, region	Satellites, aerial photography, models
Area	Aerial photography, surface−covering data recording
Surfaces	Surface, photos, observations, measurements

Individual measurements	Meteorological stations, measuring concentrations of substances in air, water, and soil etc.

Some examples of environmental monitoring will be presented:

Air monitoring: The causes of climate change will be shown and the effect of climate change on ecosystems will be discussed.

Water monitoring: Changes in the quality of natural waters, the nature and sources of the contamination of freshwater will be presented, considering the standard impact delimiters. The term “water quality” will be discussed with its implication for the determination of standards, and the characteristics or properties of acute or potential impacts will be indicated. An evaluation will be presented comparing the following standards:

- quality standards with regard to drinking water,
- standards for water irrigation,
- standards for the protection of aquatic life, and
- the saprobic system.

The necessity of the quality of drinking water will be explained in relation to possible negative impacts on human health when these quality standards are not observed.

Soil monitoring: Soil quality will be discussed in general and in terms of the aspect of food production. Soil has an important significance for the ecosystem as:

- a habitat for flora and fauna,
- a filter and sinker of harmful substances, and
- a bio – reactor for the cycles of hazardous substances.

Monitoring of soils is relevant with regard to changes of the soils through chemical impacts (fertilisers, pesticides etc.) or physical impacts such as erosion or deforestation and with regard to biodiversity changes caused by biocides, contaminants and/or habitat destruction.

Environmental monitoring will be presented as a source of information for the formulation of limiting values, guide values and environmental standards. They should exists for the different components of the environment such as the atmosphere, pedosphere, hydrosphere, biosphere and anthroposphere.

The categories which influence environmental quality will be presented and defined.

They include: wastewater, waste heat, emissions, refuse, etc. and they will be set against environmental categories such as: air quality, the climatic situation, noise situation, water quality, soil quality, etc.

In the next phase, some special systems of monitoring are presented, after which the exercise will be carried out.

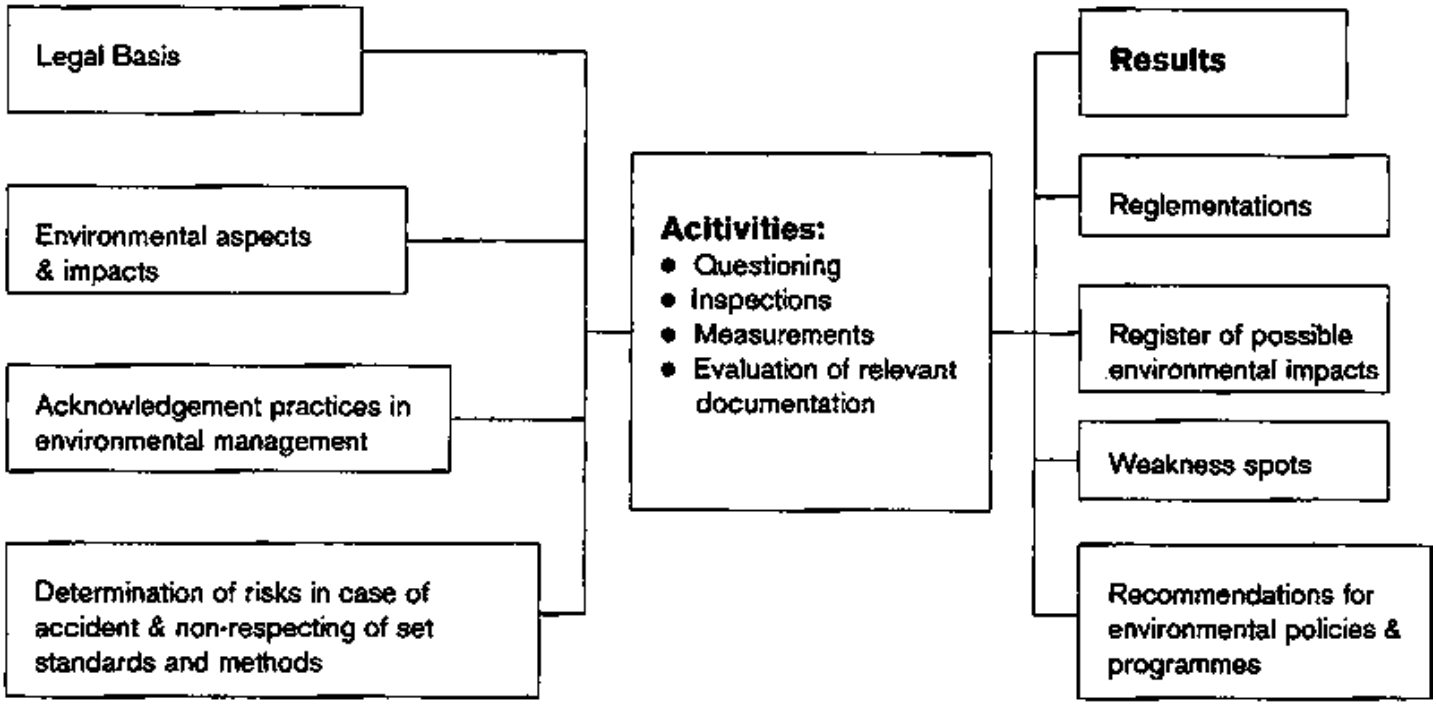
Setting up of an inventory

This includes:

- an analysis of the basis for the development of an environmental monitoring system,

- an inventory of the sources of possible environmental impacts and of problematic areas in the companies,

- analysis of possibilities to solve the recognised problems.



Overview of the components of an inventory

Technical Instruments of Environmental Monitoring

In an overview, the technical instruments for the analyses of air and water (in relation to air– and water quality) including the sampling methods will be presented.

Illustrated are for the measurements of air quality:

- measurements of sulphate dioxide, nitrite oxides, carbon monoxide and ozone;

for the measurement of water quality:

- measurements of the Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD).

Industrial Monitoring

Industrial environmental monitoring is an instrument for enterprises to provide the necessary data for environmental controlling which is a component of the environmental management system set up in firms to control and diminish their negative impacts on the environment. In this context, monitoring means measuring quantitatively internal substance and energy flows, the utilisation of natural resources by the enterprise, and also the emissions and wastes generated in the life cycle of products or services. Product and process evaluation, environmental controlling and management will be discussed further in Module 7.

Biological Monitoring

There is an ample variety of biological monitoring methods which are employed by environmental organisations in especially in Europe and North America. For example, the German Federal Environmental Agency (Umweltbundesamt) published in 1994 a comprehensive study of biological monitoring methods which are used for the control of the water quality of the River Rhine. This study includes a total of 22 tests methods of different trophic levels (Bacteria, algae, small Crustacea, Bivalvia and fish species) which were set up on the basis of defined criteria to detect a wide spectrum of pollutants. The methods are designed in a way that they can indicate pollutant concentrations in excess of the background levels of the river which might occur as a result of industrial accidents.

These tests can also partly be used to measure the toxicity of sewage waters in the framework of a biological early warning system. The facilitator will explain under which conditions the different tests can be employed and illustrates their particular functioning as well as the technical instruments necessary to carry out the tests.

Special emphasis should be placed on their utility in the area of industrial waste water analysis and treatment.

To illustrate the possibilities of biological monitoring, examples should be given from the area of sewage water treatment with regard to the capability of biological monitoring methods to detect toxic metabolites also after the biological treatment of the sewage waters which changed these metabolites slightly so that they can not be detected any more with physical – chemical methods (an examples are hydroxilised PAHs (Poly–aromatic Hydrocarbons).

Illustrated will be tests using species of:

Bacteria	**Algae**	**Protozoa**	**Daphnia**	**Bivalvia**	**Fish**

Source: Umweltbundesamt (Federal Environmental Agency), 1994.
Continuous Biotests for Water Monitoring of the River Rhine.
Text 58/94, Umweltbundesamt, Berlin.

Participatory Monitoring

A relatively new type of monitoring is the participatory monitoring of the environment which means a monitoring approach that develops partnerships of multiple stakeholders for efficient and socially inclusive monitoring. In participatory monitoring, the central role of local people in the environment is recognised. The emphasis is moved away from externally–defined data–seeking programmes and is placed on locally–relevant processes for gathering, analysing and using information. Thus, monitoring will no longer be an activity undertaken for, and by outsiders, but an activity that builds on local community activity and increases their capacity to record and analyse local conditions. If this method is to be used, it is important that the objectives of the monitoring are clear, that the expectations and information needs of all stakeholders are understood and that the end users of the information are specified. The definition of indicators which are valid for all stakeholders implicated in the process is a central requirement of this approach to monitoring meaning also that a certain amount of negotiations has to be carried out in order to find common ground. All negotiations and debates should be part of the process documentation.

In participatory monitoring, there could be conflicting demands between scientific rigour and the maintenance of local participation, but the balance of the two should depend on the objectives of the monitoring process: more scientific methods should be employed where certain impacts need to be verified, whereas more flexible methods may be used where the learning of stakeholders is a priority.

Case studies of participatory monitoring of the environment are described and analysed in Guijt & Abbot (1998). Their review identified three categories of participatory monitoring methods based on the visualisation techniques of Participatory Rural Appraisal (see Module 5), those that use oral testimony to uncover patterns of environmental and social change and those based on adapting methods of ecological assessment to make them more accessible to local people. Guijt & Abbot (1998) have suggested that of the approaches used in the case studies those that involved stakeholders in the complete monitoring process produced information that was more relevant and useful for the stakeholders than those in which local people acted only as data gatherers.

Source: Guijt, I. & J. Abbot, 1998. Changing Views on Change: Participatory Approaches to Monitoring the Environment. Discussion Paper 2, SARLS Programme, International Institute for Environment and Development, 54 p.

Background Information for the Trainer/Facilitator

Introduction to Environmental Monitoring

Environmental monitoring is a complex system for monitoring and controlling the ecosphere, encompassing the monitoring, evaluation and warning of the changes which occur in ecological systems. It can cover the monitoring of only small, limited areas, of larger areas or even global systems. Environmental monitoring, hence, is a principal instrument to control environmental quality and pollution, and is a basis for environmental management.

Environmental monitoring can be organised as a sectoral task (meaning measuring data with regard to only one sector of the environment and/or only regionally) or cross–sectorally. The main objectives of a sectoral environmental monitoring are to monitor factors which influence the environment, the assessment of the

actual state of the environment and to predict and assess future environmental quality. A sectoral environmental monitoring system analyses the status of a region, a city and/or industrial sites.

Its results are of national interest, but can also be compared to those from other nations and analysed with regard to regional and global issues.

Cross−sectoral or overlapping monitoring systems are aimed at giving continuously and systematically information about the quality of the ecosphere and at showing how to initiate measures against potential dangers. With these systems it should be possible to document existing hazards and to detect new ones in the early states as well as to analyse and interpret the framework of hazards and to inform the public and authorities.

Exercise E4−1 Monitoring Activities in a Given Area of Your Country

Task: Please describe the present and potential state of monitoring activities in a given area of your country. Different groups may have different areas/regions for discussion. The task is to determine the following:

Present situation	**Desired situation**
What has been monitored?	What should be monitored?
What are the reason (s) for the monitoring?	What are the reason (s) for the monitoring?
Which monitoring methods are used?	Who could do the work?
Who is (was) doing the work?	How could it be done and using which resources?
Where are the data used?	Is training required for it?

Time Frame:

This exercise will be done in working groups. There will be 60 min for the task and 30 min for the presentation.

Transparency T4−1 Comprehensive Environmental Monitoring

Levels of Monitoring of Ecological Systems

Areas of monitoring, instruments of monitoring	1. Earth, continents	2. National scale	3. Areas of test−programmes in monitoring	4. Defined areas of monitoring	5. Measurements and sampling
Scale	1:5 Mio to 1:1 Mio regional 1:1 Mio to 1: 200000	1:200000 to 1:10000	1:10000 to 1:5000	1:5000	1:100
Areas of monitoring programmes	**GEMS** Global Environmental Monitoring System, **GRID** Global Resource Information	National parks, regions, areas of interest	Selected problem−related areas	Areas of permanent monitoring and programmes	Points of measurements, environmental certifications, programmes of measurements

	Database, **CORINE** Co–ordination of Information on the Environment				
Source of data, acquisition of data	From satellites, national and international area–related data of usage	From satellites, aerial photo interpretation, area–related data of usage	Aerial photos, orthophotos, area–covering resource data	Aerial photos, mapping during periods of vegetation, monitoring of animals, etc.	Measuring stations, chemical or physical measurements, samples, bio–indicators
Method of monitoring	Methods of classification, global modelling, models of; distribution, statistics, scenarios	Scenarios, regional modelling, models of distribution	Feedback modelling, modelling of balances	Groups of parameter, methods of permanent monitoring, indicator programmes	Methods of indicator determination, analysis of processes and trends, correlation, sampling
	DEDUCTIVE			**INDUCTIVE**	
Objects of monitoring	**Ecosphere** – material flow, – energy flow, – flow of information	**Eco–system Unit** – material flow, – energy flow, – interactions society–environment	**Ecological Systems** – material flow, – energy flow	**Bioceonosis** Competition Symbiosis, parasitism, variety **Populations** Individuals, biomass	**Individuals** Growth, spreading, mortality, behaviour

Module 5: Methods of Environmental Assessment

Objectives

Participants have learned two methods of environmental assessment, using different techniques of data collection. These methods represent the basis for the concept of a new methodology (Participatory Environmental Appraisal (PEA)) which contains key elements of Rapid Environmental Assessment (REA) and Participatory Environmental Appraisal (PRA).

Schedule (Time frame: 240 min)

Time	Contents	Methods	Materials/Resources	Objectives/Remarks
30'	Rapid Environmental Assessment (REA)	Input, discussion	Flipchart or board and cards	Introduction to REA as a data collection technique
60'	Participatory Rural Appraisal (PRA)	Input, discussion	Transparencies: RRA & PRA definitions, flipchart or board and cards	Introduction to PRA as a data collection technique using participatory methods
30'	Participatory	Input, discussion	Transparency PEA definition,	Introduction to PEA as

	Environmental Appraisal (PEA)		flipchart or pinboard and cards	a combinational approach of PRA and the rapid assessment of sources of pollution
120'	2 Exercises (30' and 90')	Working groups and presentation to the plenary	Pinboards and cards	The participants will develop assessment plans based on the previously introduced methods

Description of the Procedure

The facilitator introduces briefly the history and importance of the rapid and participatory environmental assessment methods. The application of the rapid approach to environmental assessment is discussed defining Rapid Environmental Assessment (REA).

REA is an instrument which allows the user to work out sufficient information to characterise an environmental situation with a minimum of time, action, personnel and technical help. An example will be presented of how an evaluation team should be grouped for special cases, which data must be gathered for which purpose, and how the evaluation of the data should be carried out.

After a brief introduction to Rapid Rural Appraisal, the principles of Participatory Rural Appraisal (PRA) are presented, which could be followed by a discussion on the following questions: “Which demands are involved in a PRA?” “Which are the potentials and limitations of PRA?” (see Transparency M5–1).

Finally, Participatory Environmental Appraisal (PEA) is introduced, followed by the two exercises which are described below.

At this stage, participants should have learned from the described methods of environmental assessment how usable data on environmental quality can be compiled in a short time, with a minimum of instruments and resources and should use this knowledge for the exercises.

Background Information for the Trainer/Facilitator

1. Rapid Environmental Assessment (REA)

Rapid Environmental Assessment (REA) is an instrument of environmental management which is used as a relatively quick but limited method of data acquisition for particular programmes or projects. The main procedure of this method is to analyse existing data and information from different sources. The data have to be compiled, evaluated and interpreted with special reference to the specific problem in question, i.e. the existing data (collected at some time in the past) will be interpreted in order to deduce and extrapolate from them the present state of the environment and possible impacts which might result from implementing the project or programme under question.

For the abatement of environmental problems, it is mandatory to have an inventory of the types of pollution, including their location and emission levels. Very detailed and precise inventories can be very resource–intensive and might involve sophisticated monitoring and data–processing systems, and the budgetary and personnel requirements for such programmes are often beyond the scope of many agencies. However, by using the limited existing information, it is possible to make reasonably accurate emission inventories at a relatively low cost. The rapid assessment procedure is designed to utilise, wherever possible, data which are readily available in most countries. In most cases, there will not be the need for extensive factory or source sampling surveys which would involve high levels of technical competence and large expenditures.

One condition for the data acquisition for Rapid Environmental Assessment is the formation of an interdisciplinary working group, which is able to draw correct conclusions from monitoring results or analysing a very limited number of parameters of different media. In some cases, no analysis is undertaken at all. The observation of certain changes made by inhabitants of the areas concerned or an analysis of the history of the

area might give enough information for an assessment.

2. Participatory Techniques Including Participatory Rural Appraisal (PRA)

A growing awareness of the failures of conventional development approaches in meeting the needs of resource−poor people has led to the exploration of alternative methodologies for investigating resource management issues, and planning, implementing and evaluating development activities.

Experience shows that integrating the needs of the target groups and their own solutions/knowledge in the implementation of activities ensures the relevance of the suggested actions and extension subjects. In addition, the adaptation of the solutions to a local context and the sustainability of their realisation are guaranteed. Since the development of Rapid Rural Appraisal (RRA) into Participatory Rapid Appraisal (PRA), participatory methods are emerging as a new paradigm to face development challenges.

Participatory approaches, such as PRA offer a creative approach to information sharing, and a challenge to prevailing biases and preconceptions about rural people's knowledge. Advocates of participation argue that the production of knowledge and the generation of potential solutions should be developed with those whose livelihood strategies form the subject for research. The methods used range from field−based visualisation, to interviewing and group work. The common theme is the promotion of interactive learning, to share knowledge, and to undertake flexible, yet structured analysis. These methods have proven to be valuable for understanding the perceptions of the functional value of resources, processes of agricultural intervention and social and institutional relations. Furthermore, participatory approaches can bring together different disciplines such as biology, agriculture, health and community development to enable an integrated vision of livelihoods and well−being. Participatory approaches also offer opportunities for mobilising local people to joint action.

Emphasis is placed on supporting people to express themselves and to elaborate an action plan for self−reliance. In this context, the external consultant assumes more and more an advisory role and the role of a facilitator in the development process by integrating technical, social and methodological skills.

Sources: Schönhuth, M. & U. Kievelitz, 1994. Participatory Learning Approaches. Rapid Rural Appraisal, Participatory Appraisal. GTZ, No. 248, 183p.

PARTICIP GmbH; Participatory Planning Process in Environmental Protection, 1995.

3. Participatory Environmental Appraisal (PEA)

Participatory environmental assessment is the study of a topic or problem related to environmental issues. A fairly broad analysis of the concerned area is pursued in order to achieve a maximum understanding of the local context. This analysis goes beyond the pure collection of environmentally relevant data of different types of pollution and their impacts. It includes the understanding and assessment of the reasons and circumstances of human behaviour which are causing the environmental problems. The process can be highly participatory in some instances, and less participatory in others, depending on the topic, the scale and the purpose of the study. In addition, the selection of rapid assessment tools may vary considerably depending on the type of study undertaken. It is the task of each survey team to identify, to apply and to develop along the way the most appropriate toolkit for the implementation of the study process. For a PEA, an interdisciplinary team is needed to understand the whole complexity of the issue under study including the socio−cultural and institutional aspects which also have to be considered. Therefore, sociologists, anthropologists, economists and political sciences should be presented in the team in addition to members with environmentally related disciplines such as biology, agronomy, chemistry and geography.

This new approach aims to combine the advantages of the two methods, i.e. the participatory, non−extractive way and tools of PRA, that means sharing a common reality with concerned people and actors and the techniques for rapid assessment of environmental pollution and impacts.

Box B5−1 Definition of Participatory Environmental Appraisal

Participatory Environmental Appraisal (PEA) is a relatively new approach aiming at the combination of Participatory Rural Appraisal techniques and the Rapid Assessment of sources of air−, water− and soil pollution.

Exercise E5–1 Steps to Assess the Environmental Situation

Task:

The assessment of the environmental situation of a given city will be practised. Please apply the concepts learned, develop the necessary initial screening for the assessment and identify significant impacts.

You represent staff members of the environmental administration, and you have been instructed by the Chairman of the City of _____ (please choose one city which most of the members of your group know) to develop a concept for the assessment of the environmental situation (initial screening) in the city.

Think about the steps needed to propose, plan and implement the environmental assessment. Take the present situation of the city you have chosen as a starting point. Try also to include reflections about necessary personnel, financial, material and time resources which you will need for the realisation of the project. It is also important to, present the constraints which could hinder the realisation of the project. The steps do not need to be in a chronological order.

The results of the brainstorming are going to be presented to the Mayor and to representatives of bilateral donors who will judge whether it is worth supporting the project or not. Therefore, put the results of your work on cards and pin them on the boards.

Time frame:

10 min for brainstorming and 20 min for the presentation and discussion.

Exercise E5–2 The Development of a Plan for a Participatory Environmental Assessment (PEA)

Task:

Please form three groups. Each group will work with one of the following three cases:

Group 1 (Uplands): The nomad minorities' economy where growing opium plants is the major source of income, should be stopped according to a governmental decision. The provincial environmental agency intends to implement this important task in three communities. Please set up a PEA plan in order to collect the information which can serve as basis for the provincial authorities' decision on how to proceed with the plan.

Group 2 (Coastal): The provincial authorities intend to realise a support for off–shore fishing and sea products processing in a fishing village in order to decrease the pressure on the coastal environments. Please elaborate a PEA programme to find the data which would be necessary to design and implement such a project.

Group 3 (Urban): Many families living in a suburban area of the city of H. are willing to use the city sewage for fish breeding in order to improve their income and nutrients. This type of fish breeding has already been carried out with good results in the capital city. Please work out a PEA plan so that you can find out whether it would be feasible to implement this project also in the city of H.

Please answer the following questions:

- Who should be included in the survey team?
- What kind of secondary information should be collected? and where?
- How to proceed with the PEA in terms of information types, surveyed places/sites and participants.

Time frame:

There are 45 min for the group work and 15 min of the presentation time for each group to introduce their results to the plenary.

Transparency T5–1 Definition of Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA)

Rapid Rural Appraisal (RRA) can be defined as a systematic, semi–structured activity conducted on–site by a multidisciplinary team with the aim of quickly and efficiently acquiring new information and hypotheses about rural life and rural resources.

Participatory Rapid Appraisal (PRA) is a way of enabling local (rural and urban) people to analyse their living conditions, to share the outcomes and to plan their activities.

Source: Participatory Learning Approaches, GTZ, No. 248, 1994

• PRA is based on attitudes, methods and exchange.

• The knowledge of local people is taken as the starting point, and visiting planners or administrators learn from them, by using many different locally adapted methods.

• The ultimate goal is to identify possible specific actions, based on a shared understanding of the situation at hand.

Module 6: Planning Instruments of Environmental Management

Objectives

Participants are introduced to different planning instruments of environmental management. Participants know which planning instruments and methodologies are used and can be applied in their respective localities.

Schedule (Time frame: 390 min)

Time	Contents	Methods	Materials/Resources	Objectives/Remarks
90'	Environmental quality goals and standards	Input, discussion	Pinboards, flipchart	Introduction to the formulation of environmental quality goals and standards as prerequisites for environmental policy
120'	Environmental Impact Assessment	Input, discussion	Pinboard, transparencies	EIA is introduced as one instrument of environmental planning
90'	Introduction to landscape urban planning, nature protection zones & biodiversity protection	Input, discussion, group work	Transparency: The urban environmental action planning cycle	Participants are introduced to landscape and urban planning, and biodiversity protection as instruments of environmental management
90'	Exercises	Group work and presentation to the plenary	Pinboards, cards, pens, copies of the exercise sheets and the planning matrix	To familiarise the participants with the concepts of environmental quality and assessment plan development

Description of the Procedure

A hierarchical environmental quality concept will be developed, and participants should be able to define it. The individual levels will be presented and specified in the correct sequence. For the presentation, the following environmental areas will be considered: air/climate, soil, water bodies, and biotopes.

To perform effective and sustainable environmental management, an environmental quality concept has to be developed first. This consists of a plan including different levels of objectives. The levels are part of a hierarchical system which goes from general aims down to very defined specific objectives.

An introduction to the environmental planning process and implementation will be given and the planning instruments of environmental management, such as environmental impact assessment, urban and landscape planning, and nature protection zones will be presented.

The participants should organise themselves in groups and develop a concept to adapt the requirements to their own respective working area. They should be able to define independently the objectives of environmental management with the knowledge gained in the modules already worked on. They should also recognise that the basis for successful environmental management is the definition of goals, which means the definition of the desired environmental quality.

Background Information for the Trainer/Facilitator

1. Environmental Quality Goals and Standards

Environmental quality goals have to be specified by environmental standards on the basis of scientific and socio–economic criteria. When formulating goals in environmental policies, it is necessary to include the criteria of several sectors of society and harmonise them; besides the scientific criteria (especially the results of cause–and–effects studies and environmental monitoring), the sociopolitical reception, and economic and technical criteria are also of importance.

2. Environmental Impact Assessment (EIA)

Environmental Impact Assessment (EIA) is an instrument of anticipatory and preventive environmental policy and an integral tool of the environmental planning process. It is to be used to ensure that the potential environmental effects of proposed public and private projects are considered and assessed comprehensively prior to the decision on their implementation. All expected effects on human health, ecosystems (including flora and fauna), climate and atmosphere are considered in an EIA. An EIA ensures that these consequences are considered in the design, implementation and operation of the project.

Likewise, an EIA incorporates the concerns of the interested parties (for example: local communities, politicians, investors, etc.), and integrates social effects pertaining to gender issues or the concerns of specific societal groups into the project (e. g.: resettlement of indigenous people due to environmental or landscape changes, archaeological sites, monuments, etc.).

An EIA is required prioritarily for those projects that cause a substantial change in renewable resources, significantly change farming and fishing practices, and considerably exploit hydrological resources. Infrastructure projects, industrial activities, extractive industries, waste management and disposal projects are in need of an EIA.

All adverse consequences on the environment are taken into account by means of mitigation or environmental protection measures or alternatives (including the “no–action” alternative). These mitigation measures are often presented as the Environmental Management Plan. Once the conclusions of an EIA are reviewed, the project planners can then tailor the proposed project in such a way that its aims can be achieved and sustained with a minimum of detrimental impact on the environment.

3. Landscape Planning

Landscape planning determines the capacity of the ecosystem in terms of various potentials of nature. It investigates the interconnected relationships of soil, water, air, climate, plant and animal species. The effects of all present and proposed land uses on ecosystems are documented. For that reason, landscape planning is used as a “multi–resource and cross–sectoral approach”. It makes the scenic landscape and the natural ecosystem the basis for all land use considerations.

Landscape planning provides the necessary requirements for the inclusion of nature protection measures and landscape management in planning decisions. It determines the capacity of the natural resources and their limits.

Landscape planning presents guidelines for assessing the environmental consequences and compatibility of other projects and measures. In addition, it stipulates the ecological and design criteria which are necessary for the safeguarding of the capacity of the ecosystem and scenic landscape.

Spatially comprehensive planning which includes state, regional and local planning (land use and master plan), and the other planning sectors (e.g.: transportation or land consolidation) is carried out on different scales.

4. Urban Planning

The urban environmental action planning process can be seen as a more or less cyclical process with five main stages, as illustrated below. Following various preparatory activities, environmental problems are reviewed and prioritised, and the most serious problems are considered in depth with a view to finding appropriate solutions. While action is being taken to solve these initial problems, a new cycle is started by evaluating whether the initial problems are being resolved satisfactorily and, if so, moving on to a new round of problem identification.

The five stages of the Urban Environmental Planning Cycle

Stage I.	The preparation which includes in–house preparation and preliminary awareness raising.
Stage II:	Establishment and operation of the Urban Environmental Action Planning Committee (Model from Thailand. Source: Urban Environmental Management Guidelines, GTZ, 1994).
Stage III:	Generation of activities in which working groups are formed to analyse problems, determine methods and strategies, prepare operation plans and plan co–ordination and budgeting.
Stage IV:	Plan implementation, which encompasses plan approval, plan management, monitoring and evaluation.
Stage V:	Evaluation and initiation of new activities for the evaluation and addressing of new priorities.

5. Nature Protection Zones and Biodiversity Protection

The objectives of nature conservation are geared towards protecting the whole of the natural environment. Nature conservation contributes towards unveiling the interaction between the various sectors of the environment and towards linking measures related to individual environmental media in such a way that the functioning of the natural ecosystems is safeguarded.

Implementing objectives of nature conservation and landscape management will concentrate on:

- creating biotope network systems,
- making adequate allowances for the interest of nature conservation in the relevant areas of use (sustainable, environmentally compatible use),
- protecting against pollution caused by the input of harmful substances, and
- implementing measures of direct species protection.

Exercise E6–1 Development of an Environmental Quality Concept

Task:

Please try to design an environmental quality concept based on your own professional experience with regard to the environmental media:

- air quality
- water quality
- soil quality

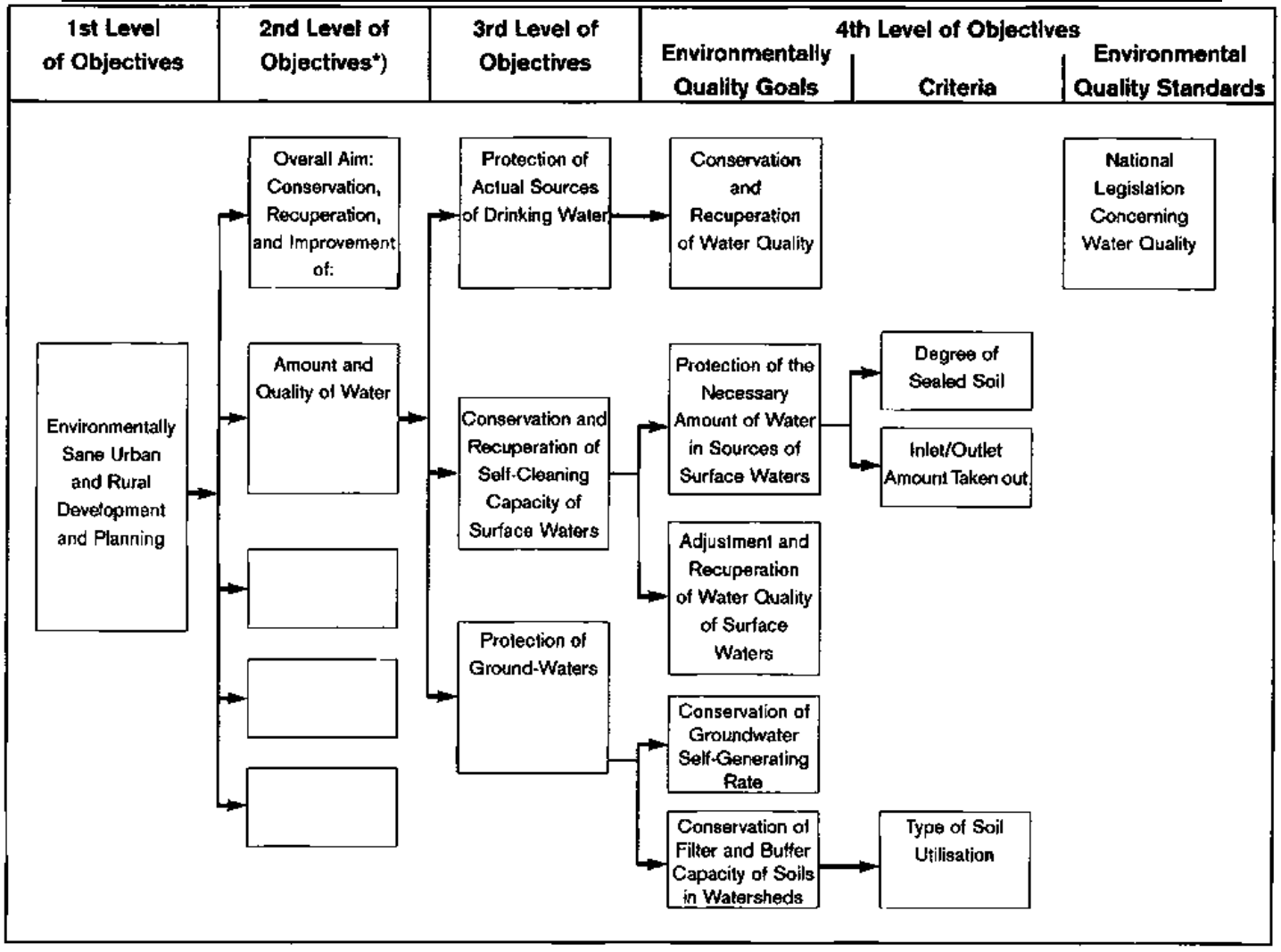
Please choose an example with which you have dealt before or which fits into the context of your own daily work, and try to use it as a basis for an environmental management plan.

Determine primary and secondary objectives and try to complete the given matrix with criteria, standards and plans.

For the purpose of this exercise, please form one or two groups. One group will be responsible for air quality, the others for quality of water and soils. Please join the group where your example fits in best.

Time Frame:

The two exercises (M6–1 and 2) will be carried out by two groups simultaneously. The time span for the group work is 50 min, for the presentation in the plenary 40 min. The groups can then be divided further for the respective exercises depending on the group size.



Exercise E6–1a A Planning Matrix for Environmental Assessment

Exercise E6–2 Establishment of a Catalogue of Criteria for an Environmental Assessment

Task:

A short distance from a major city (5 km), a refinery plant or a textile industry plant is going to be built. There are arguments against these industries because of the pollution expected to affect the densely populated vicinity. The industries are rejecting these arguments by emphasising the good technical standard of the respective plants. What can the authorities do to facilitate the decision as to whether permission for constructing the plant should be granted or not?

Please try to establish a catalogue of criteria for an assessment and decide which ones can be used in a questionnaire put to the industries to reveal the relevance of their projects.

For the purpose of this exercise, the group might split into two groups, one will define the criteria concerning the refinery plant, the other one will do the same for the textile factory.

Please discuss the conditions and possibilities for establishing an environmental impact assessment. Note down the procedure and individual steps and present the results with the METAPLAN Method.

Time Frame:

The two exercises (M6–1 and 2) will be carried out by two groups simultaneously. The time span for the group work is 50 min, for the presentation in the plenary 40 min. The groups can then be divided further for the respective exercises depending on the group size.

Information for the Facilitator:

Participants should present a catalogue as a result of this exercise, containing the necessary questions and not the answers to these questions. The questions should start with the formulation: “Which impact is expected on which environmental media resulting from which production plant?”

Transparency T6–1 Main Conceptual Steps of an Environmental Impact Assessment

Problem Identification
consideration of the relevant issues and the frame of the analysis
Description of the System
description of the proposed action with alternatives and the pre–impact situation of the environment
Impact Assessment
prediction of the expected ecological consequences of the proposed action and the alternatives, and of mitigation measures
Final Assessment
classification of the expected consequences under consideration of the environmental burden and the strategy of environmental protection
Recommendation of Course of Action
recommendations about the manner of execution (with modifications or alternatives) or the cancelling of the proposed action, described in the Record of Decision (ROD)

Transparency T6–2 Main Procedural Steps of an Environmental Impact Assessment

Opening of the Proceedings

description of the proposed project

Screening or Initial Environmental Examination

preliminary analysis of environmental impacts to determine whether full–scale assessment is necessary

Scoping Process

to determine the scope of the issues to be addressed and for identifying the significant issues related to the proposed action

Environmental Impact Study (EIS)

– analysis of the pre–impact state,
– prognosis of environmental impacts,
– evaluation,
– recommendations for further acting

Preparation of the Environmental Impact Statement

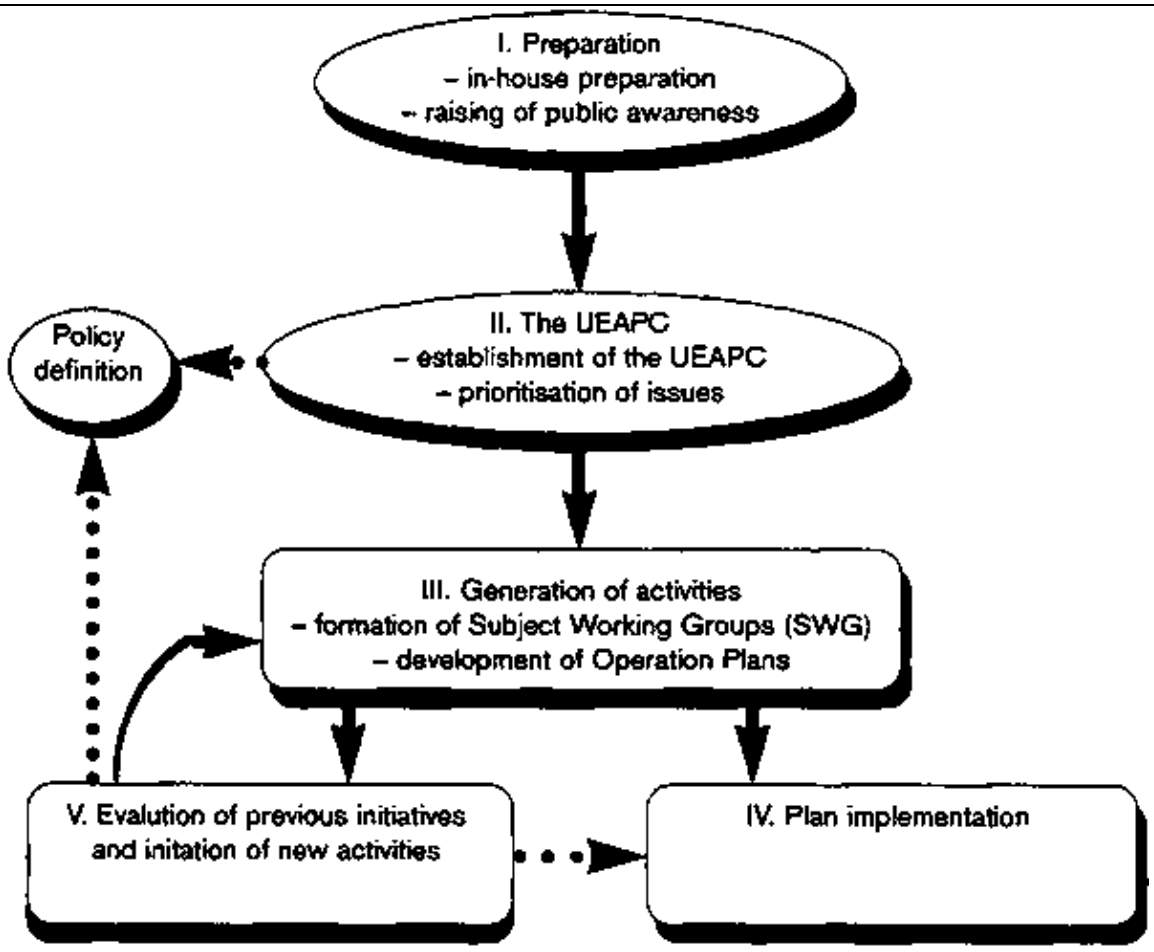
compiling the results of EIS and the public hearing, describing alternatives and mitigation measures

Decision about Proposed Project

with consideration of EIS and Environmental Impact Statement and described in the Record of Decision (ROD)

Post Control

checking the fulfilment of environmental requirements and testing the accuracy of the environmental impact prognosis



Transparency T6–3 The Urban Environmental Action Planning Cycle (UEAPC)

Source: Urban Environmental Management Guidelines Thailand, GTZ, 1994

Module 7: Environmental Economics and Industrial Environmental Management

Objectives

Participants are introduced to the principles and application of market–based instruments for environmental protection, with reference to its application in industrial management.

Schedule (Time frame: 450 min)

Time	Contents	Methods	Materials/Resources	Objectives/Remarks
90'	Conflict situation: economy versus ecology	Input, discussion, brain–storming	Transparencies, pinboards, cards	Participants are introduced to the conflict situation: economy versus ecology
135'	Introduction to environmental economics and market–based instruments	Input, discussion	Transparencies: e.g. Economic Instruments for Environmental Protection & Natural Resource Management (and copies for the participants), Environmental Policy through Market Forces	Market–based instruments for environmental protection are presented and discussed
135'	Environmental Management Systems, eco–auditing, ISO 9000, ISO 14000	Input, discussion	Transparencies, pinboards, cards	To familiarise participants with the concept of environmental management systems
90'	Life–cycle analysis and assessment, eco–labelling, marketing, product–design, liability	Input, discussion	Transparencies, pinboards, cards	Participants will learn the concept & structure of an life–cycle assessment & environmental products on the market

Description of the Procedure

The trainer/facilitator will present the effects development or industrial activities which can exert on the quality of the environment. Then, participants are grouped to identify conflict situations between economic development and environment/ecology. Each group selects one specific development activity in their country (e.g. industry, agriculture, tourism, etc.) to do the above mentioned group work.

Concepts of environmental economics will be introduced briefly. Then, existing market–based instruments for environmental management will be presented and analysed. The application of these instruments in industrialised nations, especially in Germany, will be included.

The existing solutions in the industrialised nations will be presented and analysed, and it will be determined how far these solutions can be applied to developing country conditions.

The application of economic instruments in some developing countries will be presented by an external resource person. It could be followed by group work to determine which instruments are applied in the

respective countries of the participants and which solutions could be applied in future for different development sectors.

Background Information for the Trainer/Facilitator

Conflict Situation: Ecology Versus Economy

As the protection of the environment has become one of the most important challenges of the present time and in the future, it is no longer a responsibility of individuals but of organisations, institutions, industry and other parts of society. It is a global, technical and social challenge.

The results of the industrial revolution of the last century and the immense increase in industrial production after the second World War destroyed a remarkable amount of the natural environment in the industrialised nations, but also in other parts of the world.

The environmental effects of development activities, especially industrial development over a long time period and on a large scale can be seen to different extents in not only the industrialised countries but also in developing ones. In most cases it is not possible to repair the damage done. In many cases the only chance is to avoid new problems and minimise the existing ones.

It should be emphasised to the participants that on the other hand, our present way of life, which is characterised by an extensive utilisation of natural resources at a low price level is bound to lead to a negative impact on the environment.

Environmental Economics and Market–Based Instruments

Environmental policies in a market–oriented economic system should be conducted through measures which evince market conformity. In this context, a difficult problem arises: environmental commodities (such as air, water and landscape) do not possess any market price or at least not any evident price. Environmental commodities which are seen as collective goods have been declared “free goods”. This causes a violation of the polluter–pays principle because the use of the environment is not, or not sufficiently, paid for by the economic subjects. Furthermore, the principle of precautionary action is being violated because handling environmental resources thoughtfully cannot become part of the calculation of companies unless they are transformed into market prices.

If natural resources are used and the environment polluted in the way described above, natural resource use and pollution can be seen as an externality. An externality is any impact on a third party's welfare that is brought about by the action of an individual (or company etc.) and is neither compensated for nor appropriated.

For an external cost to exist,

- the activity of one or more agents must cause a loss of welfare (e.g.: health) to other agents in economy, and

- the loss of welfare must not be compensated for.

To overcome this, external costs have to be internalised. Internalisation means the integration of external costs into the price–cost structure of the economy by means of market–based incentives or other appropriate policy measures. In resource–intensive industries, such internalisation should prompt exploration of more efficient resource use, including recycling and resource substitution or conservation. The objective is to approximate optimal levels of natural resource stocks and corresponding extraction rates through full (depletion) cost pricing and full damage costs for environmental degradation. This should also make consumers recognise that pollutive products have higher market prices than non–pollutive ones. In principle, other social costs of development such as those of achieving current and intergenerational equity could also be included in full–cost pricing.

Market–based incentives include economic instruments. Economic instruments are classified as any instrument that aims to induce a change in behaviour of economic agents by internalising environmental or depletion costs through a change in the incentive structure facing these agents (rather than mandating a standard or technology).

Economic instruments may be classified into seven broad categories:

- property rights,
- market creation,
- fiscal instruments,
- charge systems,
- financial instruments,
- liability instruments, and
- performance bonds and deposit refund systems.

In Germany, only a limited range of economic instruments are in use. These include taxes, charges, fees, deposit–refund–systems, and legal liability. Furthermore, some financial assistance is provided for environmental investments by the private sector in the form of grants, soft loans or tax allowances.

Corporate/Industrial Environmental Management Systems and Eco–Audits

Besides traffic and energy generation, industries are the biggest polluters of the environment because of their utilisation of resources, their production, transport, distribution, utilisation and disposal of products. Many concepts have been developed in recent years, thought to enable industries to contribute more effectively to environmental protection. These concepts include industrial and corporate environmental management systems. Their objectives are, for example, saving energy and resources, reducing emissions, solid and liquid waste from production processes and substituting environmentally hazardous substances. Generally, such systems must facilitate the measurement of performance both by internal management and by external auditors. The components of an environmental management system will normally be linked closely with an organisation's corporate management system. Environmental management as a corporate guideline and fundamental principle of corporate politics should effect and involve each sector of the firm.

Any effective management system should be accompanied by a corporate environmental policy which will have as the overall objective the company's compliance with existing and proposed environmental regulations and should be attuned to social and consumer pressures which are generally in advance of any new environmental regulations.

The approach to environmental management which is now increasingly adopted is one that is integrated, systematic and preventive. The new set of standards developed by the International Standard Organisation (ISO 14000) will include environmental policies, life cycle analysis, environmental auditing, waste management, emergency planning and prevention. ISO 14001 and other management systems were developed for use by individual enterprises or manufacturing installations.

These systems give options for recognition of environmental performance:

- by compliance with ISO 14001, companies can obtain a certification;

- the European Union's Eco–Management and Audit Scheme (EMAS) is supported by a regulation, meaning that companies who wish to participate in the system must establish and maintain an environmental protection system which meets the requirements set out in this regulation; and

- companies wishing to register under BS 7750, the British Standard management system must establish and maintain a management system according to the specifications of the BS 7750.

The environmental management framework for a company should include:

- an explicit policy statement, environmental goals and objectives,

- mechanisms for ensuring achievements of these goals and objectives (e.g. environmental controlling which should play the same role in the environmental management system as controlling in the corporate management system and should interface with it. The data necessary for environmental controlling should be provided by an environmental monitoring system),

• supporting services (e.g. sufficient financial, administrative and information technology resources should be placed at disposal of the environmental management system),

• enforcement mechanisms (e.g. internal controls and restrictions),

• personnel training and a clear definition of the roles and responsibilities for various functions in the system.

The results of an effective environmental management system should be cleaner production and resource recovery. The goal of cleaner production is to minimise environmental impacts by changing either the way goods and services are produced (process technology) or the products themselves (product design). At the level if individual companies, cleaner production can be implemented by:

• adopting new technologies,

• good housekeeping (which needs effective environmental monitoring and controlling),

• changing products and/or input materials, and

• reusing materials on site.

Resource recovery means recycling and reusing wastes within companies or by exchanging wastes between companies (e.g. between companies located on industrial estates). For instance, this can involve the recovery of energy from waste facilities, or pyrolytic destruction with recovery of heat and materials.

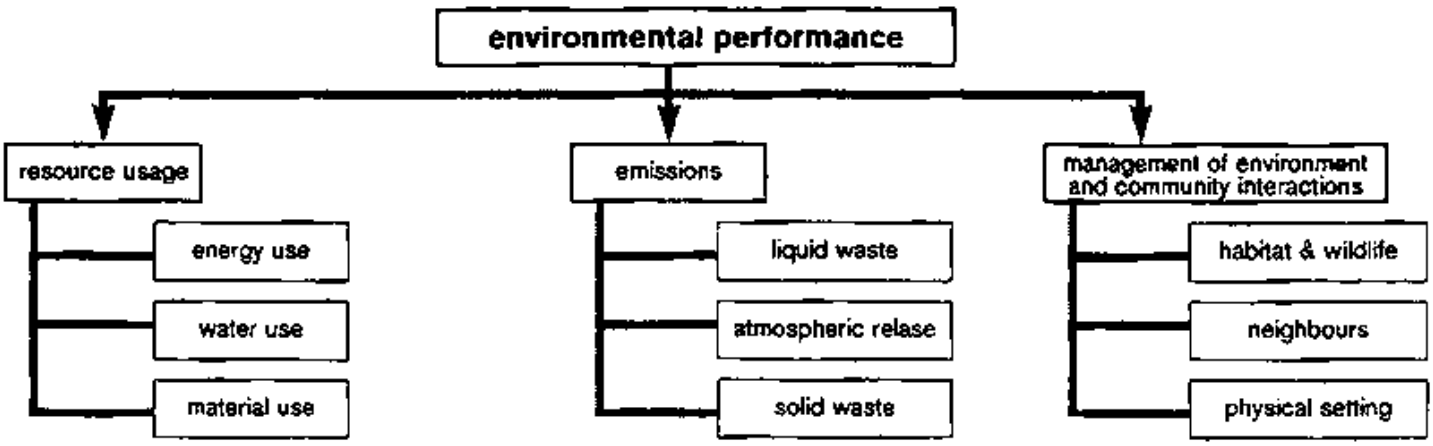


Figure F7–1 Environmental performance objective (UNEP, Techn. Report 39)

Environmental Audits

Another component of environmental management is the environmental audit. The interpretation of this function is very different throughout the world. It ranges from simple reports of emission data to very complicated industrial risk assessments. The process can be company internal or external making the results of the audit public (e.g. when the company adheres to one of the systems described above).

Environmental audits in Europe and the United States are defined as a basic management tool comprising a systematic, documented, periodic and objective evaluation of how well the management systems and equipment of enterprises and commercial concerns are performing with respect to meeting regulatory requirements for the compliance and enforcement of the nation's environmental standards. It encourages industries to adopt low waste technologies and helps to minimise resource consumption. Environmental audits should be seen by industries as a part of their Quality Assessment/Quality Control process, so that they can establish a “green edge” over their competitors in environmentally sensitive markets, both domestic and foreign.

The objective of an audit is to facilitate the management in controlling the environmental practices of the company and to provide operational plans and tools to overcome risks of bad performance. Nowadays audits are usually carried out by a small group of experts belonging to the company or by external specialists.

(see also UNEP, 1997. The Environmental Management of Industrial Estates. UNEP IE Technical Report 39: 123–129)

Life Cycle Analysis and Assessment

Life cycle assessment (LCA) has been defined as a “scientific and technical methodology to assess, analyse and evaluate environmental and other impacts of a product, product group or material”. LCA is a form of systems analysis for quantifying industrial processes and products by enumerating flows of energy and materials. LCA is an objective process to evaluate the environmental burdens associated with energy and material use, and wastes released to the environment, to assess the impact of those energy and material uses and releases on the environment, and to evaluate and implement opportunities to effect environmental improvements. The assessment includes the entire life cycle of the process, product or activity encompassing the extraction and processing of raw materials, manufacturing, transportation, distribution, use/reuse/maintenance, recycling and final disposal. The outcome of such an exercise is often used to compare one product with another for optimising industrial processes.

Structure of Life Cycle Assessments

A life–cycle assessment should preferably be composed of the following separate, but interrelated components:

• **Goal definition:** a clarification of the purposes of the study and substantiation of the various choices to be made during the exercise of the life–cycle assessment (e.g. to delineate the extent of background material in the inventory – i.e. “where does the cradle start and where does the grave end”) to ensure that the results fit the intended applications.

• **Inventory:** an identification and quantification of energy and raw material usage, air emissions, water–borne effluents, solid wastes and other environmental releases throughout the life cycle of a product, process or activity.

• **Classification:** an aggregation of data on environmental loading in agreement with their (potential) contribution to a number of environmental effects or risks.

• **Evaluation:** a final and aggregated assessment of the environmental impact based on the classification procedure using ad hoc choices than more formalised methods consisting of a multi–criteria analysis with weighting factors.

• **Improvement analysis:** a systematic and managerial evaluation of the needs and opportunities to reduce the environmental burden associated with the process or product under study, including both quantitative and qualitative measures of improvement (e.g. changes in choices of raw material, manufacturing processes, waste management as well as marketing and information activities).

Marketing, Eco–Labelling

Marketing

Ecological management not only includes the internal activities of a company. It must also be integrated into all external activities, such as advertising and marketing.

Marketing Objectives

A company's marketing objectives, as a strategy for survival, should be geared towards qualitative instead of quantitative growth. A strategy must be developed to clearly separate the company's identity from that of its competitors, taking into account all market relevant targets and objectives. It is important to think in terms of “improvement in quality” before thinking of “increase in quantity”.

For a management with ecological orientation, “marketing” would be regarded as:

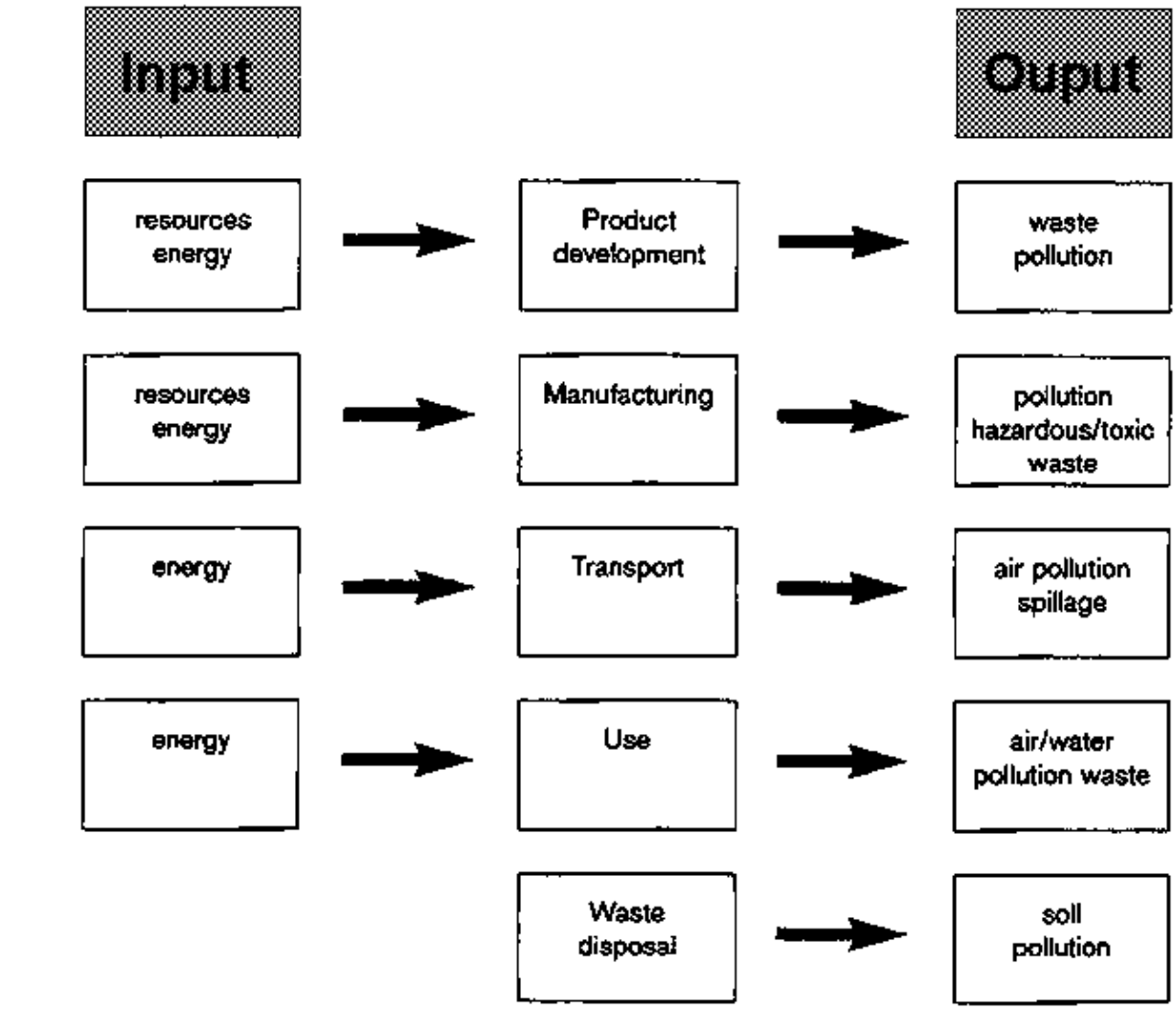
• a documentation of the basic directives of the firm's strategy;
• an instrument for realising the firm's strategies;
• an instrument for defining the firm's future terms of reference.

This combined approach to marketing should take into account certain marketing objectives (market research, information policies), such as:

- target group policies,
- policies for brands and labels,
- product strategies,
- strategies for packaging material,
- distribution policies,
- price policies, and
- communication policies.

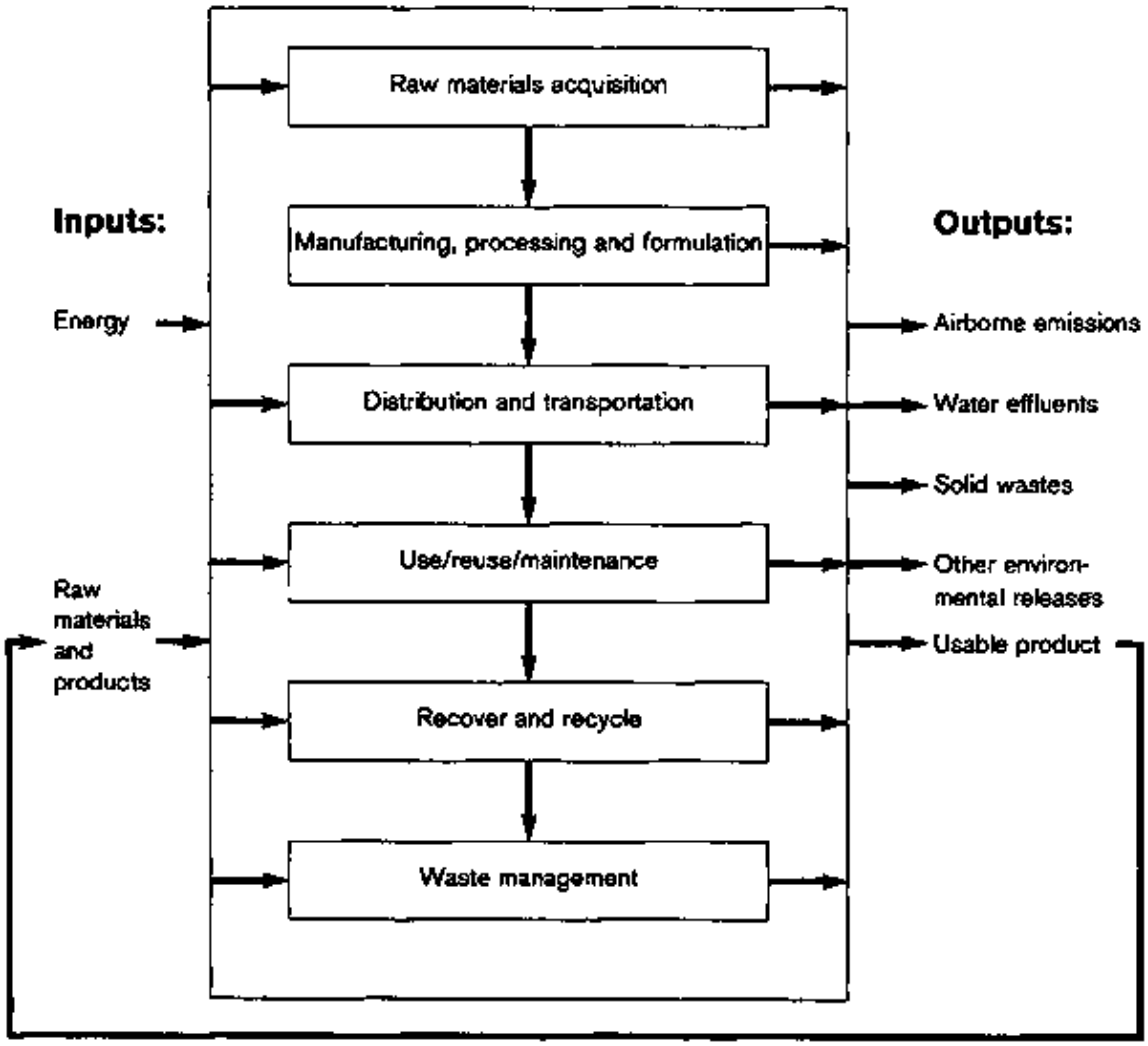
Policies for Brands and Labels

Policies for brands and labels combine the environmental approach with the name of the product and/or the name of the company. It must be clearly seen from the product that its production is environmentally sound, that the use of the product does not affect the environment more than absolutely necessary and that an environmentally acceptable method of disposal exists for the product.



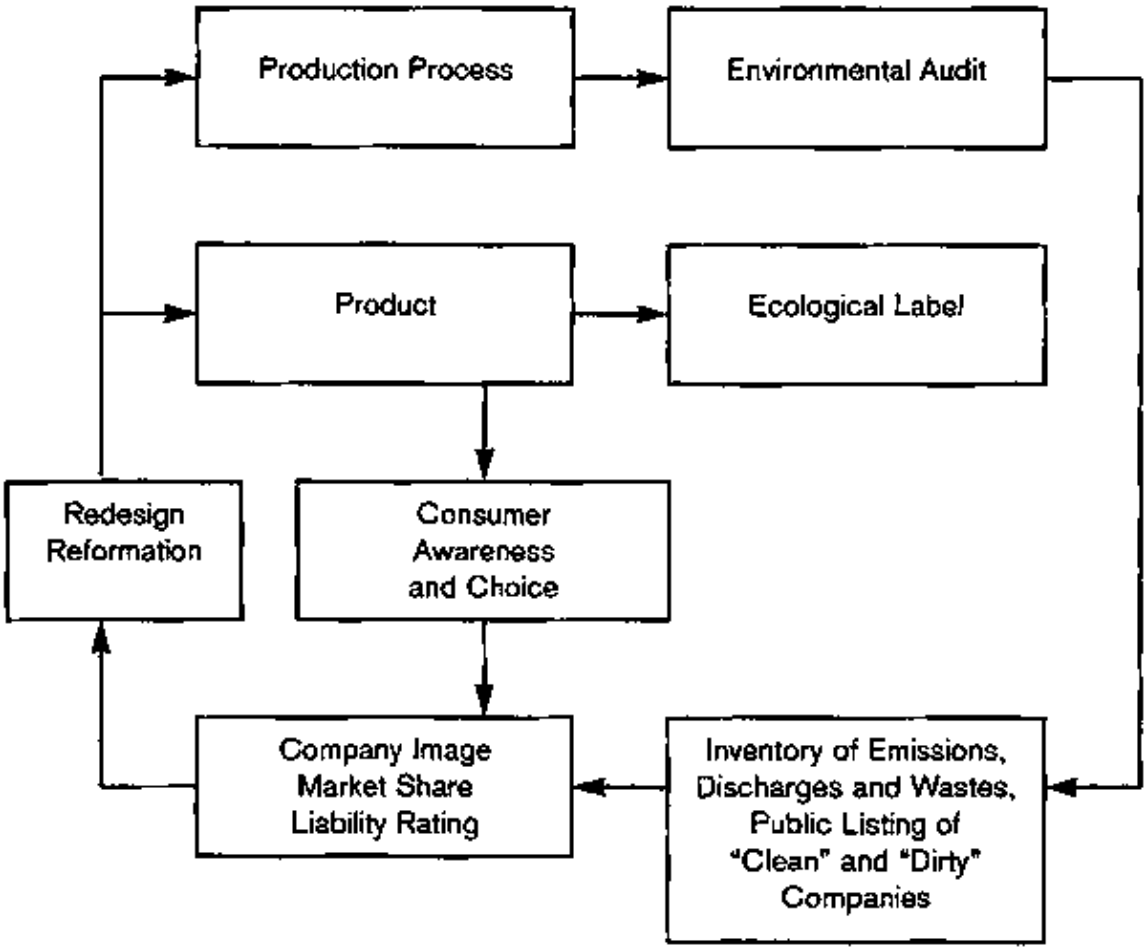
Transparency T7–1 Industry and the Environment

Source: Bowonder B., Reimerdes and Städter H., 1993.
Manual on Corporate Environmental Protection, Working Paper.

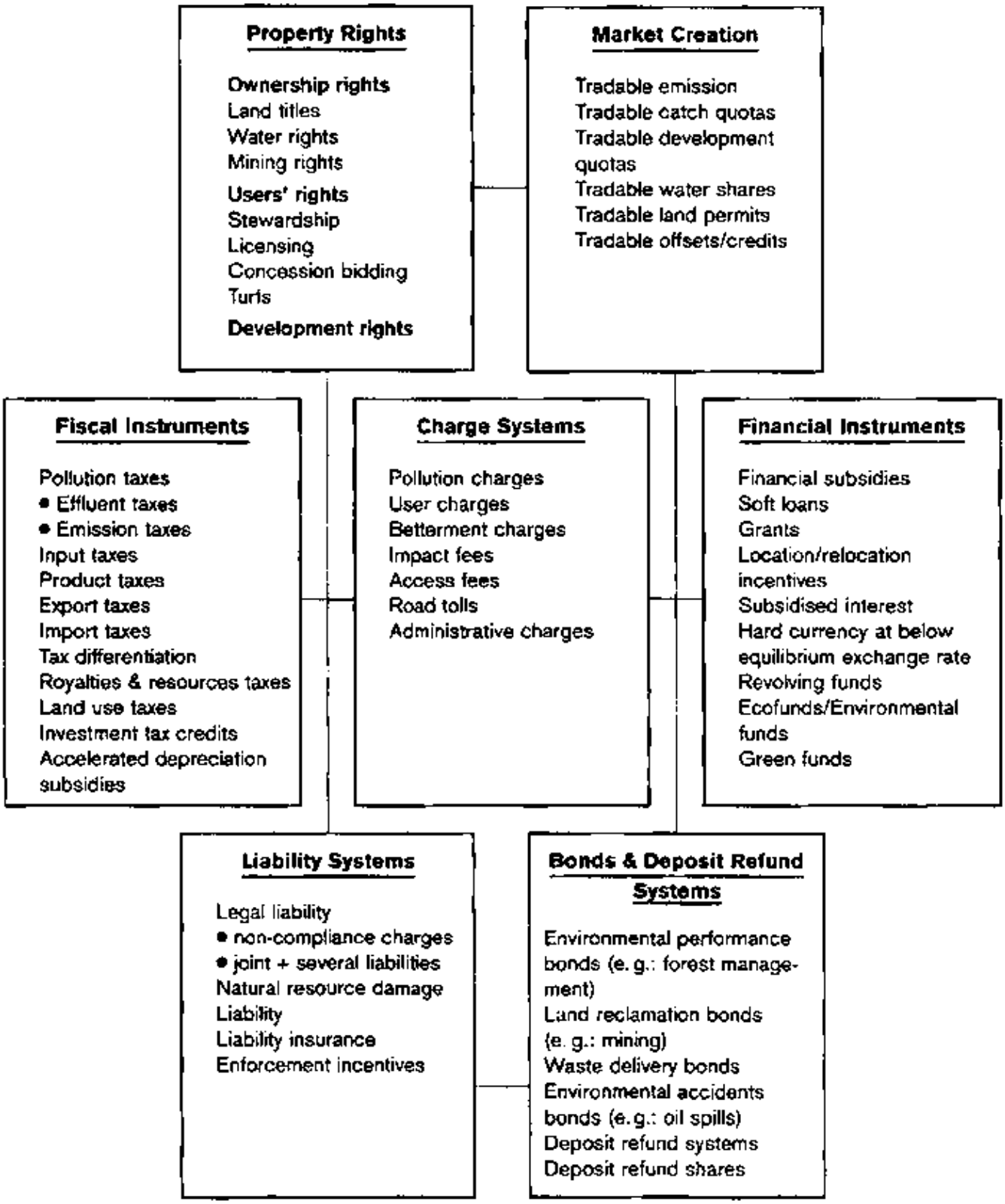


Transparency T7–2 Components in a Product Life Cycle

Source: Adapted from the Society of Environmental Toxicology and Chemistry, 1991.



Transparency T7–3 Environmental Policy Through Market Forces



Transparency T7–4 Economic Instruments for Environmental Protection and Natural Resource Management

Source: Market–based Instruments of Environmental Management in Developing Countries, DSE, Höttler L. & Paulus S., 1995

Transparency T7–5 Property Rights – Economic Instruments for Environmental Protection and Natural Resource Management

Ownership rights

Land titles
Water rights
Mining rights

Users' rights

Stewardship
Licensing
Concession bidding
Turfs

Development rights

Transparency T7–6 Market Creation – Economic Instruments for Environmental Protection and Natural Resource Management

Tradable emission

Tradable catch quotas

Tradable development quotas

Tradable water shares

Tradable land permits

Tradable offsets/credits

Transparency T7–6a Charge Systems – Economic Instruments for Environmental Protection and Natural Resource Management

Pollution charges

User charges

Betterment charges

Impact fees

Access fees

Road tolls

Administrative charges

Transparency T7–7 Fiscal Instruments – Economic Instruments for Environmental Protection and Natural Resource Management

Pollution taxes

• Effluent taxes • Emission taxes

Input taxes

Product taxes

Export taxes

Import taxes

Tax differentiation

Royalties & resources taxes

Land use taxes

Investment tax credits

Accelerated depreciation subsidies

Transparency T7–8 Financial Instruments – Economic Instruments for Environmental Protection and Natural Resource Management

Financial subsidies

Soft loans

Grants

Location/relocation incentives

Subsidised interest

Hard currency at below equilibrium exchange rate

Revolving funds

Ecofunds/Environmental funds

Green funds

Transparency T7–9 Liability Systems – Economic Instruments for Environmental Protection and Natural Resource Management

Legal liability

• non–compliance charges
• joint + several liabilities

Natural resource damage

Liability

Liability insurance

Enforcement incentives

Transparency T7–9a Bonds & Deposit Refund Systems – Economic Instruments for Environmental Protection and Natural Resource Management

Environmental performance bonds (e.g.: forest management)

Land reclamation bonds (e.g.: mining)

Waste delivery bonds

Environmental accidents bonds (e.g.: oil spills)

Deposit refund systems

Deposit refund shares

Module 8: Environmental Communication

Objectives

Participants have shared the know–how and skills for integrating successfully environmental communication in projects or programmes. Past experiences and best practices in environmental communication are reviewed and assessed, and the trainer/facilitator and the participants reflect on options for using strategic environmental communication methods and instruments in the professional situation of the participants.

Schedule (Time frame: 360 min)

Time	Contents	Methods	Materials/Resources	Objectives/Remarks
55'	Unit 1: Introduction to communication problems; and carrying out of the communication exercises: 'Paper Tear' & 'Drawing Bricks', 5 major communication barriers	Short inputs, exercises	Prepared pinboard, 'Drawing Bricks' instructions & 3 sheets of white paper/participant, transparencies/handouts	Participants are introduced to problems and barriers in communication, and experience these in the exercises
35'	Unit 2: The basic principles of environmental communication	Input	Flipchart, transparencies/handouts	Key definitions, objectives, and principles of environmental communication are presented
30'	Unit 3: The 'policy–life cycle' of an environmental project and the role of environmental communication in it	Buzz groups, input	Pinboard, cards, transparencies/handouts	The sequential stages of a policy or programme in time are explained
30'	Unit 4: 10 steps of a successful communication strategy	Input	Prepared pinboard and/or transparencies/handouts	The systematic relation between elements of a communication strategy will be assessed
120'	Unit 5: Reflection on the 10 steps by means of a case study	Working groups	Selected case study: copies, pinboards, cards	The participants will work on answering the following question: “How would you design & implement a communication strategy for the case under study?”
30'	Presentation of the results of the group work on the case study	Presentation and discussion in the plenary		
60'	Unit 6: Integrating environmental communication in	Short exercise, short presentation, discussion in	Pinboards, cards, flipchart, transparencies/handouts	The participants are asked to give suggestions on how they would put into practice what they have

	participants' projects	working groups, presentation in the plenary		learned today

Unit 1: Introduction to Communication Problems

Unit 1: Objectives

The participants have will understood the conceptual aspects of communication problems related to their professional environment and social experience.

Unit 1: Description of the Procedure

The trainer/facilitator presents on cards the major objectives, conceptual issues and elements to be addressed in the module and comments briefly on each element.

In order to sensitise the participants to the difficulties which can underlie communication processes, the facilitator asks the group to participate in two communication exercises: 'Paper Tear' and 'Drawing Bricks' which both can show how especially one–way communication impedes a clear understanding of issues transferred from one party to another (the 'Drawing Bricks' exercise can be replaced by other similar games such as 'Broken T' or 'Images' which may take less time and may be presented in plenary only).

After completion of the exercises, the trainer describes the five barriers where communication can go wrong. S/he points out that 'Said' is mostly much easier than 'Done' as was shown by he results gained from the two previous exercises. Technical barriers or problems of outreach come between what is said and what is heard; intellectual or common language difficulties can come between what is heard and what is understood; a lack of credibility or the socio–cultural gap between the communicators can come between understanding and accepting; and many structural and political–economical factors may come between accepting and acting, and between doing something once and maintaining the new behaviour or practice. 'Smoking Kills You!' or 'Cars pollute the environment' campaigns are good examples for messages which have not been very successful. Many people heard them, understood the messages, accepted the facts – and yet do not stop smoking or driving cars, or if they did it once they might not sustain it. The ultimate conclusion that can be drawn here is that actual behavioural change is hard to achieve but is nevertheless indispensable for any kind of development. The barriers that need to be overcome in the process of communicating in order to achieve change are the 'daily bred' of all those who are working in education, extension, communication or environmental policy development.

If time is left, the participants should be asked how the exercises relate to communication problems they face with people and community groups in their own professional environment. The participants should conduct a 10 min brainstorming session answering the following questions:

- Which social groups or institutions do you address?
- What kind of communication obstacles do you face?
- Can those obstacles be overcome by better communication alone or are they caused by structural constraints (such as no legal basis, no funds, no political power etc.)?
- Why do the communication problems exist?
- Could you think of possible solutions to overcome these communication problems?

In order to quickly document the responses, clustered according to the following matrix answers and comments given, they will be that has been prepared in advance.

Communication problems encountered in the professional environment of the participants:

Problems	Reasons	Solutions

Remark: The handouts presented in this module should be used as the basis for preparing appropriate overhead transparencies.

Exercise E8−1 Paper Tear

The facilitator hands a sheet of A4−paper to each of the participants and asks them to follow exactly his instructions. The goal of the exercise is that the group should produce identical pieces of paper while tearing them apart:

The instructions are:

- stop talking and close your eyes,
- fold the paper in half,
- tear off the upper right hand corner of the paper,
- fold the paper in half again,
- tear off the lower left hand corner of the paper,
- open your eyes, unfold your paper and hold up what you have produced so that everyone can see the results.

Typically, many different shapes will be created and the participants will be surprised. The importance of clear communication can be discussed and the fact emphasised that one−way communication is not very effective in conveying mental images or concepts − even for simple tasks.

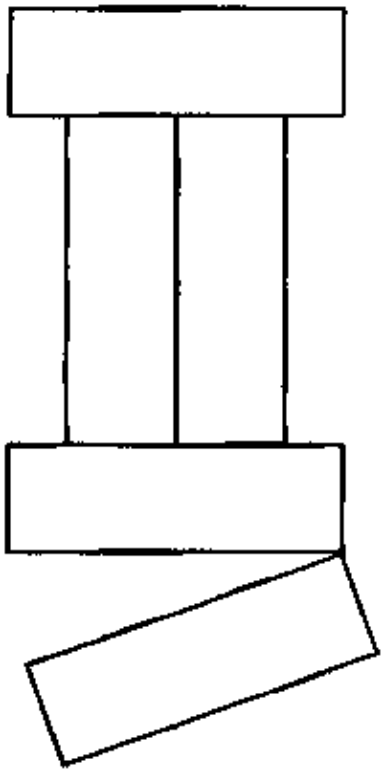
Exercise E8−2 Drawing Bricks

The participants are divided into groups of 4 to 5 persons and they are given the following instructions for a 20 min working group session:

- one volunteer per group sits apart from the others behind a screen (or turns around so that the others cannot see him or her face to face).
- he or she is given a sheet with a figure on it (see below) which no one else can see.
- the volunteer tries to explain to the group what the figures looks like. Only verbal expressions are allowed.
- the rest of the group is asked to draw what they are told by the volunteer.
- in this phase of the exercise, the group is not allowed to ask questions or talk to each other. They must draw the figure in silence and individually.
- the individual drawings of all group members are pinned to a board.
- next, the volunteer is given a second sheet. It shows the same figure as before but the group does not know this.
- the exercise is repeated but this time the group is allowed to ask questions to the volunteer and to talk to each other. Again the volunteer may react only verbally.

• at the end, the collective group figure is compared to the individual drawings and the original.

Exercise E8–2 Drawing Bricks



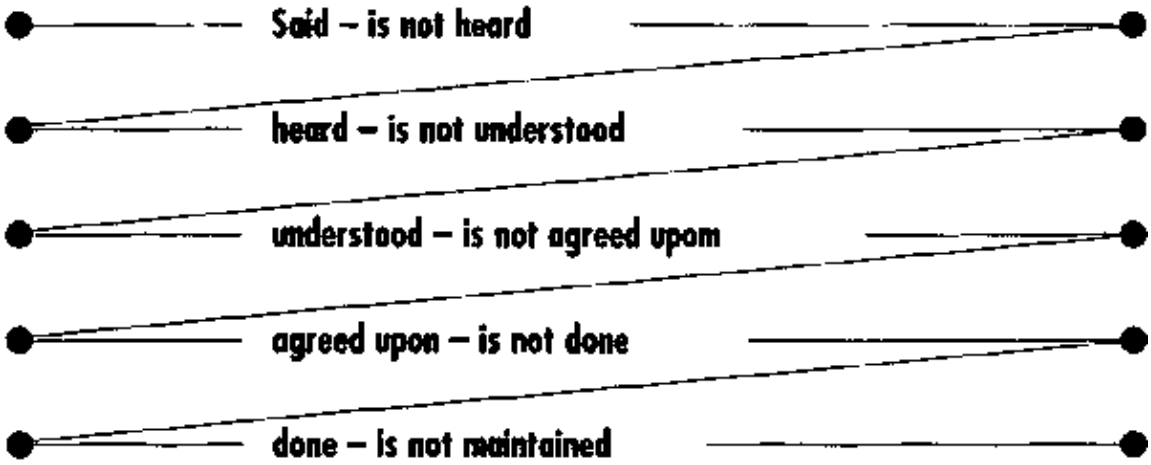
The groups are asked to reflect on the exercise considering the following questions:

1 Which assumptions were by made the volunteer?
2 Why was it so hard for the group to understand the instructions?
3 What was the main difference between Phase 1 and Phase 2?

Even though the figure is quite structured and relatively easy to explain, the groups usually have great difficulties to draw it. Mostly, the problems emerge from visual perceptions, technical terminology and expressions that are used and interpreted differently by the volunteer and the group. This is hard to overcome when communication is allowed only one–way. When two–way communication is possible, several rounds of questions and answers and feedback usually lead to a “shared meaning” – the real essence of communication.

The same exercise can also be done by using other drawings and/or by asking the participants to reproduce the drawing in a shorter time. In order to add the meaning of social norms, conventions and common understandings different drawings – one composed of regular shapes, and one composed of irregular shapes – could be used.

Transparency T8–1 Said – Done! – Five Barriers Where communication Can Go Wrong



Unit 2: The Basics of Environmental Communication

Unit 2: Objectives

The concepts of growth, development and principles of environmental communication sustainability are discussed and the basic are presented.

Unit 2: Description of the Procedure

The trainer/facilitator presents a brief synthesis of the major concepts in the environmental debate in which environmental communication is embedded. Even though many elements of 'development' and 'sustainability' have entered the international debate on visions of the future, many elements which are related to the 'growth' models of the past are alive and well. Growth models are problematic because also problems exhibit growth, especially environmental problems. Some of these problems even show an exponential growth.

Exponential Growth

A simple exercise can illustrate the dynamics of exponential growth – e.g. as related to population growth or the overuse of resources. The facilitator folds a piece of A 4–paper in half four times, shows it to the participants, and asks:

> "I folded this paper four times. It is now about 1 cm thick. Forget about the physical barriers and imagine
>
> I would fold it in half another 29 times. How thick do you think the paper would be?"

If participants do not know how to answer, the facilitator may suggest some answers such as: "Less than 1 m, less than 10m, less than 100m, more than 100m?"

The answer is – 5.400 km, the distance between Frankfurt and Boston.

The facilitator explains that complex phenomena like this make environmental communication so important – and so difficult.

These introduction set the stage for the presentation of the definitions, objectives and principles of environmental communication as described in the following handouts.

Handout H8–1 What is Environmental Communication?

• Environmental communication is the planned and strategic use of communication processes and media products to support effective policy making, public participation and project implementation geared towards environmental sustainability.

• Environmental communication is a two−way social interaction process enabling the people concerned to understand key environmental factors and their interdependencies so that they can act upon related problems in a competent way. The major aim of environmental communication is not so much information dissemination but to promote a shared vision of a sustainable future and to build capacity in social groups so that they themselves can solve or prevent environmental problems. Embedded in a well−defined communication strategy, environmental communication makes efficient use of methods, instruments and techniques well established in development communication, adult education, social marketing, agricultural extension, community health etc.

Why is Environmental Communication so Special?

• **Complexity:** Environmental communication has to deal with natural and social sciences, economics, law, business management, politics and human behaviour, and their many trade−offs and interactions.

• **Comprehension Gap:** There is often a considerable gap in the extent of knowledge and comprehension of technical dimensions of the environment between that of experts in the above mentioned fields and that of the broad public.

• **Personal Impacts:** Environmental communication may have effects in non−rational, namely emotional and spiritual dimensions.

• **Risk Element:** Risk is a frequent factor in environmental communication, especially with regard to distinctions between passive/uncontrollable or active/voluntary dimensions.

Environmental Communication Objectives

• People affected by environmental problems or projects are informed and their interest in possible solutions is raised.

• Indigenous know−how, local skills and experiences are integrated into environmental and project management and planning.

• Alternative action plans are negotiated and mediated between relevant actors so that negative effects of development will be reduced.

• Opportunities for participation of relevant actors in environmental programmes and projects are facilitated so that their credibility will be increased.

• Prerequisites for successful behavioural changes will be met through a dialogue with relevant actors and implemented through co−operation with other sectors of society.

Liebig's Law on Plant Growth or What Environmental Communication is not About

Information is not the 'missing link' between a problem and a solution. Here, Liebig's Law on plant growth can be applied: the yield is dependent on the one indispensable nutrient (light, water, fertiliser etc.) which is available in the lowest concentration.

This principle transferred to environmental and developmental issues means that even the most sophisticated communication strategy could not solve a problem if a minimum of economic resources, social organisation and political bargaining power is lacking. Thus, a project should define from the onset why and for whom information is generated and how beneficiaries are supposed to translate them into communication and action.

Handout H8−2 Environmental Communication Principles

Environmental Communication is:

the missing link... between subject matter of environmental issues and socio–political processes and policy making and public participation;

strategic and systematic ..as it uses strategic planning and an integrated systems approach for networking among various actors, and their levels and functions in an organisational hierarchy;

process– not product–orientated ..as it relies more on cost–effective and creative communication processes than on expensive media products so that even though its skills are defined technically, equally important are social, communicative, organisational and political competence;

integrated approach ..as it uses multi–faceted and integrated approaches involving mass media and community media, individuals, groups and masses, and stakeholders comprising state authorities, NGO, community–based organisations, private sector, research institutions etc.;

strategic planning ..as makes use of step–by–step strategic planning as part of a policy or project life cycle in the different phases of which communication takes over distinct functions and roles;

community orientated ..as it is embedded in human and behavioural dimensions and is orientated towards community needs, problems, and demands;

ecologically socialised ..as it fosters responsible resource management through an environmentally sound socialisation of individuals and groups;

social learning ..because it means managing a social learning process that motivates and mobilises for change through strategic alliances among stakeholders.

Unit 3: The Policy or Project Life Cycle

Unit 3: Objectives

The participants understand the sequence of phases in a policy or project life cycle and can relate these to the various roles and functions communication inputs play in projects and during the phases of a project life cycle.

Unit 3: Description of the Procedure

In order to set the stage for the presentation on the role and functions of environmental communication in the Policy or Project Life Cycle, the trainer/facilitator asks the participants to split into buzz groups of 3 persons each and discuss among themselves for 3–5 min:

> “When a certain environmental problem emerges – which phases does a typical policy or project go through that addresses this problem?”
>
> “And how high or low is the public recognition of the said problem during the various phases?”

The responses are written on cards by the participants. A maximum of 4 cards per group are collected by the facilitator and pinned on a board thereby clustering identical or similar meanings.

The trainer/facilitator then relates the participants' experiences to her or his prepared presentation. Firstly, examples are given of the relationship between environmental communication and certain management tools, followed by a description of the “Policy or Project Life Cycle”, the typical phases a policy or project goes through and the communication inputs therein. The KAP–analysis (Knowledge, Attitudes, Practices) will be explained and finally an example for environmental communication inputs in a marine conservation programme is presented.

Handout H8–3 Environmental Communication and other Management Tools

Environmental communication is the missing link between the subject matter of environmental issues and the related socio–political processes of policy making and public participation. It works best in combination with other instruments such as economic incentives, laws and regulations or sectoral planning. Most of all, environmental communication is very intricately related to education and training activities. It bridges “hard” technical know–how and “soft” action–orientated behavioural change. It supports agreements between scientific and social actors on any given environmental issue. Its high public participation potential is indispensable for the acceptance, credibility and sustainability of environmental programmes.

The Various Functions of Environmental Communication

In a policy or project life cycle, environmental communication plays a crucial role at all stages. Problem identification, agenda setting, policy formulation, implementation, evaluation, management and control etc. cannot function without properly defined communication support. Concepts, technologies and skills related to environmental sustainability need to be communicated to policy makers, opinion leaders, strategic groups or the public at large. Breaking down complex information into understandable elements and putting those on the agenda in a socio–culturally relevant and economically feasible way to different audiences is a prerequisite for consensus building and change in any civic society. Hence, environmental communication is necessary for decision making in a democracy and implementing effective action towards environmental sustainability.

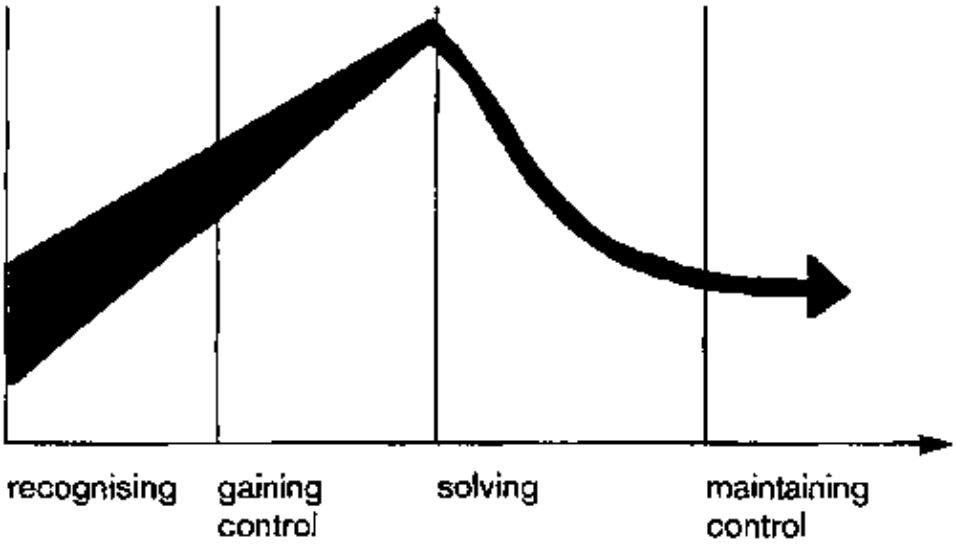
Environmental Communication and the Policy Maker

Communication will play a crucial role throughout the policy and programme life cycle. The essential aspect for a policy maker or planner is to realise that different actors are involved at each stage, and that each actor has different perceptions, interests and 'hidden agendas'. The potential contributions of communication are related to the various stages of the policy or project life cycle. During the recognition phase, the role of the policy maker increases until it reaches a peak when the problem at hand gets under control. Public awareness of the problem decreases when solutions are offered but still needs to be maintained. During all these stages, communication plays a continuous, yet different role – as indicated in the following.

Environmental Communication in Policy Making and Project Management

Environmental communication is a management tool, such as the transmission in a car. The car will not move without it but the transmission cannot move on its own. Similarly, environmental communication transforms the power generated by policy makers and project managers into action. Driven by this impetus, communication helps stakeholders to change directions and shift to a higher gear towards sustainable practices in their work and lives.

Handout H8–4 The Policy and Project Life Cycle



The Policy and Project Life Cycle: the relevance of a problem in public perception

Recognising

A problem is identified and lobbied for by social groups, and a public discussion starts.

Communication activities include: regular opinion/attitude surveys • media content analysis • continuous networking with NGOs and consumer groups • regular meetings with interest groups.

Gaining control

Policies are formulated, project or programmes are designed, research commissioned, and options for improvements are intensely deliberated.

Communication activities are: KAP surveys • integrating communication in the mix of policy instruments • design of a communication strategy • communication with those involved.

Solving

Policies, programmes and projects are implemented. The debate slows down while people affected remain informed. In this phase, communication is used as an independent and as a complementary instrument.

Communication activities include: • information on other instruments (laws, incentives etc.) • M&E are carried out through qualitative research.

Maintaining control

The emphasis is on routine surveys. Decentralisation and public–private partnerships may be considered for sustainability.

Communication activities include: regular public information • reporting on changes in policy design and implementation • updated opinion/attitude surveys.

To understand which point in its life cycle a particular policy or project has reached is an essential basis for determining which communication instruments should be used.

Handout H8–5 Environmental Communication in Planning and Implementation

Methods of environmental communication that fulfil different functions in changing the framework of environmental projects and programmes, namely the KAP – analysis.

Knowledge/**A**ttitude/**P**ractice (KAP) have effects mainly in two major phases of the “policy life cycle”: planning and implementation.

Methods	**Planning**	**Implementation**
Knowledge information dissemination	agenda–setting + information on the environmental problem, potential solutions offered by relevant organisations, actual participation options, potential activities, surveys on acceptance of planned activities	information on actual state of the environmental problem, ongoing activities and their success, opportunities for participation, necessary changes of practices, incentives and sanctions, surveys on acceptance and success of activities and changes of practice
Attitude experiential learning	applicable at any given time planning support, information and opinion surveys, sensitisation for changes of practices.	
Practice action orientation	involving relevant actors in developing solutions to... the programme at large and particular activities, the communication strategy as an integral component, networking, establishing lasting co–operations.	involving relevant actors in... monitoring and process–orientated modifications of ongoing activities (“action–learning”), continuation of participation started at all levels of the programme, their communication

		strategy and co–operation schemes, evaluation of completed activities, deriving “lessons learned” for future expansions.

Handout H8–6 Promoting Participation in Sustainable Development Policy

The systematic use of communication is essential not only in project implementation but also to the improvement of policies and programmes designed to promote participation in support of sustainable development. Communication is a two–way process in which a combination of 'top–down' and 'bottom–up' flows of information and experiences is required to analyse a given situation, determine the characteristics of strategic groups or the key problem to be tackled in order to arrive at the best mix of policy instruments. The most carefully conceived laws, economic incentives or technological solutions will not work until the people concerned have been informed, asked their opinion and, ultimately, gained 'ownership' of the changes and interventions initiated to solve the problem at hand.

This can be exemplified by means of the role of communication in the different phases of a marine conservation programme in Indonesia, indicating the different functions of communication required in different stages of the Project Life Cycle.

Protected Area Systems Planning	**Park Management Phases**	**Communication Input**
	1–Preparation	• personal visits • qualitative knowledge/attitude/practice (KAP) surveys • establishing contact with NGOs • basic information material on environment and protected areas • regular briefings/interviews and meetings with interest groups
	2–Composition	• quantitative knowledge/attitude/behaviour (KAP) surveys • integrating communication in the mix of policy instruments • design of communication strategy • extension/communication to those who will get involved
	3–Implementation	• communication to raise awareness of conservation issues among key–sectors of the local population • informing groups on the use of other management instruments (new legislation, subsidies, alternative technology etc.) • M&E through qualitative research
	4–Maintenance	• public information • regular option/attitude surveys

Unit 4: Ten Steps of an Environmental Communication Strategy

Unit 4: Objectives

The participants understand the sequence of steps in the design of a communication strategy and can relate these to the various roles and functions communication inputs can play at different times.

Unit 4: Description of the Procedure

In order to set the stage for the presentation on the steps towards a successful environmental communication strategy, the trainer/facilitator asks the participants to split into buzz groups of 3 persons each again and discuss among themselves for 3–5 min:

"Which elements do you have to think of if you had to plan a communication campaign, project or strategy?"

The responses are written on cards by the participants. The cards of each group are collected by the facilitator and pinned on a board, thereby clustering identical or similar meanings.

The trainer/facilitator then relates the participants' suggestions to the prepared presentation of the "Communication Strategy" by adding elements or steps to the four major phases and will explain vertical and horizontal communication models.

10 Steps towards an Effective Communication Strategy

Many planners tend to think that producing posters and video films or launching a mass media 'campaign' is a solution to problems rooted in environmentally unsustainable practices. But such isolated ad–hoc initiatives that are not integrated into a comprehensive communication strategy, will just cause inflated expectations in rational appeals and the cognitive dimension of messages. Therefore, at the beginning of any project or programme, it should be determined why information is diffused, for whom it is meant and how beneficiaries are supposed to translate information received into communication and action. This is best achieved in a systematic and comprehensive environmental communication strategy which is composed of 10 steps or elements.

Past Experiences have shown that one should:

- plan the communication strategy ahead, considering also research, continuous M& E, process documentation and a strategy of how to end one's commitments for the project;

- begin the communication programme locally and in a modest way, linking issues raised, problems addressed and solutions proposed to existing trends, services and potentials;

- use media in such a way that they are compatible with each other from a low operational level to higher operational levels, e.g. theatre ? video ? TV;

- diversify the operational levels, e.g. local: theatre, city: newspaper, and national: TV;

- use participatory approaches in media production, management, training etc. in order to increase local ownership and credibility and, hence, programme effectiveness, significance and sustainability.

Handout H8–7 10 Steps – Towards an Effective Environmental Communication Strategy

Stage 1	**Assessment**
	1 Situation and Problem Analysis
	2 Audience and KAP–Analysis (KAP = Knowledge/Attitude/Practice)
	3 Programme and Communication Objectives
Stage 2	**Planning**
	4 Communication Strategy Development
	5 Community Participation
	6 Media Selection and Media Mix
Stage 3	**Production**

7 Message Design

8 Media Production and Pre–testing of Contents and Material

Stage 4 Action & Reflection

9 Media Performance & Field Implementation

10 Process Documentation, Monitoring and Evaluation

1 Situation and Problem Analysis

- Which problem do the programme planners want to solve?
- What is the cause of the problem?
- Formulate what the planners want to achieve.
- Formulate the objectives per social group of beneficiaries.
- Which programme instruments are to be used?
- Do you think the objectives can be met using these instruments?
    - If not – are the problems constraints?

2 Audience and Knowledge – Attitude – Practice (KAP) – Analyses

- In which meaningful ways can the audience be segmented?
- How many different audiences can be addressed with one strategy?
- Does the problem correspondent with the felt needs of the beneficiaries?
- Which social groups are really involved?
    - Which social groups are distinguished by the planners?
- Which solutions have been tried already for the social groups involved?
- Formulate a specific problem for each social group on a consensus basis.
- Formulate the different understandings of the problem for each group.
- How and why are different audiences linked to or separated from each other?
- At which level (vertical vs. horizontal, personal vs. professional etc.) do audiences communicate with each other?
- Identify per social group the up–to–date levels of knowledge, attitude and practice with regard to the environmental problem at hand.
- Which are the major obstacles and underlying causes of the inappropriate practices?
- Where do you expect major resistance and barriers to behavioural changes?
- Which sources of information and channels of communication are relevant to environmental topics?

3 Programme and Communication Objectives

- Formulate for each social group what change in practice is needed to solve the specific problem.
- Is a change of attitude needed for the intended behaviour?
- Formulate for each social group the change of attitude needed.

• Is additional information/knowledge needed for attitudinal change?

• Formulate for each social group the additional information needed.

• Formulate for each group the levels of information, attitude and behaviour to be realised.

• What other supplies, services must be available when the people are ready?

• Behavioural change depends on changes of attitudes which again depend on an increase of knowledge and information.

4 Communication Strategy Development

• Are there any individuals who deliver regularly information on the issue in question?

• Can these individuals be involved in the strategy?

• Are there regular times/places/occasions where social groups exchange information?

– Make an inventory of 'information markets' and media used.

• Which other (mass) media relate what kind of information to which social group?

– Make a sociogramme linking groups to media and information channels.

Determine precisely

– what the action is and how it will be undertaken,
– who will to carry out the action,
– how much resources will be needed and how to obtain such resources,
– when the action will to be accomplished,
– how to set standards for measuring progress and impact of implementation.

5 Community Participation

• On which topic should the dialogue be centred in the social groups involved?

– Do you expect the members of the groups to listen?
– If not – Is this due to previous bad experiences, prejudices, beliefs?
– What rationale is behind these beliefs?
– Is this due to a lack of interest or trust?
– Why are the social groups not interested or do not trust?

• Do members of the social groups listen to others when they are communicating similar messages?

– Who are those others and why are they listened to?

• Formulate which promises you can make to the social groups.

• Are the social groups organised in any way?

– Can you identify leaders/change agents?
– Who are they and can they be motivated to co–operate?

• Make an inventory of media, communication channels and resource persons or institutions who are available for co–operation at the community or local level.

• Identify potential entry and starting points for dialogue, communication processes and media productions in co–operation with community groups.

• Facilitate community members to assign roles amongst themselves in order to share responsibilities in solving the problem.

• Is any form of training needed to involve community groups, other professionals (such as journalists or NGOs) or related institutions?

6 Media Selection and Media Mix

• Determine appropriate media to be used according to:

– participation potential for social groups
– local availability and acceptance
– rational of emotional appeal
– textual and visual literacy
– cost and maintenance
– situational flexibility.

• Determine the appropriate media mix according to:

– various dimensions of perception, e.g. audio – visual – audio–visual
– cross–fertilisation among different media, professional groups etc.
– a balance of the advantages and disadvantages of different media
– up–stream compatibility, e.g. theatre ? video ? TV
– top–down and bottom–up liaison potential.

• Try for formulate the expected media effects.

7 Message Design

• Messages should be:

– true and trustworthy
– precise and consistent
– short and memorable
– relevant to the communication objectives.

• All communication material should relate to the 4 Ps of social marketing:
product, place, promotion, price.

• Make a precise production and dissemination plan for each material.

• Inform staff on involvement and timing,

• Select external communication specialists for support.

8 Media Production and Pre–testing of Contents and Material

• Pre–test before producing larger quantities of material.
• Pre–test on location and with social groups that represent your audiences.
• Define precisely what should be tested, e.g.

– relevance
– textual/visual understanding
– motivation/action potential
– acceptance/credibility

9 Media Performances & Field Implementation

• Produce as close as possible to where the material will be employed.

• Determine a time table for each type of media used and for each social group.

• Consider events/occasions/time and places most appropriately.

  – If possible, co–ordinate mass media and community media inputs.
  – If possible, reinforce your strategy by side effects, incentives.
  – Make sure that messages are delivered only after the material set–up
  – which is intended to support the work on the corresponding problem is available.

• 'Cross–fertilise' communication media and channels.

• Plan for multiplication effects.

  – If possible, encourage local participation and horizontal dissemination.

10 Process Documentation, Monitoring and Evaluation

• Determine precisely what should be monitored and evaluated by whom.

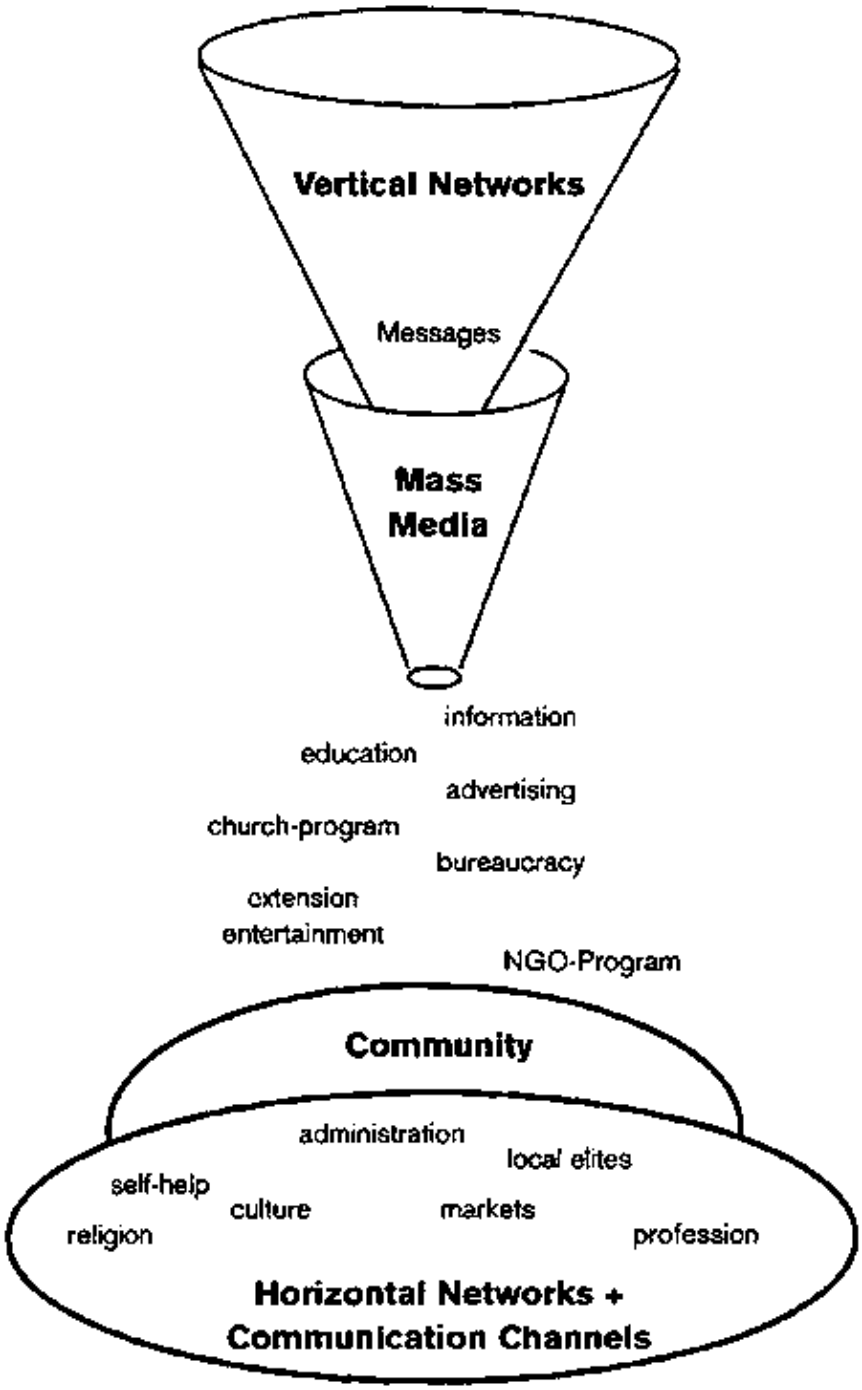
  – Internal or external evaluation.
  – Evaluation as part of repeated community self–surveys.

• Develop a set of expected results and indicators.
• Set up a detailed process–documentation.
• Make evaluation a continuous task.

  – Re–define problems, social groups, messages regularly.

• Most important to all M & E:

Did the project achieve any behavioural change and incited corresponding action?



Transparency T8–2 Community Communication Networks

Unit 5: Development of an Environmental Communication Strategy Related to a Case Study

Unit 5: Objectives

The participants practice the design of a communication strategy on the basis of a prepared case study with emphasis put on the various roles and functions communication inputs can play at different steps.

Unit 5: Description of the Procedure

Based on the presentation of the steps towards a successful environmental communication strategy, the group will conduct an exercise elaborating an environmental communication strategy according to the material they have received earlier.

The participants form three groups. The groups work in different areas of the seminar room. Each group is provided with a pinboard and cards. The time available for the group work is 120 min, afterwards each group has 10 min for the presentation in plenary. They should be encouraged to do this in a visualised format, pretending they are in a Municipal Council Hearing where they have to present their ideas briefly, precisely and attractively.

Before the beginning of the exercise, the facilitator asks the groups to read the case study individually and then to address the tasks stated at the end of the case study.

He or she should refer to the 'Said – Done' transparency again and remind participants of how they felt during the 'Paper Tear' and 'Drawing Bricks' exercises. For their group work, each group may consider to nominate a tutor and/or a reporter at the beginning of the exercise.

Due to the limited timeframe available, not all tasks given could be carried out by the groups. Therefore, the facilitator should select only a manageable number of tasks. The tasks comprise the design of a communication strategy that would meet the communication objectives of the case. The groups should go through the 10 steps of elaborating the strategy in an iterative discussion process.

Once the groups have started to work, the facilitator should walk from group to group to assist the groups answering questions and giving suggestions with regard to con tents, methods, and instruments, the organisational set–up and dynamics of the group, and their time management.

In their work the participants should take into account:

- he logical sequence of the steps,
- the role communication inputs might play at different stages of the project,
- the difference between top–down information dissemination at the general public level and horizontal participatory communication processes at the community level,
- integrating other stakeholders, institutions, media etc. into the strategy with whom to form alliances.

Further Information:

- Rubbish, Recycling and the Role of Media: Media Support to a Program Fostering the Human Development and Recycling Efforts of Waste Pickers in Indonesia.
- Waste Pickers and the Informal Recycling Market in Indonesia. A Sector Analysis in 1992.

In: Manfred Oepen, 1997. Training Curriculum: Environmental Communication. DSE.

Exercise E8–3 A Case Study

Public Awareness Strategy for the Surabaya Urban Development Program (SUDP) – Municipal Cleansing Department (Dinas Kebersihan)

Background

The waste contains resources such as paper, plastic, glass and metal which may be recovered and reused or processed into raw materials to be used by factories. Organic material in the waste may be turned into compost. These components can be considered raw materials, as they are traded on the open market and have a market value. The market value of the recycled materials increases from the point of collection, through middlemen, dealers and suppliers to the processing plants and until the factory. There are a least three categories of employment created by the recycling of waste, broadly classified as:

- waste pickers (pemulung) as self–employed low–skilled workers in the informal sector engaged mainly in waste picking in collection areas, at transfer points or landfills;

- low−skilled workers employed by middlemen (bos lapak), dealers (bandar), suppliers and the processing plants;

- managerial positions, such as bos lapak, composting and other processing plant managers.

The general situation analysis of informal sector groups engaged in recycling waste is characterised by their treatment as 'tramps', obstacles to 'development' and 'pariahs' of society. However, these groups serve at least three important and underestimated functions. They absorb part of the otherwise state−covered social costs of 'modernisation' through self−employment in the urban informal sector as there is no employment in the rural or the formal sector. They also shoulder part of the ecological costs of development through collecting and processing waste for which otherwise the state would have to pay in terms of waste transport and disposal. Lastly, waste pickers contribute economically to the efficiency of the formal sector because they provide raw materials from the recycled waste at a comparatively low price.

For these reasons, the Indonesian President Suharto has called the waste pickers in 1988 a 'self−reliant brigade' that needs to be respected and supported, and the former Minister for the Environment, Emil Salim, referred to them as 'environmental heroes'. Indeed, their record is impressive: in 1988 in Jakarta, more than 5.2500 m^3 of non−organic waste were produced per day out of which about 37.000 waste pickers recycled 25 %. According to the government think−tank EKUIN, this adds up to a total value of US $ 48,5 Mio extracted from solid waste in one year in one city alone.

Therefore, the Surabaya Municipality has decided to integrate recycling and composting in their Solid Waste Management Master Plan (SWM). So far, there was no waste separation at the household level and no composting. The City is willing to co−operate with the waste pickers in the informal sector because they have a high competence in recycling. For this purpose, a public awareness strategy was to be elaborated and employed.

Terms of Reference

The development of an Integrated Public Awareness Strategy being composed of selected thematic priorities for an environmentally sustainable Solid Waste Management (SWM) concept, defined target groups, an appropriate media mix and areas of intervention for community participation.

Previous Communication Approach

With respect to past activities of the Municipality and its Cleansing Department (DK) in the field of awareness raising on SWM, the following communication initiatives have been used to familiarise the society with SWM:

- Billboards, slogans and banners on SWM

- Slides on SWM in movie cinemas

- Spots on SWM on major government and private radio and TV stations (TVRI/RRI, RCTV, SCTV etc.)

Moreover, there are numerous community participation activities, including non−formal education, media use and interpersonal dialogue on SWM issues. The list of social groups involved comprises 21 ranging from elementary students via the Rotary Club and Army to Women's Clubs.

The communication instruments are basically posters, leaflets, books, logos, stickers, banners and loudspeakers at markets, terminals, stadiums, bus and train stops, in cinemas, schools, hospitals, hotels, main streets and waste depots. Also, educational curricula, exercises, exhibitions and contests on SWM − related topics were held at schools.

The above activities are largely government−driven top−down initiatives based on normative appeals and slogans. They lack mostly genuine participation on the part of the community and usually lack a two−way orientation. The effects of the measures undertaken have never been empirically evaluated. Thus, it is impossible to tell whether they were successful or not. However, from lessons learned in other situations and countries it can be said that the existing system of public awareness raising in relation with improving SWM in Surabaya is not fully coherent, complete and consistent and will have only a limited success.

Objectives

Therefore, the development of an Integrated Public Awareness Strategy was set in the context of the structure of objectives as described in Handout 8. Other instruments than communication inputs are meant to support the strategy. Some more specific expected outputs are:

- public awareness and participation with regard to integrated recycling schemes is raised.
- households, local authorities and the private sector support integrated recycling schemes.
- the skills and productivity of recycling workers are improved.

Tasks for the Case Study Practice Session

1. Concentrate your communication strategy on these two objectives:

- reduce waste volume by recycling/composting through waste pickers.
- improve waste management by the separation of waste at the household level.

Define precisely your communication objectives and the general and specific changes in behavioural practices you would like to achieve. Then, prioritise them.

2. Identify and segment carefully the most strategic target groups and stakeholders in the Surabaya community that should be addressed and co−operated with.

3. Identify the criteria for the selection of 3−4 pilot areas where the programme should be initiated. These locations should show different characteristics in order to test the programme objectives and the communication inputs under various conditions.

4. Identify potentials for co−operation with other agencies and stakeholders forming strategic alliances to re−enforce and cross−fertilise the strategy without extra costs.

Select the methods and instruments that can be used for situation analysis, needs assessment and problem identification and prioritisation.

5. Use the results from the previous steps as inputs for the other steps of the Communication Strategy.

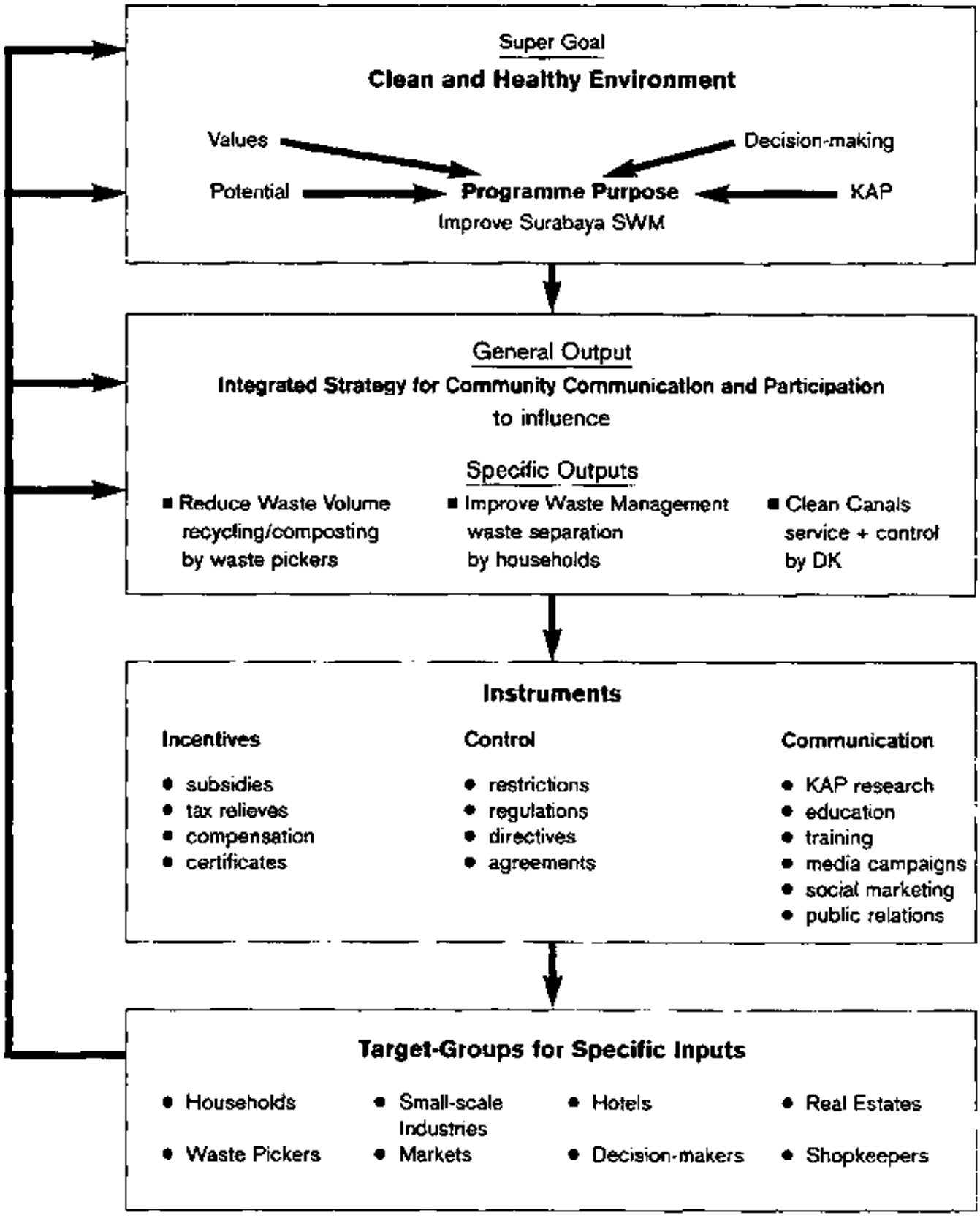
6. Select a mix of credible, participatory and mutually supportive communication media and channels.

7. Design 1−2 potent key messages per issue and per target group.

8. Determine which media and messages should be pre−tested and how.

9. Determine which media should be used when and how in co−operation with mass media, mass organisations, special events, the educational system etc.

10. Determine how you will measure 'success' by means of a M & E system.



Handout H8–8 The Super Goal, General Output and Instruments of the Public Awareness Strategy

Unit 6: Integrating Environmental Communication into Participants' Projects

Unit 6: Objectives

The facilitator identifies a specific framework showing how and where environmental communication methods and instruments can be integrated into the work of the participants.

Unit 6: Description of the Procedure

In order to set the stage for this unit, the facilitator asks the participants to get together in a circle so they can see her or him and then s/he will give them the following instructions:

1–2–3–Go!

“When I say 'Go!' everyone clap their hands together as if it were 'one sound'”.

Then the facilitator counts slowly “1–2–3”, claps her or his hands, pauses a moment and says “Go!”. The facilitator pauses another moment and lets everyone realise what they just did. Almost everyone will have clapped their hands immediately after the facilitator has carried out her/his clapping and did not wait for the signal “Go!”. This result demonstrates that action, in this case the facilitator's action, speaks louder than words.

After the warming–up exercise, the facilitator will explain briefly which options are available to the participants to integrate environmental communication into projects and programmes:

- the different fields where environmental communication can be used,
- some prerequisites to the efficient use of environmental communication,
- the fields of consultancy,
- and some characteristics a good environmental communication consultant should display.

This unit will be concluded by the exercise during which the participants should elaborate an environmental communication strategy to be used in their home institutions.

Exercise M 8–4 How to Integrate Environmental Communication into Participants' Projects

Task:

In this exercise, the participants are asked to discuss the question:

“How could you use what you have learned today about environmental communication, in your professional environment?”

The participants will form two working groups and go to work in different areas of the plenary room. They are asked to discuss this question for about 20 min and are encouraged to visualise their ideas briefly, precisely and attractively pretending they have to be presented to the Decision–Making Board of their home institution.

Once the groups have started to work, the facilitator should walk from group to group to answer any question the group may have.

The participants should note that:

- environmental communication has to planned systematically and strategically, including inputs in terms of staff and funding;

- they may be able to generate in–house environmental communication expertise;

- there might be the need for an external environmental communication consultant at different stages of a project, programme or training;

- there are advantages to co–operate with other stakeholders, institutions, media etc. and to form strategic alliances.

Time Frame:

After the discussion, the groups now have about 7 min each to present the key issues of their environmental communication action plan to be carried out in their own organisations to the plenary.

Handout H8–9 The Framework for Successful Work in Environmental Communication

Sectors, in which environmental communication has proven effective	• support and capacity development of environmental centres, institutions and administrations, • urban–industrial environmental protection, • development and implementation of national, regional or local environmental action plans or sector strategies, • environmental management in rural regional development planning, social forestry or park management, • solid waste management, energy and water management,
Prerequisites	• generate technical know–how, • integrate environmental communication in project planning, • provide advanced training options, • allocate appropriate staff and funding, • define environmental communication as an output (supporting the goal of a project, e.g. “Information on EIA Law disseminated”) or an **activity** (supporting the output of a project, e.g. “Communication strategy on recycling developed with relevant actors”)
Fields of Consultancy	• advanced training in specific environmental communication strategies, • training in selected environmental communication methods, instruments and media, • development of a local pool of experts, • process coaching during environmental communication implementation, • exchange of experience at the international, national, regional and local level, • capacity and institutional development, • strategic alliances (partnerships, twinning etc.)
Environmental Communication Consultant Profile	• needs–orientated and participatory, • more process– than goal–orientated, • little intervention depth, • uses local know–how and co–operating with local partners, • incorporating communication or social science, • applies participatory methods of environmental communication, • media design, • conflict management and mediation, • interdisciplinary co–operation, • strategic and systematic thinking, • moderation and visualisation skills, • process coaching in an intercultural context, • capacity and institutional development, • sector–specific environmental know–how.

Module 9: Environmental Information Management

Objectives

The participants will be familiarised with important issues and elements of Environmental Information Systems (EIS) that empower them to strengthen the information management capacities of their organisations.

Special emphasis is placed on:

- analysing the mechanisms of decision–making and their relationship with information,
- investigating the process of gathering information,
- examining important issues of EIS, such as information sharing and information management capacity.

Schedule (Time frame: 630 min)

Time	Contents	Methods	Materials/Resources	Objectives/Remarks
90'	**Unit 1: Management and Information**			
35'	Description of the stakeholders in environmental management, their decision making and their inter–relationships	Input, brainstorming, METAPLAN	Prepared chart, pinboards, cards	The participants recognise the scope of stake–holders and complex management structures in the environmental sector
25'	The development triad	Brainstorming, METAPLAN, discussion in the plenary	Exercise 1, pinboards, cards	The concept of the development triad is introduced
30'	The management and information pyramid	Short input, discussion in the plenary	Flipchart, transparency 1	The different levels of information gathering and management are presented
90'	**Unit 2: Decision–making**			
30'	The decision – making model and information	Short input, brainstorming with METAPLAN, discussion	Pinboards, cards transparencies 2, 3	The participants will understand the decision–making process and the importance of information for the process
60'	Exercise 2: The four types of decision – making and role of information	Short input, working groups, presentation and discussion in the plenary	Exercise sheets for all participants, pinboards, cards	The participants become familiar with the different types of decision–making and assess the function of information for them
135'	**Unit 3: From Data to Action**			
90'	Exercise 3: “The Chirezi Epidemic”	Working groups, presentation and discussion in the plenary	Transparencies, exercise sets for all participants, pinboards, cards	To further the understanding of the importance of: – systematic data management – linkage of spatial and non–spatial data, – information systems
45'	The definition of data, information, communication, and indicators	Input and plenary discussion, METAPLAN	Transparencies 4,5, pinboards, cards	To understand the terms data, information and communication, and the purpose and nature of

				indicators
95'	**Unit 4: What is an Environmental Information System?**			
65'	Introduction to environmental information systems (EIS)	Input, discussion in the plenary	Worksheet 2, transparency 6, pinboard, cards	The participants recognise the need for an EIS, as well as the principle and structure of an EIS
30'	The need for information sharing	Brainstorming with METAPLAN, plenary discussion	Pinboards, cards	The participants understand the need for information sharing
110'	**Unit 5: Sharing Environmental Information**			
40'	The reluctance of institutions to share information and if information is shared which information should be shared	Short input, brainstorming with METAPLAN	Transparency 7, pinboards, flipchart, cards	The reasons for resistance to information sharing are understood and a framework to determine shared information is presented
70'	Exercise 3: Comparison of concepts of environmental information networks	Working groups, plenary presentation & discussion	Exercise sheets for all participants, pinboards, cards transparency 8	The participants develop and assess concepts of information networks
100'	**Unit 6: Building Information Management Capacities**			
30'	Information management and information management capacity	Input, brainstorming with METAPLAN	Pinboards, cards, flipchart	The participants are familiar with the concept of information management and information management capacity
80'	Exercise 4: Assessing the information management capacity of an organisation	Working groups, presentation and discussion in the plenary	Exercise sheets for all participants, pinboards, cards flipcharts	The participants apply the concept of information management capacity to a real – world example

Unit 1: Environmental Management and Information

Unit 1: Objectives

The participants recognise the scope of stakeholders in environmental management and the complex management structures.

They are familiar with the different management levels and the respective information needs.

Unit 1: Description of the Procedure

The trainer/facilitator introduces the module and presents briefly the general objective.

Then, the trainer/facilitator undertakes a brain storming exercise with the participants using a pre–structured presentation (see below).

The following questions will be discussed:

Who are the stakeholders in environmental management?

What kind of decisions do they take?

What are the relationships between the stakeholders?

During the exercise, emphasis should be placed on who really makes the decisions, e.g. the farmers on the plot level.

Spatial Unit	Stakeholders, Institutions	Main Activities	Decisions/Mandates
Global	UN–Organisations		
International	EC, SADC, ASEAN		
National	Nat. Governments		
Regional	District Governments		
Local	Community, villages		
Plot	Farmers, Enterprises, Landowners		

After the discussion, the facilitator hands out the Exercise 1 to the participants and asks them to read it. This will be followed by a discussion of the principle of the development triad in plenary.

To introduce management, the trainer/facilitator asks for a brainstorming in the plenary with regard to the question: “What does management mean?” and based on the results presents the following functions of management and the management activities involved.

Box M 9–1 The Main Management Functions

Management Function	Activities
Planning	strategic planning (long–term) programme planning (mid–term) operations planning (short–term)
Organising	organisational structure operating rules procedures
Supervising	lead, motivate and develop subordinates
Staffing	selection and professional development of organisational personnel (training)
Controlling and Monitoring	monitor activities of subordinates monitor performance of organisation provide necessary corrections assess job performance disciplinary measures

The presentation of management activities will be continued by showing the “Management Pyramid” and discussing the following questions: “What kind of decisions are made on each level?” and “What kind of information is required?” after which the complete figure will be shown and explained. Management activities will be defined according to Box 1.

A taxonomy of managerial activities

Nearly 25 years ago, a three–part taxonomy of managerial activities was introduced that remains useful today:

• Operational control: The process of ensuring that specific tasks are carried out effectively and efficiently.

• Management control: The process by which managers ensure that resources are obtained and used effectively and efficiently in the accomplishment of the organisation's objectives.

• Strategic planning: The process of deciding on the organisation's objectives, changes in these objectives, the resources used to attain them, and the policies governing the

acquisition, use, and disposition of these resources.

Exercise E9–1 The Development Triad

Tasks:

- Please read the exercise.
- Do you agree with the concept of the “development triad”?
- Do you have any comments?
- Please note your comments on cards to be pinned on the boards for discussion.

Part of the reason why environmental issues are so challenging is that the values attached to natural resources vary tremendously between stakeholders. In some cases values may have evolved over thousands of years of interaction with the environment and are embedded in the spiritual life or culture of a community. In other cases, they may have been recently acquired in response to new economic pressures or opportunities. A paradox exists since, in many cases, the signs of environmental deterioration are clear to many, yet there is no consensus on how to respond.

Individuals, communities, industry, nations and international bodies all make decisions which affect the sustainability of environmental resources and, consequently, all have a role to play in their conservation and sustainable use. No segment or level of society is left out, since decisions made by one group can affect the livelihoods of others. Thus, wherever possible, policies aimed at conserving biological resources should reflect the perspectives and needs of all stakeholders who stand to win or lose.

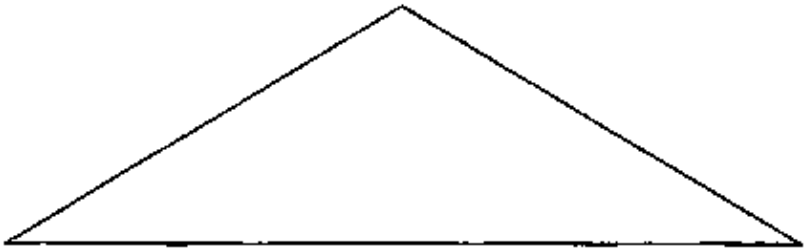
Even small–scale environmental challenges tend to arouse the interest of many stakeholders. Such stakeholders are typically politicians, civil servants, natural resource managers, local government administrators, non – governmental and community – based organisations, business leaders, industry representatives, professional associations, scientific researchers, teachers, the general public, media and international community.

Despite their apparent diversity, most stakeholders fall into one of three categories: government, private sector and civil society. Together, these are referred to as the development 'triad', since they represent the three core interests shaping development policy. In the long term, policies which do not represent all three broad interests are destined to falter, stall or fail.

The figure depicts the development triad in terms of its constituent stakeholders. The term 'civil society' represents all of those stakeholders who are not actively engaged with government or private enterprise, including non–governmental organisations, community.

Exercise E9–1 The Development Triad

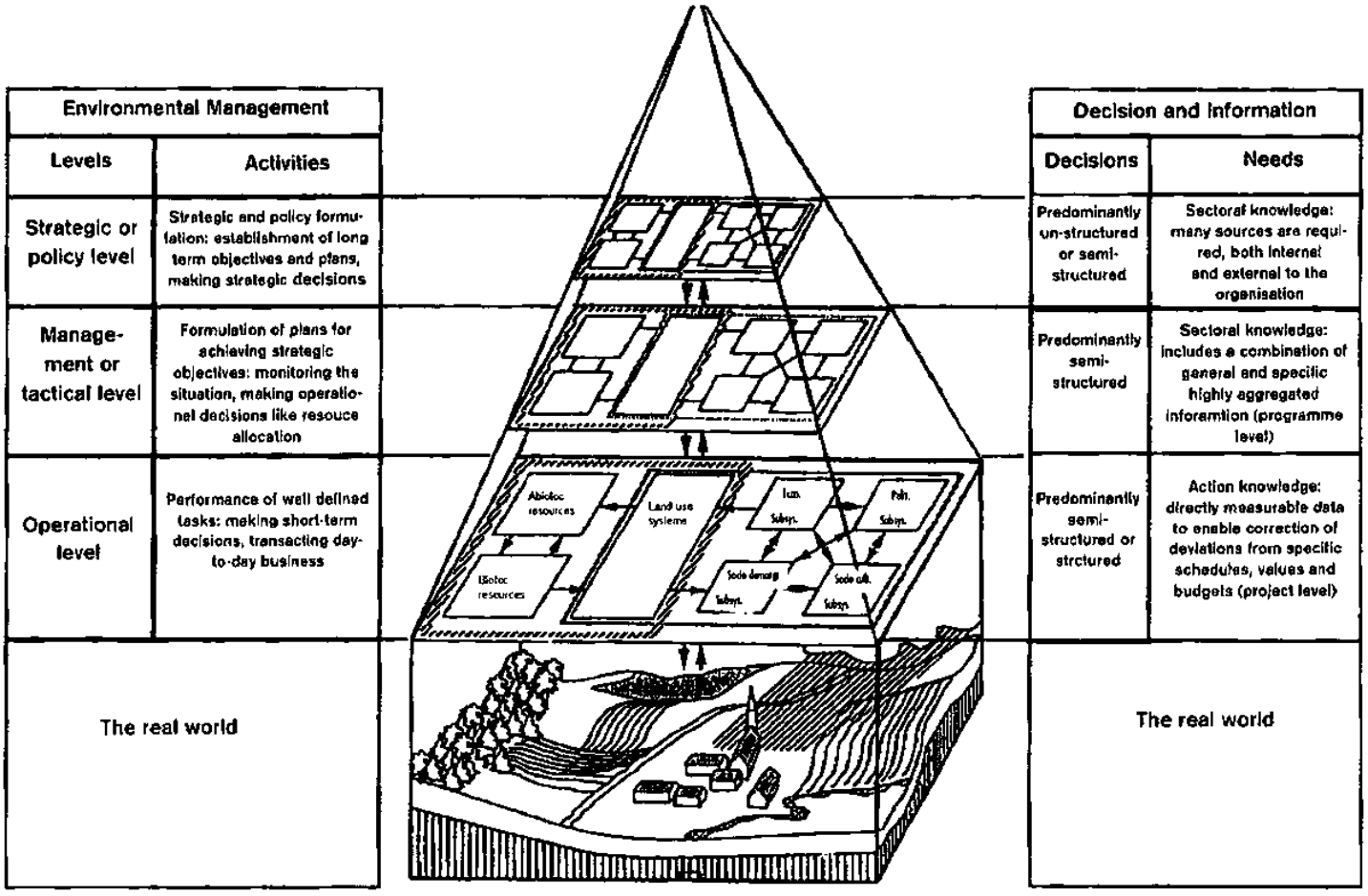
Government:
local, state, national;
administrations; international treaties; protocols; conventions



Civil society:
general public; community groups;
local, national, and international
non-profit and non-governmental
organisations

Private sector:
self-employed small businesses;
companies; trade bodies;
consortia; transnationals

The Development Triad



Transparency T9–1 The Management and Information Pyramid

Unit 2: Objectives

The participants recognise the elements of the decision−making process. They learn about different decision types and assess the role of information in the decision process.

Unit 2: Description of the Procedure

The trainer/facilitator presents the decision−making cycle and process and discusses with the group where in the process information is important and which functions are fulfilled by it. Decision−making tools are indicated such as: **Cost−Benefit−Analysis** (putting cost and benefits in monetary terms) and **Multi−Criteria−Analysis** (draws on non−monetary measurements).

The following exercise will be carried out in groups, and the results of the group work will be presented and discussed in the plenary. The participants should form not more than 3 working groups. As a final result to the discussion, the trainer/facilitator should add the following information to the individual decision types:

For Exercise 2: The role and use of information in decision−making:

Decision type:	**Role of information**	**Use of information**
formal rational	support decision−making	comprehensive
bureaucratic	support decision−making	comprehensive
political	support own position	selective
demagogic	defend decision	defend decision

Unit 2: Background Information for the Trainer/Facilitator

Decision theory basics

Decision theory is concerned with the logic by which one arrives at a choice between alternative objects, actions or hypotheses. The choice between alternative solutions is made according to decision rules derived from one objective or a set of objectives. Decisions may be characterised as single – or multi – objective in nature, based on either a single criterion or multiple criteria. While one is occasionally concerned with single criterion problems, most problems approached in reality are multi−criteria multi−objective in nature.

The primary issues in multi−criteria evaluation relate to the standardisation of criteria scores and the development of weights of criteria on a continuous scale. Multi−objective decision making tends to distinguish between complementary and conflicting objectives. In cases of complementary objectives, multi−objective decisions can often be solved through a hierarchical extension of the multi−criteria evaluation process. With conflicting objectives it is sometimes possible to rank order the objectives and reach a prioritised solution.

Definition of decisions

A decision is a choice between alternatives. The alternatives may represent different courses of action, different hypotheses about the character of a feature, different sets of features, etc.

Definition of criteria

A criterion is a the evidence upon which a decision is based that can be measured and evaluated. Criteria can be of two kinds, factors and constraints:

- Factors: A factor is a criterion that enhances or detracts from the suitability of a specific alternative for the activity under consideration.

- Constraints: A constraint serves to limit the alternatives under consideration. A good example of a constraint would be the exclusion from development of areas designated as wildlife reserves. However, in some instances the constraint will be expressed as some characteristic that the final solution must possess. Such constraints are often called goals.

Decision rule

The procedure by which criteria are combined to arrive at a particular evaluation, and by which evaluations are compared and acted upon, is known as a decision rule. A decision rule might be as simple as a threshold applied to a single criterion or it may be as complex as one involving the comparison of several multi–criteria evaluations. In general, two kinds of decision rules prevail: those in which the decision rule involves the evaluation of alternative hypotheses about individual features (classification), and those in which it involves a decision about alternative features to be included in a set (selection).

Objective

Decision rules are structured in the context of a specific objective. The nature of that objective, and how it is viewed by the decision makers (e.g. their motives) will serve as a strong guiding force in the development of a specific decision rule. An objective is thus a perspective that serves to guide the structuring of decision rules.

Evaluation

The actual process of applying the decision rule is called evaluation. There are:

- **Multi – criteria evaluations:**

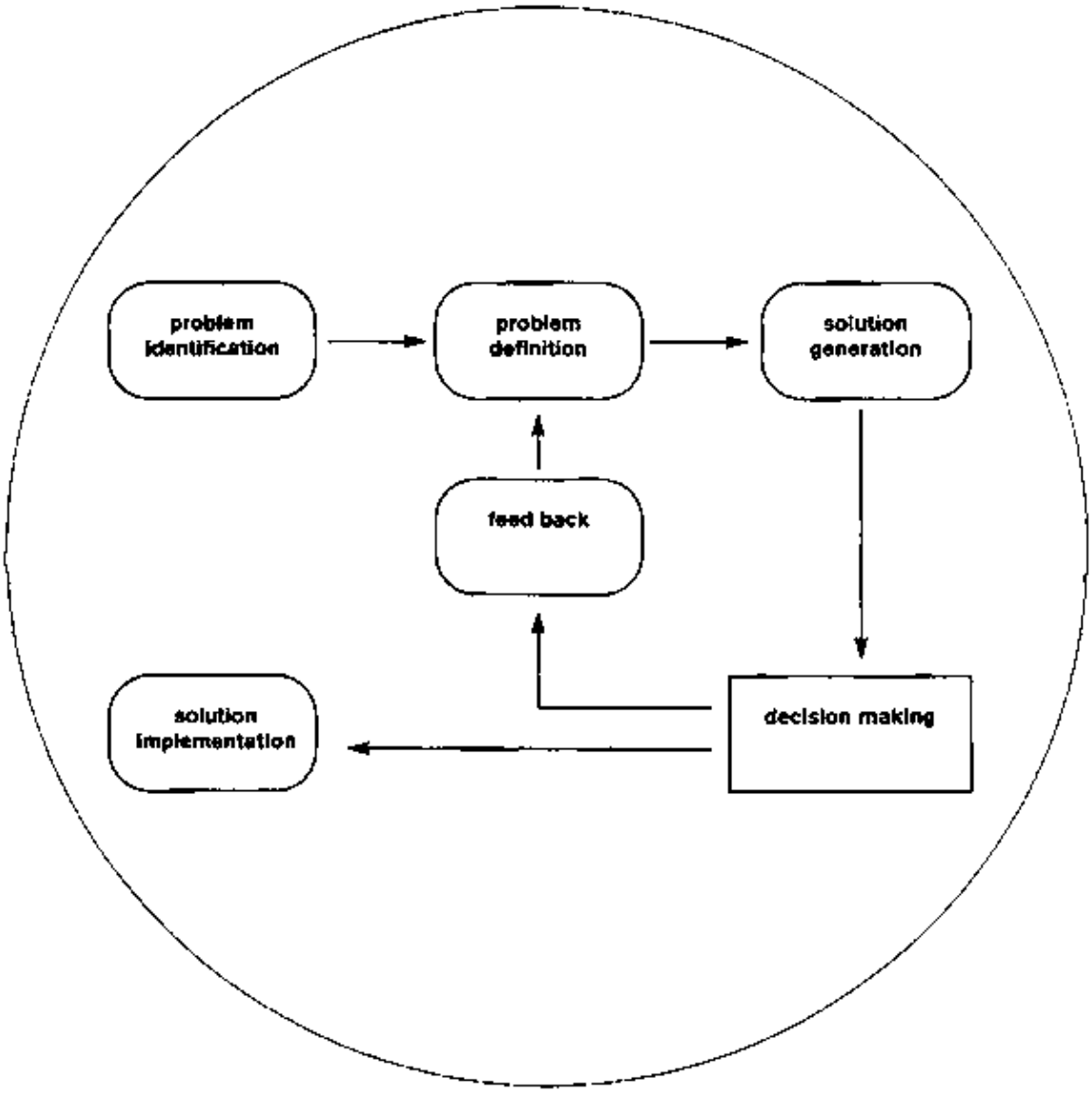
  To meet a specific objective, it is frequently the case that several criteria will need to be evaluated.

- **Multi – objective evaluations:**

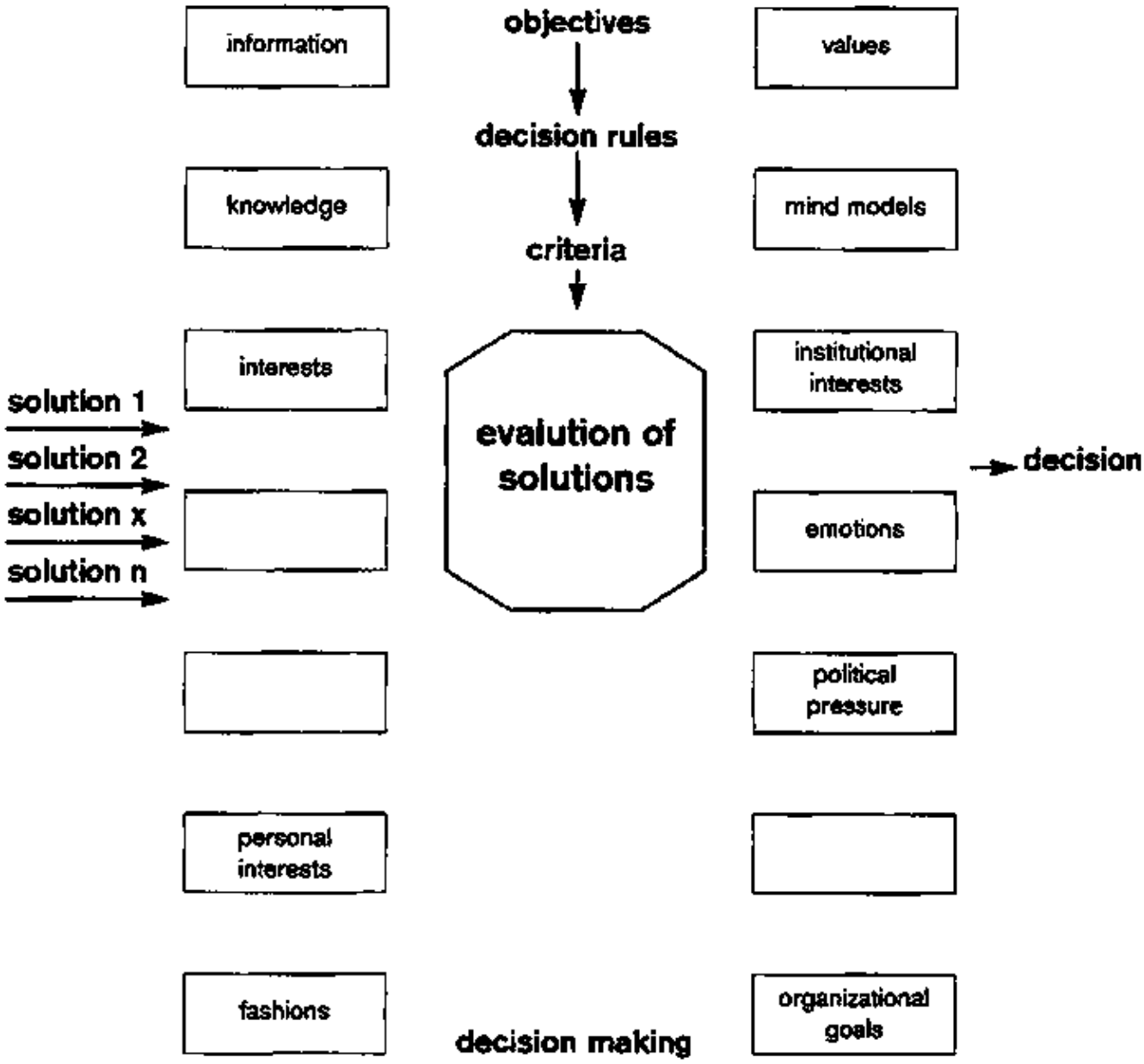
  While many decisions we make are prompted by a single objective, it also happens that we need to make decisions that satisfy several objectives. These objectives may be complementary or conflicting in nature.

Uncertainty and risk

Clearly, information is vital to the process of decision making. However, we rarely have perfect information. This leads to uncertainty, of which two sources can be identified: database and decision rule uncertainty. Risk may be understood as the likelihood that the decision made will be wrong. Risk arises as a result of uncertainty, and its assessment thus requires a combination of uncertainty estimates from the various sources involved.



Transparency M 9–2 The Decision–making Cycle



Transparency M9–3 The Decision–making Process

Exercise E9–2 The Four Decision Types and the Role of Information

Tasks: Please discuss the four decision types. Is such a taxonomy useful? What is the role of information in the different decision types? Note your major ideas on cards to be presented in the plenary. The time span available will be 30 min for the preparation, ca. 7 min for each presentation, followed by a general discussion.				
	Decision Types			
	formal rational	**bureaucratic**	**political**	**demagogic**

Decision making style	rational, comprehensive structured, optimised, orderly	satisfying procedural rationality, structured	unstructured, conflicting spontaneous, intuitive, "muddling through"	decision making process is a "show" decision has been made before
Objective of decision making	optimal solution	optimal solution within the frame–work of the organisation	feasible solution under the given conditions	"sell" a decision, impose own interests
Decision making process	problem definition solution generation decision making	problem definition solution generation according to mandate decision making according to procedures	not defined, negotiations, compromise, finding a compromise for conflicting positions	according to own interests
Interest of participants in the decision making	homogeneous	homogeneous	heterogeneous	homogeneous

Unit 3: From Data to Action

Unit 3: Objectives

The participants recognise the difference between data, information and indicators. They understand the processing of data into information and indicators, as well as the importance of communication processes

Unit 3: Description of the Procedure

Firstly, the exercise "The Chirezi Epidemic" will be carried out.

After the conclusion of the exercise, the trainer/facilitator will define the terms Data, Information and Communication and present their relations with each other.

Finally, the concept of indicators will be introduced. Examples of indicators, such as GNP and Trade surplus are given and the facilitator proceeds to discuss the following questions with the participants:

Which one is a good indicator?: "The dams still have 60 million m^3." or "The dams are 20% full." Which environmental indicators do you know?

After the definition of indicators, their compilation will be explained and an example of the use of indicators in environmental policy will be given.

Unit 3: Background Information for the Trainer/Facilitator

Objectives of Indicators

The objective of environmental indicators is to communicate information about the environment and about human activities that affect it in ways that highlight emerging problems and draw attention to the effectiveness of current policies. Indicators must tell us, in short, whether things are getting better or worse.

Indicators transform data into information for action. They add quantity and quality aspects and enable decisions. They are tools that, used with wisdom and restraint, can build support for needed change. They create awareness of a problem and inspire the direction, quality and quantity of action. Indicators should be:

• user–driven. Indicators must be useful to their intended audience and convey information that is meaningful to decision makers and in a form they and the public find readily understandable.

• policy–relevant. Indicators must be pertinent to policy concerns, and be easily interpretable in terms of environmental trends or progress toward national policy goals.

• highly–aggregated. Indicators may have many components, but the final indices must be few so that decision makers and the public will not readily absorb them.

Developing Indicators

Two key processes guide the extraction of indicators from their underlying data source: abstraction and summary.

Abstraction filters off unnecessary information by using selected observations as surrogates for the behaviour of entire systems. This is vital in situations in which the subject of study, for instance the integrity of an ecosystem or the impact of an industrial process, is too complex to be described completely. However, there are limits as to how much abstraction can be applied, since natural phenomena do not behave uniformly in either space or time.

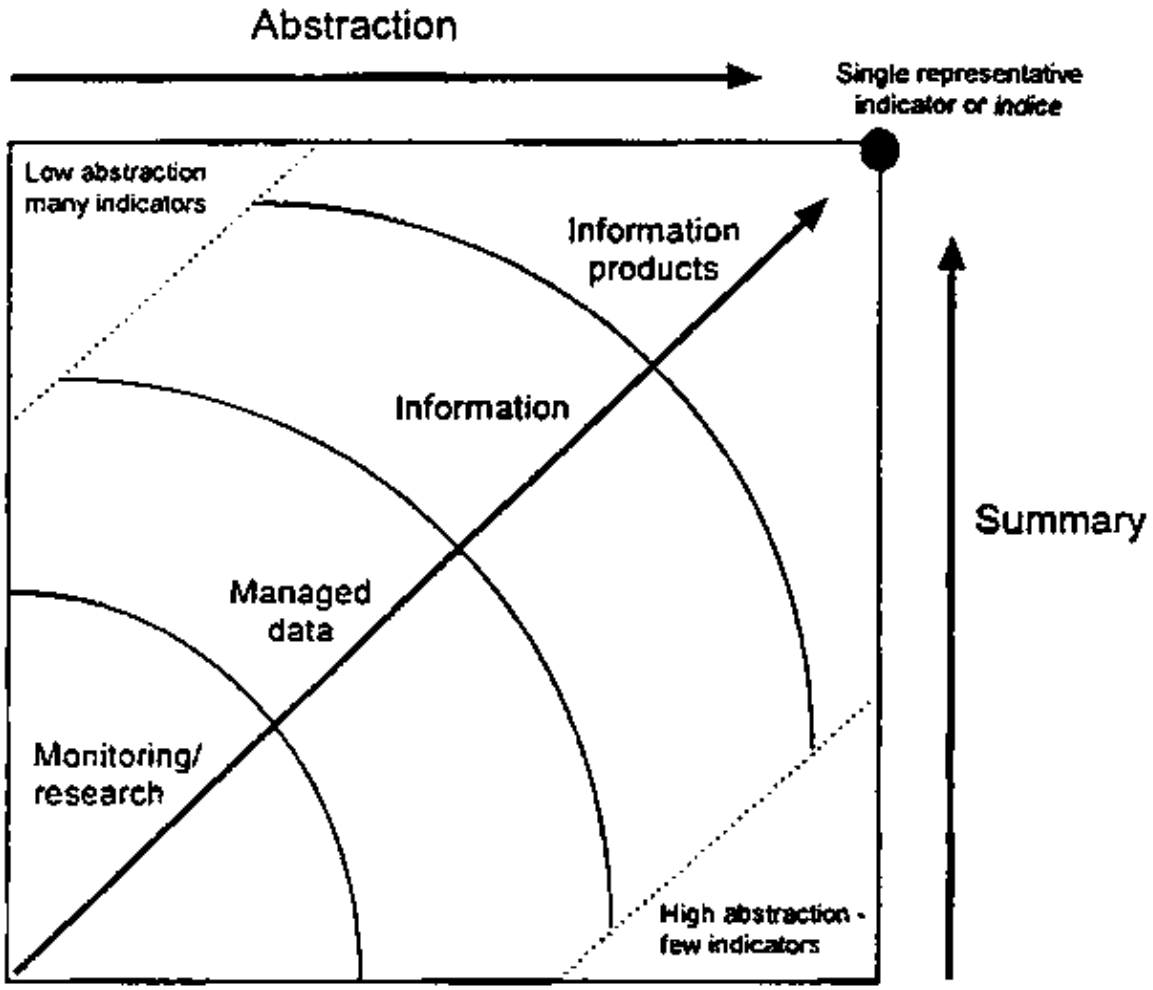


Figure F9–2 Abstraction and Summary in the Process of Developing Indicators

Unnecessary information can also be filtered off by summarising observations in simple ways, such as sums, averages, densities, etc. Environmental data are particularly well suited to spatial summary since, by definition, they originate from different points in the environment. Variations in natural phenomena can therefore be summarised over political, administrative or natural geographical units such as watersheds and eco–climatic zones with relative ease.

Environmental Indicators in the Context of Sustainable Development

Since the United Nations Conference on Environment and Development in 1992, sustainability has become a widely shared goal. Although information can provide an improved basis for decision making and gauging progress, accountability is possible only if goals and measures of progress are explicit. Appropriately formulated indicators can provide such measures.

Sustainability involves – at a minimum – interacting economic, social, and environmental factors. Thus, progress towards sustainability requires directing policy attention to all three. But analysts do not agree on whether existing economic and social indicators – such as GDP, the consumer price index, or the unemployment index – are useful measures of progress towards sustain–able development and so far no consensus has been formed on indicators of sustain–able development, There is also no agreement on a conceptual framework for developing such indicators.

That said, many highly aggregated economic and social indicators have been widely adopted and are frequently reported. But there are virtually no comparable national environmental indicators to help decision makers or the public evaluate environmental trends or assess the effectiveness of national efforts to maintain environmental quality. Consequently, environmental policy issues have often been overlooked at the highest levels of national and international decision making, and virtually nowhere is accountability for environmental decision making as high as it is for economic and social issues.

How Indicators Can Influence Action

In 1990, the World Resources Institute (WRI) published the first estimates of greenhouse gas emissions for all major countries. Although background data were also given, the estimates were presented as an aggregated greenhouse index – an indicator that summed up for each country the overall impact on the atmosphere of its annual emissions of the major greenhouse gases. The estimates attracted widespread press attention and became very controversial, partly because the index allowed users to compare national emissions. Yet, they also helped provoke worldwide debate over the causes of such emissions, such as the combustion of coal, oil, and other fossil fuels and the clearing and burning of tropical forests, inspiring research, and influencing policy actions in several countries. WRI has continued to publish the greenhouse index and to note trends in greenhouse gas emissions and their potential implications for climate change. With the passing of time, the controversy has faded: estimates once fiercely contested now attract no unusual attention. Indeed, countries that have signed the Climate Convention have committed themselves to calculate and report their own emissions. Yet, the controversy and subsequent changes in both received wisdom and public policies illustrate the power of indicators to communicate and to influence public discourse.

Source: World Resource Institute, 1995. Environmental Indicators: A systematic Approach to Measuring and Reporting on Environmental Policy Performance in the Context of Sustainable Development.

Exercise E9–3 “The Chirezi Epidemic”

Information for the Trainer/Facilitator

The purpose of the game

is to confront the participants with a series of practical problems which are related to data and information management. The participants should understand the importance of systematic data management, the linkage of spatial and non–spatial data and the use of indicators.

Directions

The exercise is carried out in groups of ca. 6 participants to form not more than three groups. Each group of participants receives the attached set of documents. To complicate the game, the maps, and/or the sheets carrying the information about the environmental diseases could be cut into pieces.

The time available for the group work is 45 min. Each group has up to ten minutes for the presentation and the remaining time should be used to discuss the results and how the groups have arrived at solving the problem.

Solution

The epidemic is caused by arsenic poisoning from the glass factory (see Warangi Pumping Station water analyses: measurement of As on June 6, 1993).

Exercise E9–3–Handout "The Chirezi Epidemic"

Description of the Situation

The Ministry of Health in country x has reported a serious epidemic outbreak in Chirezi, a town of 55.000 inhabitants, in the Palele district. 2000 people are seriously ill, most of them children under 8 years of age. 10 children are critically ill. The first sick people were reported on Monday 10.06.95 at 11 am. The outbreak reached its peak on Tuesday and has now calmed down. The epidemic remained restricted to the city area of Chirezi. No incidences were observed in the vicinities.

Most of the patients show bloody diarrhoea, vomiting, inflammation of the mouth and oesophagus. The breath and the faeces of the patients have a distinct garlic smell. Since the local hospital has not been able to determine a bacterial or viral cause for the sickness, it is possible that the disease has been caused by an environmental accident.

Tasks

You belong to a task force sent by the Ministry of the Environment to support the local staff. The minister wants to know if an environmental accident is the cause of the epidemic. If so, what and were is the origin? And what can be done to prevent a similar event in future?

Your team has received the available data and starts working now. You have 45 minutes to prepare your findings and conclusions. Please nominate a speaker to present the results to the minister. Please use transparencies or cards on the pinboard for the presentation.

The Industries in the Vicinity of Chirezi

Elephant Breweries

Built 1975. Owner: Elephant Breweries Ltd. Capacity: 1 million hectolitres per year. 250 employees. Factory area: 98 hectares. Conventional sewage plant built 1992. Mostly organic waste, residues of brewing process. Treated water is dumped into Tolewe river. Permit issued 10.02.1993.

Roses Glass Factory

Built 1993. Owner: Roses Glass Enterprises Ltd. Start of production: January 1994.

Products: glass bottles, glasses and ceramics. Biggest glass producer in the country. 500 employees. Factory area: 200 hectares. Own trunk road to Resco Main Road. Sewage plant with chemical unit to bind toxic chemicals from glass processing (e.g. arsenic and cadmium). Constructed 1993. Treated water is dumped into Tolewe river. Permit issued 01.01.1994. Regular inspections. Best tax payer in the district.

Mawena Automotives

Production of batteries and spare parts for trucks. Established 1982. Owner: Mawena and Partners Ltd. 240 employees. Factory area: 200 hectares. Extension is planned for the next year.

Diseases Caused by Environmental Hazards

Diseases can be caused by environmental hazards such as chemical agents, radiation, and physical hazards. The effects of exposure, in both natural and work settings, are greatly influenced by the exposure routes which are primarily air pollution and water pollution, but also contaminated food and direct contact with toxins. Synergistic effects – two or more toxic exposures acting together – are also important, as illustrated by the greatly increased risk of lung cancer in asbestos workers who smoke cigarettes. The potential interaction of a number of hazardous chemicals at toxic waste dumps poses a current public health problem that is of unknown dimensions.

Industrial society has introduced or increased human exposure to thousands of chemicals in the environment. Examples are inorganic materials such as lead (Pb), mercury (Hg), arsenic (As), cadmium (Cd) and asbestos,

and organic substances such as polychlorinated biphenyls (PCBs), vinyl chloride and the pesticide DDT. Of particular concern is the delayed potential of these chemicals to produce cancer, as in the cases of lung cancer and mesothelioma caused by asbestos, liver cancer caused by vinyl chloride, and leukemia caused by benzene. Minamata disease, caused by food contaminated with mercury, and Yusho disease, from food contaminated with chlorinated furans, are examples of acute toxic illnesses occurring in non−occupational settings.

Mercury Poisoning

Mercury is acutely hazardous as a vapour and in the form of its water−soluble salts, which corrode membranes of the body. Chronic mercury poisoning, which occurs when small amounts of the metal or its fat−soluble salts, particularly methylmercury, are repeatedly ingested over long periods of time, causes irreversible brain, liver and kidney damage. Because of increasing water pollution, significant quantities of mercury have been found in some species of fish, which has aroused concern with regard to uncontrolled discharge of the metal into the environment.

Arsenic Poisoning

Arsenic is used in large quantities in the manufacture of glass to eliminate a green colour caused by impurities of iron compounds. A typical charge in a glass furnace contains 0.5 percent of arsenic trioxide. Arsenic is sometimes added to lead to harden it and it is also used in the manufacture of such military poison gases as lewisite and adamsite. Until the introduction of penicillin, arsenic was of great importance in the treatment of syphilis. In other medicinal uses, it is now displaced by sulfa drugs or antibiotics. Lead arsenate, calcium arsenate, and Paris green are used extensively as insecticides. Certain arsenic compounds, such as gallium arsenide (GaAs), are used as semiconductors. GaAs is also used as a laser material. Arsenic disulfide (As_2S_2), also known as red pigment and ruby arsenic, is used as a pigment in the manufacture of fireworks and paints.

Arsenic is poisonous in doses larger than 65 milligrams, and the poisoning can arise from a single large dose or from repeated small doses, which could be, for example, the drinking of polluted water, inhalation of arsenical gases or dust. On the other hand, some persons, notably the so−called “arsenic eaters” of the mountains of southern Austria, have found that arsenic has a tonic effect and have built up a tolerance to it, so that they can ingest each day an amount that would normally be a fatal dose. This tolerance, however, would not protect them against the same amount of arsenic administered hypodermically.

A reliable test that can detect the presence of minute amounts of arsenic is often important because arsenic is a violent poison which is widely used and therefore is a frequent contaminant. The Marsh test, named for its inventor, the English chemist James Marsh, supplies a simple method for detecting traces of arsenic so minute that they would escape discovery in ordinary analysis. The substance to be tested is placed in a hydrogen generator and any arsenic present is converted to arsine, (AsH_3), which mixes with the evolved hydrogen. If the stream of hydrogen is heated as it passes through a glass tube, the arsine decomposes, and metallic arsenic is deposited in the tube. Minute amounts cause an appreciable stain; as little as 0.1 mg (0.000003 oz) of arsenic or antimony can be detected by using the Marsh test.

Lead Poisoning

Lead is used in enormous quantities in storage batteries and in the sheathing of electric cables. Large quantities are used in industry for lining pipes, tanks and X−ray apparatus. Because of its high density and nuclear properties, lead is used extensively as protective shielding for radioactive material. Among numerous alloys containing a high percentage of lead are solder, type metal and various bearing metals. A considerable amount of lead is processed in the form of its compounds, particularly in paints and pigments.

Lead taken internally in any of its forms is highly toxic; the effects are usually felt after it has accumulated in the body over a period of time. The symptoms of lead poisoning are anaemia, weakness, constipation, colic, palsy and often a paralysis of the wrists and ankles. Flaking lead−based paints and toys made from lead compounds are considered serious hazards for children. Children are especially at hazard from lead, even at levels once thought safe. Lead can reduce intelligence, delay motoric development, impair memory, and cause hearing problems and troubles in balance. In adults, one lead hazard which occurs at levels once thought safe is that of increased blood pressure. Present−day treatment of lead poisoning includes the administration of calcium disodium ethylenedia−minetetraacidic acid, or EDTA, a chelating agent. Lead is removed from the body by displacing the calcium in EDTA and forming a stable complex that is excreted in the urine.

Cadmium

Cadmium may be electrolytically deposited as a coating on metals, chiefly iron or steel, on which it forms a chemically resistant coating. Cadmium lowers the melting point of metals with which it is alloyed; it is used with lead, tin and bismuth in the manufacture of fusible metals for automatic sprinkler systems, fire alarms and electric fuses. An alloy of cadmium with lead and zinc is used as a solder for iron. Cadmium salts are used in photography and in the manufacture of fireworks, rubber, fluorescent paints, glass and porcelain. Cadmium has been used as a control or shielding material in atomic energy plants because of its high absorption of low−energy neutrons. Cadmium sulfide is employed in a type of photovoltaic cell, and nickel−cadmium batteries are in common use for specialised purposes.

Cadmium sulfate ($3CdSO_4 \cdot 8H_2O$) is used as an astringent. Cadmium sulfide (CdS), formed as a bright yellow precipitate when hydrogen sulfide is passed through a solution of cadmium salt, is an important pigment known as cadmium yellow. The selenide CdSe is also used as a pigment. Cadmium and solutions of its compounds are highly toxic, with cumulative effects similar to those of mercury poisoning.

Cholera

is a severe infectious disease endemic in India and some other tropical countries and occasionally spreading to temperate climates. The symptoms of cholera are diarrhoea and the loss of water and salts in the stool. In severe cholera, the patient develops violent diarrhoea with characteristic “rice−water stools” vomiting, thirst, muscle cramps and sometimes circulatory collapse. Death can occur as quickly as a few hours after the onset of symptoms. The mortality rate is more than 50 percent in untreated cases, but falls to less than 1 percent with proper treatment.

The causative agent of cholera is the bacterium Vibrio cholerae, which was discovered in 1883 by the German physician and bacteriologist Robert Koch, Virtually the only means by which a person can become infected is from food or water contaminated by bacteria from the stools of cholera patients. Prevention of the disease is therefore a matter of sanitation. Cholera epidemics swept through Europe and the United States in the 19th century but did not recur in those areas after improvement of the water supply.

Control of the disease is still a major medical problem in several Asian countries. The World Health Organization (WHO) estimates that 78 percent of the population in less developed countries is without clean water and 85 percent without adequate faecal waste disposal. Epidemics of cholera occurred in 1953 in Calcutta, India; between 1964 and 1967 in South Vietnam; among Bangladeshi refugees fleeing to India during the civil war of 1971; and in Peru in 1991. The 1971 outbreak killed about 6500 persons. Treatment consists mainly of intravenous or oral replacement of fluids and salts. Packets for dilution containing the correct mixture of sodium, potassium, chloride, bicarbonate and glucose have been made widely available by the WHO. Most patients recover in three to six days. Antibiotics such as tetracyclines, ampicillin, chloramphenicol, and trimethoprim−sulfame−thoxazole can shorten the duration of the disease.

A vaccine made from killed bacteria is commercially available and offers partial protection for a period of three to six months after immunisation. Experimental studies have shown that the cholera bacterium produces a toxin that causes the small intestine to secrete large amounts of fluid, which leads to the fluid loss characteristic of the disease. This has led to work on a vaccine containing inactivated toxin. Attempts are also being made to develop a vaccine containing live bacteria that have been altered so that they do not produce the toxin.

Cadmium Poisoning

Cadmium salts and oxides are very irritating to the respiratory and gastrointestinal tracts. Inhaled cadmium dust or fume has caused pulmonary oedema and pneumonitis, sometimes fatal. Head−ache, persistent cough, productive of copious frothy and sometimes bloody sputum is accompanied by laboured breathing and chest pain. Fever may follow. Symptoms may persist for weeks. Ingested cadmium causes nausea, vomiting, diarrhoea, abdominal pain and tenesmus.

Relatively small inhaled and ingested doses produce serious symptoms. Protracted absorption of cadmium has led to renal damage (proteinuria and azotemia), anaemia, liver injury (jaundice) and defective bone structure (pathologic fractures) in chronically exposed persons.

Symptoms and Signs of Poisoning by Solid Arsenicals

Manifestations of acute poisoning (large amount absorbed over a short time) are distinguishable from those of chronic poisoning (lesser doses absorbed over a longer time interval).

The symptoms and signs of Acute Arsenic Poisoning usually appear within one hour of ingestion, but may be delayed several hours. Garlic odour of the breath and faeces may help to identify the responsible toxicant in a severely poisoned patient. Gastrointestinal effects include inflammation of the mouth, pharynx, and oesophagus, burning abdominal pain, thirst, vomiting and ricewater or bloody diarrhoea. These effects result from the action of an arsenical metabolite on blood vessels generally, but the splanchnic vasculature particularly, causing dilation and increased capillary permeability. Renal injury is manifest as proteinuria, hematuria, glycosuria, oliguria, casts in the urine, and, in severe poisoning, acute tubular necrosis. Central nervous system effects include headache, dizziness, muscle weakness and spasms, hypothermia, lethargy, delirium, coma and convulsions. Cardiovascular manifestations include shock, cyanosis, and cardiac arrhythmias, which are due to direct toxic action and electrolyte disturbances. Liver damage may lead to increased concentrations of circulating hepatocellular enzymes and to jaundice. Injury to blood–forming tissues may cause anaemia, leukopenia, and thrombocytopenia. Death usually occurs one to three days following symptom onset and is usually the result of circulatory failure.

Chronic Arsenic Poisoning from repeated absorption of toxic amounts generally has an insidious onset of clinical effects and may be difficult to diagnose. Dermal manifestations are usually more prominent than the gastrointestinal effects which characterise acute poisoning: hyperkeratosis, hyperpigmentation, exfoliative dermatitis, subcutaneous oedema of the face, eyelids, and ankles, white striations across the nails (Mees lines), and sometimes loss of nails or hair. Stomatitis, anorexia, and weight loss are typical. Peripheral neuropathy (paresthesia, pain, anesthesia, paresis, ataxia) may be a prominent feature. Liver injury reflected in hepatomegaly and jaundice may progress to cirrhosis, portal hypertension, and ascites. Nephropathy is indicated principally by proteinuria. Electrocardiographic abnormalities and peripheral vascular disease have been reported. Anaemia, leukopenia, and thrombocytopenia are characteristic. Late sequelae of protracted high intakes of arsenic include skin cancer, an increased risk of lung cancer, and, rarely, encephalopathy (ophthalmoplegia, chronic headache, speech and mental disturbances).

Lead Poisoning

What is lead poisoning? Lead is a neurotoxic metallic element that can be absorbed by the body, primarily through the lungs and the stomach. Lead poisoning occurs only when too much lead accumulates in the body. Generally, lead poisoning occurs slowly, resulting from the gradual accumulation of lead in the bone and tissue after repeated exposures. However, it is important to note that young children absorb 50% of a lead ingestion, while adults absorb only 10%.

Why is lead poisoning dangerous? Left untreated, lead poisoning can damage many internal organs, including the kidney, nervous system and brain. Because of the possibility of permanent impairment, lead poisoning is particularly dangerous during the critical development periods of infants and young children under seven.

Water Analysis “Warangi Pumping Station” (Automatic analysis)

All values in Milligrams per Liter

Date	Ca	Mg	Na	K	Fe	Pb	Se	As	Cd	HCO3	SO4	CL	NO3
25.04.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
26.04.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,001	0,003	29,22	75,96	119,2	1,99
27.04.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	0,015	0,002	28,72	76,85	130,8	2,03
28.04.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
29.04.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	0,015	0,002	28,72	76,85	130,8	2,03
30.04.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
01.05.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,001	0,003	29,22	75,96	119,2	1,99
02.05.95	86,01	2,99	2,96	0,069	24,67	0,021	0,003	0,021	0,003	24,25	71,36	156,2	2,09
03.05.95	82,25	3,5	3,12	0,062	21,23	0,0018	0,001	0,0015	0,001	22,61	75,96	119,2	2,21

04.05.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
05.05.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,001	0,003	29,22	75,96	119,2	1,99
06.05.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	0,015	0,002	28,72	76,85	130,8	2,03
07.05.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
08.05.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	0,015	0,002	28,72	76,85	130,8	2,03
09.05.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
10.05.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,001	0,003	29,22	75,96	119,2	1,99
11.05.95	86,01	2,99	2,96	0,069	24,67	0,021	0,003	0,021	0,003	24,25	71,36	156,2	2,09
12.05.95	82,25	3,5	3,12	0,062	21,23	0,0018	0,001	0,0015	0,001	22,61	75,96	119,2	2,21
13.05.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
14.05.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,001	0,003	29,22	75,96	119,2	1,99
15.05.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	0,015	0,002	28,72	76,85	130,8	2,03
16.05.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
17.05.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
18.05.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,001	0,003	29,22	75,96	119,2	1,99
19.05.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	0,015	0,002	28,72	76,85	130,8	2,03
20.05.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
21.05.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	0,015	0,002	28,72	76,85	130,8	2,03
22.05.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
23.05.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,001	0,003	29,22	75,96	119,2	1,99
24.05.95	86,01	2,99	2,96	0,069	24,67	0,021	0,003	0,021	0,003	24,25	71,36	156,2	2,09
25.05.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,562	0,001	25,25	76,26	110	2,01
26.05.95	61,23	3,01	2,95	0,062	21,23	0,019	0,005	0,001	0,003	29,22	75,96	119,2	1,99
27.05.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	0,015	0,002	28,72	76,85	130,8	2,03
28.05.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
29.05.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	0,015	0,002	28,72	76,85	130,6	2,03
30.05.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,015	0,001	25,25	76,26	110	2,01
31.05.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,0015	0,003	29,22	75,96	119,2	1,99
01.06.95	86,01	2,99	2,96	0,069	24,67	0,021	0,003	0,001	0,003	24,25	71,36	156,2	2,09
02.06.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	0,015	0,002	28,72	76,85	130,8	2,03
03.06.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
04.06.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,015	0,003	29,22	75,96	119,2	1,99
05.06.95	86,01	2,99	2,96	0,069	24,67	0,021	0,003	0,0015	0,003	24,25	71,36	156,2	2,09
06.06.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,001	0,001	25,25	76,26	110	2,01
07.06.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,021	0,003	29,22	75,96	119,2	1,99
08.06.95	86,01	2,99	2,96	0,069	24,67	0,021	0,003	0,038	0,003	24,25	71,36	156,2	2,09

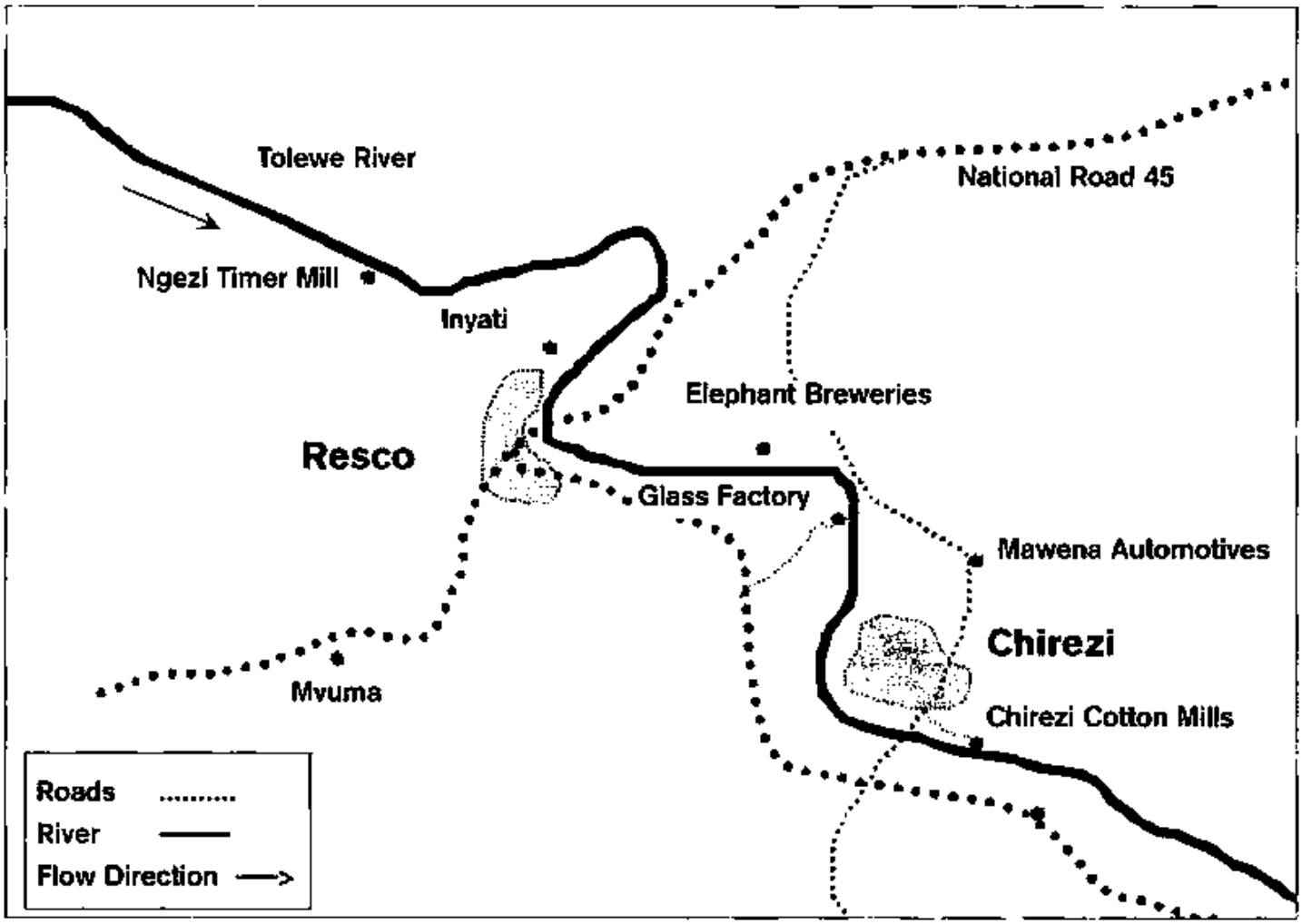
09.06.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	51,652	0,002	28,72	76,85	130,8	2,03
10.06.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
11.06.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,015	0,003	29,22	75,96	119,2	1,99
12.06.95	86,01	2,99	2,96	0,069	24,67	0,021	0,003	0,0015	0,003	24,25	71,36	156,2	2,09
13.06.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,001	0,001	25,25	76,26	110	2,01

Water Quality Analysis "Resco Purification Station"

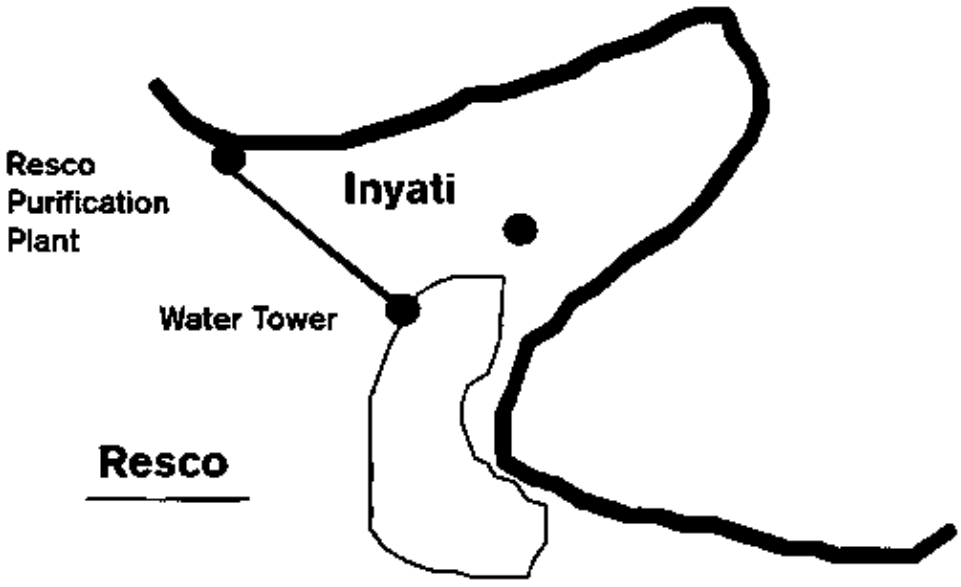
All values in Milligrams per Liter

Date	Ca	Mg	Na	K	Fe	Pb	Se	As	Cd	HCO3	SO4	CL	NO3
04.03.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
06.03.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,001	0,003	29,22	75,96	119,2	1,99
08.03.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	0,015	0,002	28,72	76,85	130,8	2,03
10.03.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
12.03.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	0,015	0,002	28,72	76,85	130,8	2,03
14.03.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
16.03.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,001	0,003	29,22	75,96	119,2	1,99
18.03.95	86,01	2,99	2,96	0,069	24,67	0,021	0,003	0,021	0,003	24,25	71,36	156,2	2,09
20.03.95	82,25	3,5	3,12	0,062	21,23	0,0018	0,001	0,0015	0,001	22,61	75,96	119,2	2,21
22.03.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
24.03.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,001	0,003	29,22	75,96	119,2	1,99
26.03.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	0,015	0,002	28,72	76,85	130,8	2,03
28.03.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
30.03.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	0,015	0,002	28,72	76,65	130,8	2,03
01.04.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
03.04.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,001	0,003	29,22	75,96	119,2	1,99
05.04.95	86,01	2,99	2,96	0,069	24,67	0,021	0,003	0,021	0,003	24,25	71,36	156,2	2,09
07.04.95	82,25	3,5	3,12	0,062	21,23	0,0018	0,001	0,0015	0,001	22,61	75,96	119,2	2,21
09.04.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
11.04.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,001	0,003	29,22	75,96	119,2	1,99
13.04.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	0,015	0,002	28,72	76,85	130,8	2,03
15.04.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
17.04.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
19.04.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,001	0,003	29,22	75,96	119,2	1,99
21.04.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	0,015	0,002	28,72	76,85	130,8	2,03
23.04.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
25.04.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	0,015	0,002	28,72	76,85	130,8	2,03

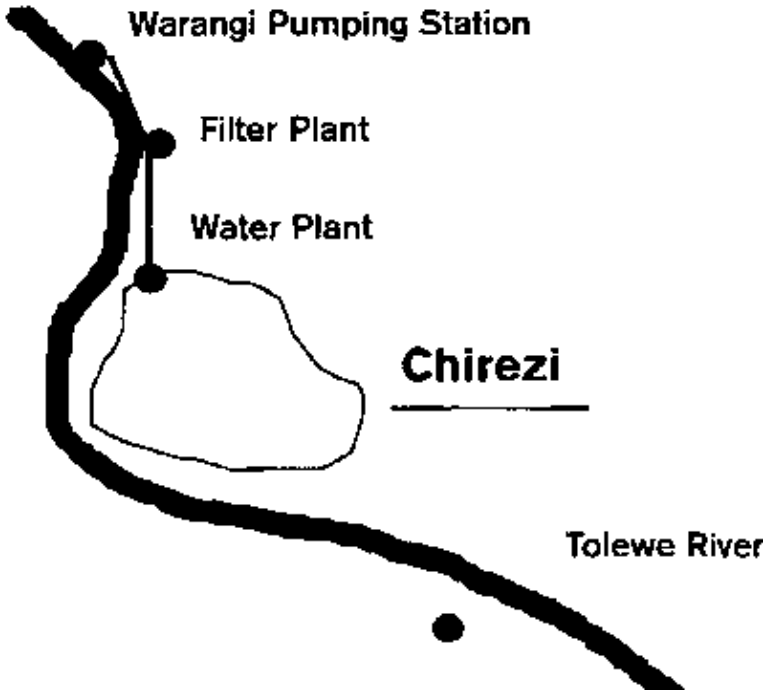
27.04.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
29.04.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,001	0,003	29,22	75,96	119,2	1,99
01.05.95	86,01	2,99	2,96	0,069	24,67	0,021	0,003	0,021	0,003	24,25	71,36	156,2	2,09
03.05.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,019	0,001	25,25	76,26	110	2,01
05.05.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,001	0,003	29,22	75,96	119,2	1,99
07.05.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	0,015	0,002	28,72	76,65	130,8	2,03
09.05.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
11.05.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	0,0015	0,002	28,72	76,85	130,8	2,03
13.05.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,015	0,001	25,25	76,26	110	2,01
15.05.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,0015	0,003	29,22	75,96	119,2	1,99
17.05.95	86,01	2,99	2,96	0,069	24,67	0,021	0,003	0,001	0,003	24,25	71,36	156,2	2,09
19.05.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	0,021	0,002	28,72	76,85	130,8	2,03
21.05.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01
23.05.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,0015	0,003	29,22	75,96	119,2	1,99
25.05.95	86,01	2,99	2,96	0,069	24,67	0,021	0,003	0,001	0,003	24,25	71,36	156,2	2,09
27.05.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,015	0,001	25,25	76,26	110	2,01
29.05.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,0015	0,003	29,22	75,96	119,2	1,99
31.05.95	86,01	2,99	2,96	0,069	24,67	0,021	0,003	0,0015	0,003	24,25	71,36	156,2	2,09
02.06.95	85,37	3,2	3,03	0,062	26,81	0,002	0,001	0,001	0,002	28,72	76,85	130,8	2,03
04.06.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,015	0,001	25,25	76,26	110	2,01
06.06.95	81,23	3,01	2,95	0,062	21,23	0,019	0,005	0,0015	0,003	29,22	75,96	119,2	1,99
08.06.95	86,01	2,99	2,96	0,069	24,67	0,021	0,003	0,015	0,003	24,25	71,36	156,2	2,09
10.06.95	82,25	3,5	3,06	0,072	25,23	0,0018	0,001	0,0015	0,001	25,25	76,26	110	2,01



Resco Area Map



Resco Water Supply System



Chirezi Water Supply System

Transparency T9–4 Defining Data, Information, Communication and Indicators

Defining: Data

- Data are **facts** that result from measurements or observations about the world
- Data describe the **traits** of objects, **relationships** between objects, **events** and **processes** of the real world

Defining: Information

- Information is **processed data**
- Information is **data that have been interpreted** to facilitate understanding
- Information is **knowledge** about the historical, present and future conditions and processes of the real world which determines action
- Information is **knowledge** about facts, processes and events **transmitted by a communication process**

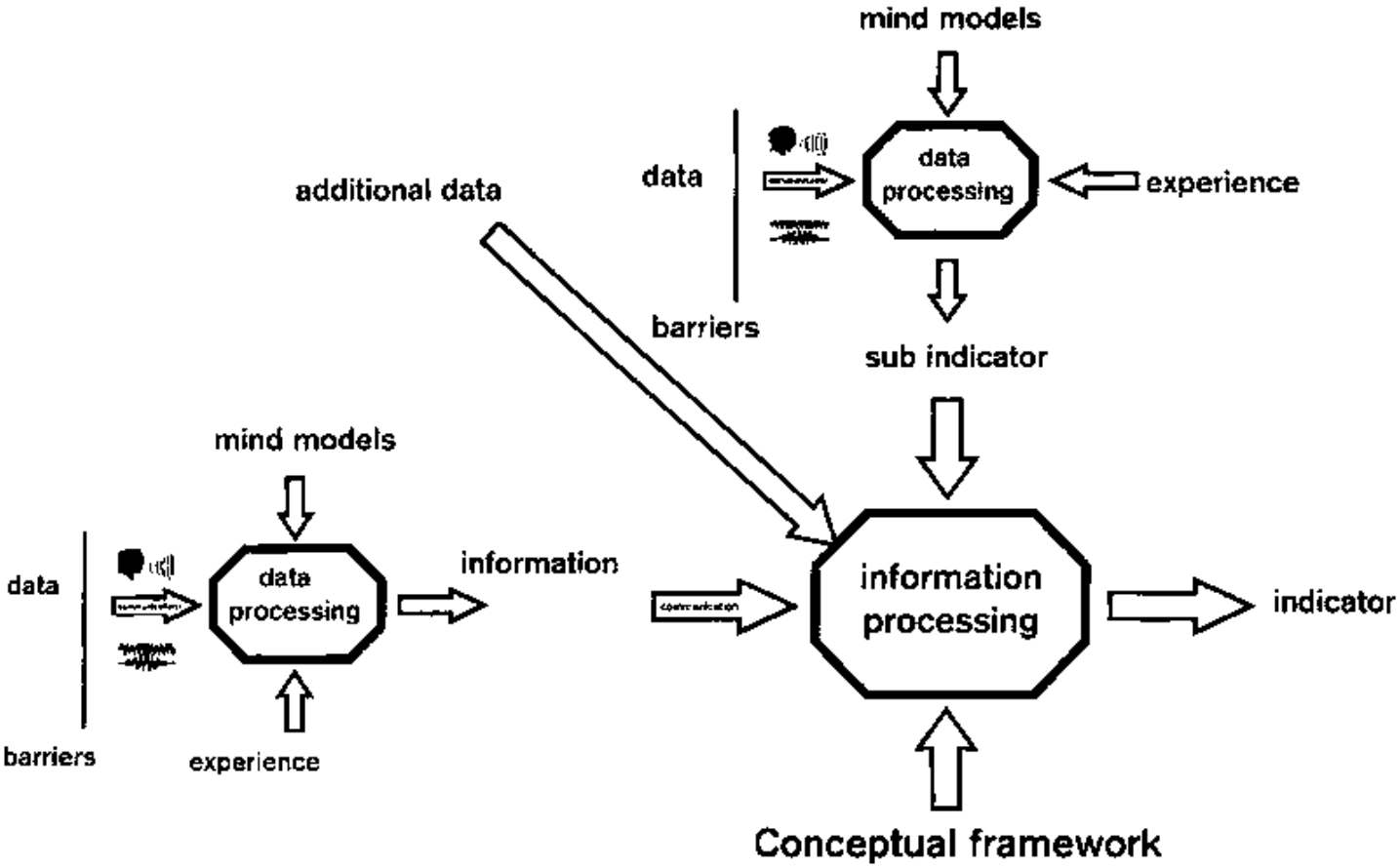
– knowledge is always based upon own experience
– learning is possible through own experience or communication
– information replaces the learning process

Defining: Communication

Communication is the act of imparting, conferring or delivering **knowledge, opinion** or **facts** from one to another

Defining Indicators

As commonly understood, an indicator is something that provides a clue to a matter of larger significance or makes perceptible a trend or phenomenon **that is not immediately detectable** (e.g. a drop in barometric pressure may signal a coming storm). Thus, the significance of an indicator extends beyond what is actually measured to larger phenomena of interest.



Transparency T9–5 Compilation of an Indicator

Unit 4: What is an Environmental Information System?

Unit 4: Objectives

The participants recognise the principle, components and traits of an environmental information system. They understand the necessity of systematic information management.

Unit 4: Description of the Procedure

The trainer/facilitator presents an introduction to Environmental Information Systems. Firstly, the question “Is there a need for an information system?” will be discussed in the plenary. The basis for the discussion is the Handout 9 – 6 which will be handed out to the participants.

The trainer/facilitator proceeds to define “Information Systems” and “Environmental Information Systems”, and the need for information sharing.

Unit 4: Background Information for the Trainer/Facilitator

Is there a need for an information system?

An information system is created to satisfy a user's need for information that is more specific, summarised and relevant to the decisions that need to be made than the information normally produced in an organisation. The information has to be available soon enough to be of value in the decision–making process (e.g. indicators).

What is an information system?

An Information System (IS) is a system of people, resources and procedures that produces and distributes information to relevant organisational members in a rapid, comprehensive, accurate and cost–effective way.

An information system is an organised set of people, processes, data, and tools for the cost–effective transformation of data into information (products).

An information system is the part of an organisation that is responsible for the management of the organisation's information resources – all of its collective knowledge (institutional memory) – and for the system that makes use of it. Information is understood as a corporate resource (systematic information management).

What is an Environmental Information System (EIS)?

An Environmental Information System (EIS) is a system of people, resources and procedures that produces and distributes cost–effective environmental information products for potential users in a rapid, comprehensive and accurate way.

An Environmental Information System (EIS) is an expanded geographic information system for storing, processing and presenting spatial, temporal and subject–related data in order to describe the state of the environment with regard to options, burdens and hazards which form the basis for environmental management and protection measures.

The functions of information systems are to: **collect – store – retrieve – process data; present information.**

The need for information sharing

Historically, the combination of an organisation's structure and operations have resulted in the fragmentation of tasks of work projects into individual tasks and growing powerlessness among manual and clerical workers. In contrast, such fragmentation of tasks tends to increase the power of knowledge of workers and their organisations, since they often control information that is unique and indispensable.

Scientific management promotes the subdivision of tasks within individual organisations, bureaucracy tends to subdivide tasks and delegate them to separate organisations or separate departments. (There are two reasons for the development of specialised bureaucracies: expertise and client groups. As increasingly specialised client groups come to light, new organisations arise.) The subdivision of tasks and the development of increasingly specialised bureaucracies has as one of its consequences the fragmentation of data (ownership of data). Therefore, the achievement of new or larger tasks requires data from several institutions.

A special challenge arises when producing information to address environmental concerns. The information needed to support policy and practices in this area is multi–disciplinary in nature, even when confined to a single sector such as forestry or agriculture, and may be required on a diverse and variable set of topics. It is inevitable, therefore, that the underlying datasets will be scattered amongst many organisations and sources, making the task of integration especially time–consuming.

Potential benefits of information sharing include: cost savings, time savings, reduction of redundancies, less duplication of efforts, improved co–ordination, between organisations, decreased redundancies, improved data quality, better awareness and better use of existing expertise.

Transparency T9–6 National Environmental Action Plans and Information: Example NEAP Zambia

In 1992 the Zambian government decided to review and update the environmental policy through the development of the National Environmental Action Plan (NEAP). There was a need to review existing policies with the intention of ensuring the sustainable use of natural resources within a coherent environmental management strategy. Such strategy would aim at maintaining ecosystems, essential ecological processes and the biological diversity of the country. The NEAP is founded on three fundamental principles:

- The right of citizens to a clean and healthy environment.

• Local community and private sector participation in natural resources management.

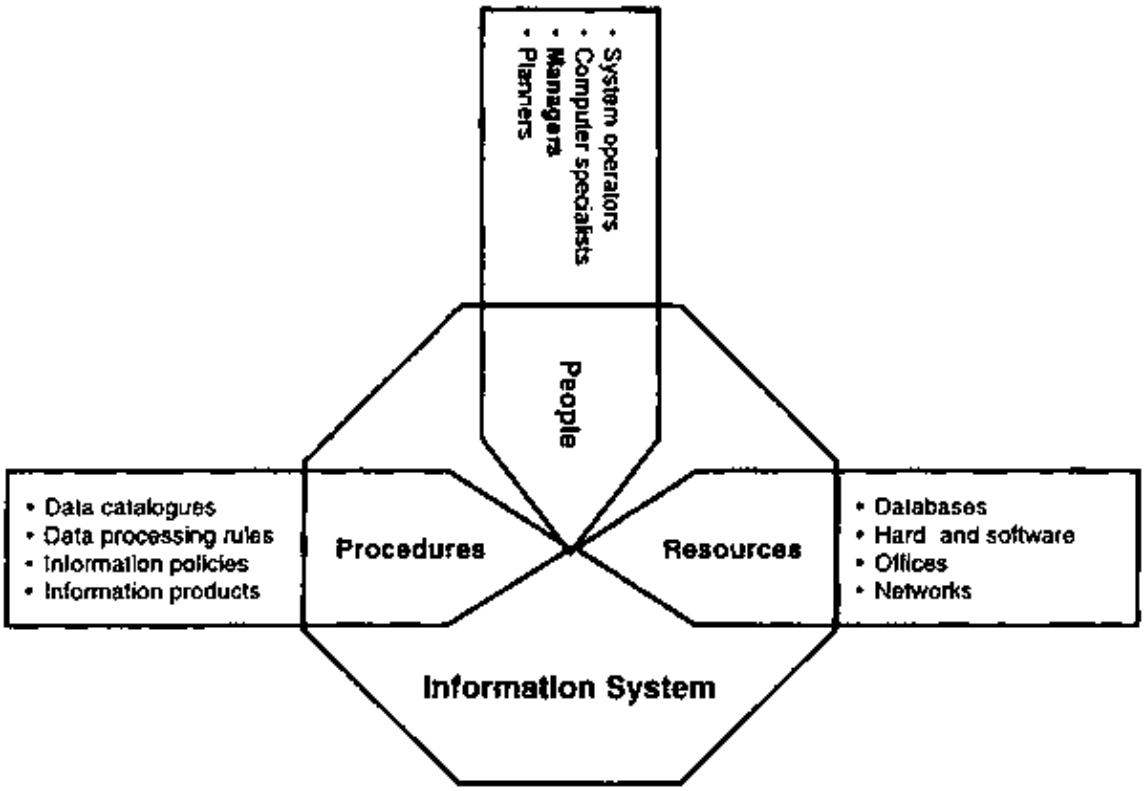
• Obligatory Environmental Impact Assessments (EIA) of major development projects in all sectors.

The overall objective of the NEAP is to integrate environmental concerns into the social and economic development planning processes of the country. It seeks to internalise environmental management objectives in the economic and social activities of all major sectors of the economy. The NEAP process has defined the scope of the main environmental problems Zambia faces and the legislative and institutional framework which deals with them and their inadequacies.

Based on potential social and economic costs, the NEAP document prepared in 1994 identified the following as the most critical areas of environmental concern in Zambia: deforestation, water pollution and inadequate sanitation, soil degradation, air pollution in the copper mining towns and wildlife depletion (fish and game).

Reliable information as to the exact extent and degree of such environmental problems is critical in order to identify opportunities for intervention and constraints that may affect sustainability. Effective management of natural resources requires sustained efforts to survey and monitor the qualitative and quantitative characteristics of the resource base. Natural resources managers need information about resource distribution, abundance, their rate of exploitation, and how development activities affect them.

Alas, key multi–disciplinary data and information necessary to address environmental issues are often scanty or even unavailable and, where they exist, often incomplete, outdated, inaccurate or fragmented amongst and within various institutions. The absence of a reliable information base hampers the sound, well–informed and timely decision–making needed for appropriate intervention and mitigation. Thus, there is an urgent need to develop reliable information systems to provide timely data and information at various levels.



Transparency T9–7 Components of an Information System

Unit 5: Sharing Environmental Information

Unit 5: Objectives

The participants recognise the principle, components and traits of an environmental information system. They understand the necessity of systematic information management.

Unit 5: Description of the Procedure

The trainer/facilitator presents the reasons for the reluctance of institutions to share information and discusses in the plenary the question: “What are typical signs of resistance to chance in general and especially to a change to information technology in organisations or institutions?”

This is followed by a presentation on which types of information should be shared.

The unit is concluded by the exercise to compare concepts of environmental information networks. After the presentation of the group work, the trainer/facilitator will compare the two presented networks (see below) and will introduce the managed network as a positive combination of the two original networks.

Remarks to the networks presented in the worksheet:

Centralised data management is efficient in situations where partners work within a single operation, so that individual feelings of data ownership are subsumed by corporate objectives. It is also useful in situations where, for security reasons, data must be managed under tightly controlled conditions (e.g. in a bank). Finally, it is the only practical way forward in cases where individual partners do not have the capacity to manage data themselves.

A central unit may be perceived as controlling access to data and information products by custodians. Under such conditions it may be difficult, even impossible, to establish a 'co−operative' spirit since, quite correctly, partners expect to retain full rights and responsibilities over their data.

With fully−distributed networks, however, partners are not co−ordinated or provided with direction, resulting in duplication of effort, lack of agreed standards, waste of resources and generally impeded progress towards common information objectives.

The weaknesses of both approaches can be rectified through the formation of a hybrid, or **managed network,** which allows free communication between partners and provides co−ordination and other network−wide services through a “hub” (see Transparency 8).

Unit 5: Background Information for the Trainer/Facilitator

Why are organisations reluctant to share their information?

Fear of loosing power

The source of a bureaucrat's or institution's power is their professionalism and ability to guard their expertise from outsiders. Whoever possesses information needed for the completion of a task is valuable. As long as an organisation maintains control of valuable information, it can remain dominant and protect, or even improve, its professional position. Should the organisation lose control, or should the information lose its value, the position of the organisation will weaken.

Respect of property rights and investments in information

Many groups possess knowledge of a cultural, economic or scientific nature which is of great value to the conservation and sustain−able use of biological resources. This may have been built up over many years or generations and represent a significant investment in terms of time, money and intellectual effort. It is not surprising that there are fears that intellectual property will be diluted, misrepresented, or otherwise used to the disadvantage of its owner when shared. This leads to the erection of unnecessary barriers to information sharing. Sometimes such beliefs are well founded, for instance in the case of owners of indigenous knowledge who are fearful of exploitation by drug companies; owners of scientific knowledge, particularly those whose careers depend on publications, who fear plagiarism or lack of acknowledgement; and owners of technological knowledge who fear infringement of patents, copyright and other forms of know−how.

Unclear objectives of information sharing

Owners of all types of information may feel uncomfortable about sharing their investment until they are assured of why it is needed and how it will be used. Given that access to information is a vital part of most people's everyday work (whether this is from other parts of the same organisation or from external individuals, organisations or sources), efficient procedures for information sharing are essential to productivity.

Technical obstacles

In many cases, the lack of standards for file formats, transfer standards and thematic classification constitutes a serious barrier to information sharing. Onerous physical procedures for retrieving, compiling, editing or copying as well as incomplete databases further complicate the issue.

Administrative obstacles

Lack of administrative procedures for information sharing such as memoranda of understanding, corporate data exchange policies, scarcity of funds to process the request (e.g. staff time, cost of media), or organisational cultures hostile to information sharing constitute major obstacles.

Lack of awareness of benefits of information sharing

In general, there is a lack of awareness of the benefits of information sharing, allowing the potential disadvantages, including fears about loss of intellectual property, to dominate. Potential benefits include:

- cost and time savings
- less duplication of efforts
- decreased redundancies
- increased awareness of issues
- reduction of redundancies
- improved co−ordination between organisations
- improved data quality
- better use of existing expertise

Resistance to change

To people at work, new technology can spell all kinds of trouble. It can mean loss of jobs, disruption to known procedures, the need to learn new skills, or the further dehumanisation of the work itself. New technology means change and change means uncertainty. An unknown future, which can be dangerous, disadvantageous and difficult, is usually seen as a threat.

A particular change may, of course, be none of these things. It may bring a better quality of working life, the opportunity to become more proficient, etc., but the most common reaction is to expect the worst. The phrase 'resistance to change' implies a blind, irrational negative response to a potential change.

Bureaucracies have an additional general inertia against changes which is due to the use of general operating procedures in the organisation which tends to predispose the organisation to continue past practices and the role of professionalism and professional training which also determines the way work is carried out. That is, in bureaucracies, the following pattern are often found:

- outdated information
- resistance to share information
- resistance to change in general
- resistance to information technology.

Resistance to a change to information technology (IT) is documented widely and failure rates are high when it is implemented. It is useful to identify three reasons for failure:

Organisational mismatch. The IT system may serve no useful purpose in the organisation or may not match the way the organisation functions.

User acceptability. The IT system may have real or suspected negative implications for significant user groups and they may mount opposition to it. Resistance may be organised and explicit but more often it is covert, consisting of various forms of non−co−operation.

Non−usability. Users may be willing to use the IT system but in practice may encounter difficulties. It may be inaccurate, unreliable, difficult to understand and difficult to operate. As a consequence they may give up and resort to tried and trusted methods.

What information should be shared?

Policy development or refinement of policies where these already exist, are key justifications for generating environmental information. The first step in developing suitable information is to agree what these issues are and, having achieved this, to decide which of them have the highest priority.

Most issues demanding information result from direct physical, chemical or biological pressures exerted on the environment by human activities. They vary tremendously across the world, depending on the history, culture, trade, politics, climate, and geographic composition of the locations concerned so that stakeholders may attribute different priorities to such issues according to local perceptions of importance.

Priorities also change over time: they arise, come to the attention of specific decision−making groups, and then disappear − perhaps to resurface later in a different form. The key challenge in producing environmental information is to understand not only what information is needed, but also when, how and to whom it should be delivered to achieve the greatest impact.

Recognising that each country will respond uniquely to the challenge of producing environmental information, a flexible, process−oriented approach is proposed. This breaks down information objectives into a series of small, achievable steps which progressively empower stakeholders. This is illustrated by the information cycle.

The Information Cycle

It consists of five distinct processes. One process **'agree on issues'** (1) should−be undertaken before the others since it establishes overall goals. The remaining four processes are **'determine information needs'** (2), **'design products'** (3), **'agree on stakeholders roles'** (4), **and 'enable stakeholders'** (5) and cover the activities necessary to produce cost−effective information on the agreed issues. Individual components of the results may be revisited as policies evolve and information needs are refined.

(1) What are the priority issues demanding information

Recognising that resources for information management are limited, this process aims to secure agreement on those issues which most urgently require information in the interests of conservation and sustainable use of biological resources. Large and complex issues, such as 'poverty', 'population growth' or 'deforestation' should be avoided. While undeniably important, they are just too broad to be addressed effectively. More focused issues such as 'drainage of wetland X for agriculture' or 'effect of pollution of river Y on species Z' are more tractable.

A high degree of consultation is required during the agreement process, since stakeholders may have widely differing views on priorities. Reconciling different viewpoints by negotiating a consensus on priority issues can help build ties between stakeholders and facilitate co−operation.

(2) Determination of the information needs of decision−making groups

The key to effective use of for instance biodiversity information is to focus only on essential information. In situations where financial resources are scarce this is, inevitably, the information required to set and achieve immediate policy and management goals. However, solutions to biodiversity issues are notoriously complex and it is not always easy to determine what information is essential. One approach is to ask decision makers to articulate their needs directly, but this may not succeed if they have only a hazy idea of their requirements. The price for not pursuing this challenge is heavy: without the 'right' information, incorrect decisions can be made and scarce resources used unwisely. A thorough assessment of information needs is therefore a critical initial step.

(3) The design of strategic information products

Information products provide support to decision−makers by addressing the constraints they face on using information. Information products can consist of summaries of complex data sets with indications of the most pertinent information.

(4) Agreement on stakeholder roles and responsibilities for information production

Recognising that the development of biodiversity information is a multi−stakeholder, multi−disciplinary activity, an efficient mechanism for co−ordinating stakeholder contributions is vital. One way of achieving this is to establish a high−level body of stakeholder representatives (e.g. a Steering Committee), charged with forming and managing technical teams to deliver its objectives. This two−tier structure breaks down barriers to cooperation by facilitating communication at both organisational and technical levels.

(5) Stakeholders should be enabled to deliver the required information

Stakeholders may be unable to fulfil their agreed roles due to constraints in human or technological resources, funding, or co−ordination with other stakeholders. This is particularly true when stakeholders are collaborating on information production for the first time and joint operational procedures have yet to be established. In such circumstances, data can be mobilised by addressing key concerns such as data access, data standards, data quality and data flexibility. The judicious application of information technology can also be effective.

The Production of Information Products

Definition: An information product is one or more items of information or an information service designed for a specific audience for a specific purpose (e.g. indicator, report, map).

Developing an information product

Developing a data or information product usually requires a series of tasks. The data and information pyramid below illustrates how primary data, obtained through monitoring and research activities, is transformed into managed data, information and finally into information products.

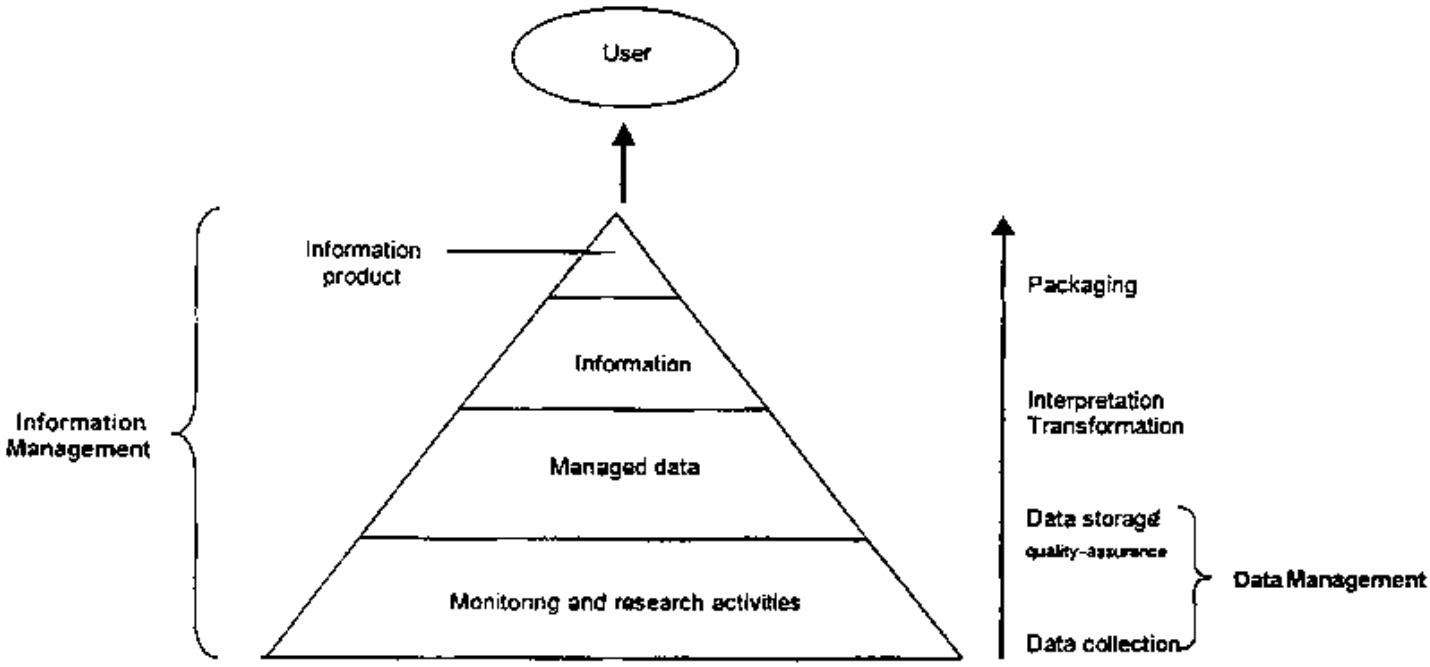


Figure F9−3 The Data and Information Processing Pyramid

The processes associated with these stages are data collection, data storage and quality−assurance, interpretation or transformation and packaging respectively. Each process has a processing requirement, or set of tasks which need to be applied to the data in order to facilitate progress to the next stage. The types of technologies and skills needed to undertake the tasks should be assessed as an integral part of the product design.

Exercise E9−4 Comparison of Concepts of Environmental Information Networks

Task:

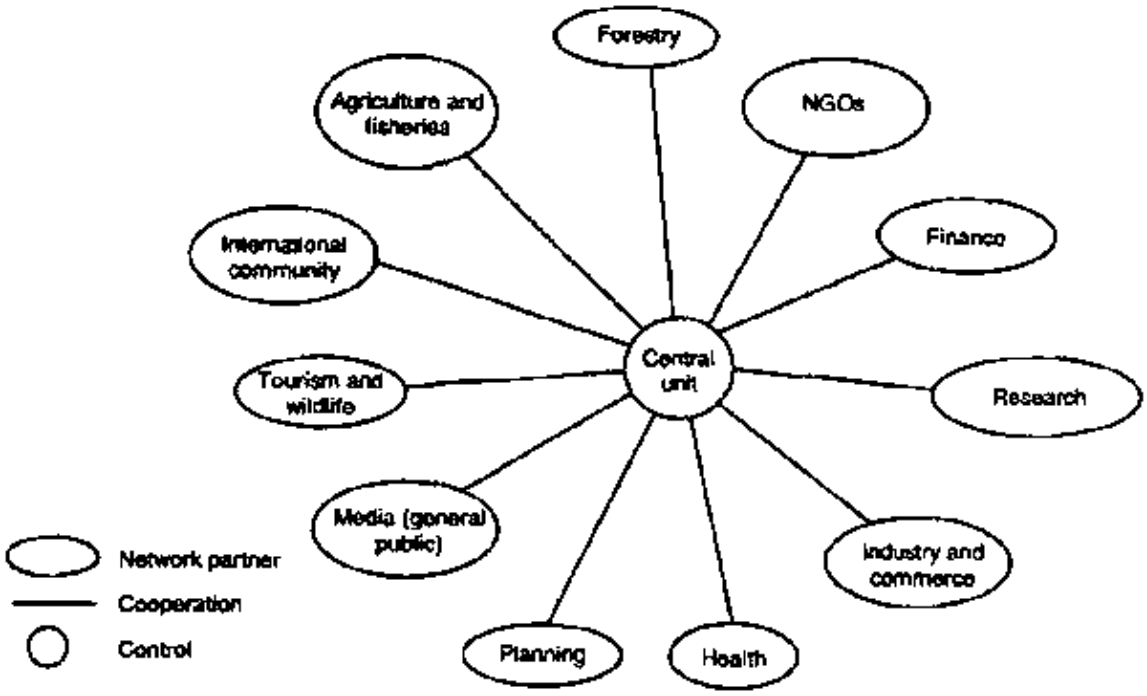
Please read the exercise and discuss the below presented network concepts in your group answering the following questions:

> What are the advantages and disadvantages of each type of network?
> In which situations will either of it work?

Please compare the two concepts and prepare a short presentation of each network concept and the results of your discussion and comparison (use cards or flip chart paper). Choose a presenter. The time span available is 25 min for the preparation and 5 min for each group for the presentation. This will be followed by a general discussion.

I. The Centralised Information Network

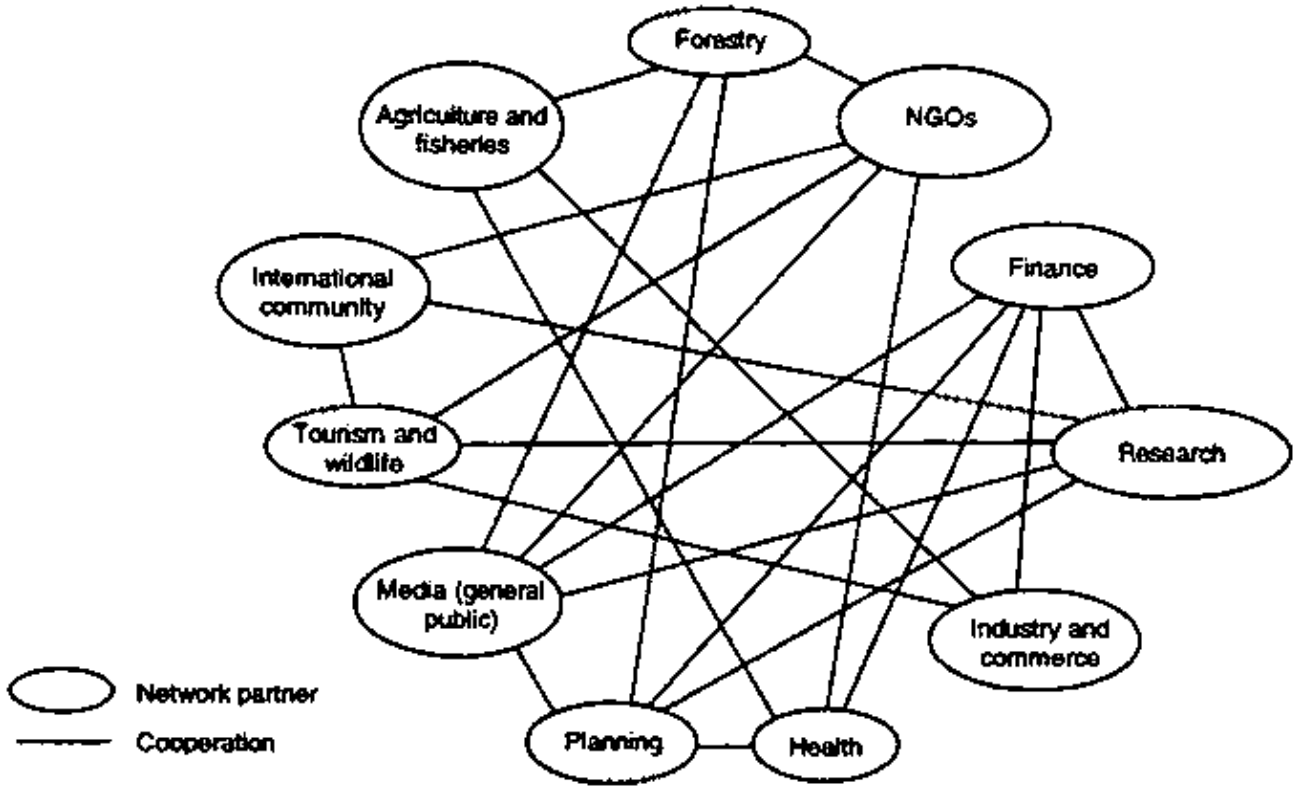
In a centralised network architecture a single organisational unit is at the centre of the network. Individual partners communicate and co−operate with that structure by providing specific data and advice, but not directly with other partners. The central unit provides all the necessary people, facilities and procedures to generate information products. This is equivalent to saying that the information system is located in one, central location, with partners supporting this as necessary.



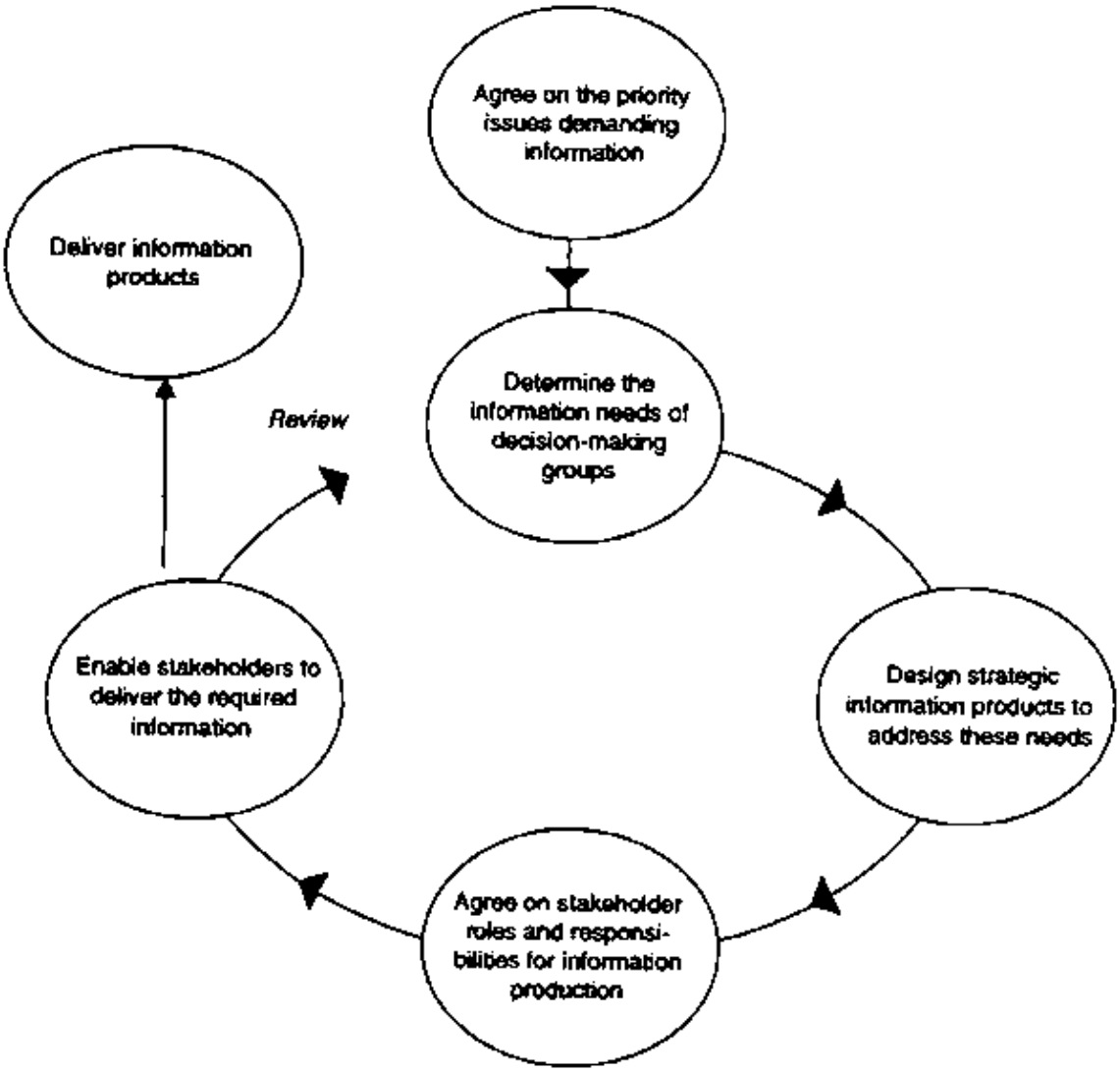
Exercise E9−5 Comparison of Concepts of Environmental Information Networks

II. The Distributed Information Network

In a distributed network architecture partners operate in an unrestricted environment where communication is encouraged between all parties. No attempt is made to co−ordinate or control the partnerships which may develop; there is a total democracy of co−operation. This is equivalent to saying that the information system is spread across all the network partners, i.e. the network is the system. The Internet is the ultimate example of a fully−distributed network.



Distributed Network

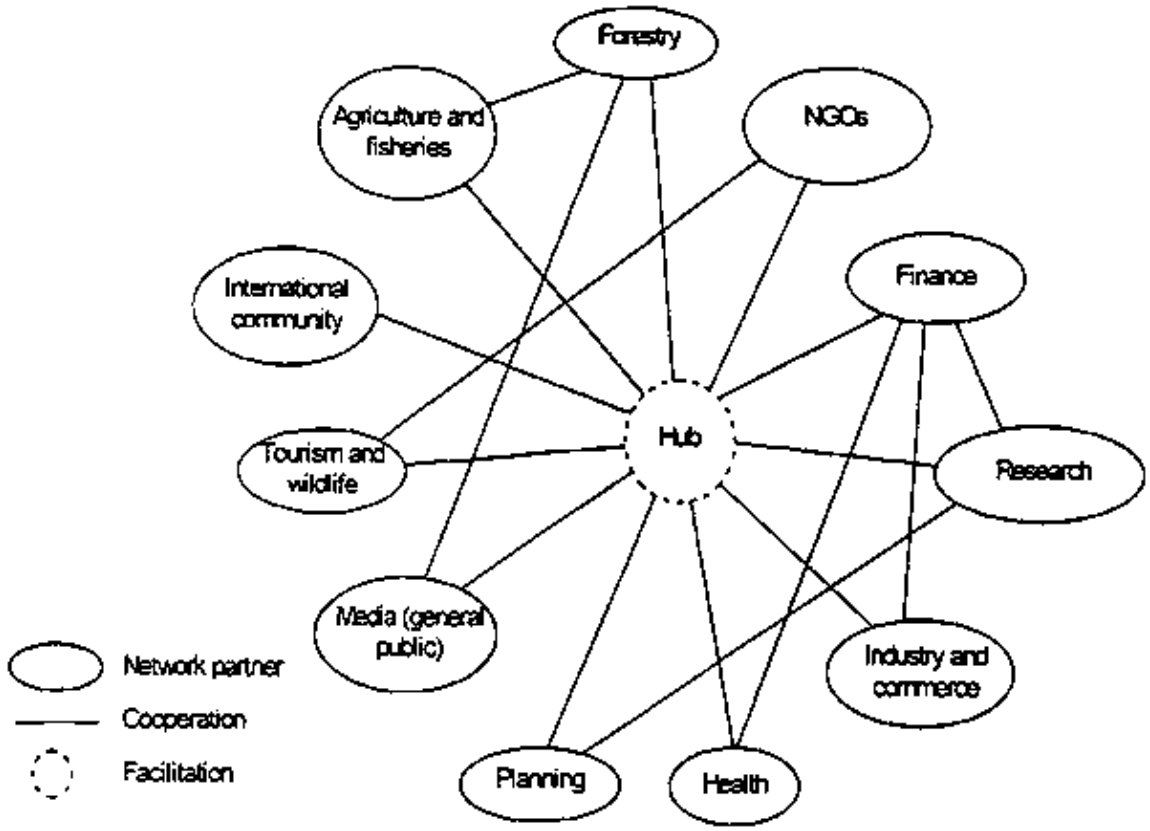


Transparency T9–8 The Information Cycle

Transparency T9–9 The Managed Network

In a managed network, there are three distinct roles for partners to play: **custodians, the hub** and **users.** All the activities necessary to ensure the achievement of network objectives are encompassed by these roles. One or more roles may be undertaken by each partner, as long as the implications of each role, in terms of the services they are expected to provide to the network, are well understood. In practice, partners determine which roles they wish to play on the basis of how closely their own objectives correlate with those of the network and, naturally, by their physical capacity to participate.

Unlike a centralised network, the hub of a managed network serves the **collective interests** of network partners, **rather than the specific interests of a single organisation** or operation. It may be directed by a committee of representatives of the network partners, with associated administrative support.



Unit 6: Building Information Management Capacities

Unit 6: Objectives

The participants know the concept of Information Management (IM) capacity. They apply the IM–capacity concept to a real–world example.

Unit 6: Description of the Procedure

The trainer/facilitator defines and discusses information management and information management capacity. This is followed by the exercise to assess the management capacity of a known institution. The participants should form not more than four groups for the group work.

Unit 6: Background Information for the Trainer/Facilitator

Definition of Information Management:

Information management is the timely and cost–effective transformation of data into information (products).

A Taxonomy of Management Information Systems

In 1968 Gary Dickson proposed a model of information system development that centred on the structure of the organisation and its information needs at various levels. In Dickson's model, applications systems are categorised as clerical, information, decision support, and programmed (expert) systems and are known as Management Information Systems (MIS).

• Clerical Systems

Computerised systems at this level simply replace certain manual operations. The earliest commercial systems were of this type and were almost exclusively accounting related. Accounting applications, which are oriented largely toward transactions, have well–defined inputs, outputs, and processing rules and are thus prime candidates for computerisation.

• Information Systems

For managers, the ability to store and retrieve data is a tool for control and effective decision making. Information systems (as the term is used by Dickson) exist primarily to assist the manager with control and/or decision−making activities. The system provides summarised data that the manager synthesises into information for control and/or decision making.

• Decision Support Systems

Application systems at this level are almost exclusively interactive manager − machine systems. The decision−making situations that these systems address are relatively complex; that is, reaching a decision involves both processing data according to fixed rules and algorithms (which computers accomplish very well) and synthesising information according to heuristics or just plain “gut feeling” (which a manager can do). The actual decision is usually the result of repeated loops between the computer and the decision−maker.

• Expert Systems (programmed systems)

Decisions that can be made on the basis of a condition defined according to a set of rules are addressed by, so−called programmed systems. The most sophisticated of these systems are based on concepts from the field of artificial intelligence. The development of application systems at this level requires that the IS manager be a member of the senior management team. The IS manager must have a keen sense of the business and of creative ways to apply computer technology to gain competitive advantage and augment market share.

What is information Management Capacity?

The phrase 'information management capacity means different things to different people. To some, it applies only to the hardware and software necessary to build databases and information systems. To others, it encompasses the political commitment, constructive policies and public support necessary to apply information to the resolution of environmental concerns. A key question to bear in mind is 'what capacity is needed?', as well as 'what capacity exists?'.

A pragmatic definition of information management capacity may include the data, skills and facilities available to an organisation for information production as well as its underlying management systems and external partnerships. Important components of information management capacity are:

- reliable data on appropriate themes
- skills and facilities to store, maintain and quality−assure data
- skills and facilities to integrate, analyse and process data into information products
- skills and facilities to package up and communicate information products to users
- management systems and procedures
- external liaison, co−operation, and partnerships.

Data, skills and facilities are relatively easy to quantify, since they are physical in nature and can be documented. Management systems and external partnerships are more subjective in nature. An organisation's management systems dictates the efficiency of everything from task allocation and scheduling, to project design, strategic planning and co−operation with external partners.

Constraints in information management capacity can impede progress towards corporate or network objectives. Indeed, considering the number and seriousness of the environmental concerns affecting most countries, it is almost inevitable that 'needs' for capacity building will outweigh what can be delivered with available resources. This applies to individual organisations and networks alike, and equally to government, non−governmental and private organisations. In all cases, strict priorities for investment in information management capacity are needed, and the greatest challenge is deciding how and where those investments should be made.

The process covering capacity building is to enable progress. The aim of this process is to address identified weaknesses, supplement (not duplicate) existing capacities, and seek greater overall efficiency in information production. Investments should, wherever possible, be based on an assessment of where existing capacities are located and how readily these can be mobilised for specific tasks. This can be achieved by surveying the capacity of the individuals or organisations concerned, for instance with respect to the range and quality of the data sets they manage, the human resources which they possess, and their ability to access technical and physical facilities.

The survey may vary in scope from a single organisation (or part thereof), to a group of co−operating organisations in the case of an information network. The results support the process of strategic planning, which involves identifying gaps in capacity and areas requiring closer co−operation. This allows objectives, targets, roles and responsibilities to be defined in such a way that the organisations concerned achieve their goals in concert with the wider needs of society for environmental information. Above all, efforts to build capacity should be co−ordinated. Within an information network, this can be achieved through the network hub, which may wish to form a technical team to undertake the assessment and report back to the hub with its findings.

Assessing Information Management Capacity

The main reason for assessing capacity is to provide organisations with the information they need to build their own information management capacity and co−operate more effectively with others. Where large numbers of organisations are involved, the assessment could be very demanding in both cost and time. For this reason, it is necessary to engage the full support and resources of network partners, by making it clear why the assessment is being conducted and how its results will be used to benefit them.

Key benefits of the assessment are the opportunity to strengthen ties with other organisations, the opportunity to participate in the strategic planning of the network, and the opportunity to review internal strengths and weaknesses.

The processes of information needs analysis and information product design should result in concise definitions of information, data and processing needs in the form of a series of product specifications. The assessment should therefore identify where the capacities necessary to develop the products are located, and how easily they can be mobilised.

The assessment should support network development. It should focus on the capacity required to achieve network objectives, rather than attempt any form of comprehensive assessment. For example, in a network aiming to promote sustainable agriculture, it may be unnecessary to assess the availability of data on wildlife distribution. More important in this case would be an assessment of data on the impact of various agricultural practices. How and what to assess is described in Exercise 4.

Exercise E9−5 Assessing the Information Capacity of an Environmental Institution

Tasks

Please read the text carefully and select an environmental institution you know well. Briefly define its role in a potential EIS and assess its information management capacity using the factors described below. Try to cover all factors, giving one example per factor. Document your results using cards. Select a presenter.

The time span available is 40 min for the preparation and 10 min for the presentation for each group.

A pragmatic definition of information management capacity may include the data, skills and facilities available to an organisation for information production as well as its underlying management systems and external partnerships.

The assessment should empower managers to review, perhaps restructure, their information management activities in such a way that their objectives are achieved in concert with those of the networks in which they participate. Organisational development activities may be required to support restructuring. Aspects of an organisation which should be included in the assessment are described below.

Data Sets

Summaries of the data sets for which the organisation acts as custodian, for example their theme, scale, completeness, currency, reliability, precision and pricing strategy, plus an indication of how they were collected, their intended uses, and the data standards and quality−assurance procedures which have been employed. Particularly, important or relevant data sets should be highlighted, as should urgent data needs.

Skills

Descriptions of the skills and experience available to the organisation which are of most relevance to information production, for example the number and education or training–level of researchers, data managers, librarians, statisticians, analysts, designers, publishers or communicators. Particularly strong or relevant expertise should be highlighted, as should urgent needs.

Exercise E9–5 Assessing the Information Capacity of an Environmental Institution

Facilities

Descriptions of the main facilities accessible by the organisation to enhance information production, for example measuring equipment, computer software and hardware, data input and output devices, and physical facilities (e.g. dedicated premises, transport). Particularly, useful or relevant facilities should be highlighted, as should urgent needs.

Management Systems

The best evidence for effective management systems is corporate productivity, and a good means of measuring this is by reviewing the organisation's portfolio of projects as they relate to the provision of data and information to users. Particularly impressive or illustrative projects should be highlighted. Weaknesses in management systems, where these are widely recognised, should also be described.

Partnerships

Memoranda of Understanding provide some evidence of external partnerships, although these do not guarantee co–operation in themselves. Other indicators include the extent to which data and other commodities are shared with other organisations, and the degree to which common standards and policies for information management are employed. Organisations should be encouraged to prepare diagrams illustrating the nature of their linkages with other organisations, in particular those which involve the transfer of data and information. Productive partnerships should be highlighted, and weak ones also noted.

Module 10: Environmental Management: An Exercise for the Development of an Environmental Management Plan

Objectives

Participants apply the methods described in this course to develop an environmental management plan for a region with a specific social and industrial structure and given environmental problems.

Schedule (Time frame: 450 min)

Time	Contents	Methods	Materials/Resources	Objectives/Remarks
30'	Exercise for the development of an environmental management plan	Text reading	Flipchart, photocopies of the text	Participants apply the methods learned in the course to develop an environmental management plan for a region with specified environmental problems
30'	Discussion questions/answers	Formation of groups	Pinboard, flipcharts	To answer questions and clear any doubt
240'	Elaboration of the environmental management plan	Group work	Work rooms for group work, flipchart, pinboards & cards	In working groups, participants simulate environmental authorities and prepare an environmental management plan according to their specific area of expertise
150'			Pinboards, flipchart	

	Presentation, discussion evaluation			Participants present their environmental management plan to the plenary

Description of the Present Situation

The following brief description of the situation and possible future developments (with regard to environmental and socio−economic issues) presents a scenario in a provincial harbour town in a tropical country.

In this province, the environmental quality is under threat of considerable further deterioration because of several developments and new activities planned by the government and various economic branches. The environment is threatened by the following developments:

1. Urban growth. The urban areas are growing rapidly due to an increasing degree of industrialisation in the region. The city is beginning to be heavily affected by air pollutants, emitted by the growing number of factories which produce fertilisers, cement and polymers amongst other products. To a great extent, these industrial products are meant for export so that there can be no discussion of closing down the plants which cause the pollution.

The inhabitants of settlements located in the vicinity of the industrial area and other individual factories have started to complain about periodic coughs and eye irritations, and especially children suffer from these conditions. Generally speaking, the inhabitants of the area perceive the environmental situation as increasingly unsatisfactory and have began to voice their grievances. Further problems of the rapid urbanisation are the inadequacy of sanitary facilities and sewage systems causing problems of water pollution and endangering the supply of drinking water. Water pollution is also caused by industrial effluents and wastewater. In addition, growing quantities of communal and industrial waste pose a potential environmental problem. The authorities of the region plan to improve the situation, but are hampered by a lack of regulations and guidelines on the provincial level which would help them to deal with and to solve the problems.

With regard to the industrial sites, some environmental standards limiting the amount and type of emissions exist but only the big factories measure their emissions themselves and pass on the results to the government. No control has as yet been exerted by the government with regard to the accuracy of the analyses. Hardly any information exists about the type and amount of emissions generated by small− or medium−scale industries which make up the greatest part of the industrial enterprises in this urban area.

Besides the increase in urbanisation and industrialisation, other developments and planned changes to the area involving different parties have to be considered in order to evaluate possible impacts on the environment.

2. Harbour enlargement. The urban area in question is located near the coast and possesses a harbour which has so far been used mainly for fishing boats and ships which transport part of the coal produced in nearby coal mines. The Ministry of Transportation is interested in enlarging the area and docks of the harbour as well as the infrastructure leading to the harbour. The enlargement of the harbour is seen as necessary to increase the amount of exports and tourism. Possible negative impacts are marine pollution, e.g. oil spills, and increased sealing of surfaces, concentration of traffic in the harbour area, etc.

3. Fisheries. Representatives of the fishing industry are also interested in the enlargement of the harbour which would provide more dock space for bigger off−shore fishing boats. They intend to increase the amount of fish caught off−shore and, thus, want to have larger fish−processing facilities built in the harbour area.

4. Coal mining. Coal mines in the area use open−cast coal production. This way of mining coal has several negative environmental effects. Besides causing erosion in the mining area, it produces airborne particles which pollute surface freshwaters and the marine environment up to a few kilometres off−coast. Furthermore, depending on wind direction and strength, the airborne particles endanger human health by causing respiratory complaints. The Ministry of Energy intends to increase the coal mining in the area in order to ensure a stable supply of fuel for a thermal power plant and also for increased export.

5. Tourism. A further economic branch to be developed is the domestic and international tourism in the region. For this, new hotels and therefore a new infrastructure are planned which will cause additional

burdens on the environment if not regulated, as well as socio−economic problems.

Exercise E10 Developing an Environmental Management Plan

Participants are members of different departments of the environmental authorities of that province. These departments include:

- the air quality monitoring section,
- the water management section (including waste waters and drinking water supply),
- the waste management section (municipal and industrial solid waste), and
- the industrial environmental commission.

1. Participants are asked to form four groups, corresponding to the sections described above.

2. Each group should prepare an environmental management plan according to their specific field of expertise.

The management plan should consist of:

- a system to control air quality especially with regard to industrial emissions;

- a system for the control of water quality focusing on surface waters, for the control and handling of wastewater (municipal and industrial) and a system to safeguard the drinking water supply of the area;

- a system for dealing with the increasing amount of industrial and municipal solid waste including the recently produced hazardous wastes derived from some of the new factories; and

- strategies to control the industrial environment, e.g. the factories themselves including their use of resources, processing methods and type of manufactured products, as well as their output (waste and emissions, wastewater), e.g. environmental auditing.

The management plan should contain the instrument of Participatory Environmental Appraisal (PEA). Please define the steps needed to set up a PEA, determine the composition of the PEA team, and identify appropriate addressees for the interviews. Furthermore, indicate the steps needed to set up a monitoring system, naming the parameters and indicators to be used. Please show how you would evaluate the results you have obtained from the PEA and the monitoring system and describe how your environmental planning would be designed.

Please design a comprehensive environmental information system for the storage and documentation of the sampled data and to ease the evaluation of success, decision−making and networking of the different activities and actors.

Please list the arguments you would use for the design and execution of your environmental plan, and describe the actions you would suggest to convince the relevant bodies (e.g. industry or other governmental sections) to co−operate with or support your plan to improve the situation.

Additionally, think of appropriate methods of environmental communication between the governmental actors and the different target groups in the community who are implicated in the implementation of the environmental management plan. Based on the results of the PEA, a communication strategy should be outlined.

3. Please visualise your results using the METAPLAN technique showing the different target groups and levels, catalogue of measurements and lists of suggestions.

4. The environmental plans and strategies of the different sections should be combined into a comprehensive environmental management plan suitable for local or regional planning and environmental management.

5. Presentation of the environmental management plan in the plenary, evaluation and discussion.

Part 3. Hints for Facilitation*

Visualisation in Participatory Programmes (VIPP) depends on good facilitation. Facilitation is an art and craft. It is a craft in that the facilitator must know and follow the rules, learn how to pose the right question at the right moment and write clearly. It is also an art which requires experience and intuition since the facilitator must create a drama which allows the group to give all of its potential to the process. The facilitator must be able to get the group out of situations of conflict creatively and to respond to the requirements of the group at any given moment by adopting a new technique or by accepting an idea coming from the group. Hence the facilitator should be flexible and receptive, yet firm on the rules.

Although the facilitator should not act as an expert on the subject of the event, her or his role in VIPP events is not entirely neutral. The facilitator should openly show her or his values with regard to the humanistic philosophy of VIPP but will never impose a technical position on the participants. The facilitator guides a process which brings about an understanding of the difference in values and opinions and which allows everyone to accept or reject other opinions. It is this process which leads to consensus to which everybody, including the facilitator, has contributed.

Role of the Facilitator

The VIPP facilitator is in charge of the proceedings of any event, usually in interaction and co–ordination with the organisers. He or she is responsible for the design of the event: the formulation of the daily programme, the selection of the techniques to achieve the goals and the steering of group processes. The facilitator is not a chairperson of the event, nor should he or she manipulate an outcome. He or she assumes a role of a “methodological leader” who enables the group to bring out its experiences in dialogue, in the creation of new knowledge, as well as in decisions for action.

The facilitator will carefully observe the process and the participants. If he or she senses that someone feels excluded from the process, it is his or her task to deal with this either by conducting an individual discussion or by changing the group process.

Generally, except for very small groups, there should be a team of facilitators. There are several reasons for this. Conflicts within the team can be solved by clarifying the different positions and sometimes by simulating the possible consequences if the different opinions were implemented. But it is not useful to hold an all–night discussion on a nuance of the next day's programme. There are common rules for managing the methodology in an event. But the individual character of each facilitator allows a whole range of possible uses of techniques.

A facilitator must feel secure with the sequence and programme design. Of course there is room for experimentation in VIPP, but a facilitator who does not believe in a particular technique, or is not sure about it, should leave it to a colleague to carry it out.

Source: Visualisation in Participatory Programmes, UNICEF Bangladesh, 1993.

Facilitation is a Team Effort

- Facilitators have different personal characteristics which are perceived and accepted differently by participants.
- The design of the event will be more reflective and creative if a team is involved.
- Facilitation is very intensive and demanding. Therefore, it requires some rest and reflection during the process to achieve optimum results.
- Each part of the programme has to be prepared the day before, thus, while one facilitator is guiding the group process, the other may sit down and reflect on the programme details

for the next day.

• The facilitator needs feedback on performance and this can be the reaction of participants that can be evaluated immediately, during breaks, or at the daily evaluation and planning meetings at the end of the day.

• Sometimes the facilitator requires new material or to collect cards from the participants, so one of the co−facilitators will act as an assistant.

Although many of us have been trained to compete, co−operation is required for a team of facilitators: there has to be trust in each other; recognition of strengths and acceptance of weaknesses of others, a relationship with an attitude of reciprocal learning and helping. If this is the case, the design of an event will become very transparent to each member of the team, so that everyone can play their part. There must be a realisation that the success of the events does not depend on individual performance but on the team's performance and on respecting the expectations and contributions of the participants.

The qualities of a good facilitator

First of all, becoming a good facilitator requires time and experience. Learning by doing is the best way. Nevertheless, there are certain qualities which enable someone to become a good facilitator. And there are also conditions which make it impossible or difficult for someone to be a good facilitator.

The personal qualities for a good facilitator are outlined below.

Some of these qualities may be inherent or learned through socialisation. Others can be improved through experience and concerted practice. For instance, the handwriting and drawing ability could be improved with certain techniques such as the proper holding of a marker or the use of simple devices to draw curves or squares.

Qualities of a good Facilitator

• Trust in other people and their capacities.

• Patience and good listening skills.

• Self−awareness and openness to learn new skills.

• Confidence without arrogance.

• Good life experience and a good grasp of common sense.

• Respect for the opinion of others, not imposing ideas.

• Practice in creative and innovative thinking.

• Ability to create an atmosphere of confidence among participants.

• Flexibility in changing methods and sequences, not always sticking to the same sequence of techniques.

• Knowledge of group development including the ability to sense a group's mood and consequently change methods or adjust the programme on the spot.

• A good sense for the arrangement of space and materials in order to create an attractive physical arrangement for the participants.

• Skill in drawing and handwriting.

Facilitation requires knowledge of group dynamics and how groups develop over time. The learning of facilitation is a process which combines various elements: self−critical reflection on one's own performance; a learning−by−doing attitude as well as listening carefully to other experiences and watching colleagues perform. And the most important instrument for learning is constructive critique from a colleague or supervisor.

This may be aided by a video recording of performance which can show certain actions or appearances which might inhibit or improve the facilitation process. It is very difficult for us to perceive consciously our own behaviour. Accepting a supervisor's advise requires belief in our own personal capacity to change.

Good facilitation requires giving directions, mainly through stimulating questions to be answered by the participants. If the facilitator is too non−directive, participants will lose respect for him or her and anarchy may be the result. There is a fine balance to be maintained here. Facilitation is not only a craft with necessary skills and rules, it is an art. The design of a workshop or event is a creative act which depends on the imagination of the facilitators and their ability to stimulate participants.

There is not only one correct way to apply VIPP, there are always several possibilities which depend on the skills and knowledge of the facilitator. The art of facilitation consists of a combination of imagination, intuition, aesthetics and a feeling for the potential of a group of people. There is no fixed way to learn this except by doing and steadily improving.

Each event should be treated as unique and therefore requires preparation. The facilitator must be consciously involved in the topic and the process of each group. Each event is a new challenge for designing a people−centred process. It is not like repeating a speech for a new audience. There is a danger that popular facilitators/trainers will become overloaded with events and will, because of time pressure, develop a routine, performing instead of facilitating. Therefore, if you are a facilitator or if you contract a team of facilitators, you should begin with a detailed preparation. Facilitation is a very hard but rewarding job. A participant may lose concentration and day dream for some moments during the event while the facilitator has to follow each idea, reaction and intervention of the participants, never resting. This is exhausting and requires time to reestablish energy for the next session or for new events.

The rewards of good facilitation are self−evident: a good group feeling and affection between participants and facilitators, quality in the results of the event; the confirmation that the event has begun a productive group process which may go on in future. The reward may also be the feeling that there is now a better understanding and sympathy between people who have come together for a common purpose, people who work together on a daily basis, alliances who meet only occasionally, or people of different cultures who have come together temporarily and may never meet again.

Part 4. Annex

Further Reading 1: Selected Articles

Module 3. Introduction to Environmental Management

Born, S.M. & W.C. Sonzogni, 1995. Integrated Environmental Management: Strengthening the Conceptualisation. Environmental Management 19: 167−181.

Carpenter, J.F., 1998. Internally Motivated Development Projects: A Potential Tool for Biodiversity Conservation Outside of Protected Areas. Ambio 27: 211−216.

De Wit, A.E. & E, van der Werf, 1997. Professional training in environment and development: an example from the field of development co−operation. International Journal of Sustainable Development and World Ecology 4: 51−64.

Ezcurra, E. & M. Mazari−Hiriat, 1996. Are Mega−Cities Viable?. A Cautionary Tale form Mexico City. Environment, Jan./Feb.

Glasby, G.P., 1995. Concept of sustainable development: a meaningful goal? The Science of the Total Environment 159: 67−80.

Hockings M., Carter, B. & F. Leverington, 1998. An Integrated Model of Public Contact Planning for Conservation Management. Environmental Management 22: 643−654.

Hukkinen, J., 1998. Institutions, Environmental Management and Long−Term Ecological Sustenance. Ambio 27: 112−117.

Hurni, H., 1998. A Multi−level Stakeholder Approach to Sustainable Land Management. Advances in Geo−ecology 31, Vol 1 & 2. Catena Reiskirchen: 827−836.

Jänicke, M. & H. Weidner, 1997. Global Environmental Policy Learning. In: Jänicke, M.&H. Weidner (Eds.). National Environmental Policies. A comparative Study of Capacity−Building. Springer, Berlin: 299−313.

Keiter, R. B., 1998. Ecosystems and the Law: Toward an Integrated Approach. Ecological Applications 8: 332−341.

Kindler, J., 1998. Linking Ecological and Development Objectives: Trade−offs and Imperatives. Ecological Applications 8: 591−600.

Kroger, H.I. & S.P. Simonovic, 1997. Development of a Risk Measure as a Sustainable Project Selection Criterion. International Journal of Sustainable Development and World Ecology 4: 274−285.

Logan, B. & B. E. Rittmann, 1998. Finding Solutions for Tough Environmental Problems. Environmental Science & Technology, Nov.: 502−508.

Margerum, R. D. & S.M. Born, 1995. Integrated Environmental Management: Moving from Theory to Practice. Journal of Environmental Planning and Management 38: 371−391.

Oksanen, M., 1997. The Moral Value of Biodiversity. Ambio 26: 541−545.

Omen, A., 1998. Political and Institutional Conditions for Sustainable Land Management. Advances in Geoecology 31, Vol 1 & 2. Catena Reiskirchen: 985−990.

O'Riordan, T., 1991. The new environmentalism and sustainable development. The Science of the Total Environment 108: 5−15.

Orvos, D. R. & J. Cairns, Jr., 1998. Estimating the risks associated with implementing goal and conditions for global sustainability. International Journal of Sustainable Development and World Ecology 5: 153−163.

Perkins, P. E., 1995. An overview of international institutional mechanisms for environmental management with reference to Arctic pollution. The Science of the Total Environment 160/161: 849−857.

Pleune, R., 1997. The Importance of Contexts in Strategies of Environmental Organisations with Regard to Climate Change. Environmental Management 21: 733−745.

Pretty, J., 1998. Furthering Co−operation Between People and Institutions. Advances in Geoecology 31, Vol 1 & 2. Catena Reiskirchen: 837−849.

Reyers, B. van Jaarsveld, A.S. & M.A. McGeoch, 1997. An Evaluation of Global Conservation Effort: Constraints and Contrasts. International Journal of Sustainable Development and World Ecology 4: 286−301.

Ruttan, V.W., 1998. Designing Institutions for Sustainability. In Loehmann, E. & D. Kilgour (Eds). Designing Institutions for Environmental and Resource Management. Edward Elgar, Chelterham: 142−161.

Sagar, A.U., 1998. Sustainability, sustainable development and forest resources. International Journal of Sustainable Development and World Ecology 5: 164−171.

Simonovic, S. P., Burn, D. H. & B.J. Lence, 1997. Practical Sustainability for Decision−making. International Journal of Sustainable Development and World Ecology 4: 231−244.

Sindelar, B. W., Montagne, C.R. & R.R.H. Kroos, 1995. Holistic Resource Management: An approach to sustainable agriculture on Montana's Great Plains. Journal of Soil and Water Conservation 50: 45−48.

Smith, L.G., Nell, C.Y. & M.V. Prystupa, 1997. The Converging Dynamics of Interest Representation in Resources Management. Environmental Management 21: 139−146.

Stocking, M., 1998. Conditions for Enhanced Co−operation Between People and Institutions. Advances in Geoecology 31, Vol 1 & 2. Catena Reiskirchen: 985−990.

Venter, A. K. & C. M. Breen, 1998. Partnership Forum Framework: Participative Framework for Protected Area Outreach. Environmental Management 22:. 803−815.

Module 4. Environmental Monitoring

Bricker, O.P. & M.A. Ruggiero, 1998. Toward a National Program for Monitoring Environmental Resources. Ecological Applications 8: 326−329.

Brinkmark, E. & L. Brinkmark, 1998. Improved Soil Monitoring by Use of Spatial Patterns. Ambio 27: 45−52.

Brydges, T. & A. Lumb, 1998. Canada's Ecological Monitoring and Assessment Network: Where We Are and Where We Are Going. Environmental Monitoring and Assessment 51: 595−603.

Crabbe, H. & D.M. Elsom, 1998. Air Quality Effectiveness of Traffic Management Schemes: U.K. and European Case Studies. Environmental Monitoring and Assessment 52: 173−183.

Edwards, D., 1998. Issues and Themes for Natural Resources Trend and Change Detection. Ecological Applications 8: 323−325.

Freer−Smith, P.H., 1998. Do Pollutant−related Forest Declines Threaten the Sustainability of Forests? Ambio 27: 123−131.

Guijt, I. & J. Abbot, 1998. Changing Views on Change: Participatory Approaches to Monitoring the Environment. Discussion Paper 2, SARLS Programme, International Institute for Environment and Development, 54 p.

Nusser, S.M., Breidt, F.J. & W.A. Fuller, 1998. Design and Estimation for Investigating the Dynamics of Natural Resources. Ecological Applications 8: 234−245.

Shrivastav, R., Marthur, S. K., Shrivastan, M. M., Das, S. & S. Prahash, 1996. Bricks as Historical Record of Heavy Metals Fallout: Study on Cooper Accumulation in Agrar Soils since 1910. Environmental Monitoring Assessment 40: 271−278.

Procházková, D., 1995. Theoretical Background of Environmental Monitoring and its Conception in the Czech Republic. Environmental Monitoring and Assessment 34: 105−113.

Stow, C. A. et al., 1998. Long−term Environmental Monitoring: Some Perspectives from Lakes. Ecological Applications 8: 269−276.

Turner, G.W., Ruffio, R.M. & M.W. Roberts, 1997. Comparing Environmental Conditions Using Indicators of Pollution Hazard. Environmental Management 21: 623−634.

Urquhart, N.S., Paulsen, S.G. & D.P. Larsen, 1998. Monitoring for Policy−relevant Regional Trends over Time. Ecological Applications 8: 246−257.

Yoder, C.H. & E. T. Rankin, 1998. The Role of Biological Indicators in a State Water Quality Management Process. Environmental Monitoring and Assessment 51: 61−88.

Umweltbundesamt (Federal Environmental Agency), 1994. Continuous Biotests for Water Monitoring of the River Rhine. Text 58/94, Umweltbundesamt, Berlin.

Monitoring Methods. In: Holmes, G., Singh, B.R. & L Theodore, 1993. Handbook of Environmental Management and Technology. John Wiley & Sons, N.Y., 553−571.

Module 5. Methods of Environmental Assessment

Abbruzzese, B. & S.G. Leibowitz, 1997. A Synoptic Approach for Assessing Cumulative Impacts to Wetlands. Environmental Management 21: 457−475.

Appiah−Opoku, S. & Q. Mulamootil, 1997. Indigenous Institutions and Environmental Assessment: The Case of Ghana. Environmental Management 21: 159−171.

Bailey, J., 1997. Environmental Impact Assessment and Management: An Underexplored Relationship. Environmental Management 21: 317−327.

Becker, J., 1998. Sustainable Development Assessment for Local Land Uses. International Journal of Sustainable Development and World Ecology 5: 59−69.

Berström, L. & J. Stenström, 1998. Environmental Fate of Chemicals in Soil. Ambio 27: 16−23.

Boyle, J., 1997. Cultural Influences on Implementing Environmental Impact Assessment: Insights from Thailand, Indonesia, and Malaysia. Environmental Impact Assessment Review 18: 95−116.

Campbell, D.E., 1998. Emergy Analysis of Human Carrying Capacity and Regional Sustainability: An Example Using the State of Maine. Environmental Monitoring and Assessment 51: 531−569.

Carpenter, J.F., 1998. Internally Motivated Development Projects: A Potential Tool for Biodiversity Conservation Outside of Protected Areas. Ambio 27: 211−216.

Chessmann, B.C., 1995. Rapid Assessment of Rivers using Macroinvertebrates: A Procedure based on Habitat−specific Sampling, Family Level Identification and a Biotic Index. Australian Journal of Ecology 20: 122−129.

Cook, C.C. & P. Donnelly−Roark, 1992. Public Participation in Environmental Assessments in Africa. In: Goodland, R. & V. Edmundson (Eds.). Environmental Assessment and Development. The World Bank, Washington, D.C.: 84−100.

Douglas, J, & J.G. Taylor, 1998. Riverine based eco−tourism: Trinity River non−market benefits estimates. International Journal of Sustainable Development and World Ecology 5: 136−148.

Eijsackers, H., 1998. Soil Quality Assessment in an International Perspective: Generic and Land−use Based Quality Standards. Ambio 27: 70−77.

Feldmann, L, 1997. The European Commission's Proposal for a Strategic Environmental Assessment Directive: Expanding the Scope of Environmental Impact Assessment in Europe. Environmental Impact Assessment Review 18: 3−14.

Hickie, D. & M. Wade, 1997. Development of Guidelines for Improving the Effectiveness of Environmental Assessment. Environmental Impact Assessment Review 18: 267−287.

Kakonge, J.O., 1997. EIA and Good Governance: Issues and Lessons from Africa. Environmental Impact Assessment Review 18: 289−306.

Kassinis, G., 1997. A Model for Estimating Pollution Emissions for Individual Economic Activities. Environmental Impact Assessment Review 18: 417−438.

Lawrence, D.P., 1997. Integrating Sustainability and Environmental Impact Assessment. Environmental Management 21: 23−42.

Leitmann, J. 1992. Rapid Urban Environmental Assessment: First Step Toward Environmental Management in Developing Countries. In: Goodland, R. & V. Edmundson (Eds.). Environmental Assessment and Development. The World Bank, Washington, D.C.: 54−64.

Pastakia, C. & A. Jensen, 1997. The Rapid Impact Assessment Matrix (RIAM) for EIA. Environmental Impact Assessment Review 18: 461−482.

Power, M & S.M. Adams, 1997. Perspectives of the Scientific Community on the Status of Ecological Risk Assessment. Environmental Management 21: 803−830.

Power, M. & LS. McCarty, 1998. A Comparative Analysis of Environmental Risk Assessment/Risk Management Frameworks. Environmental Science & Technology, May: 224−231.

Schönhut, M. & U. Kievelitz. Participatory Learning Approaches: Rapid Rural Appraisal, Participatory Appraisal. Schriftenreihe der GTZ 248, TZ–Verlagsgesellschaft, 183 p.

Shackley, M., 1998. Designating a Protected Area at Karanambu Ranch, Rupüuni Savannah, Guyana: Resource Management and Indigenous Communities. Ambio 27: 207–210.

Swiss Directorate for Development Co–operation and Humanitarian Aid (SDC), 1993. Participatory Rural Appraisal (PRA). A working instrument in the series: Working instruments for planning, evaluation, monitoring and transference into action (PEMT).

Waters–Bayer, A. & W. Bayer, 1994. Planning with pastoralists: PRA and more. A review of methods focused on Africa. Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), Division 422 Working Paper, Göttingen: 153 p.

Wackernagel, M. & J.D. Yount, 1998. The Ecological Footprint: An Indicator of Progress Toward Regional Sustainability, Environmental Monitoring and Assessment 51: 511–529.

World Health Organisation, 1992. Rapid Assessment of Sources of Air, Water, and Land Pollution. Who Offset Publication No. 62, Geneva.

Module 6. Planning Instruments of Environmental Management

Amir, S. & J. Hyman, 1993. Measures of Ecosystem Health and Integrity. Water Science Technology 27: 481–488.

Bagarinao, T., 1998. Nature Parks, Museums, Gardens, and Zoos for Biodiversity Conservation and Environment Education: The Philippines. Ambio 27: 230–237.

Barde, Jean–Philippe, 1989. The Economic Approach to the Environment. The OECD Observer.

Briassoulis, H., 1995. Environmental Criteria in Industrial Facility Siting Decisions: An Analysis. Environmental Management 19: 297–311.

Dieter, H.H., Grohmann, A. & D. Thompson, 1997. Specific Contributions of Politics, Economics, and Toxicology in Setting Socially Consensual Limit Values. Environmental Management 21: 505–515.

Dore, H.I.M. & J.M. Nogueira, 1994. The Amazon Rain Forest, Sustainable Development and the Biodiversity Convention: A Political Economy Perspective. Ambio 23: 491–496.

Dosch, F. & S. Losch, 1998. Spatial Planning Tasks for Sustainable Land Use and Soil Conservation in Germany. Advances in Geoecology 31, Vol. 2. Catena Reiskirchen: 933–944.

Fanai, N. & D.H. Burn, 1997. Reversibility as a sustainability criterion for project selection. International Journal of Sustainable Development and World Ecology 4: 259–273.

Field, B.G., 1998. Embracing the informal sector: an inclusive and more sustainable approach to development planning. International Journal of Sustainable Development and World Ecology 5: 277–287.

Firth, P., 1998. Fresh Water: Perspectives on the Integration of Research, Education, and Decision Making. Ecological Applications 8: 601–609.

Folke, C. et al., 1997. Ecosystem Appropriation by Cities. Ambio 26: 167–172.

Funnell, D.C. & R. Parish, 1995. Environment and Economic Growth in the Atlas Mountains, Morocco: A Policy–orientated Research Agenda. Mountain Research and Development 15: 91–100.

Garrity, D.P. & P.C. Agustin, 1995. Historical land use evolution in a tropical acid upland agro–ecosystem. Agriculture, Ecosystems and Environment 53: 83–95.

Gleick, P.H., 1998. Water in Crisis: Paths to Sustainable Water Use. Ecological Applications 8: 571–579.

Hagvar, S., 1994. Preserving the Natural Heritage: The Process of Developing Attitudes. Ambio 23: 515–518.

Hanley, N., Spash, C. & L. Walker, 1995. Problems in Valuing the Benefits of Biodiversity Protection. Environmental and Resource Economics 5: 249–271.

Latour, J.B., Reiling, R. & Slooff, W. 1994. Ecological Standards for Eutrophication and Desiccation: Perspectives for a Risk Assessment. Water, Air and Soil Pollution 78: 265–277.

Merkhofer, M.W., Conway, R. & R.G. Anderson, 1997. Multiattribute Utility Analysis as a Framework for Public Participation in Siting a Hazardous Waste Management Facility. Environmental Management 21:831–839.

Policansky, D., 1998. Science and Decision Making for Water Resources. Ecological Applications 8: 610–618.

Slocombe, D.S., 1998. Defining Goals and Criteria for Ecosystem–Based Management. Environmental Management 22: 483–493.

Therivel, R., 1998. Strategic Environmental Assessment of Development Plans in Great Britain. Environmental Impact Assessment Review 18: 39–57.

Torstensson, L., Pell, M. & B. Stenberg, 1998. Need of a Strategy for Evaluation of Arable Soil Quality. Ambio 27: 4–8.

Umweltbundesamt (Federal Environmental Agency), 1997. Environmental Quality Objectives and Action Targets for Water Protection. Text 8/97, Umweltbundesamt, Berlin.

Umweltbundesamt (Federal Environmental Agency), 1996. Exchange of experiences between European cities in the field of clean air planning, CO_2 reduction and energy concepts. Common Workshop of the Federal Environmental Agency and COST 617 Management Committee 30/31 May, 1996 in Berlin, 197 p.

Walker, B., 1995. Conserving Biological Diversity through Ecosystem Resilience. Conservation Biology 9: 747–752.

Wall, G., 1997. Is Ecotourism Sustainable? Environmental Management 21: 483–491.

World Health Organisation, Centre for Environmental Management and Planning, 1987. The Nature of Environmental Impact Assessment. Chapter II in: Environmental And Health Impacts Assessment Of Development Projects. London, Elsevier Applied Science: 13–42.

World Health Organisation, Centre for Environmental Management and Planning, 1987. Selection of Projects fur EIA. Appendix in: Environmental And Health Impacts Assessment Of Development Projects. London, Elsevier Applied Science: 223–245.

Xianrong Wang, Pink Zha & Jia Lu, 1998. Ecological planning and sustainable development: a case study of an urban development zone in Shanghai, China. International Journal of Sustainable Development and World Ecology 5: 204–216.

UNEP, 1997. Indonesian Department of Industry: Technical Guidelines for an Environmental Impact Analysis of an Industrial Estate. UNEP IE Technical Report 39: 123–129.

Module 7. Environmental Economics and Industrial Environmental Management

Amsberg, J. von, 1992. The Sustainable Supply Rule for Economic Evaluation of Natural Capital Depletion. In: Goodland, R. & V. Edmundson (Eds.). Environmental Assessment and Development. The World Bank, Washington, D.C.: 127–151.

Blonk, H. et al., 1997. Towards a Methodology for Taking Physical Degradation of Ecosystems into Account in LCA. International Journal of LCA 2: 91–98.

Beltrany, G., 1997. LCA Philosophy: Safeguard Subjects: The Conflict Between Operationalization and Ethical Justification. International Journal of LCA 2: 45–51.

Clift, R., 1995. Clean Technology – An Introduction. Journal of Chemistry, Technology and Biotechnology 62: 321–326.

Cowell, S.J. & R. Clift, 1997. Impact Assessment for LCAs Involving Agricultural Production. International Journal of LCA 2: 99–103.

Daly, H., 1992. Operationalizing Sustainable Development by Investing in Natural Capital. In: Goodland, R. & V. Edmundson (Eds.). Environmental Assessment and Development. The World Bank, Washington, D.C.: 152–195.

Den Butter, F. & M.W Hofkes, 1995. Sustainable Development with Extractive and Non–Extractive Use of the Environment in Production. Environmental and Resource Economics 6: 341–358.

Farber, S., Moreau, R. & P. Templet, 1995. A tax incentive tool for environmental management: an environmental scorecard. In: Ecological Economics 12: 183–189.

Finnveden, G., 1997. Valuation Methods Within LCA – Where are the Values? International Journal of LCA 2: 163–169.

Garrod, B., 1997. Business Strategies, Globalisation, and Environment. In: OECD Proceedings. Globalisation and Environment. Preliminary Perspectives. OECD, Paris: 269–314.

Graedel, T., 1997. Designing the Ideal Green Product. International Journal of LCA 2: 25–31.

Heijungs, R. & J.B. Guinée, 1995. On the Usefulness of Life Cycle Assessment of Packaging. Environmental Management 19: 665–668.

Jones, T., 1997. Globalisation and Environment. In: OECD Proceedings. Globalisation and Environment. Preliminary Perspectives. OECD, Paris: 7–18.

Lathrop, K.W. & T.J. Centher, 1998. Eco–Labelling and ISO 14000: An Analysis of US Regulatory Systems and Issues Concerning Adoption of Type II Standards. Environmental Management 22: 163–172.

Mak, J. & J.E.T. Moncur, 1998. Political Economy of Protecting Unique Recreational Resources: Hanauma Bay, Hawai. Ambio 27: 217–223.

Neitzel, H., 1997. Application of Life Cycle Assessment in Environmental Labelling. International Journal of LCA 2: 241–249.

Neumayer, E., 1998. Preserving natural capital in a world of uncertainty and scarce financial resources. International Journal of Sustainable Development and World Ecology 5: 27–42.

O'Neill., 1997. Managing without Prices: The Monetary Value of Biodiversity. Ambio 26: 546–550.

Panayotou, T., 1990. Economic Incentives in Environmental Management and Their Relevance to Developing Countries. In: Eröcal, D. (Ed.). Environmental Management in Developing Countries. Organisation for Economic Co–operation and Development: 83–133.

Pearce, D., 1990. New environmental policies: The recent experience of OECD Countries and its relevance to the developing world. In: Eröcal, D. (Ed.). Environmental Management in Developing Countries. Organisation for Economic Co–operation and Development: 47–81.

Perrings, C., 1995. Ecology, Economics and Ecological Economics. Ambio 24: 60–64.

Pizzocaro, S., 1998. Steps to industrial ecology: reflections on theoretical aspects. International Journal of Sustainable Development and World Ecology 5: 229–237.

Saur, K., 1997. Life Cycle Impact Assessment. International Journal of LCA 2: 66–70.

Simpson, D. R., 1998. Economic Analysis and Ecosystems: some Concepts and Issues. Ecological Applications 8: 342–349.

Shyamsundar & R. Kramer, 1997. Biodiversity Conservation – At What Cost? A Study of Households in the Vicinity of Madagascar's Mantadia National Park. Ambio 26: 180–184.

The World Resource Foundation, 1995. Life cycle analysis & assessment. In: Warmer Bulletin 46, Pull–out Information Sheet.

Van der Hamsvoort, C. & U. Latacz–Lohmann, 1998. Sustainability: a review of the debate and an extension. International Journal of Sustainable Development and World Ecology 5: 136–148.

Warford, J.J., 1995. Environment, health, and sustainable development: the role of economic instruments and policies. World Health Organisation 73: 387–395.

Wehrmeyer, W. & D. Tyteca, 1998. Measuring environmental performance for industry: from legitimacy to sustainability and biodiversity?. International Journal of Sustainable Development and World Ecology 5: 111–124.

Yuracko, K.L. et al., 1997. A Life Cycle Decision Methodology for Recycle of Radioactive Scrap Metal. International Journal of LCA 2: 223–228.

Module 8. Environmental Communication

Norton, B.G., 1998. Improving ecological communication: the role of ecologists in environmental policy formation. Ecological Applications 8: 350–364.

Oepen, M., 1988. Breaking the Culture of Silence. A Development Support Communication Program in Indonesia. Sarilakas 3, Manila.

Oepen, M., 1992. Gold in the Garbage: Media Support to a Scavenger Development Programme in Indonesia. Development +Co–operation 4.

Oepen, M., 1997. Rubbish, Recycling and the Role of Media: Media Support to a Program Fostering the Human Development and Recycling Efforts of Waste Pickers in Indonesia. In: Manfred Oepen, 1997. Training Curriculum: Environmental Communication. DSE.

Oepen, M., 1992. Waste Pickers and the Informal Recycling Market in Indonesia. A Sector Analysis in 1992. In: Manfred Oepen, 1997. Training Curriculum: Environmental Communication. DSE.

Oepen, M. (Ed.), 1995. Media Support and Development Communication in a World of Change. Proceedings of a ACT/FU Berlin/WIF Conference in Berlin 1993.

Smith, G.R., 1998. Are we leaving the community out of rural community sustainability? International Journal of Sustainable Development and World Ecology 5: 82–98

Vasseur, L. et al., 1997. Advisory Committee: A Powerful Tool for Helping Decision Makers in Environmental Issues. Environmental Management 3: 359–365.

Module 9. Environmental Information Management

Haklay, M., Feitelson, E. & Y. Doytsher, 1998. The Potential of a GIS–based Scoping System: an Israeli Proposal and Case Study. Environmental Impact Assessment Review 18: 439–459.

Mateau, J., 1997. Methods of Assessing and Achieving Normality Applied to Environmental Data. Environmental Management 21: 767–777.

Peng, W., 1998. Synthetic Analysis for Extracting Information on Soil Salinity Using Remote Sensing and GIS: a Case Study of Yanggao Basin in China. Environmental Management 22: 153–159.

Valenzuela, C.R., 1990. Basic Principles of Geographic Information Systems. In: Belward, A.S. & C.R. Valenzuela (Eds.). Remote Sensing and Geographical Information Systems for Resource Management in Developing Countries. Kluwer Academic Publishers, Dordrecht: 279–295.

Valenzuela, C.R., Brouwer, H. & A. Meijerink, 1990. Land Use Model Using a Geographic Information System. In: Belward, A.S. & C.R. Valenzuela (Eds.). Remote Sensing and Geographical Information Systems for Resource Management in Developing Countries. Kluwer Academic Publishers, Dordrecht: 425–441.

Water

Briscoe, J., 1993. When the Cup is Half Full. World Bank, Washington 35: 9–37.

Thanh, N.C. & D.M. Tam, 1990. Water Systems and the Environment. Chapter I in: Thanh, N.C. & A.K. Biswas (Eds.). Environmentally–sound Water Management. Dehli, Oxford University Press: 1–29.

Biswas, A.B., 1990. Objectives and Concepts of Environmentally–sound Water Management. Chapter II in: Thanh, N.C. & A.K. Biswas (Eds.). Environmentally–sound Water Management. Dehli, Oxford University Press: 30–58.

Kindler, K., 1990. Planning and Decision–Making Framework. Chapter III in: Thanh, N.C. & A.K. Biswas (Eds.). Environmentally–sound Water Management. Dehli, Oxford University Press: 59–86.

Ghooprasert, W., 1990. General Management Techniques: Part I: Techniques and Methods: Institutional, legal and financial framework. Chapter IV in: Thanh, N.C. & A.K. Biswas (Eds.). Environmentally–sound Water Management. Dehli, Oxford University Press: 87–101.

Ghooprasert, W., 1990. General Management Techniques: Part II: Environmental Education, Training and Research. Chapter IV in: Thanh, N.C. & A.K. Biswas (Eds.). Environmentally–sound Water Management. Dehli, Oxford University Press: 102–118.

Ghooprasert, W., 1990. Management of Water Projects. Chapter V in: Thanh, N.C. & A.K. Biswas (Eds.). Environmentally–sound Water Management. Dehli, Oxford University Press: 141–154.

Sandström, K., 1998. Can Forests “provide” Water: Widespread Myth or Scientific Reality? Ambio 27: 132–138.

Water Scarcity as a Key Factor Behind Global Food Insecurity: Round Table Discussion. (IXth World Water Congress, Montreal). Ambio 27: 148–154.

Soil

de Haan, F.A.M., 1993. Soil Quality in Relation to Soil Pollution. In: Lake, J.V., Bock, G.R. & K. Ackrill (Eds.). Environmental Change and Human Health. Ciba Foundation Symposium 175, J. Wiley & Sons: 104–123.

Holmgren, P., Masakha, E.J. & H. Sjöholm, 1994. Not All African Land is Being Degraded: A Recent Survey of Trees on Farms in Kenya Reveals Rapidly Increasing Forest Resources. Ambio 23: 390–395.

Kleinman, P.J.A., Pimentel, D. & R. B. Bryant, 1995. The Ecological Sustainability of Slash–and–burn Agriculture. Agriculture, Ecosystems and Environment 52: 235–249.

Stahl, M., 1992: Land Degradation in Eastern Africa. Innovation, May 1992: 3–7.

Chemistry/Air

Hoffmann, M.R., 1993. Chemical pollution of the environment: past, present and future. In: Lake, J.V., Bock, G.R. & K. Ackrill (Eds.). Environmental Change and Human Health. Ciba Foundation Symposium 175, J. Wiley & Sons: 23–123.

Further Reading 2: Books

Module 3: Introduction to Environmental Management

Becker, B. (Ed.), 1996. Sustainable Resource Management in Tropical and Subtropical Environments. INK–Mitteilungen 1, Witzenhausen: Gesamthochschule Kassel, Inst. F. Nutzpflanzenkunde gemässigter, subtropischen und tropischer Regionen, 107 p.

Bergesen, H.O. et al. (Eds.), 1998/99. Yearbook of International Co–operation on Environment and Development. Earthscan, 368 p.

Berkes, F. & C. Folke (Eds.), 1997. Linking Social and Ecological Systems. Management Practices and Social Mechanisms for Building Resilience. Cambridge, 460 p.

Bitton, G., 1997. Environmental Formula Handbook for Environmental Engineers and Scientists. Wiley, 234 p.

Blume, H.P., Eger, H., Fleischhauer, E. Hebel, A., Reij, C. & K.G. Steiner (eds.), 1998. Towards Sustainable Land Use. Furthering Co–operation Between People and Institutions. Advances in Geoecology 31, Vol. 1 & 2. Catena Reiskirchen, 1560 p.

Boyse, M.S. (Ed.), 1997. Ecosystem Management. Yale Univ. Press, New Haven, 361 p.

Brown, L.R. et al., 1997. Vital Signs 1997–1998. The Environmental Trends that are Shaping our Future. Earthscan, 168 p.

Carius, A., Hötller, L. & H. Mercker (Eds.), 1995. Environmental Management in Kenya, Uganda and Zimbabwe. DSE Berlin.

Gunnerson, C. G. & J.A. French (Eds.), 1996. Wastewater Management for Coastal Cities. The Ocean Disposal Option. Ser: Environmental Engineering. Springer, Berlin, 345 p.

Jones, G. & G. Hollier, 1997. Resources, Society and Environmental Management. Chapman, London, 370 p.

Kågeson, P., 1998. Growth versus the Environment. Is there a Trade–off? Kluver Academic Publisher, 300 p.

Katz, M. & D. Thornton, 1997. Environmental Management Tools on the Internet. Accessing the World of Environmental Information. St. Lucie Press, Delray Beach, 170 p.

Jänicke, M. & H. Weidner (Eds.), 1997. National Environmental Policies. A Comparative Study of Capacity–Building. Springer, Berlin.

Loehmann, E. & D. Kilgour (Eds.), 1998. Designing Institutions for Environmental and Resource Management. Edward Elgar, Chelterham, 368 p.

Maitland, P.S. & N.C. Morgan (Eds.), 1997. Conservation Management of Freshwater Habitats. Lakes, Rivers and Wetlands. Chapman & Hall, 248 p.

O'Callaghan, P.W., 1996. Integrated Environmental Management Handbook. Wiley, Chichester, 368 p.

Peine, J. D. (Ed.), 1999. Ecosystem Management for Sustainability. Principles and Practices. CRC Press LLC, 500 p.

Theodore, L. Dupont, R.R. & T.E. Baxter, 1998. Environmental Management. Problems and Solutions. Springer Berlin, 250 p.

Varma, C.V.J., Rao, A.R.G. & S.P. Kaushish (Eds.), 1998. Water Quality and its Management. Proc. First Int. Spec. Conf., March 1998, Dehli, India. Balkema, Rotterdam, 583 p.

Vogt, K.A., Gordon, J., Wargo, J., Asbjornson, H. Palmitto, P.A., Clark, H.J. & J.L. O'Hara, 1997. Ecosystems. Balancing Science with Management. Springer, New York, 470 p.

Wehrmeyer, W. (Ed.), 1996. Greening people. (human resources and environmental management)., Greenleaf Publ., Sheffield, 409 p.

World Resource Institute, 1995. Environmental Indicators: a systematic approach to measuring and reporting on environmental policy performance in the context of sustainable development.

Module 4. Environmental Monitoring

Allegrini, I. & F. DeSanto (Eds.), 1996. Urban Air Pollution, Monitoring and Control Strategies. NATO ASI Series. Partnership Sub−Series 2 − Environment. Springer Berlin, 477 p.

Campbell, M. (Ed.), 1997. Sensor systems for environmental monitoring. Blackie Acad. & Professional, London.

Ellenberg. H. et al., 1991. Biological Monitoring, Signals from the Environment. Vieweg, Braunschweig, 318 p.

Gosovic, B., 1992. The Quest for World Environmental Co−operation. The Case of the UN Global Environment Monitoring System. Routledge, New York, 284 p.

More, J. W:, 1986. The Changing Environment. Springer−Verlag, New York.

Subramanian, K.S. (Ed.), 1997. Environmental Biomonitoring. ACS, Washington, DC, 288 p.

Vo−Dinh, T. (Ed.), 1996. Advanced Technologies for Environmental Monitoring and Remediation. SPIE, Bellingham, Wash., 286 p.

Module 5: Methods of Environmental Assessment

Bailey, P., 1996. Methods for Integrated Environmental Assessment. Stockholm Environmental Institut, 33 p.

Barrow, C.J., 1997. Environmental and social impact assessment. Arnold, London, 310 p.

Boulding, R. (Ed.), 1996. EPA: Environmental Assessment Sourcebook. Ann Arbor Press, Chelsea, Mich., 386 p.

Chapman, D. (Ed.), 1996. Water Quality Assessment. (a guide to the use of biota, sediments and water environmental monitoring). E & FN Spon, London, 626 p.

Cheremisinoff, P.N. (Ed.), 1997. Ecological Issues and Environmental Impact Assessment. (Advances in environmental control technology series.) Gulf Publishing. Co., Houston, 802 p.

Doyle, D. & B. Sadler, 1996. Environmental assessment in Canada. Canadian Environmental Assessment Agency, Ottawa, 44 p.

Duursma, E.K. & J.L. Carroll, 1996. Environmental Compartments. Equilibria and Assessment of Processes between Air, Water, Sediments and Biota. Springer, 277 p.

Kirkpatrick, C.H. (Eds.), 1997. Sustainable development in a developing world. (integrating socio−economic and environmental assessment). Elgar, Cheltenham, 264 p.

Ortolano, L., 1997. Environmental regulation and assessment. Wiley, New York, 604 p.

Quint, M.D. (Ed.), 1996. Environmental impact of chemicals: assessment and control. Cambridge, Roy. Soc. Chem., Inf. Serv., Spec. Publ. 176, 243 p.

UNEP, 1996. Environmental Impact Assessment. Sourcebook, Nairobi 1996. UNEP, Environment and Economics Unit.

Vanclay, F. (Ed.), 1996. Environmental and Social Impact Assessment. Wiley, 325 p.

Module 6: Planning Instruments of Environmental Management

Barthlott, W. & M. Winiger, 1998. Biodiversity. A Challenge for Development Research and Policy. Springer, Berlin, 429 p.

Biswas, A.K. (Ed.), 1997. Water Resources: Environmental Planning, Management, and Development. McGraw Hill, New York, 737 p.

Gray, P. & P.M. Wiedemann, 1996. Risk and Sustainability: Mutual Lessons from Approaches to the Use of Indicators. Arbeiten zur Risk–Kommunikation 61. Juelich, Forschungszentrum Jülich, 31 p.

Module 7. Environmental Economics and Industrial Environmental Management

Callan, S. & J.M. Thomas, 1996. Environmental Economics and Management. Theory, Policy, and Application. Irwin, Chicago, 725 p.

Costanza, R., Cumberland, J., Daly, H., Goodland, R. & R. Norgaard, 1997. An Introduction to Ecological Economics. St. Lucie Press, Boca Raton, 275 p.

Curran, M.A. (Ed.), 1996. Environmental life cycle assessment. McGraw Hill, New York.

Grubler, A., 1998. Technology and Global Change. Wiley, 462 p.

Hillary, R. (Ed.), 1997. Environmental Management Systems and Cleaner Production. Wiley, Chichester, 359 p.

Hutchinson, A. & F. Hutchinson, 1997. Environmental Business Management. McGraw Hill, London, 390 p.

Marcus, P.A. (Ed.), 1997. Moving ahead with ISO 14000 (Improving environmental management and advancing sustainable development). Wiley, New York, 302 p.

OECD Proceedings, 1997. Globalisation and Environment. Preliminary Perspectives. OECD, Paris, 366 p.

Simpson, R.D. & N.L. Christensen, 1997. Ecosystem Function and Human Activities. Reconciling Economics and Ecology. Chapman & Hall, 256 p.

Spedding, L.S., 1996. Environmental management for business. Wiley, Chichester, 366 p.

Tibor, T. & I. Feldman, 1996. ISO 14000. A Guide to the New Environmental Management Standards. Irwin, Chicago, 237 p.

UNEP, 1997. The environmental management of industrial estates. UNEP IE technical report 39, 138 p.

Welford, R. (Ed.), 1996. Corporate environmental management. Systems and strategies. Earthscan, London, 273 p.

Module 8. Environmental Communication

Baofo, K. (ed.), 1993. Media and Environment in Africa. ACCE, Nairobi.

Byers, B.A., 1996. Understanding and Influencing Behaviors in Conservation and Natural Resources Management. African Biodiversity Series 4, USAID, Washington D.C.

Canter, D. (Ed.), 1988. Environmental Policy, Assessment and Communication. Aldershop, 329 p.

FAO, 1995. Understanding farmers' communication networks. An experience in the Philippines. FAO, Rome.

Fortner, R., Smith–Sebasto, N. & G. Mullins, 1994. Handbook for Environmental Communication in Development. Columbus, Ohio.

Fraser, C., & S. Restrepo–Estrada, 1998. Communicating for Development. Human Change for Survival, London.

GreenCom–USAID, 1997. What Works: A Donor's Guide to Environmental Education and Communication Projects. USAID, Washington D.C.

Hines, J.M., Hungerford, H.R. & A.N. Tomera, 1987. Analysis and Synthesis of Research on Responsible Environmental Behaviour: A Meta Analysis. Journal of Environmental Education 18: 1–9.

Meyers, G.M. (ed.), 1998, Environmental Communication Planning Handbook for the Mediterranean Region. IAE, Genf, 116 p.

Oepen, M. (ed.), 1995. Media Support and Development Communication in a World of Change. Proceedings of a ACT/FU Berlin/WIF conference in Berlin, 1993. Bad Honnef.

Module 9. Environmental Information Management

Arden, T., 1995. Information technology. Pitman, London, 280 p.

Belward, A.S. & C.R. Valenzuela (Eds.), 1990. Remote Sensing and Geographical Information Systems for Resource Management in Developing Countries. Kluwer Academic Publishers, Dordrecht, 506 p.

Borghoff, U.M., 1998. Information technology for knowledge management. Springer, Berlin, 232 p.

Ceccarelli, T., 1997. Towards a planning support system for communal areas in the Zambezi Valley, Zimbabwe. Utrecht Univ., 277 p.

Davis, G.B., 1997. The Blackwell encyclopaedic dictionary of management information systems. Blackwell, Cambridge, Mass., 263 p.

DeMers, M.N., 1997. Fundamentals of geographic information systems. Wiley, New York, 486 p.

Günther, O., 1998. Environmental information systems. Springer, Berlin, 244 p.

Huxhold, W.E., 1991. An introduction to urban geographic information systems. Oxford Univ. Pr., New York, 337 p.

Ingarden, R.S., Kossakowski, A. & M. Ohya, 1997. Information dynamics and open systems. Kluwer Acad. Publ., Dordrecht, 307 p.

Johnson, A.I., Petterson, C.B. & J.L: Fulton (Eds.), 1992. Geographic Information Systems (GIS) and Mapping – Practices and Standards. ASTM Philadelphia, 346 p.

Jones, C.B., 1997. Geographical information systems and computer cartography. Longman, Harlow, 319 p.

Keen, P.G.W., 1995. Every manager's guide to information technology. Harvard Business School Press, Boston, Mass. 290 p.

Kramer, H.J., 1996. Observation of the Earth and its Environment. Springer, Berlin, 960 p.

Laudon, K.C.; Laudon J.P., 1997. Essentials of management information systems. Prentice Hall, Upper Saddle River, NJ, 563 p.

Levine, L., 1994. Diffusion, transfer and implementation of information technology. North Holland, Amsterdam, 428 p.

Mingers, J., 1997. Information systems. McGraw–Hill, London, 387 p.

O'Brien, J., 1995. Introduction to information systems. Irwin, Chicago.

Rodriguez, M.V.R., & A.J. Ferrante, 1996. Information technology for the 21st century. Computational Mechanics Publ., Southampton, 302 p.

Star, J. & J. Estes, 1990. Geographic information systems. Prentice Hall, Englewood Cliffs, 303 p.

Glossary of Terms

A

Abiotic. Not biological or not relating to living organisms.

Acid Deposition (Acid Rain). The processes by which acids are delivered to the Earth's surface from the atmosphere. The deposition may take place in either wet form (as aqueous acids) or in dry form (as dry salt particles). Wet deposition is through precipitation (drizzle, fog, sleet, snow, and rain) containing principally sulphuric and nitric acids. These acids are produced by the chemical combination of water vapour with sulphur dioxide and nitrogen oxide gases. These gases are emitted into the atmosphere from the smokestacks of power plants and smelters and from automobile exhaust pipes. The harmful effects of acid rain include damaging building and metals, killing trees, and aggravating or causing human health problems.

Afforestation. The planting of trees in unforested areas, e.g.: on roadsides, waste lands, village lands and in agricultural fields (dispersed trees, strip plantings/wind breaks, etc.).

Air Pollutant. Dust, fumes, mist, smoke and other particulate matter, vapour, gas, odorous substances, or any combination thereof. Any air pollution agent or combination of such agents, including any physical, chemical, biological, radioactive (including source material, special nuclear material, and by−product material) substance or matter which is emitted into or otherwise enters the ambient air.

Air Quality Standard. The level of pollutants prescribed by law or regulation that cannot be exceeded during a specified time in a defined area.

Amelioration. Improvement or making better; e.g.: their has been some amelioration in pollution levels.

Anthropogenic. Made by people or resulting from human activities. Usually used in the context of emissions that are produced as a result of human activities.

Atmosphere. The envelope of air surrounding the Earth, and bound to it by the Earth's gravitational attraction.

B

Biocoenosis. Way in which animals and plants exist together in a certain feeding area.

Biodiversity (biological diversity). The totality of genes, species and ecosystems. There are approximately thirty million species on earth, possibly even more, of which only 1.43 million species are described scientifically. Extinction of species is an evolutionary process, but scientific evidence suggests that the rate of extinction has increased over the very recent past and that about one−quarter of existing species are at risk of extinction in the next twenty to thirty years. Additionally, habitats for wildlife are declining rapidly thereby increasing the loss of biodiversity. The most effective way of ensuring the survival of a species is by protecting its habitat.

Biological Indicators. Plants, animals and other organisms which, because of their special sensitivity, are suitable for use as indicators of the presence of harmful substances. A distinction is generally made between accumulation indicators (enrichment of harmful substances) or effect indicators (specific effects produced by harmful substances in the organisms).

Biomass. The mass of living organisms forming a prescribed population in a given area.

Biosphere. The system of Earth and its atmosphere that supports life. In the global carbon cycle, the biosphere serves as a sink (reservoir); carbon is stored and preserved in living organisms (plants and animals) and life−derived organic matter (litter, detritus). The biosphere controls the magnitude of the fluxes of several greenhouse gases, including CO_2 and methane, between the atmosphere, oceans, and land. The terrestrial biosphere includes living biota (plants and animals) and the litter and soil organic matter on land. The marine biosphere includes flora, fauna and detritus in the oceans.

Biota. The animal and plant life (flora and fauna) of a given area.

Biotic. Referring to living organisms (as opposed to the chemical constituents of an environment).

Biotope. Small area with uniform biological conditions (climate, soil, altitude, etc.).

"Bubble Concept". The "bubble concept" was first applied to multiple−stack sources of air pollution. It was given this name because it treats a collection of smokestacks or sources within a large factory as if they were encased in a bubble. Pollution control requirements are applied to the aggregate of emissions leaving the bubble rather than to each individual stack or source. In other words, it is a compensation model which covers a number of individual emission sources of a single emitted substance, so that the various individual sources of emissions are regarded as a single emission source.

By−product. Something additional produced during a process.

C

Carbon dioxide (CO_2). Colourless gas produced when carbon is burnt with oxygen.

Carbon monoxide (CO). Poisonous gas found in fumes from car engines, from burning gas and cigarette smoke.

Carrying capacity. Capacity of an ecosystem to support healthy organisms while maintaining its productivity, adaptability and capability of renewal.

Chlorofluorocarbons (CFCs). A family of inert, non−toxic and easily liquefied chemicals, implicated in two major environmental problems: Ozone−layer depletion and global warming. CFCs are used as coolants in refrigerators and air−conditioners, as propellants in aerosol cans, as solvents, and as blowing−agents that inflate flexible foams. It takes about fifteen years for a CFC molecule to drift into the upper atmosphere, where it can last hundred years or more destroying an estimated ten thousand ozone molecules over that time. All conventional CFC uses are covered by the Montreal protocol, and are likely to be halted in industrial countries by 2000 at least.

Communicative Competence. Horizontal communication which supports development towards greater countervailing or bargaining power should instigate communicative competence. This is the capacity to reflect upon and articulate the key factors of one's environment, a prerequisite for 'social' and 'political competence', i.e. the capacity to use one's potentials for active social and political participation and share in a given society's decision−making processes and wealth.

Community Communication, is a process of horizontal and vertical social interaction and networking through media regularly produced, managed and controlled by or in a close co−operation between people at the community level and at other levels of society who share a socio−political commitment towards a democratic society of countervailing powers. As the people participate in this process as planners, producers and performers, the media should become informing, educating and entertaining tools that would also make non−privileged and marginalised people think and speak for themselves.

Contaminant. Any physical, chemical, biological, or radiological substance or matter in water.

Cost−benefit Analysis. Examination in economic terms of the advantages and disadvantages of a certain course of action.

D

Debt−for−Nature Swaps. They have been applied to address simultaneously issues of indebtedness and environmental conservation. They can be considered as a subsidy of foreign (governmental or non−governmental) organisations to prompt environmental protection in indebted developing countries.

Deforestation. Loss of forest. The clearing of forests and the conversion of land to non−forest uses.

Desertification. Land degradation in arid, semi−arid and dry sub−humid areas resulting from adverse human activities and climatic conditions, ultimately leading to desert−like conditions.

Development. Increasing the capacity to meet present and future human needs and to improve the overall quality of human life.

E

Ecological Process. A continuous action or series of actions governed or strongly influenced by one or more ecosystems.

Ecology. Study of the relationships among organisms and the relationship between them and their physical environment.

Ecosystem. An integrated system of plants, animals and other organisms existing together with the nonliving components of their environment and interacting with each other.

Ecosphere. Biosphere, part of the earth and its atmosphere where living organisms exist (including parts of the lithosphere, the hydrosphere and the atmosphere).

Eco–toxicology. The science of investigating the effects of dangerous substances and radiation on ecosystems. A variety of factors (e.g.: persistence, fat solubility, accumulation capacity) are investigated for the purpose of evaluating their harmful effect (ecotoxicity).

Emissions. An emission describes the air pollution, noise, rays, heat, light, shock or other phenomena emanating from an installation or product. It is usually measured as the concentration of a pollutant per cubic meter of waste gas.

“End of Pipe”. A method which attempts to eliminate problems after they have been caused.

Environment. The surroundings of any organism, including the physical world and other organisms.

Environmental Impact Assessment. An analytical tool that systematically examines the possible consequences of the implementation of projects, policies and programmes. Its main objective is to provide decision–makers with an account of the implications of alternative courses of action before a decision is made and then to alter – if necessary – the final project design.

Environmental Management. This can be defined as a strategy by which human activities that affect the environment are organised with the aim of maximising social well–being and of preventing and mitigating potential environmental problems by addressing their root causes.

Environmental Management and Auditing System. A system which combines the voluntary implementation of an environmentally–oriented management system by companies in the industrial sector with their partaking in environmental audits which assess the performance of the company with regard to environmental issues. A positive assessment results in a certificate for the company which is considered as improving the company's “green” image.

Environmental Monitoring. The repetitive observation of phenomena within a pre–defined framework of time and place. Data collected during monitoring must be processed, stored, retrieved and presented.

Environmental Planning. Can be defined as the initiation and operation of activities to direct and control the acquisition, transformation, distribution, and disposal of resources in such a manner as to sustain human activities. The activities should be planned so that a minimum of disruption of physical, ecological and social processes occurs.

Environmental Protection. The act of protecting the environment by regulating the discharge of waste, the emission of pollutants, and other human activities.

Environmental Quality Standards. These characterise the definite value which has to be reached or preserved in accordance with a politically specified environmental quality goal. They are also means for the control of the necessity or efficiency of environmental protection measures.

Externality. Externality is a cost (or a benefit) of an economic activity by one party that is unintentionally imposed on (or received by) another party without compensation (or payment) and which leads to inefficiencies and/or inequalities of the free market.

F

Fallout. Pollutive matter which falls from the atmosphere as particles, either in rain or as dust.

Forest. Natural assembly of plants and animals, of which the dominant organisms are trees.

Forest Conservation. All activities intended to preserve and rehabilitate tropical forests, and specifically those designed to protect or restore biological diversity (biodiversity), including ecological functions, or the forest ecosystems in questions and at the same time secure, as far as possible, its current and future utility value for mankind and, in particular, for forest peoples.

Forest Management. The development and implementation of plans to protect, enrich, manipulate and exploit wood and non–wood products from natural or plantation forest resources.

G

Greenhouse Effect. As a natural phenomenon, the greenhouse effect is a process in which energy from the sun (solar radiation) passes through the atmosphere fairly freely, but the heat radiated back from the earth is blocked partially or absorbed by gases in the atmosphere. This blocking or absorption occurs because energy is radiated from the earth at a lower frequency and, thus, can be, to some extent, trapped by atmospheric gases. The radiation absorbed by clouds, water vapour, and carbon dioxide produces the greenhouse effect. The greenhouse analogy arises because the glass in a greenhouse, like the earth's atmosphere, admits solar energy but traps the infrared energy generated by the soil and plants.

“Green Auditing”. This is a management facility based on a systematic, documented, periodical and objective assessment to ensure that company organisation, management practises and environmental protection arrangements are in good working order.

H

Habitat. Type of environment in which an organism lives.

Hazardous Waste. Any waste or combination of wastes which poses a substantial present or potential hazard to human health or living organisms because such wastes are: non–degradable or persistent in nature, or biologically magnified, or lethal, or they may otherwise cause or tend to cause detrimental cumulative effects; also, a waste or combination of wastes of a solid, liquid, contained gaseous, or semisolid form which may cause, contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible illnesses, taking into account the toxicity of such waste, its persistence and degradability in nature, its potential for accumulation or concentration in tissue, and other factors that may otherwise cause or contribute to adverse acute or chronic effects on the health of persons or other organisms.

Heavy Metals. Metals with specific gravity (density) greater than 4.5 g/cm^3. Some heavy metals are essential trace elements for humans, animals and plants (iron, cobalt, nickel, manganese, zinc, cooper, molybdenum), whilst others pollute the environment as radio nuclides or toxic heavy metals (e.g.: cadmium, mercury, lead). Heavy metals enter the environment via waste, sewage, or the incineration process; where they constitute an acute risk to living organisms, especially at higher concentrations.

Human Ecosystem. The interaction between humans and their environment.

Husbandry. Farming or looking after animals and crops.

Hydrosphere. All the Earth's water in the sea, the atmosphere and on land.

I

Immissions. In the German context, the word “immission” means the effects of emissions on people, animal, plants, and inanimate objects. Whereas in the English context, it means generally air quality. It is usually measured as the amount of a hazardous substance per cubic meter.

Information/Communication. Is the linear transfer of signals from a sender to a receiver disregarding feedback or understanding, while communication necessarily implies media, social context, significant content, dialogue and, most importantly, 'shared meaning' between two or more communicators.

Integrated Pollution Control. This is the range of organisational and legislative changes that enable institutions to deal with the connected nature of environmental problems.

International Standardisation Organisation (ISO). Internationally valid standards laid down by this organisation, each of which is compiled by a Working Committee.

ISO 9000. Quality management and quality assurance standards.

ISO 14 000. Environmental Management and Eco−auditing standards.

L

Leachate. A substance which is washed out of the soil. A liquid which forms at the bottom of a landfill site.

Life−support System. An ecological process that sustains the productivity, adaptability and capacity for renewal of lands, water, and/or the biosphere as a whole.

Limnology. The scientific study of physical, chemical, meteorological, and biological conditions in fresh waters, such as rivers and lakes.

M

Market−based Instruments. Any instrument that aims to induce a change in behaviour of economic agents by internalising environmental or depletion cost through a change in the incentive structure that these agents face (rather than mandating a standard or a technology) qualifies as an economic instrument.

Mediation. A policy instrument for resolving environmental disputes. The principle hereby is to settle disputes through negotiation. Participation in the procedure is voluntary; and hierarchical structures are abandoned almost entirely. The objective is to find a solution based on consensus. Mediation represents a form of assisted negotiation with and independent person who organises and guides the negotiations.

Mitigation. Avoiding the impact altogether by not taking a certain action or parts of an action. Minimising impacts by limiting the degree or magnitude of the action and its implementation. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.

Models of Communication

> **Vertical (dominant) model:** sender − media − receiver and related centrally planned development strategies alone proved incapable to solve the burning social and political development problems at hand because they are non−democratic and deny people's access to participation in the media and extension or 'delivery systems'. This is not to say that these models are totally useless, as the media applied can, for example, create awareness, provide information and feedback on innovations not available at the grassroot level and diffuse successful elements of tested approaches. Their basic problem is that they often do not instigate behavioural change of the people who are the receivers. Social action facilitated by interpersonal communication is also necessary.
>
> **Horizontal models of communication:** communicator − dialogue − communicator. These models used alone proved limited as well, namely where analysing, professionally responding to and co−determining the structural social transformation processes at decision−making points and institutions beyond the grassroot's level and control were asked for. Oversimplified, handing out media for situation analysis, mobilisation, action and reflection of the community level may result in raised consciousness, group solidarity, self−confidence and organisational capacities but does not necessarily solve complex problems. It is also necessary to lobby for one's interests in the political, economic and social arena through alliances with other social groups via communicative, social and political competence.

N

Natural Resources. Natural resources include the renewable elements of the ecosphere such as water and the terrestrial and aquatic biomass, the non−renewable elements such as land in general, minerals, metals and fossil fuels, and the semi−renewable elements such as the soil quality and the assimilative capacity of the

environment.

Non–Governmental Organisations (NGOs). A catch–all term that covers what are known in various nations as scientific institutions, citizens' groups, regional associations, professional groups, community groups, public–interest groups, voluntary groups, environmental organisations, and religious organisations. In other words, any organisation that is not a part of federal, provincial, territorial or municipal government.

O

Ozonosphere. The ozone layer is the layer in the atmosphere between ten and fifty kilometres above the surface of the earth.

P

Participatory Development. Deals with the improvement of livelihoods and the well–being of people through full involvement and empowerment, as beneficiaries and active participants, at all stages of the development process.

Pollutant. Dredged spoil, solid waste, incinerator residue, filter backwash, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water.

Polluter–Pays Principle. This means that the full costs of avoidance, disposal or equalisation of environmental burdens should be passed onto the originator as far as possible. It is hoped that this should result in an economically efficient and sparing use of natural resources.

Polyaromatic Hydrocarbons (PAHs) are of a range of persistent, toxic compounds that are produced mainly by the incomplete combustion of hydrocarbon fuels. Many are carcinogens, mutagens or both. Those of low molecular weight occur mainly as vapour in the air, those of higher molecular weight as particles in soil or water.

Preservation. Keeping something in its present state.

Principle of Co–operation. It is a policy with the aim to involve social groups as far as possible in defining and implementing objectives and measures of environmental policy. This principle also means that responsibility for the environment should be accepted by all parts of society – not only by environmental organisations, but also by individuals, science and, in particular, industry.

Principle of Precautionary Action. An environmental policy which is aimed towards anticipating and preventing environmental problems and not only towards repairing damage already done or averting dangers to the environment. The aim hereby is the minimisation of risks to human beings and the environment now and in the future which will be achieved through combining the preservation of natural systems and appropriate development in science and technology.

R

Rapid Environmental Assessment. An assessment of the possible impacts of a proposed project based on already available data from which impacts are deduced.

Recycling. Converting solid waste into new products by using the resources contained in discarded materials.

Reforestation. The replacement of trees in forest areas.

Restoration. The return of a degraded ecosystem to its original conditions.

Risk Analysis. The investigation of the risk of damage to humans, animals, plants and material goods resulting from harmful environmental effects within a given region. The risk is defined as the product of the probability of the occurrences of an undesired incident and the degree of the damage.

S

Saprobic. Referring to the classification of organisms according to the way in which they tolerate pollution.

Saprobic System. (Saprobes = living organisms in waterways containing putrefactive substances to a differing degree such as worms, bacteria, fungi and algae). A system for the determination of the quality of water.

Sustainability. A characteristic of a process or state that can be maintained indefinitely.

Sustainable Development. A policy that meets the needs of people today without destroying the resources that will be needed in the future (World Commission on Environment and Development, 1987, p. 8). Sustainable development is interpreted (as opposed to optimal development which means that the growth path maximises the present value of the future flows of welfare), as a continuous increase in – or at least maintenance of – human welfare over time. The concept of survivability which recognises the existence of a minimum level of welfare below which societies cannot survive can be added to this concept.

T

Technology Transfer. The practice of making technological information available at low or no cost to agencies in developing countries. Although it may conflict with patent considerations, technology transfer is an effective means of ensuring the spread of energy–efficient, greenhouse–gas–diminishing industrial capabilities. The term also refers to the co–development of new or advanced systems through partnerships between enterprises in different countries.

Tradable Permit. Polluters are given permits to pollute up to the standard and have the option of buying and selling permits in the marketplace. Tradable permits work through quantities; they allow polluters to switch between sources of pollution provided; they honour an overall target for the environmental quality.

List of Acronyms

ACP	African Caribbean Pacific (countries)
ALA	Asian and Latin–American (countries)
CSD	Commission on Sustainable Development
EA	Environmental Assessment
EC	European Commission
EIA	Environmental Impact Assessment
EIS	Environmental Impact Study
EMS	Environmental Management System
DSE	Deutsche Stiftung für internationale Entwicklung
	German Foundation for International Development
FAO	Food and Agriculture Organisation of the United Nations
FRG	Federal Republic of Germany
GIS	Geographical Information System
IIED	International Institute for Environment and Development
ISO	International Standards Organisation
NEA	National Environmental Agency
NGO	Non–governmental Organisation
ODA	Overseas Development Administration

OECD	Organisation for Economic Co−operation and Development
PCM	Project Cycle Management
PEA	Participatory Environmental Appraisal
PRA	Participatory Rapid Appraisal
RRA	Rapid Rural Appraisal
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WB	World Bank
WHO	World Health Organisation
WTO	World Trade Organisation
ZÖV	Zentralstelle für öffentliche Verwaltung
	Public Administration Promotion Centre

DSE in Brief

The German Foundation for International Development (DSE) provides a forum for development policy dialogue and offers initial and advanced training of specialists and executive personnel from developing and transitional countries. In addition, it supports experts of German technical and cultural cooperation, and their families, in their preparation for assignments in developing countries, and maintains the largest documentation and information centre on development cooperation issues in Germany.

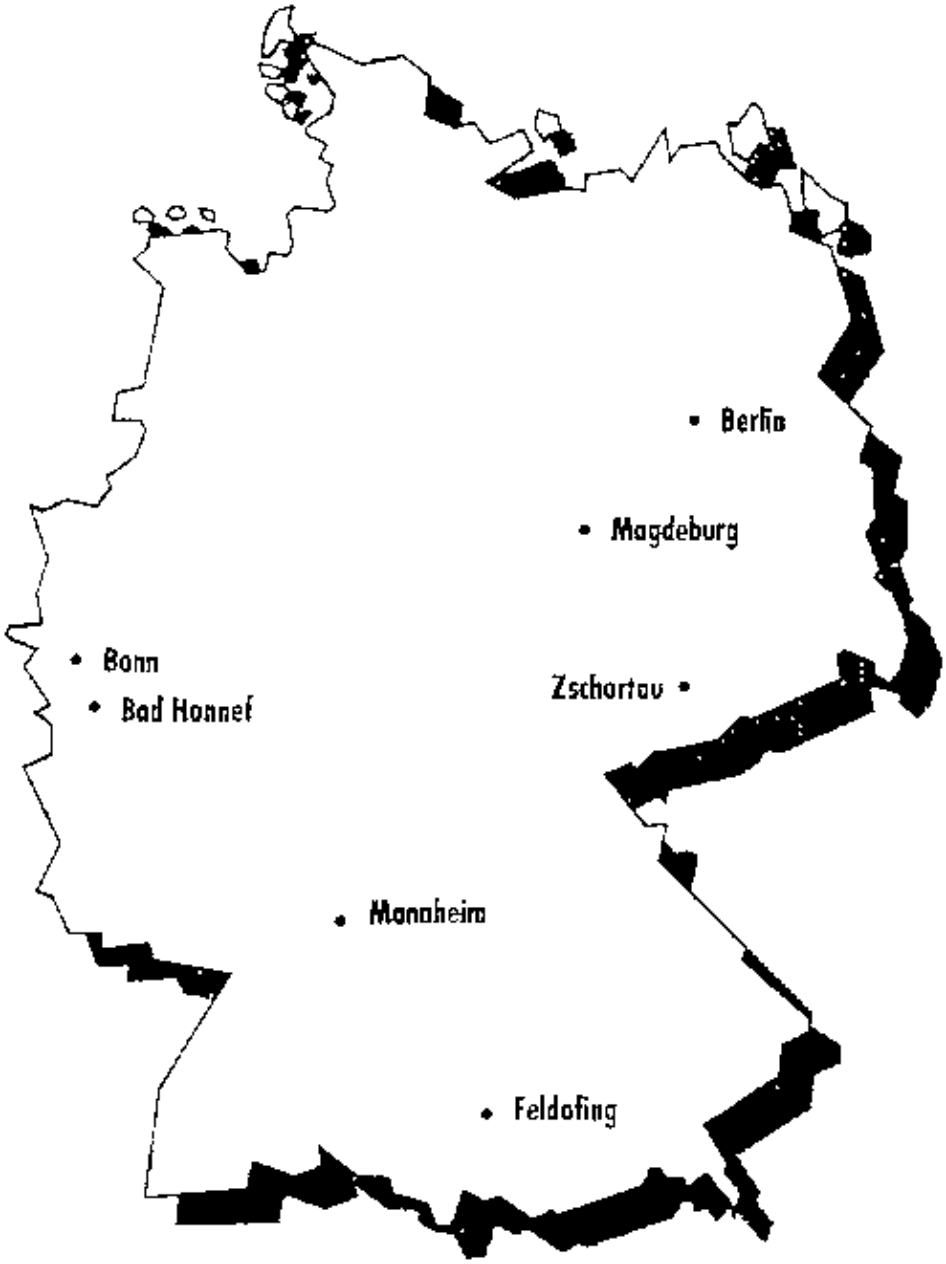
The DSE works in the areas “Education, Science and Documentation”, “Economic and Social Development”, “Public Administration”, “Industrial Occupations Promotion”, “Food and Agriculture”, “Health”, and “Journalism”.

Conferences, meetings, seminars and training courses support projects which serve economic, social, and ecologically compatible development, thus contributing to an effective, sustainable and wide−ranging development.

The DSE cooperates with partners at home and abroad. A considerable number of the programmes take place in developing and transitional countries, and the rest in Germany. Since 1960 the DSE has given advanced professional training to more than 160,000 decision−makers, specialists and executive personnel from over 150 countries. Every year approximately 10,000 participants take part in the DSE's dialogue and training programmes.

The DSE contributes to development cooperation on the basis of the guidelines of the German Federal Government's development policy. The German Foundation is funded by the Federal Ministry for Economic Cooperation and Development (BMZ). Some of its programmes, however, are financed by other donors (e.g. other Federal Ministries, the Federal States, the European Union).

Additionally, the Federal States of Baden−Württemberg, Bavaria, Berlin, North Rhine−Westphalia, Saxony and Saxony−Anhalt provide conference and training centres and buildings. Since its foundation in 1959 the DSE has been jointly financed by the Federal Government and the Federal States. This corresponds to the German Foundation's decentralized structure with specialized departments (Centres) and conference centres in a number of Federal States.



Executive Office

Director General: Dr. Heinz Bühler
Rauchstr. 25, D–10787 Berlin
Phone: +49 (30) 25433–0
Fax: +49 (30) 25433–375
E–Mail: gf@dse.de

Development Policy Forum (EF)

Director:
Dr. Gudrun Kochendörfer–Lucius
Reiherwerder, D–13505 Berlin
Phone: +49 (30) 43996–0
Fax: +49 (30) 43996–250
E–Mail: ef@dse.de

International Institute for Journalism (IIJ)

Director: Peter Prüfert
Rauchstr. 22, D–10787 Berlin
Phone: +49 (30) 25433–372
Fax: +49 (30) 25433–376
E–Mail: p_pruefert@zabt.dse.de

Central Administration

Director: Otfried Hintzpeter
Rauchstr. 25, D–10787 Berlin
Phone: +49 (30) 25433–0
Fax: +49 (30) 25433–383
E–Mail: zabt@dse.de

Education, Science and Documentation Centre (ZED)

Director: Dr. Eckhard Deutscher
Hans–Böckler–Str. 5, D–53225 Bonn
Phone: +49 (228) 40 01–0
Fax: +49 (228) 40 01–111
E–Mail: zed@dse.de

Economic and Social Development Centre (ZWS)

Director: Toni Ihlau
Reiherwerder, D–13505 Berlin
Phone: +49 (30) 439 96–0
Fax: +49 (30) 439 96–230
E–Mail: zws@dse.de

Area Orientation Centre (ZA)

Acting Director: Dr. Annette Schirmer–Seifert
Lohfelder Str. 128, D–53604 Bad Honnef
Fon: +49 (2224) 926–0
Fax: +49 (2224) 926–151
E–Mail: za@dse.de

Public Administration Promotion Centre (ZÖV)

Acting Director: Hinrich Mercker
Heussallee 2–10, D–53113 Bonn
Phone: +49 (228) 9384–0
E–Mail: zov@dse.de

Industrial Occupations Promotion Centre (ZGB)

Director: Herbert Burk
Käthe–Kollwitz–Str. 15,
D–68169 Mannheim
Phone: +49 (621) 3002–0
Fax: +49 (621)3002–132
E–Mail: zgb@dse.de

Location Magdeburg

Schellingstr. 3–4, D–39104 Magdeburg
Phone: +49 (391) 5371300
Fax: +49 (391) 5371329
E–Mail: zgbmd@dse.de

Food and Agriculture Development Centre (ZEL)

Director: Dr. Hans Pfeifer
Wielinger Str. 52, D–82340 Feldafing
Phone: +49 (8157) 938–0
Fax: +49(8157) 938–777
E–Mail: zel@dse.de

Location Zschortau

Leipziger Str. 15, D–04509 Zschortau
Phone: +49 (34202) 845–0
Fax: +49 (34202) 845–777
E–Mail: zelzt@dse.de

Public Health Promotion Centre (ZG)

Director: Dr. Walter Seidel
Breite Str. 11, D–10178 Berlin
Phone: +49 (30) 20319–0
Fax: +49 (30) 20319–111/222
E–Mail: zg@dse.de

Internet: http://www.dse.de