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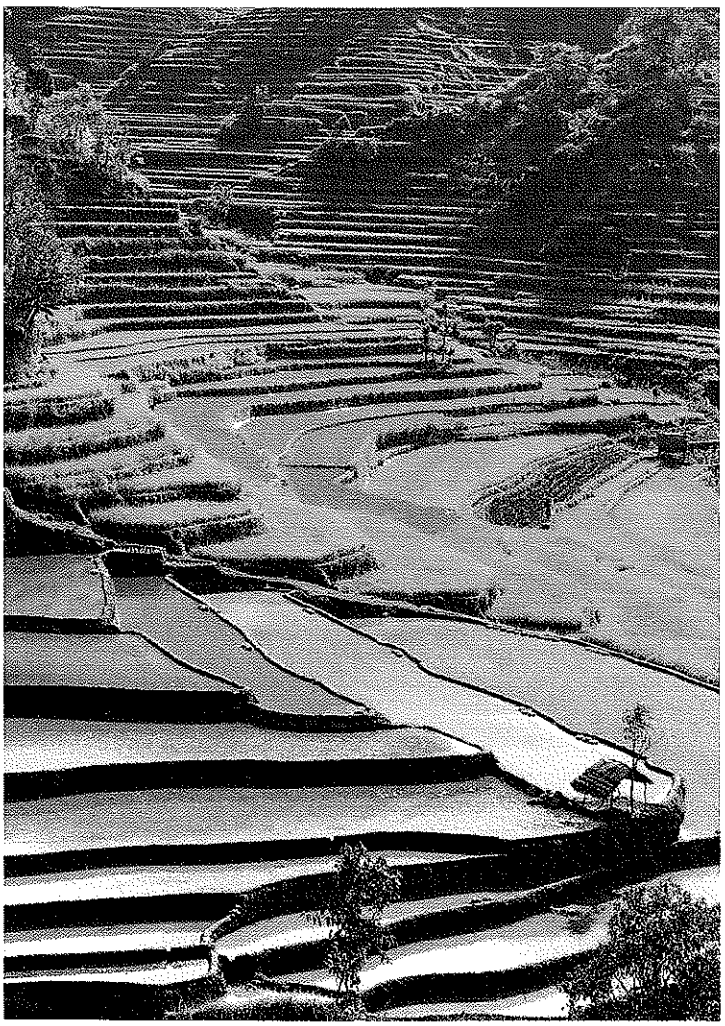
Environmental Appraisals for Agricultural and Irrigated Land Development



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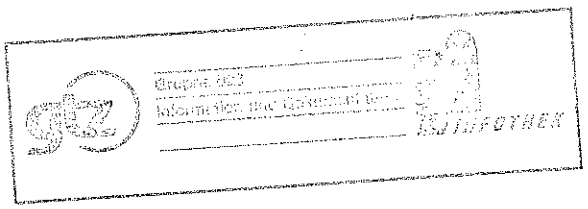
Environmental Appraisals for Agricultural and Irrigated Land Development

by

Thomas Petermann



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Environmental Appraisals for Agricultural & Irrigated Land Development

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Box 1

How to use these guidelines on environmental appraisals

Rationale

These guidelines provide a set of methods and tools to be used in planning and managing environmentally sound projects. Practical sector-specific guidance on how to undertake environmental appraisal and to follow-up by an environmental management plan is given.

Type of guideline

- The guidelines are applicable to agricultural and irrigated land development and associated activities such as flood control, drainage and land development.
- EIA procedures applicable to a wide variety of kind of project activities are outlined.
- Available EIA guidelines are amended (ICID, ADB, WB, USAID, ISPAN).
- The guidelines supplement the Review on Irrigation and the Environment: Part II Environmental Considerations in Planning and Operation (Petermann: GTZ 1993.1).

Applications

- The conduct or administration of site-specific environmental appraisals (synon. EIA), e.g. detailed appraisals (conventional EIA), semi-detailed or rapid appraisals.
- To develop perspectives of environmental management during project planning and operation.

For whom and for what?

- EIA practitioners who plan and conduct EIA-studies, or EIA-trainers.
- EIA administrators who undertake screening, scoping and formal EIA statements or review EIA studies.
- Project staff such as planners, managers, senior sector specialists who are involved in environmental planning and management.
- Sector specialists such departmental staff and specialists of relevant line ministries, or provincial and district staff.

Guideline elements

Excluded from these guidelines are:

- National EIA regulations, i.e. those mandatory rules which elaborate national EIA laws
- Particular prediction or assessment techniques for EIA, e.g. models on landscape analysis, health risk assessments, water pollution diffusion, or spatial data analysis
- Impacts associated with off-farm activities such as fertilizer production plants, processing or marketing facilities of agricultural products.

INTRODUCTION

An Environmental Appraisal is a planning and management instrument which contributes to sustainable development at the project level. Its focus is:

- To identify and evaluate at the earliest possible planning stage environmental changes which are caused by a specific project activity or development scheme. The term **environmental impact assessment** (**EIA**) is used synonymously and describes this process from identification and evaluation of possible hazards, to the decision - usually taken by an implementing agency - as to or not classify the project as environmentally sound (EIA statement);
- To ensure that predicted negative impacts will be reduced, mitigated or compensated during the planning stage and that adequate environmental management instruments are established to monitor and control negative impacts.

Aim of these guidelines

These guidelines are intended to help agricultural planners, environmental specialists and administrators and project managers to:

- Examine whether a **statutory EIA** process and detailed EIA studies are required according to national laws and regulations;
- Define the **focus** and **boundaries** of environmental appraisals for agricultural and irrigated land developments including reservoirs, flood control and infrastructure;
- Classify affected environmental components in a **systematic approach**;
- Assist in developing a holistic approach towards **environmentally sound irrigated agriculture** for both new and existing developments, many of which have suffered environmental degradation and lost productivity.

These guidelines do not provide solutions of the analysis, prediction and assessment of environmental impacts which a **specific project** may bring. Such changes are site-specific, depending on ecological conditions, as well as on technological, cultural and economic developments and decision-making at different levels. The complexity of environmental processes in agro-ecological systems is such that a general prediction of changes brought about by a specific activity is not possible. Accurate prediction of environmental changes needs site-specific investigations which remain the domain of subject specialists, such as hydrologists, agricultural and water engineers, agronomists, land use planners, ecologists, biologists or public health specialists.

Here, assistance is given to develop the methodological framework for such specialist appraisal, and examples describe how to assess the overall impacts in a holistic way. Guidance is given in:

- Describing the **procedure** of environmental appraisals and its **integration** into the whole planning and implementation process;
- Identifying potentially **important environmental changes** by the use of tools such as matrices, checklists and impact networks (see *Annexes* and *Working Aids*);
- **Evaluating environmental changes** in a site-specific context by the use of a methodological frame;
- Preparing **environmental impact assessment studies** (EIA studies) and proposals for **environmental management plans** (EMP).

Through use of these guidelines, agricultural and irrigation planners and managers may become more aware of environmental issues and will be involved in developing environmental management concepts that lead toward environmentally sound development. In this way, specialist expertise may be used more effectively and closer cooperation is promoted between agricultural policy makers, planners, project managers, environmental specialists and the land users or other stakeholders.

Rapid environmental appraisal

Some agricultural and irrigation planners or project managers still believe that conventional EIA is not appropriate for planning and appraising projects in developing countries, because it is too rigid, expensive, time consuming, separate from the planning process, methodologically ambitious, exhaustive and unnecessarily elaborate. The procedure for rapid environmental appraisal described here attempts to overcome some of these objections. It consists of the following steps (see Box 2 for details):

1. **Screening and scoping**

   Check-lists and interaction matrices provide the framework to identify **ecologically sensitive areas** and potentially **important environmental problems** for a given project: see Working Aids and Annex.

2. **EIA report**

   Information for analysis and prediction of changes is collated during Rapid Rural Appraisals (in collaboration with land users) and by the consultation of regional sector specialists; 1-day workshops on sector-specific assessments (e.g. water, soils, bio-resources, public health) may be appropriate. A sample report and resources (personnel, time) to prepare a rapid EIA-report are outlined.

3. **Environmental management plan**

   Define site-specific environmental quality goals; prepare a plan to mitigate or reduce environmental risks and to ensure that environmental concerns are considered in project planning and operation: see Working Aids and Annex.

Special references

These guidelines are based on a draft in German: *Umweltfolgenprüfung für den Bewässerungslandbau. UVP-Verfahrensmodell für die Entwicklungszusammenarbeit (unpublished draft 1992).*

They are also a companion document to the detailed review of environmental concerns and environmental management for sustainable irrigated agriculture: *Irrigation and the Environment. Part I: Influence of Irrigation on the Environment and Vice-Versa; Part II: Environmental Considerations in Planning and Operation* (Petermann 1993.1)

A detailed review of environmental assessment guidelines governing development aid in special consideration of irrigation development is: *Richtlinien zur Umweltverträglichkeitsprüfung in der Entwicklungszusammenarbeit* (Petermann 1993.2).

Special attention should be given to the following publications and "expert systems" on environmental issues, related to irrigation, drainage and flood control:

1. The ICID Environmental Check-List (ICID 1993). To Identify Environmental Effects of Irrigation, Drainage and Flood Control Projects and the ICID Check-List computer software ENCHECK, HR Wallingford 1994
2. ECOZONE. FAO 1994. Computerised knowledge-based expert system to assess environmental impacts of agriculture (including irrigation, flood control). FAO. Rome 1992
3. US Soil Conservation Service (USDA-SCS). Technical guidelines and management tools for adequate use of conservation practices for environmentally sound agriculture (including water management, waste management), e.g. in ASAE 1993 and ASEA 1994
4. ISPAN 1995. Bangladesh Flood Action Plan. Manual for Environmental Impact Assessment. Dhaka. (Detailed guidelines for EIA in the water sector)
5. ITC. The International Institute for Aerospace Survey and Earth Sciences (Enschede, NL) issues a series which provides research studies on how to integrate spatial data processing and decision making in EIA, for example Patrono 1995.
6. The EIA Centre in Manchester (UK) issues a leaflet series and other publications on EIA and it administers an international EIA network and conducts EIA training.

Box 2

Why a rapid environmental appraisal ?

Rationale

- If time and budget constraints limit the extent to which professional expertise over a wide range of disciplines can be consulted (a conventional EIA study may need 1 year or more and requires a multi-disciplinary team of some 10 specialists!).
- If decision-makers need information quickly - for example at an early planning stage or to plan for rehabilitation of existing projects.

When to apply?

- If data are limited and detailed data gathering by baseline surveys would be costly in relation to the project budget.
- If a minor irrigation or pilot project is to be evaluated (see also WA 9).
- If efficient use of resources (time, budget, in-country facilities) may be achieved by screening only those critical environmental issues for which special impact studies may be required - for example at a later project stage - and to identify those issues which can be accomplished by non-specialists and brief expert consultations.
- To accomplish particular needs of a rehabilitation project, or in already existing projects where environmental deterioration or conflict over natural resources occur, in order to design a monitoring programme or mitigation measures.
- If special aspects of environmental concerns are already part of other project impact studies, e.g. if special reports exist on fisheries impacts, hydrological impacts or public health hazards in irrigation projects, agro-economic and social impact studies.

For whom and for what?

- Professionals involved in irrigated agriculture and water resources planning to decide on recommendations for environmental management.
- Decision-makers (at policy or project level) to help decide whether a statutory EIA is required (see WA 3).
- EIA specialists, to define further information needs and areas requiring closer study by sector specialists, e.g. for detailed EIA studies.

By whom?

- natural resources specialists (e.g. land and water development, agronomy, landscape ecology) with experience in agricultural and irrigated land development and infrastructure planning, land use planning, land husbandry, water development, etc.

How to apply?

⇒ Identify project activities: Working Aid 2; define boundaries for EIA: Figure 11;

⇒ Screening: use of interaction matrices (Annex 2) to accomplish Working Aid 3;

⇒ Scoping: develop simple cause-effect networks to decide which factors may cause effects and which effects are likely to be of importance (use Working Aid 5 to 8, and 11); identify Important Environmental Components (IEC´s) for further analysis (example in Figure 13), taking account of perceptions of local people and other affected stakeholders; accomplish Annex 3 for Initial Environmental Scoping;

⇒ Prepare a rapid EIA study: working steps are shown in chapter 7; a sample outline is given in chapter 8; personnel and time requirements are outlined in chapter 9; sample presentations for holistic assessments are in Working Aid 12, especially 12-1, -6 and -9;

⇒ Develop site-specific environmental quality goals together with land and water users and other affected stakeholders: use Working Aids 1 and 10;

⇒ Outline an Environmental Management Plan: chapter 6; Figure 15 and Working Aid 13.4.

2 ROLE OF ENVIRONMENTAL APPRAISAL

Priority environmental concerns

Agricultural and irrigated land development is designed to increase productivity. Although only 17% of the total arable land is irrigated, irrigated agriculture raises more than 35% of the worlds agricultural production in different agro-ecological zones (Figure 1). Several countries in Africa, Asia and Latin America depend on staple crops under irrigation; e.g. Egypt, India, China, Indonesia, and Peru.

All forms of agricultural development carried out over the past two centuries have focused on increased production and have neglected associated environmental changes. The increase of irrigated land associated with large reservoirs, drainage and flood control and the use of modern farming practices has contributed to environmental degradation which has opened the debate as to how irrigated agriculture can be planned and operated in an environmentally sound manner. Environmental problems have occurred throughout a wide range of regional, climatic and socio-economic conditions around the world; they are often associated with:

- Conversion of ecologically sensitive areas into irrigated land, for example irrigated areas increased during the period 1900 to 1990 from about 40 mio ha to 230 mio ha, often at the expense of wetlands, especially in Asia and Africa (FAO 1992);
- Misuse of sensitive or fragile ecosystems, especially in drylands, resulting in degradation of land by, for example, salinization and wind erosion;
- Overutilization (exploitation) of resources, e.g. scarce water resources;
- Use of non-renewable resources e.g., fossil water, fuel;
- Pollution of soil or water, for example by indiscriminate use of agro-chemicals, leaching of native salts in drylands, and poor management of wastewater or drainage use;
- Increasing biological stress and imbalances through poor land husbandry and soil conservation practices;
- Increasing risks of water-based and vector-borne human diseases.

Figure 2 summarises potentially important environmental impacts of irrigation on the environment and vice-versa. Working Aid 8 gives a systematic overview of possible environmental impacts of irrigated agriculture. A comprehensive analysis of impacts is given in *Irrigation and the Environment* (Petermann 1993.1).

Rationales for environmental appraisals

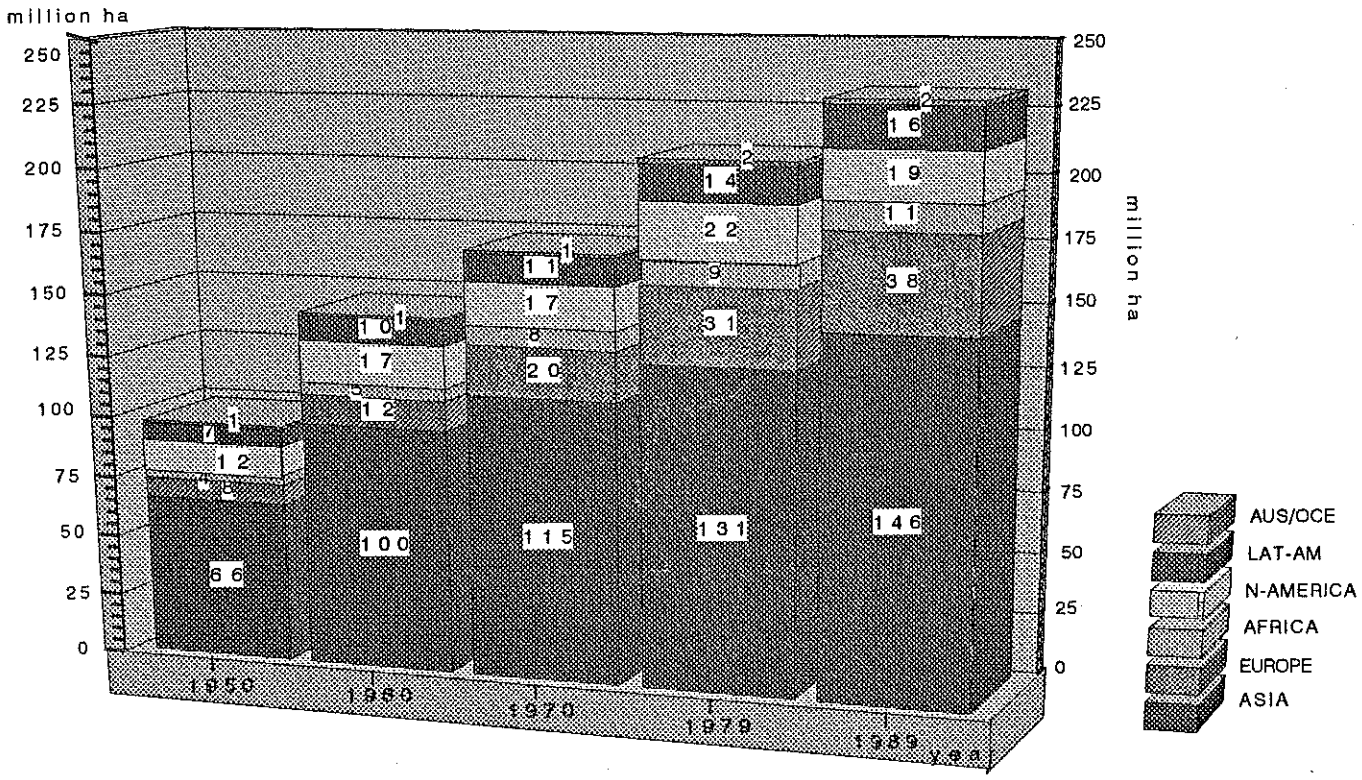
Only recently has conservation of the environment been recognised as being equally important both for the sustained well-being of people as well as for sustainablity of development projects. Governments and donor agencies have instituted legal and institutional measures to ensure that environmental issues are assessed and necessary mitigation measures incorporated into project development plans before projects are approved to achieve sustainable development (Box 3).

The opportunity to identify costly and undesirable environmental impacts, and to modify projects in the design stage or during operation; to provide a framework to resolve conflicts of interests over increasingly scarce land, water and bio-resources are the chief justification for conducting environmental appraisals. Design modifications due to EIA can either lead to cost savings or to the enhancement of under-utilised natural resources.

If an environmental appraisal is adopted, it can be an efficient management instrument for agricultural policy/decision makers as well as for project planners and managers and is just as important as economic analysis, social (or gender-) impact assessments, agricultural planning and engineering design studies.

Figure 1: Irrigated areas in the world

Trend of development (Figures from FAO 1992 and ICID 1992)

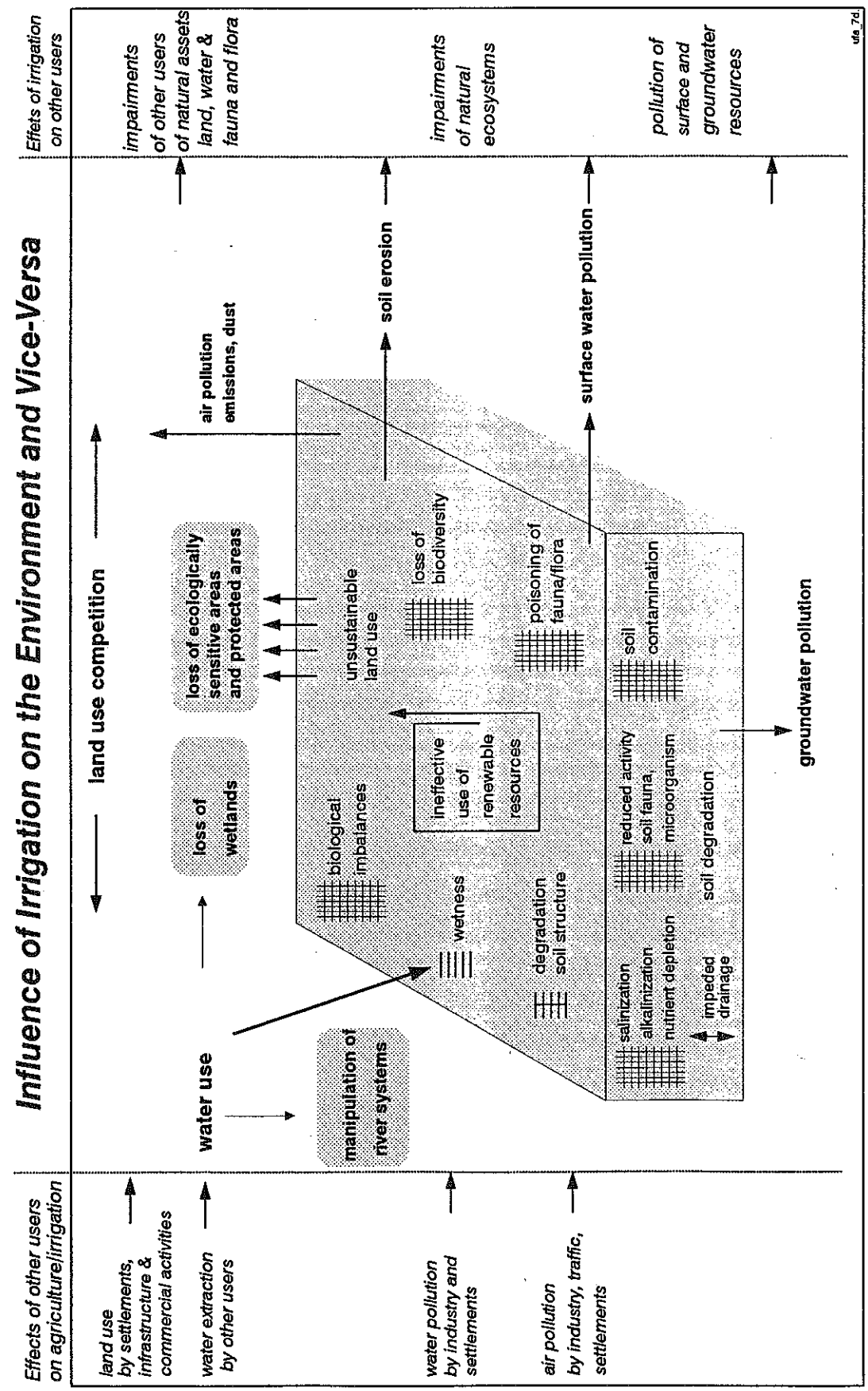


Box 3

10 Principles of Environmentally Sound Agricultural and Irrigated Land Development

1. Site selection is based on adequate land evaluation and integrated into existing land use plans at national and local level.
2. Farming systems are be based on ecologically sound and participatory land use planning procedures and sound land suitability considerations.
3. Water supply is based on integrated water resources planning and in line with water master plans. Degradation of sensitive water bodies is avoided or mitigated.
4. Efficient water use at field level is ensured by appropriate design (state-of-technology), maintenance and operation of water use systems and adjusted water requirements of integrated plant production.
5. Water pollution caused by the use of agro-chemicals is minimised.
6. Soil degradation (salinization, alkalinization, erosion, etc.) is avoided by selecting suitable sites, good land husbandry and management
7. Soil fertility is maintained or enhanced by integrated plant production systems and demand-oriented fertilizer applications.
8. Farm wastes (solid or liquid) are safely disposed of or utilised on the farm.
9. Water-related communicable health hazards are minimised through effective and environmentally sound health control measures.
10. Conservation of biodiversity and the avoidance of biological imbalances are ensured by means of landscape planning or land husbandry measures at farm level.

Figure 2 **Influence of Irrigation on the Environment and Vice-Versa**



Focus of Environmental Appraisal

This section describes the role of environmental appraisal in project planning and operation. The term project is defined in a broad sense as a specific set of activities intended to develop agricultural production. Projects may be implemented by local communities or national institutions, with or without assistance by donor agencies. Irrigation is understood as a complex agricultural production system which can consist of the following components: water use, land development, plant and/or animal production, and associated measures such as infrastructure development and health control.

Environmental appraisals are applicable at any stage of the planning or operation phases of an project to ensure environmentally sustainable development. The methodological framework of these guidelines helps to identify significant environmental effects (positive, neutral or negative) and to develop an **environmental management plan** (EMP) for sustainable resources use. The framework does not provide the site-specific questions, predictions of environmental changes, and managerial or technical solutions. In most cases, expertise from different disciplines is required to analyse the existing environmental status for detailed prognosis and evaluation of changes, and for the holistic appraisal of impacts. Expertise may be needed from any or all of the following fields:

⇒ *hydrology, water and civil engineering, agricultural engineering, land reclamation engineering, plant and animal production, land use planning, landscape and nature conservation planning, landscape ecology, biology, eco-toxicology, public health, environmental law, etc. (further readings: ERL 1984; ISPAN 1995).*

Such expertise can contribute to the EIA study, baseline surveys or special impact studies. Three types of inputs from sector specialists are proposed in these guidelines: low input for *rapid appraisal*, medium input for *semi-detailed EIA* and high inputs for *detailed EIA* (details in chapter 9).

The main output of the environmental appraisal is the **EIA study** (or report) which systematically analyses, predicts and evaluates possible environmental effects. The EIA study can include baseline surveys and assessments of different disciplines in technical annexes.

The **EMP** proposes measures to reduce or mitigate negative impacts and to ensure environmentally sound development. The EMP can be part of the EIA study or may be a separate report which is compiled at a later project stage.

Authority, responsibility and decision-making

EIA in development cooperation is different from EIA as a planning tool in the context of national legislation. In many countries, the EIA procedure is embodied in the National Policy and EIA laws regulate the implementation.

In Germany for example, formal EIA is part of the administrative procedures under the control of the governmental executive agency that administers the permission to implement a project (road, power plant, waste disposal plant, chemical plant, dams) i.e., determines whether regulations are followed in site selection, technical design, during construction and operation, and whether residual impacts are adequately reduced or mitigated. The agency evaluates the overall environmental impact, based on the findings of an EIA study which is usually prepared by consultants. Agencies have considerable latitude in interpreting the final evaluation (the EIA statement), although other involved agencies or the public can submit comments or proposals for modifications during the review period and before the EIA statement is finalised. State courts play an important role in reviewing administrative actions on behalf of affected parties. In some projects, EIA is part of other planning procedures which are regulated by federal or state laws and sector regulations (e.g. Water Act, Land Consolidation Act), and which include environmental protection or nature conservation standards and measures.

In EIA, it is important to differentiate between two types of evaluation or/and decision-making: *professional* and *political decision-making*. The EIA study undertake a professional assessment of environmental impacts, based on the technical findings and evaluations of subject matter specialists. Based on these EIA study findings, the project decision-makers of the executive agency decide how to proceed with implementation of the project and on any environmental conditionalities as proposed in the EIA or EMP. This decision is undertaken in an *EIA statement*; each agency has its own format, e.g. WB 1991, ADB 1987, BMZ 1987. The different aspects of professional versus political evaluation and the differing *perspectives of decision-making* are illustrated in Figure 3 and Box 4.

In **development cooperation**, environmental appraisals are often less formalised and not integrated into national EIA procedures. For example, in German development cooperation, EIA is an internal administrative assessment of environmental considerations. The process of environmental appraisal is under the control of the executing donor agency. In the case that a detailed EIA study is being prepared, it is usually contracted to consultants who also undertake the professional evaluation, whereas the agency prepares the final EIA statement. These are now compulsory for all projects although there is considerable latitude in interpreting the EIA procedure and methods employed. Frequently, the partners are not formally involved in the EIA and decision-making is undertaken jointly by sector specialists and environmental administrators of the executing agency. In Germany, the following EIA procedure is applied:

- Screening: determination of the need for EIA due to project type and characteristics; scoping: identification of important environmental issues for a specific project;
- Analysis, evaluation and observation of important environmental changes;
- Preparation of EIA studies: a standard format for conventional detailed EIA exists, however, this is usually not applied for small-scale projects;
- If required, planning for mitigation (after BMZ 1987).

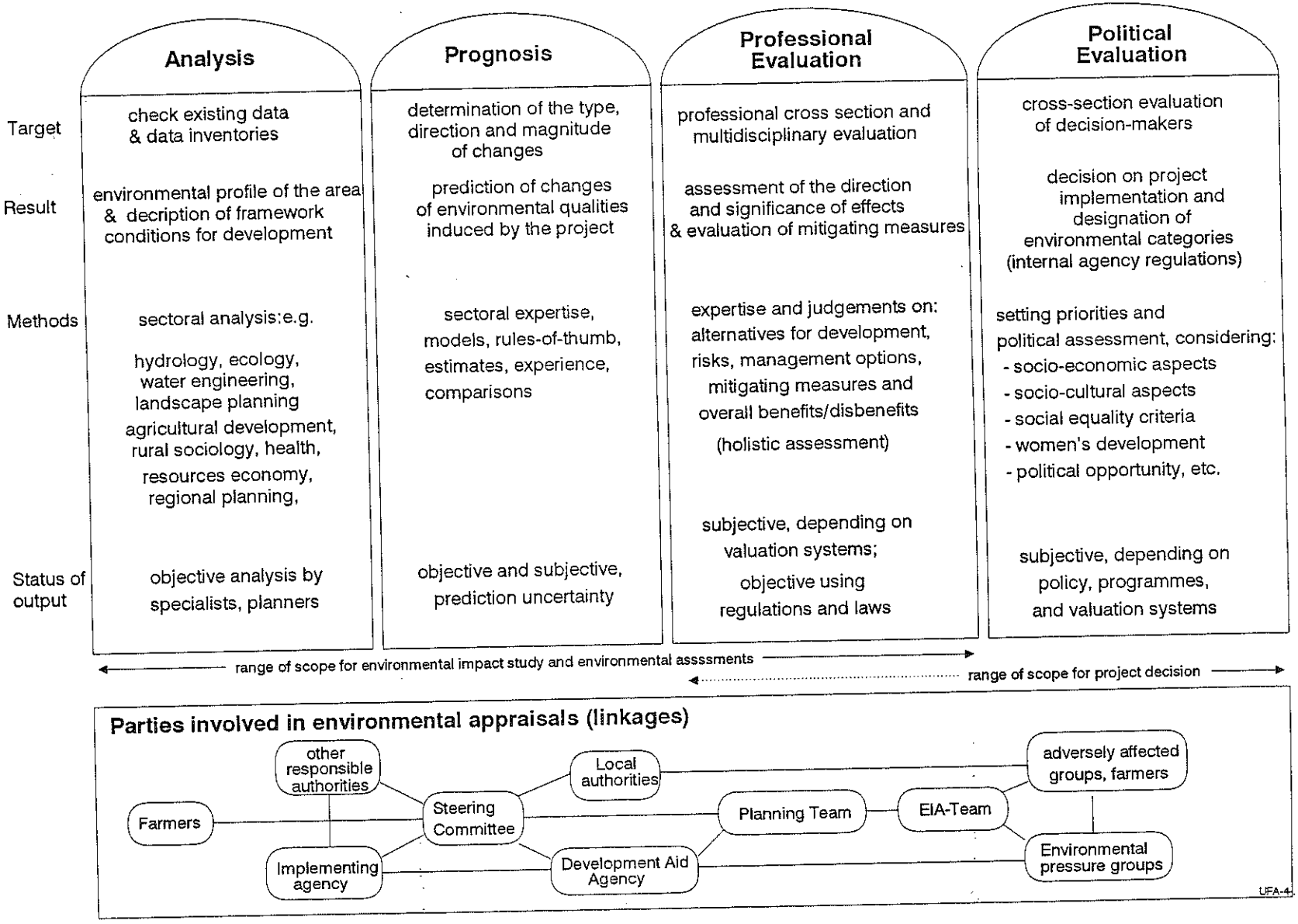
Linking EIA with project appraisal

The decision on whether or not a project will be implemented depends on feasibility studies which define the development options and goals in terms of water resources and agricultural development issues, technical feasibility, administrative-institutional aspects and economic feasibility. Only recently have environmental and social issues been treated as independent aspects in project appraisals.

Although there are many interfaces and interlinkages between natural and human environments, it is now common practice to separate *environmental appraisals* from *social impact assessments*: for example aspects of social welfare and economic development are analysed separately. In this case, environmental appraisal is only part of **Project Impact Assessment.** This procedure of an **integrated project assessment** is shown in Figure 4.

Impacts are expressed in terms of costs, benefits and disbenefits. They are quantified in monetary terms unless they defy such valuation. The calculations are summarised in the *multicriteria analysis (MCA)* of various development scenarios so that decision-makers have the ranges of future outcomes firmly in mind when deciding on a particular development project (example in Working Aid 12-10; see also chapter 6).

Figure 3 Professional vs. political evaluation in EIA



Box 4

Environmental decision-making due to perceptual biases and differing perspectives (modified after Bowonder 1987)

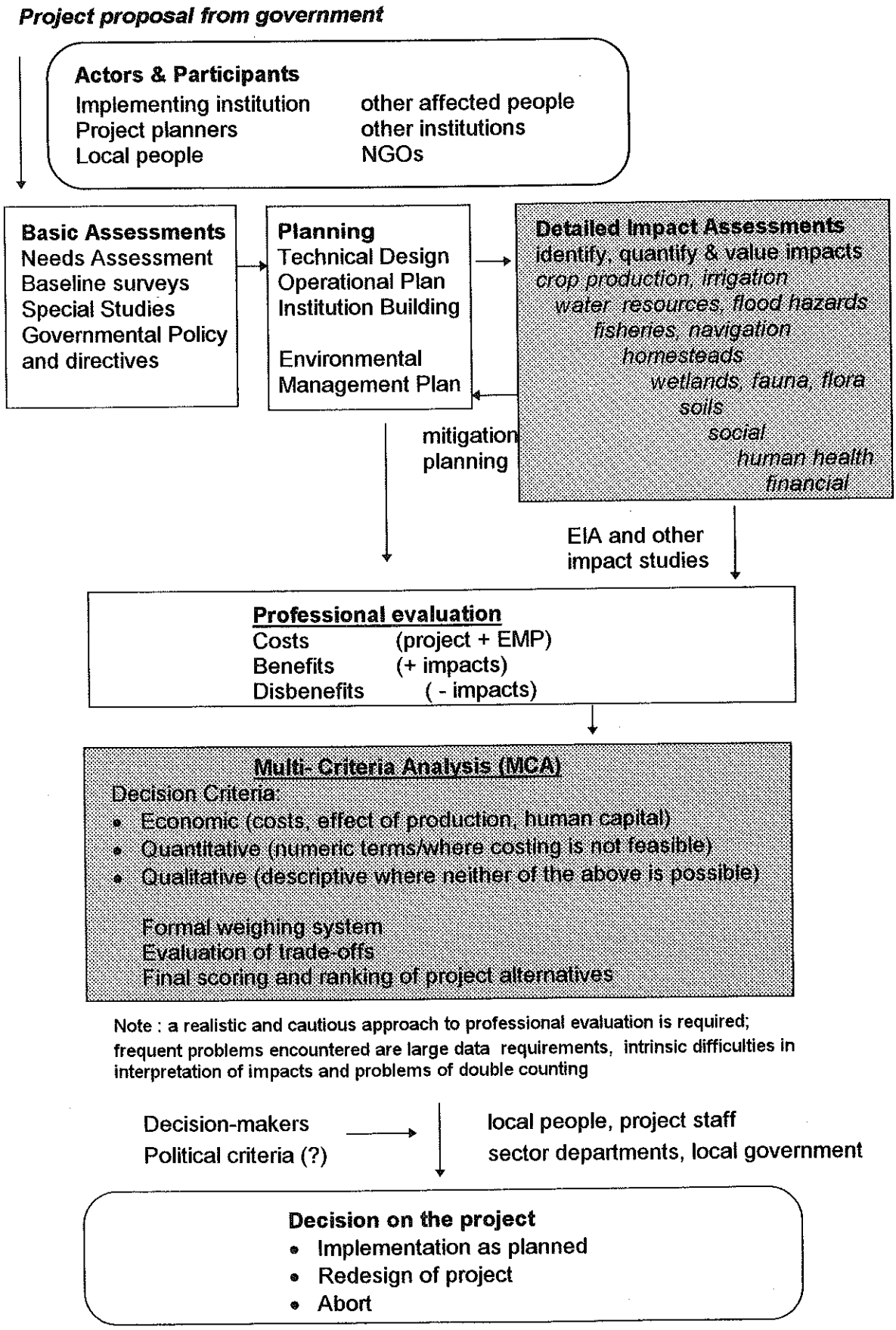
Technical perspective is an analytical view determined by methodology, knowledge, data and models and economics. *Organisational* perspective is that in which environmental issues are perceived in view of affected and affecting organisations. *Personal* perspective is dictated by individual experience, goals, and motives.

Technical (T)	Organisational (O)	Personal (P)
Science & technology based	Institution & society oriented	Individual or self-based
Cause-effect oriented	Challenge-response oriented	Challenge-response o.
Objective	Objective & subjective	Subjective
Problem solving & modelling	Delegation & problem avoiding	Leaders and followers
Analysis oriented	Experience oriented	Belief oriented
Optimisation oriented	Satisfying (acceptable rather than best)	Social and economic reward oriented
Complete rationality	Parochial priorities	Partial rationality
Minimal discounting	Moderate discounting	High discounting
Use models, probabilities & trade-offs	Standard operating procedures	Learning and experience
Takes care of uncertainty	Avoidance of uncertainty	Fear of uncertainty
Data and model oriented	Dialectic & negotiated reality	Intuition

Environmental perception has strong bearing on identification, understanding, assessment and control of a pollution problem. Hence, *environment* as we perceive it is our own invention, highly subjective and variable among differing individuals, groups, subcultures and cultures. What one describes depends on what one wants, and the acceptance of facts is itself a normative judgement. Environmental perception and decision-making is thus a function of information, past experience, perceptional readiness, stress, group pressure, interaction role, reference groups, organisational position, and reward. Existing models are belonging to these three perspectives. Also environmental decision-making models (or their components in EIA) correspond to technical, organisational and personal perspectives. It is important to *integrate* perspectives to obtain a new view of decision-making of environmental management. *Multiple perspectives analysis* (MPA) may help to identify strategies to implement, e.g. agricultural pollution controls by policy intervention packages such as public investments, pollution control monitoring, subsidies, pricing mechanism, proper incentives, institutional support, public participation.

Example: Agricultural pollution control and differing perspectives

Figure 4 Integrated project assessment and decision-making



EIA as part of the project development process

Figure 5 illustrates the proposed integration of environmental appraisal into the project planning, implementation and operation process from the viewpoint of a donor agency; a similar procedure may be applicable to a national implementing agency.

The environmental appraisal is shown in the inner part of the flow chart, the outer circle shows the normal project planning process which starts with project identification, e.g. a project proposal by an irrigation department or a group of farmers. After drafting the Project Appraisal (or Pre-Feasibility and Feasibility Studies in large-scale projects), the Detailed Design Study and the Plan of Operation are prepared on the basis of technical, organisational and financial aspects. Implementation starts after final approval of project plans. Environmental issues are interwoven at different phases of project planning and implementation.

The following example illustrates the interlinkages if preliminary technical and organisational designs at already at hand:

- ⇒ the project proposal has important environmental issues already built-in;
- ⇒ the initial appraisal (screening) determines whether an environmental appraisals is required; this depends on the project type and characteristics and the framework condition. Note: the project proposal can already include a separate EIA study according to national laws, regulations and standards;
- ⇒ if a project needs further environmental appraisal, the scoping process outlines the scope and depth of environmental analysis. In some cases, a separate EIA study is required, otherwise environmental issues can be covered in conventional planning and design studies. In any case, recommendations for preventive or mitigating measures are required to ensure environmentally sustainable development;
- ⇒ the EIA study findings are used, amongst other criteria, in the project appraisal to enable decision-makers to approve or to reject the project proposal;
- ⇒ the Environmental Management Plan recommends measures for environmentally sound development. Steering instruments are identified which are required for environmental monitoring, information and controlling, and subsequent project adjustments. These recommendations should be part of the Plan of Operation.

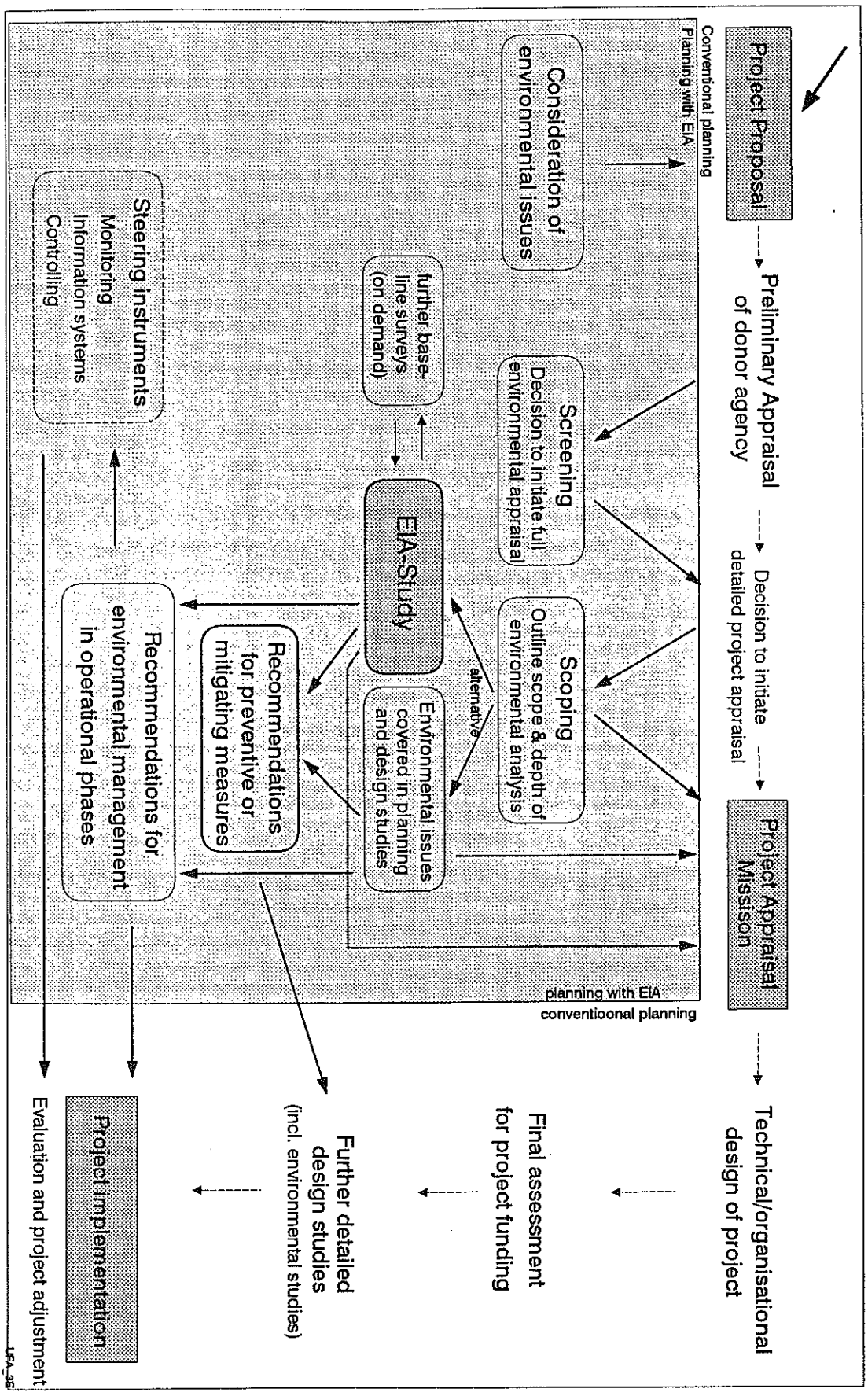
It is obvious that the actual state of project planning has considerable influence on the scope and depth of environmental appraisals, e.g. topics to be addressed, time frame and special impact surveys. Also the type of projects can cover a wide range of activities which are associated with irrigated agriculture development e.g., land reclamation, rehabilitation or extension of existing projects, or the development of components of irrigated agriculture e.g. crop diversification, modernisation of water supply or distribution systems. These guidelines are, therefore, designed to cover a wide range of project activities in order to be applicable to different types of projects, to different ecosystems and at any time of project planning.

Modified procedures for environmental appraisals

A modified procedure is applicable for large scale projects in which the preparation of technical designs (e.g. feasibility studies, detailed design studies) are part of the project cycle. The EIA can be part of the Feasibility Study and the Environmental Management Plan can be part of the Detailed Design Study.

Small scale projects are rarely subject to detailed statutory EIA. The amount of data which is usually required for detailed appraisals is rarely available, and baseline surveys may be beyond the financial resources of the planning authority or communities. In such situations, a simplification of the whole procedure and especially the depth of analysis, prediction and evaluation of environmental effects is needed, for example a *rapid environmental appraisal* (see Box 2). Furthermore, the Environmental Management Plan can concentrate on environmental key issues and address them in a simplified approach.

Figure 5 Integration of EIA into the project development process



Although a simplification is required for small projects, planners should be aware that such projects are rarely undertaken in isolation; they tend to be part of a wider programme of agricultural or irrigated land development in a region or watershed through a series of schemes. In this case, the guidelines can be used with respect to the overall development programme in a region. It may be advisable for the district planning agency to form a steering committee which supervises the EIA. For a region in which numerous small scale schemes are planned, once an appraisal is done for a pilot project with due consideration of the wider impacts (e.g. water resources), simplified appraisals could be developed for other schemes to ensure that the key environmental issues are considered.

Defining boundaries and scales of sustainability analysis for EIA

EIA is a management instrument to achieve sustainable development at the project level. Sustainability in agricultural systems means maintaining anticipated productivity over time. Sustainability is, therefore, an issue of system performance. To examine sustainability it is necessary to develop an operational framework, and in order to measure the performance of a system its boundaries must be defined.

Figure 6 illustrates the hierarchical ordering of agricultural systems and defines various scales and levels of agricultural systems analysis (modified after Sands and Podmore 1993). Because there are different levels of ecological and economic sustainability which can be subject to analysis and evaluation, it is important that the boundaries and scales for an EIA of agricultural systems are defined as early as possible. It is proposed here that EIA for projects applies only to the micro-scale of either agro-ecological or economic sustainability, applicable to field or farm level, respecively. The macro-scale of agro-ecological sustainability only applies to land use types or agricultural management systems at watershed or agro-ecological zone level, or to integrated land use or water master plans at regional or national scale.

A methodology applicable to integrated development plans (land use plans, watershed management plans, land consolidation), or to agricultural development programmes is still under development. A new instrument is the **Strategic Environmental Assessment**, (SEA; references: EIA Centre University of Manchester. Leaflet series 13.1995; UVP Report 4/95; Pirkl et al. 1994)

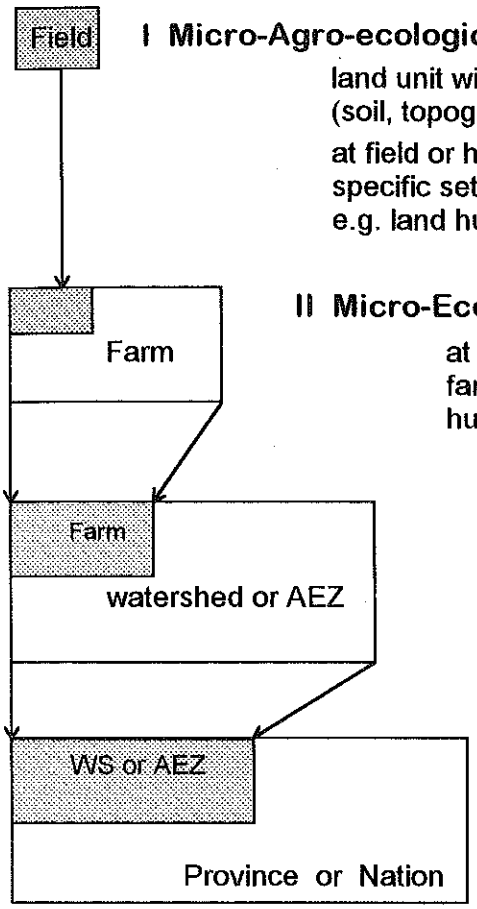
SEA has two advantages: (1.) Deficiencies of EIA at project level in terms of improvements to the planning and design of projects, in the quality of decision-making and cost effectiveness can be remedied by extending EIA at earlier stages of the planning process. Often, alternatives have been eliminated from consideration by decisions taken at the programme level, e.g. decisions on irrigation schemes in a region or to promote land husbandry programmes (such as crop diversification, mechanisation, pest control). (2.) Impacts stemming from actions which normally fall outside project-level EIA procedures are assessed, e.g. the cumulative and combined hydrological impacts of individual small projects or changes in farming practices.

Effective integrated means of promoting sustainable development are (OECD 1994):

1. Setting environmental quality goals and emission targets;
2. Institutional strengthening to promote the combined attainment of environmental quality and economic and social development goals;
3. Greater use of economic instruments to guide the agricultural and water resources sectors to more efficient and sustainable development pathways;
4. Strengthening procedures and assessment methods for the integration of environmental considerations, alongside economic and social considerations, into the formulation and evaluation of new policies, plans, programmes and projects.

The combined use of SEA and EIA methods fits within the fourth type of measures. They have the same overall objectives and they complement one another.

Figure 6 Boundaries & Scales of Sustainability Analysis for EIA



I Micro-Agro-ecological Sustainability

land unit with fairly uniform natural conditions (soil, topography, agro-climate, soil water, flora, etc.)

at field or habitat level: crop production units over which a specific set of management practices are employed, e.g. land husbandry, irrigation type

II Micro-Economic Sustainability

at farming system level or individual farm level where different sets of land husbandry practices are employed

III Macro-Agro-ecological Sustainability

different farming systems or land use types within a watershed or agro-ecological zone

IV Macro-economic Sustainability

land use systems and types, agricultural market systems

Limitations of environmental appraisals at project level

Although most countries have adopted statutory EIA, its application in agricultural projects has three major shortcomings and limitations:

1. Agro-ecosystems functioning under different types and intensities of impacts are difficult to **predict** and **quantify,** both short- and long-term perspectives (see Box 5). Many changes are likely to be speculative and they depend on future decision making by many actors from the farmer to agricultural policy makers which - amongst others - reflect changing agricultural market conditions, socio-cultural attitudes of groups or individuals, and environmental regulations or economic instruments, e.g. charges/taxes, subsidies, deposit-refund systems, market-creation, financial enforcement incentives (e.g. OECD 1989-1994).
2. Serious problems stand in the way of **valuation** of environmental impacts, even where the process of bounding allows good approximations, because many environmental impacts can only be characterised in non-monetary terms, especially in such circumstances where quantification is difficult and where the markets for these effects are absent, imperfect or incomplete (for example: opportunity costs). Although there are a number of valuation techniques (see chapter 6) which have been attempted particularly in a developed country context, they are less likely applicable in the context of many development projects.

Environmental management towards sustainable agricultural development (UNDP 1990; Horberry in DSE 1984). Project appraisals, in practice, often have a limited on project operation because they serve the administrative purpose of project approval. Further, the application of recommendations for environmentally sound measures depends on a set of framework conditions which are often beyond the control of an indi-

vidual project, such as environmental legislation, policy, enforcement of regulations, and effective administration and agricultural services. Strengthening of environmental education is required to increase awareness and management knowledge and skills of the individual land users towards better environmental management. Therefore,

- environmental appraisals should be seen as a *flexible process rather than an individual procedure for project approval*. Ideally, they are integrated into the whole project cycle and they should cover the whole lifespan of a water resources development and agricultural production system.
- an environmental management plan is as important as other outputs of the environmental appraisal process, e.g. the EIA-study, because it defines activities and check-points for evaluation to ensure sustainable development during operation.
- issues of environmental concern at the project level need supporting measures which are effective at various management and decision-making levels:
  - environmental legislation and policy at international and national level;
  - environmental resources planning at regional or national to district level;
  - local (community/village, water user groups) and individual farm level planning.

New, **holistic resource management** concepts need to be developed to change long-established patterns of attitudes of all actors and at all levels of decision making in agricultural systems. These concepts should integrate environmental legislation and policies, codes of conduct (e.g. good stewardship for land husbandry), integrated planning for sustainable land and water resource uses, environmental monitoring and information, and environmental education and training.

Special considerations for agricultural and irrigation development

When applying EIA to agriculture, distinctions must be drawn between EIA standards which had been developed for industrial or infrastructure projects, and activities in agriculture and water sectors. Agriculture and irrigation are fragmented activities which involves complex relationships with natural ecosystems (see Box 5):

- Development plans for irrigated agriculture, flood control/drainage are usually multi-sectoral and consist of numerous individual activities;
- The causes of environmental changes in ecosystems are diverse and complex, and environmental effects are variable in time, space, direction and intensity;
- The dynamic nature of agro-ecological processes makes the analytical distinction between natural processes and human-made changes difficult;
- Prediction of changes in agro-ecosystems is at best, vague because there are unpredictable evolutionary trends involved;
- Monitoring of non-point pollution sources is difficult;
- Different levels of decision-making are involved in planning and implementation (from farmer to policy-maker);
- Regulations and environmental standards for agro-ecosystems are few;
- The concept of impact mitigation is not always suited for agro-ecosystems because changes in ecosystems are not objectively verifiable as gains versus losses.

Therefore, EIA as traditionally formulated is more compatible with analysing concentrated (point-) pollution sources that inevitably affect their immediate environment (like a power plant, dam or road), whereas agriculture and irrigated land development aims to alter and intensify the use of natural resources over a wide area. EIA for agriculture requires an environmental management approach, seeking to optimise the use of natural resources in the light of long-term productivity concerns (Horberry in: DSE 1984)

Box 5

Special considerations in EIA analysis for agro-ecosystems

Distinctions can be drawn between methods of environmental appraisal for

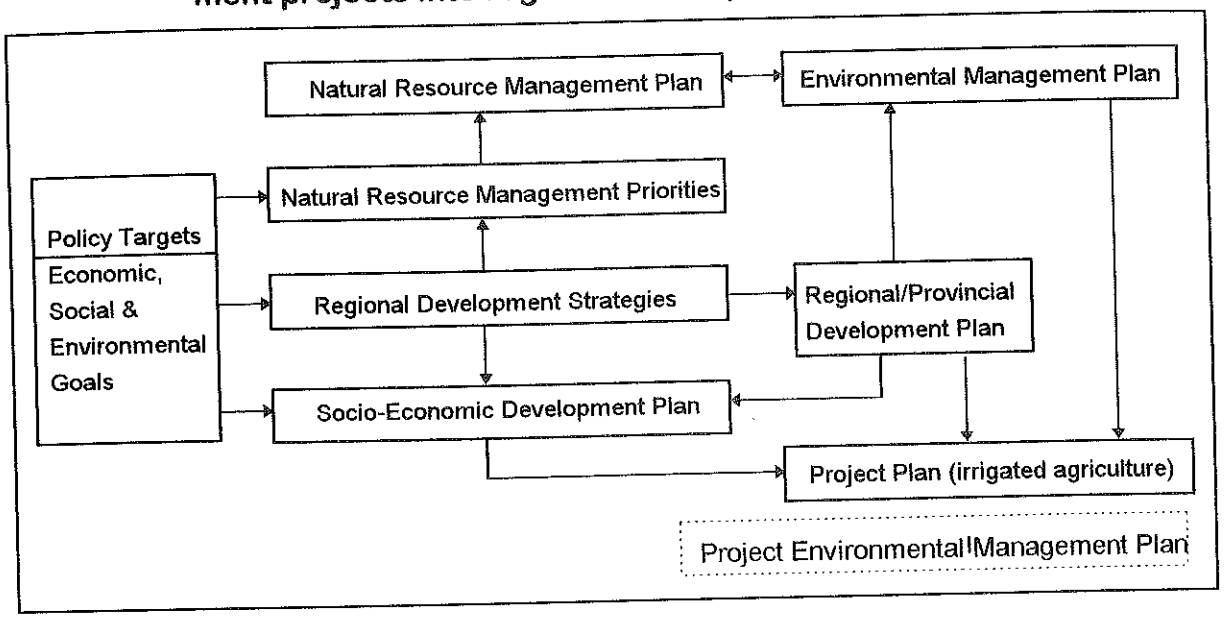
- industrial or infrastructure projects that inevitably affect their immediate environment;
- dispersed activities, such as agricultural development.

Agriculture involves complex relationships and interactions with natural ecosystems. The rate and mode of use of land-, water- and bio-resources by individual land users determine whether the intended resource use is sustainable or is destructive or detrimental to other ecosystems or resource users.

1. Causes of environmental changes in agricultural ecosystems are complex and they vary with time and space, depending on decisions of individual farmers or water user groups. Natural risks, poor planning or design, inadequate management practices of farmers as well as policy framework (for example water prices, agricultural subsidies) are all factors which can cause negative impacts. These factors, however, are flexible and continually changing. Hence, conventional methods of prognosis and risk assessments are often not applicable to agriculture.
2. Environmental effects are also variable in time, spatial arrangement, intensity and direction (beneficial or detrimental). For example, leaching of salts can be harmless during high floods (due to the dilution effect), but can be detrimental to downstream ecosystems during low flow.
3. Predictability of changes in ecosystems is difficult because (i) ecosystems consist of a web of contributors and their independent actions, (ii) the resilience of ecosystems and (iii) their adaptability to changing environments. Evolution, structural changes, complex interactions, and creativity are factors which limit the possibilities to plan for or to predict (quantify) changes in agro-ecosystems.
4. The concept of impact mitigation (damage-repair-replacement costs) plays an important role in infrastructure or industrial projects but it is rarely suited to agro-ecosystems because there is no sound evidence that it is possible to reconstruct most target communities (fauna, flora) or habitats in their entity. Firstly, changes by destruction and disturbance are natural processes in ecosystems; they are the precondition for succession and evolution. In agro-ecosystems, changes occur gradually as direct disturbances, and indirectly through isolation and formation of barriers. Secondly, changes in ecosystems are characterised by situations in which "gains" or "losses" are not objectively verifiable. However, compensation may be justified in agricultural development if sensitive ecosystems (e.g. wetlands) are converted to farmland; the loss of biodiversity can be partly compensated (not restored!) by landscape engineering.
5. The dynamic nature of irrigated agriculture leads to continuous changes and many environmental changes are only detectable or effective after several years. Furthermore, human ecosystems are characterised by non-predictable trends in terms of socio-cultural and economic changes, technical innovations, and factors influenced by policies.
6. Monitoring of environmental changes is time-consuming and costly, and changes are difficult to analyse and to interpret. Non-point polluters such as agriculture are characterised by numerous and disperse, small effluents or interventions which modify ecosystem structure and functions; environmental effects can be effective over large areas and also outside the immediately affected area.
7. In agriculture, decision-making during planning and operation is complex. Different, independent levels are involved such as individuals, farming households, farmers' co-operatives, extension services, planning and controlling authorities at local and national level, consumers, policy-makers, etc.
8. There are few regulations which define environmental standards applicable for agriculture and irrigated land development, with the exception of regulations for air and water pollution or the safe use pesticides.

Furthermore, it is now recognised by agricultural and water resources planners that environmental issues cannot only be addressed only at the project level. An integrated resource management approach is required to integrate water resources and land use management and other sector approaches. The development of national environmental management plans (Carew-Reid et al.1994) and integrated natural resources management plans (FAO 1995) can play an important role in integrating agricultural and irrigated land development projects into regional development planning (Figure 7).

Figure 7 Idealised integration of agricultural and irrigated land development projects into regional development plans (land use plans)



Stakeholder involvement and local participation

Almost all EIA systems provide for consultation and participation of various stakeholders (government institutions, public) prior to the decision on a project. The public may be categorised as: local people (groups, individuals) directly involved in or indirectly affected by the development project, environmentalists (national/international groups or individuals), business interests, and other public pressure groups, including media. Each of these publics may organise themselves into, or be represented by, one or more non-governmental organisations. Effective involvement can bring numerous benefits: increase in the quality of the decision, reduction in costs and delay, achievement of transparency of decision and commitment to decision, and avoidance of public controversy and confrontation.

However, public participation in the EIA systems in developing countries is frequently insufficiently developed, and there are few concepts to foster broad-based stakeholder participation in critical phases of EIA, e.g. early planning stages, scoping or setting site-specific environmental goals for sustainable development, decision-making on the project. Provisions and practice relating to consultation, institutional collaboration and local participation are also strongly influenced the political system in the jurisdiction concerned and the lack of a culture of Western-style public participation. The confidentiality of EIA studies and lack of experience and knowledge about EIA may exacerbate the deficiencies.

Therefore, the following recommendations are made to ensure that the perceptions and the needs of the local people are considered adequately at every stage in the EIA process:

- Questionnaires and surveys:
  Needs analysis determines perceptions about development and environmental issues of the people concerned; the needs analysis can include conventional socio-economic surveys, e.g. household or market surveys, farming systems analysis
  Participatory rural appraisals (PRA) or equivalent surveying methods (local knowledge systems surveys) are efficient ways to involve local people and people who work in the area (sectoral managers at local level, social workers, etc.) to evaluate the local people's *values* and *perceptions* of sustainable natural resources development. Relevant tools include transect walks, mapping and landscape modelling, seasonal analysis, trend diagrams (e.g. FAO-RAPA 1995, GTZ 1994)
- Stakeholder and gender analyses determines who is involved, who benefits and who loses from the proposed development;
- Participatory planning workshops and consultative local meetings may be useful to enhance dialogue among stakeholders and evaluate local perceptions, especially in complex situations or if there are local conflicts over resource use;
- Formulation of environmental quality goals (for environmental management) at irrigation scheme or project level should be done jointly by governmental agencies and traditional decision-makers at local level, considering different stakeholders and gender issues;
- Results should be presented in the EIA report. Tables may summarise the environmental issues of concern and the solutions proposed by various local people.
- Environmental monitoring, education and training should promote cross-sectoral awareness and communication skills that lead to improved quality of information on environmental resources, human activities and long-term environmental consequences. Methods of public participation during implementation and operation are advertisements, leafleting, use of media, displays and exhibitions, open houses, community liaison staff, community advisory committees, public hearings, etc.

Common stakeholders and actors in EIA for agricultural development can be:

- **local people** (individuals, families, groups each with different interests)
  - agricultural land users
  - land owners
  - irrigation farmers
  - pastoralists, fishermen, etc.
  - urban and rural water users
  - landless people
  - local businessmen
  - agro-businessmen
  - non-rural people
- **traditional local leaders**
- **government**
  - national and provincial level
  - local level
- **governmental institutions** (at national/provincial/local level)
  - implementing agency
  - water development agencies
  - different agricultural agencies, including local extension staff
  - local government

cont.

  - forestry
  - environment, natural resources
  - public health
- **non-governmental organisations**
  - development organisations (international/national/local)
  - local self-help groups
  - environmental pressure groups (national/international level)
- **interested public** such as lawyers, local and national media, scientists, universities, schools, unions
- **consultants**, planners, specialists
- donors, funding agencies

3 SCOPE OF EIA

Activities in agricultural and irrigated land development

The first step in impact analysis is to identify project objectives and activities which can cause environmental changes. Plans, construction and consultative activities should be assessed in terms of their environmental sensitivity. In agriculture and irrigation, environmental changes can be caused by different activities: use of water, land reclamation, agronomic practices, infrastructure development, and health control measures (Box 6).

Activities of agro-industry (e.g. processing) or the production of agricultural inputs (e.g. agro-chemistry plants) are excluded here because they are usually subject of specific EIA studies. Detailed EIA studies of large dams and reservoirs should follow the elaborate guidelines of ICOLD and other agencies (e.g. ICOLD 1982, 1988, DVWK 1994, 1993; SMEC 1990; UNESCO 1987; ESCAP 1985).

Planning documents

The implementing agency (or farmer association) is responsible for submission of planning documents which define the project objectives and technical or organisational details of construction, maintenance and operation. Often, feasibility studies and detailed designs are prepared by consultants (Mann 1982). These documents are the basis of EIA and they are subject to analysis in working step 1 of the EIA study (see chapter 7). A summary of the Project Plan is presented as part of the EIA report (see Working Aid 13.2 and 13.3).

The EIA study can be prepared by the project planning team, or by an independent team of environmental specialists. Results can be biased by conflicting interests if the same team of consultants is contracted for planning and EIA. However, in the view of emphasising environmental management at an early planning stage rather than aiming at administrative EIA statements, the integration of environmental specialists in the team of planners can be of advantage.

The phase of planning and the quality of planning documents have considerable influence on the depth of EIA. Often, detailed planning documents are still in the stage of preparation when EIA is undertaken. Therefore, it is often impossible to predict environmental changes to the desired degree. On the other hand, important decisions on site location and water resource uses are made by decision-makers at an early planning stage. Therefore, possibilities to elaborate alternatives in EIA studies are often limited to technical details, and appraisal of alternative plans is limited to projects which involve the large-scale destruction of environmentally sensitive areas or other socially or politically controversial issues, e.g. projects associated with large multi-purpose reservoirs.

Data base

Environmental changes are analysed and evaluated on the basis of available documents and baseline data. A detailed **Checklist** for data inventories and project arrangements is presented in Annex 1. The information needed to assess the legal and institutional framework conditions is shown in Box 7.

In large projects, special baseline surveys are often required, although in practice, financial and time constraints limit the preparation of detailed and comprehensive baselines survey for environmental appraisals. Only rarely will conditions meet international standards (as defined in e.g. in ISPAN 1995; ERL 1884) for baseline surveys and rapid surveys may be more appropriate (see Box 8).

Often, analysis, prognosis and evaluation of changes can be made only at a reconnaissance level and for a limited number of environmental components. If needed, special investigations can be conducted at a later project phase, for example during operation. It can also be preferable, to concentrate on environmental monitoring rather than preparing detailed baseline surveys and predictions which often remain speculative and open to disputes because of the specific nature of environmental changes in agricultural lands.

Box 6

Activities in agricultural and irrigated land development

The irrigation farming system consists of different components and various technical or managerial options exist for each component. The irrigation system is only part of the whole farming system and on- and other off-farm activities of individual farm households may need to be considered:

- Water resources development: water supply systems, flood control systems, irrigation delivery and water use systems, drainage systems
- Land development: land clearing, land occupation, landscape modification, land manipulation, soil amelioration
- Agricultural development: crop selection, cropping-, tillage- and planting systems, pest and weed control, fertilisation, harvesting and post-harvest systems, on-farm processing, on-farm waste disposal
- Infrastructure development: housing, domestic water supply, rural roads, off-farm waste disposal, storage and processing
- Health control systems environmental modification or manipulation, chemical or biological controls

Details in Working Aid - WA 2

Box 7

General checklist of data and project arrangements

Policy and programmes

national environmental strategies; environmental action plans; EIA guidelines; sector development plans such as agriculture development plan, water master plan, nature conservation plan; land policy

Regulations and standards

health protection law and regulations (e.g. about hazardous materials, occupational risks), conservation laws, water laws, land use and tenure laws (governmental or traditional)

Socio-economic development data

demographic and economic statistics at national and district level, land use and tenure data, public health

Natural resources data

national reports on the State of the Environment, sector analysis: agriculture, land use, forestry, hydrology, nature conservation, fauna and flora, climate/air, soils sector analysis: agriculture, forests, water resources,

Environmental monitoring

pollution monitoring, public health monitoring, project monitoring, sector-specific monitoring: soil fertility, groundwater, biodiversity, etc.

National institutions

Financial and development planning, environmental agencies, other line agencies

Provincial institutions

regional planning units, agricultural services, other relevant planning agencies

Details in Annex 1

Box 8

Rapid surveys and baseline surveys

Surveys can be part of EIA, if sufficient baseline data are not available. A team approach is required for baseline data inventory, analysis and interpretation whereas data compilation can be conducted by an experienced environmental planner. Rapid surveys focus on key data of site-specific environmental components; data review relies heavily on experts brief consultancies with local people and other interested parties. Time frames given are approximations only (apply to 1000 ha project area):

- Land use system survey: 1 week survey, using participatory rural appraisal methods in a multidisciplinary team. Baseline surveys with primary data collection: 3-4 months, depending on the availability of maps and remote sensing data, and size of survey area
- Hydrological survey: 1-2 weeks field checks, rapid data inventory, analysis and data interpretation (without detailed statistical analysis and modelling). Baseline surveys: 3-4 months, may be more if primary data collection (streamflow, wetlands, sediments) and hydrological modelling are involved
- Agro-climatological data: 1-2 weeks data compilation and analysis. Baseline surveys: rarely possible within the scope of EIA
- Hydrogeological/geological data: 1 week data compilation and interpretation. Baseline surveys: 3-5 months or more, depending on the need for primary data collection: aquifer tests, well logs, boring data, etc.
- Soils data: 1-2 week data analysis (existing soil maps) and rapid field checks. Semi-detailed surveys take 3-4 months field work plus laboratory analysis
- Ecological surveys: 2 weeks data compilation and analysis from existing surveys, including a reconnaissance field trip. Baseline surveys cover a one-year period to obtain fauna and flora data during all seasons. Most important are the identification and evaluation of ecologically sensitive areas and the evaluation of the status of endangered species
- Data on water and air pollution: 1 week data analysis, additional 1 week for rapid field checks (hot spot checks with portable equipment)

  Public health risk assessment for water-related diseases: 1 week data analysis and workshop with regional health specialists. Epidemiological surveys or equivalent primary data collection may need several months or must cover at least one season.

4 SCREENING

The screening process determines *whether the project is likely to cause significant environmental effects*. It is usually a desktop examination using existing planning documents and other easily accessible information on the framework conditions of the project. The process of screening is illustrated in Figure 8 and the guiding steps are explained in Box 9.

EIA according to national regulations

Projects are subject to EIA, if their type, size and location suggest that significant environmental changes are likely to occur (e.g. UNEP 1987; EU Directive 85/337; OECD Council Recommendation 1985; different National Acts, e.g. the German Act on EIA of 1990). The European Union Directive describes a number of water resources and agricultural development projects:

- land consolidation projects
- conversion of land into intensively used agricultural areas
- water resources projects in agriculture
- farms with intensive animal production (large-scale farming).

These projects can be subject to EIA, if their further attributes suggest that significant effects are likely. Criteria are usually defined at the national level; for example the following threshold limits for EIA applications are set in Thailand and Malawi:

- size of area: if area >12 800 ha (e.g. NEB,Thailand)
- water abstraction: if river volume > 100 000 m^3/a (e.g. NEB, Thailand)
- reservoir storage if storage surface area is >15 km^2 (e.g. NEB, Thailand)
- costs involved: if total investment > 3 mio US $ (e.g. Malawi).

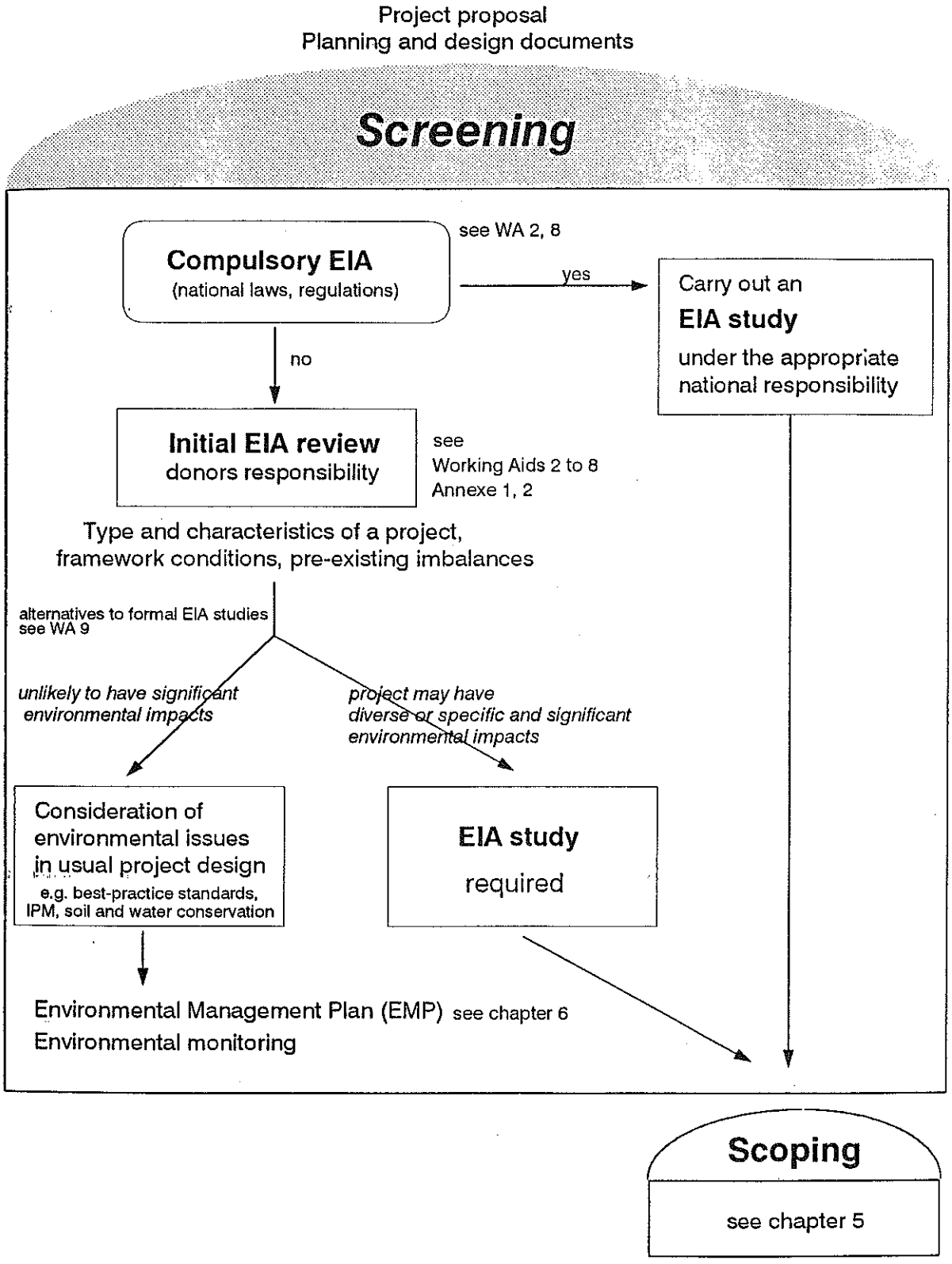
In case that one of these threshold values are exceeded, the project is subject to statutory EIA under national laws (Figure 8). The examination is executed by the responsible national agency, either the line agency (e.g. Ministry of Agriculture or Irrigation) or the environmental authority. Further procedures are usually defined in national EIA acts and regulations. Often, the existing guidelines are not sector-specific, and if, they are not directly applicable to irrigated agriculture. In practice, only few large irrigation projects fulfil one of the above mentioned national standards and the detailed EIA is rarely applied to agricultural and irrigated land development.

Project appraisal in development aid

Independent of national procedures, all donor agencies in development cooperation require procedures of environmental appraisals to ensure that projects are compatible with environmentally sound development (World Bank 1991, UNEP 1988, ADB 1987; overview in: Petermann 1993.2, ERL 1987). For example, the procedures for German technical cooperation (BMZ 1987, 1993, GTZ 1991) requires that:

- Environmental issues must be documented in all project reports (appraisal report, technical reports, project planning documents, etc.);
- The environmental co-ordination unit (GTZ-administrators) is informed and involved in environmental decision-making;
- All projects must be assessed into five environmental categories (U 0 and U 1 to U 4), depending on the degree of environmental impacts, the demand for mitigation measures and monitoring, and the likelihood of environmental risks. This evaluation is done mutually by the sector planners and other decision-makers, based on technical findings of the appraisal mission or special EIA studies.

Figure 8 Procedure for Screening



Further EIA studies

In many cases, the existing documents do not allow for a meaningful or detailed appraisal of environmental changes. A detailed EIA study is rarely done by the implementing agency (recipient country) in the early planning stage, due to lack of funds and expertise. Therefore, further appraisals are often required: baseline surveys, environmental studies and experts consultations (BMZ 1987; 1993). This applies to all projects if the screening process shows that the project is likely to produce significant environmental changes. The focus and contents of further EIA studies are determined in the *Scoping Process* (see chapter 5 and Figure 10).

Framework conditions for environmental management

The decision to continue with further EIA studies should not depend solely on project-specific attributes such as size and financial resources involved. Also the pre-existing status of environmental degradation and the potentials for efficient management should be considered.

It is commonly agreed that the acceptance and adoption of environmentally sound agriculture (e.g. best management practices) relies on various factors. Apart from the availability of resources and access to appropriate technology, the status of environmental education and technical knowledge or skills of planners and land users, and policy or legislative systems are also important (e.g. OECD publications 1989-1995, O'Callaghan 1996). Figure 9 shows internal and external factors that influence the adoption of environmentally sound management practices.

Administrative arrangements are also important for advisory services, monitoring and controlling; for example, through the agricultural extension service, water resources bodies, health services, and nature conservation authorities. If such supporting services are inadequate, incentives for environmentally sound resources management are lacking, and environmental education and knowledge are poor, then the risks for successful implementation of environmentally sound agriculture are also high. In these circumstances, it may be recommended to continue with EIA, and to identify areas of high environmental risk associated with unfavourable framework conditions.

Alternatives for EIA application

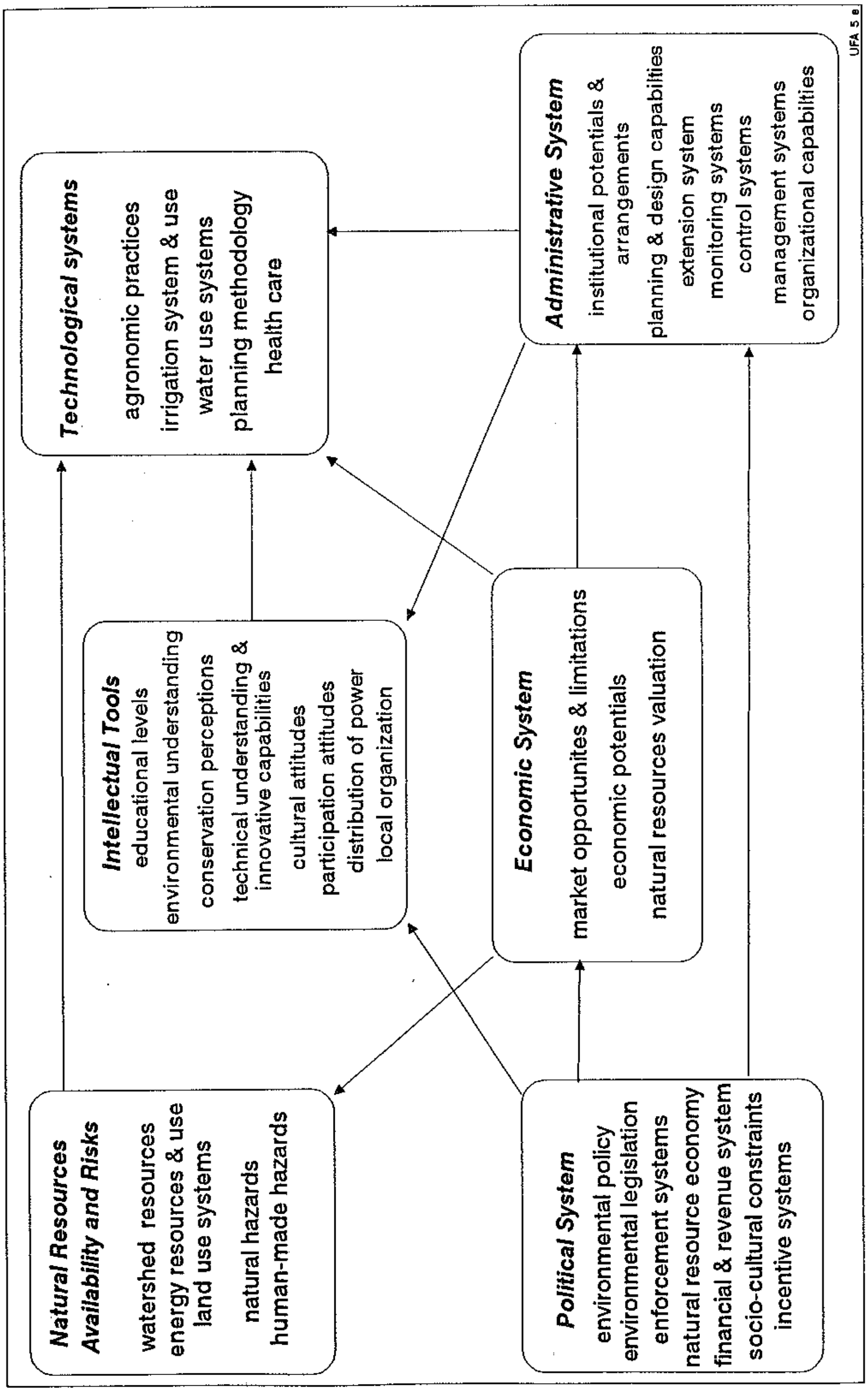
Where further EIA studies are needed, there are two options:

1 Consideration of environmental issues in normal planning and design, without specific studies; this limited approach can be appropriate if
   - potential environmental impacts are small in intensity and size
   - environmentally sensitive areas and scarce resources are unchanged
   - technical systems exist - and are likely to be adapted - by local land and water users which allow environmentally sound management
   - standards to control agricultural pollution are enforced at farm level
   - framework conditions for efficient environmental management are favourable.

2 Conducting an EIA study. Content and depth are determined in the *Scoping Process* (chapter 5).

Figure 9 **Factors influencing environmentally sound agricultural and irrigated land development**

Availability of resources and their wise use: factors, elements and interdependencies



Box 9

Guiding steps for screening

1. Collection of relevant procedural and technical guidelines regarding EIA in the relevant country; examination of whether a national law requires an EIA-study for the proposed project; determination of the responsible national authority to conduct and supervise the EIA.
2. Collection of environment-related information on the project and relevant framework conditions.
   Annex 1: Data checklist; Checklist of project arrangement
3. Description of proposed project activities and options for development, derived from available project documents, feasibility studies and detailed designs
   Working Aid 2: Checklist of project activities
4. Identification of type of project and project characteristics
   Working Aid 3: Screening checklist. Part I: Overall project screening
   Working Aid 5: Key questions for site selection
   Working Aid 6: Potential user conflicts over land/ water resources
   Working Aid 7: Checklist of ecologically sensitive areas
5. Evaluation of framework conditions related to environmentally sound irrigated agriculture. Part II: Pre-existing status of natural resources; Part III: Environmental management-related potentials.
   Working Aid 3: Screening checklist, Parts A and B
   Working Aid 4: Screening checklist: influencing factors
6. Overall initial assessment, depending on type and characteristics of the project, pre-existing degradation of natural resources, and potentials for environmentally sound development. The final scoring is descriptive. In addition, a formal EIA statement may be prepared which follows the internal regulations of donors or other involved agencies (e.g. U 1-4 categories are applied in Germany)
   Working Aid 3: Screening checklist
   Working Aid 8: Possible environmental impacts of agriculture/irrigation
   Annex 2: Interaction matrix: activities versus environmental impacts
7. Determination of further steps in EIA, considering the findings of step 6:
   - Alternative 1: At present, there are no need for further EIA-studies.
     Alternative 1a: The project is environmentally compatible: significant negative impacts and risks are unlikely; mitigation or compensation measures are not required. Further EIA studies are not required during the project planning phase. There are probably few agricultural or irrigation development projects which fall under this category.
     Alternative 1b: Alternatives to conventional and formal EIA studies may be considered for the following types of projects: rehabilitation and modernisation projects, small pilot projects, advisory or extension service projects. A preliminary list of such projects is shown in Working Aid 9. An Environmental Management Plan is needed for such projects to ensure environmentally sound irrigated agriculture at later project stages and during operation; environmental monitoring should be compulsory.
   - Alternative 2: The project is likely to cause significant environmental impacts:
     Alternative 2a. A formal EIA is required, following the national guidelines.
     Alternative 2b. Rapid, semi-detailed or detailed EIA studies are required. Further working steps are determined in the *Scoping* process, see Chapter 5.