Chapter 2
Environmentally Sound Design[1]

Contents

What is environmentally sound design?

For the purposes of these *Guidelines*, environmentally sound design (ESD) is the design and implementation of activities and projects such *that the environmental harm associated with a particular development objective is kept to a practicable minimum.*

ESD is necessary to prevent:

- Failure of economic or social development projects due to environmental causes.
- Damage to the environment which imperils future economic and social development.

Environmentally sound design is prevention-based across the project lifecycle. Prevention begins with the choice of *means* by which a development objective is achieved.

For example, the development objective (or goal) of a project or activity may be to improve agricultural productivity. Potential means to achieve this objective include; introducing new crop varieties; promoting the use of chemical inputs; introducing irrigation; changes to tilling and soil

Common Sources of Environmental Design Failures

- Failure to anticipate potential "critical events"—drought, famine or civil strife and related emergency assistance
- Failure to consider the effects of increased scale. For example, the immediate effects of a small-scale animal husbandry project may be minor. BUT if the project succeeds and animal holdings multiply, the effects may pose serious problems.
- Failure to consider the environmental effects of increased income and population growth.

[1] This chapter was originally developed in support of USAID's Africa Bureau course "Environmental Assessment and Environmentally Sound Design for Small Scale Activities."

conservation practices; integrated pest management; or some combination of these measures. Environmentally sound design dictates that each alternative be considered, and that the environmental impacts associated with each choice be weighed *alongside* technical, economic and social criteria.

Once the means are chosen, environmentally sound design also takes a prevention-based approach to the specifics of project design. Can changes in location, construction techniques, or operating practices significantly reduce critical environmental damage?

Finally, where negative impacts cannot be entirely prevented or minimized by design choices, environmentally sound design mandates that they be mitigated during project operation, or remediated after the project is decommissioned.

Examples of Environmental Failures of Small-scale Activities

- Improperly sited waste disposal from a new community health post contaminates the community water supply,
- Soil salinizes and becomes infertile due to improper irrigation practices
- Poor siting and construction of a market access road cause siltation of a stream which serves as both a community water supply and fish hatchery.

Environmental impact assessment: a process for ESD

Environmental impact assessment (EIA) is a formal process for identifying the likely effects of particular activities or projects on the environment and on human health and welfare.

As such, we view EIA as a tool to organize, facilitate and document the practice of environmentally sound design. Stated another way, *environmentally sound design is the goal or objective of any EIA process.*

EIA is useful to both project designers and planners and those who must assess project proposals for funding:

- EIA provides a structure for clearly listing environmental review requirements. Such review requirements are “safety checks” for environmental soundness.
- The documentation required by the EIA forms a basis for anyone making an environmental evaluation of a projects design and implementation. Evaluators may include funders, regulatory agencies, and the implementing organization itself.
- The systematic nature of the EIA process reduces the errors and oversights which are likely when people use ad hoc approaches to environmental design.

USAID’s environmental procedures are one particular means of implementing the general EIA process described in a separate publication.

Note that in addition to assessing a project’s potential negative environmental impacts, EIA encompasses the development of mitigation measures and management plans to reduce such impacts.

The relationship of environmentally sound design to sustainable development

Sustainable development is the overall objective of any process of economic and social development.

Meaningful movement towards more sustainable development requires both: (1) that development activities themselves be sustainable; and (2) that a set of enabling conditions be fulfilled.[2] Because ESD occurs at the project or activity level, it addresses the first sustainability requirement: ESD is essential to implementing *sustainable activities*.

As its name implies, ESD is primarily concerned with environmental sustainability. However, since ESD involves *environmental justice*, it also has an important application to *social sustainability*. Environmental justice is the idea that the poor should not bear a disproportionate part of the economic and health burdens of environmental degradation.

Environmentally sound design and best development practices

ESD requires that possible environmental damage associated with projects be predicted and its effects mitigated. This is not sufficient, however. Environmentally sound design must also adhere to a set of principles which apply to sound project design, management and implementation *in general.* These principles have grown out of the experience of development organizations in the field. In very general terms, they represent a current consensus on "best practice" in development:

- Assure technical feasibility
- Understand the social and policy context
- Secure stakeholder commitment
- Engage in supportive capacity-building
- Practice adaptive management

This document is not intended to be a primer on these best practices. As development professionals, the users of this document are well aware of their importance. Each best practice, however, has specific applications to ESD. The remainder of this section discusses these applications.

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[2] Enabling conditions for achieving more *environmentally* sustainable development include:

- a legal and policy framework enabling sustainable private-sector and public initiatives
- clearly defined national objectives related to environmental design and management
- good information regarding national/regional environmental resources and conditions (e.g., assessments or management plans)
- sufficient host county capacity to implement and apply environmental laws and policy (includes financial resources, trained professionals, effective institutions)—and clearly defined responsibility and accountability for this implementation.

Note that consideration of the enabling conditions for *economically* and *socially* sustainable development would expand this list dramatically.

Assure technical feasibility

All projects must be *technically feasible.* The construction techniques, materials, and technologies employed must meet their intended purpose over the lifetime of the project.

In the area of the environment, technical feasibility means that the design is appropriate and robust in terms of the environmental conditions of the project site(s). Environmental conditions include climate (e.g., patterns of rainfall, temperature ranges), soil types, aquifer characteristics, and the probability of extreme events such as cyclones and earthquakes. For example:

- Are the choices of crops or trees appropriate to climate and soils?
- For buildings and infrastructure, are construction methods and materials appropriate to the anticipated use and lifetime, given environmental conditions?

National Environmental Action Plans (NEAPs)

National Environmental Action Plans (NEAPs) are intended to be demand-driven, action-oriented national strategies that integrate environmental management into a country's economic development process. The first NEAP was launched in Madagascar with World Bank assistance in 1987. By 1995, more than 30 NEAPs had been initiated in Africa, and more than 50 worldwide. The Bank has often aided the NEAP process by coordinating donors and mobilizing their support.

Nonetheless, NEAPs are meaningful only if they are implemented. Early on, NEAPs enjoyed a high political profile, funding and significant momentum. Most plans, however, had inadequate implementation strategies. Translating early momentum into long-term commitment on the part of developing country governments and institutions, donors, and NGOs remains the central challenge.

Understand social and policy context

Projects and activities do not exist in isolation. They are implemented within an environmental, social, economic and institutional context. This context can determine whether a project or activity is viable or even desirable. Social and policy context issues particularly important to ESD include:

- **De facto and de jure national environmental and resource management policy.** Project design and implementation should conform to national environmental laws and regulations. They should be compatible with national environmental strategy (e.g., as set out in National Environmental Action Plans, see sidebar 2.C).

  However, there is often a large difference between official environmental law or policy in African countries ("de jure"), and what is actually implemented and enforced in practice ("de facto"). Project planners cannot assume that the protections such laws may provide in theory will be achieved in reality. For example, the upstream drainage of a village water supply may lie within a national park. In theory, the purity of the water supply is secure, as its source is protected. In reality, government laxness or corruption may leave the park open to illegal logging or mining, either of which could pollute the water sources.

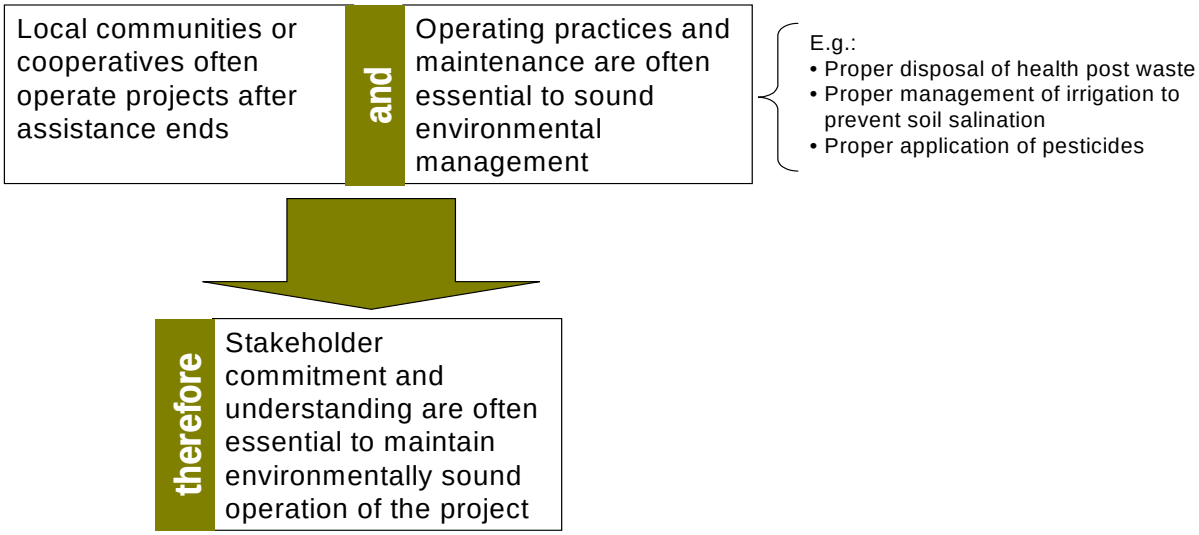
- **Local or traditional systems of resource management and allocation**. Systems of land tenure and resource management have clear relevance to most rural development projects. In rural areas of African countries, land tenure is often a mix of de jure and traditional systems—and projects must frequently obtain approval for land or resource use through *both* systems.

  Moreover, traditional systems of resource management are often *gender-specific.* That is, customs may assign the responsibility for monitoring and managing a given resource only to women, or only to men. Project designers cannot assume that the men in a community can speak for the women, or vice versa.

- **National economic policy and ongoing policy reform**. Many African governments are pursuing sectoral or structural adjustment programs to stimulate economic growth and international trade. Examples of macroeconomic tools used in such programs include altering exchange or interest rates, reducing government budgets, promoting market liberalization and enhancing the role of the private sector. These reforms can influence—both positively and negatively—how resource users manage their environment.

  For example, liberalization of export laws and/or development of transport and export infrastructure can encourage timber exports, whether or not this is a targeted activity. Inappropriate or poorly enforced forestry policies can result in an acceleration of deforestation or significant declines in forest productivity.

Figure 2.1: The importance of stakeholder commitment



Secure stakeholder commitment

Stakeholders are those groups most directly affected by the project. This includes the intended beneficiaries, the funders, and those whose use of, or access to, local resources is likely to be affected. Here, we focus on residents of local communities and users of local resources.

Figure 2.1 illustrates the importance of stakeholder commitment when local communities or cooperatives take over a project or activity after assistance ends—a very typical situation from small-scale activities. Often a project will maintain its environmental soundness only if proper operation and maintenance procedures are followed; the figure cites a few examples. Without stakeholder commitment, these proper procedures are likely to be violated. In the worst case, the project may actually do more harm than

good. (for example, if waste from a health post sickens the community at large).

Capacity-building

Capacity-building is an essential complement to and means of securing stakeholder commitment. In an environmental context, capacity building means helping local users or project beneficiaries to acquire:

- the knowledge or skills required to operate and maintain a project in an environmentally sound manner
- an understanding of how project activities affect environmental health, and why these operation and maintenance practices are important. Such understanding is essential to secure stakeholder commitment.

Adaptive Management

Under adaptive management, managers adjust the way they carry out a project in response to feedback from the field. Adaptive management requires both project monitoring and decision-making based on monitoring results.

Sharing knowledge

Adaptive management extends beyond individual projects. At its best, it means learning from other projects and other organizations. Formal and informal communication among NGOs and PVOs is essential to this learning.

As applied to the environment, adaptive management means changing project operation or design when monitoring shows unexpected, adverse environmental outcomes. For example, members of a community involved in a fertilizer project may observe that algae and plant growth in a local water body has increased markedly. This is a sign of eutrophication, possibly caused by fertilizer run-off from fields, and probably indicates a need to change fertilizer application processes.

Adaptive environmental management requires an *environmental monitoring and mitigation plan*, and explicit allocation for environmental monitoring and evaluation activity in the project budget. Monitoring and mitigation plans identify funding sources and responsibility for monitoring and evaluation from the onset of project design.

ESD and Community Participation

The need for community participation is a clear consequence of applying "best development practices" to the environmental aspects of small-scale project design and implementation. Community or stakeholder participation beginning early in the design process is key to at least three of these practices:

- **Assuring technical feasibility**. The detailed knowledge community members have of local conditions is often critical in anticipating and identifying a project's potential environmental impacts.
- **Securing stakeholder commitment**. By participating in design, implementation and monitoring, participants gain *ownership* and *responsibility*, as well as a clear understanding of objectives and

anticipated outcomes. Ownership, responsibility and understanding create incentives to identify and mitigate adverse impacts.

- **Practicing adaptive management.** Local participants are in the best position to monitor long-term environmental effects of project activities, and monitoring is a key aspect of adaptive management. Further, local participants or communities need the understanding and capacity to adapt activities to future change after donor support ceases.

Finally, community participation is an important mechanism for assuring environmental justice. Development activities often involve tradeoffs between economic or social development and environmental quality. These tradeoffs should not be imposed unilaterally by external authorities. Because local residents must *live with* the environmental consequences of activities, it is only just that they understand and have a voice in any tradeoffs that are ultimately made.

ESD and sustainable activities

The focus of this manual is *environmentally* sound design. ESD is necessary—but *not* sufficient—to design and implement truly sustainable activities. Environmental considerations must be weighed together with economic and social criteria. Critical questions include:

- Is the activity financially sustainable without continuous external support?
- Do the benefits of the activity outweigh costs?

Integrating ESD, USAID Environmental Procedures, and the Project Life Cycle

Environmentally sound design should be an integral part of the project design and implementation process, not an afterthought. USAID's Environmental Procedures create a framework in which to organize key ESD-related elements and tasks of the project lifecycle. The procedures should *not* be treated as simply an administrative requirement.

The diagram on the overleaf presents ESD-specific activities and USAID environmental compliance procedures in the context of the project's life cycle.

Community Participation and Gender

"Community participation" must involve both men and women:

- Women are often key to a developing country's food production, nrm and economic systems.
- Often "farmers" and "smallholders" are simply synonyms for the women in a community
- In many rural areas, women are the majority of the adult population
- Women have extensive knowledge of the environment and natural resource base, as they affect subsistence agriculture, the use of wood for fuel, water availability and quality, gathered foods, and certain medicines.

However, obtaining women's input may require special effort. In many cultures, gender roles prevent women from making their opinions known directly to project designers.

Project phase	(comments and description)	ESD-specific activity	USAID regulatory compliance
A. ID project objectives	What is the NEED that the project serves? (e.g., improved market access, improved access to health care)		
B. ID alternatives to achieve objectives	For example, if the project objective is to improve agricultural productivity, possible alternatives include: introducing new crop varieties, promoting the use of chemical inputs, introducing irrigation, integrated pest management, changes to tilling and soil conservation measures, or some combination of these.		
C. Conduct initial screening of alternatives	Assess project alternatives on the basis of : • economic criteria • social criteria • environmental criteria (requires a back-of-the envelope project design AND a social, economic and environmental profile of the project site)	Conduct preliminary environmental screening. Consult Chapter 3 of these *Guidelines* or other sources for likely impacts and mitigation options	For each activity in project, conduct a preliminary screening to determine which USAID environmental review category is likely to apply to the project. The category determines HOW MUCH ENVIRONMENTAL STUDY of the project is required. This has implications for (1) how likely project approval is; and (2) the effort required to submit the project proposal. USAID screening process is outlined on page XX
D. ID preferred alternative	Based on preliminary screening, what is the best compromise between economic, social and environmental criteria? (A concept paper may be written at this stage)		
E. Formulate detailed project design		Apply project best practices to environmental aspects of project design. (This Chapter): Incorporate best monitoring and mitigation practices into project design and budget (Consult chapter 3 or other sources. For general discussion of mitigation and monitoring, see Chapt 5.)	Verify initial screening result based on detailed project design. Conduct Initial Environmental Examination (IEE),* Environmental Review (ER) or Environmental Assessment (EA), as indicated. An IEE or ER will likely require some additional data collection. An EA will require significant additional data collection, establishment of a professional EA team, and a formal process for public participation. Eas assess all the alternatives considered in Phase B of the project lifecycle
F. Submit proposal for funding approval			Proposal MUST include either CATEGORICAL EXCLUSION form or IEE. For subgrants, proposal must always include a screening form and, if indicated, an ER.
G. Funding agency review			For IEE, review occurs at headquarters level (USAID's Bureau Environmental Officer). For ER (subgrants within umbrella project), review occurs at mission level.
H. Construction/ implementation (and hand-off) *(if approved)*		• Environmental monitoring • Adaptive mitigation (that is, mitigation which is adjusted depending on monitoring results)	Annual environmental status report

(conditional approval requiring changes to design)

References and Resources

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http://europa.eu.int/comm/environment/eia/eia-studies-and-reports/5years.pdf

This review of the implementation of Directive 85/337/EEC covers the time-period from 1990 to the end of 1996. It is mainly based on the answers to questionnaires sent out to member states. The review examines the extent of formal compliance, practical compliance, and the effectiveness of implementation.

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A collection of documents, tools, and websites promoting EIA.

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This document provides a review of World Bank's experience with EA from 1993-1997. The Review provides an overview of the World Bank's evolving EA policy, an assessment of the quality and effectiveness of EA work, and a discussion of their experience implementing projects with EA.

Sadler, B., The International Study of EA Effectiveness: An Overview, EIA Newsletter 12, Summer 1996, http://www.art.man.ac.uk/EIA/publications/newsletters/newsletter12/effectiveness/index.htm.

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Sadler, B., International Study of the Effectiveness of Environmental Assessment Final Report - Environmental Assessment in a Changing World: Evaluating Practice to Improve Performance, The Canadian

Environmental Assessment Agency in collaboration with International Association for Impact Assessment, June 1996. (Complete text at http://www.iaia.org/Non_Members/EIA/EAE/EAE_10E.PDF)

This report comprises the framework, findings, conclusions, and recommendations of the International Study of the Effectiveness of Environmental Assessment. It presents key points and issues related to the practice of environmental assessment.

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This document contains selected papers from a series of workshops jointly sponsored by the World Bank and UNEP. The chapters reflect different aspects and approaches to environmental accounting, mostly to do with financial and economic considerations and modifications of the UN system of national Accounts to reflect environmental and natural resources issues.

Bond, Richard, Curran, Johanna, Francis, Paul, Kirkpatrick, Colin, & Lee, Norman. Integrated Impact Assessment for Sustainable Development: Case Studies and Some Preliminary Conclusions. Impact Assessment for Sustainable Development Unit Working Paper Series, Institute for Development Policy and Management, University of Manchester. 2000. http://idpm.man.ac.uk/iasdu/w-pap1.doc

This article contributes to the development of a useable methodology for conducting integrated impact assessment (sometimes called 'integrated appraisal') by using case study experiences of development proposals. Three case studies, each of which has significant economic, environmental and social dimensions, are examined to see how appraisal was carried out in practice. Their primary purpose is to clarify some of the approaches to integrated appraisal currently in use as a prelude to identifying ways in which practice may be strengthened in the future.

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This document provides a basic framework for understanding environmental consequences of macroeconomic reforms and a process for applying EIAs to such efforts.

International Institute for Sustainable Development. Measurement and Indicators for Sustainable Development. http://www.iisd.org/

Website devoted to developing robust sets of indicators for public and private sector decision makers to measure progress toward sustainable development and to build an international consensus to promote their use. Includes tools, case studies, and reports from field studies.

Kirkpatrick, Colin, Geoge, Clive, and Curran, Johanna. Development of Criteria to Assess the Effectiveness of National Strategies for Sustainable Development. Institute for Development Policy and Management, University of Manchester. 2001. http://idpm.man.ac.uk/iasdu/nssd.doc

The study consists of a review of the literature on national strategic planning processes, which includes a review of monitoring that has taken place to date, the development of a set of criteria by which a national strategy may be assessed, and guidance on the application of the assessment methodology. While the results are applicable to all countries, they have been developed in a manner that is intended to be of particular assistance to developing countries in their implementation of national strategies.

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Population-Environment Research Network website http://www.populationenvironmentresearch.org/

The Population-Environment Research Network is a project of the International Union for the Scientific Study of Population (IUSSP) and the International Human Dimensions Programme (IHDP) on Global Environmental Change. The network exists to advance academic research on population and the environment by promoting on-line scientific exchange among researchers from social and natural science disciplines worldwide. The site includes a database of grey literature, publications, projects, conferences, datasets, software, course syllabi and other resources for research on population-environment dynamics; Cyberseminars to discuss articles, methods and issues in population and environment research; and a biweekly newsletter.

U.S. National Research Council. 1986. Ecological Knowledge and Environmental Problem Solving: Concepts and Case Studies. Washington, DC: National Research Council.
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This report explores how the scientific tools of ecology can be used in dealing with a variety of environmental problems, such as prediction and management of environmental impacts, management or renewable resources, protection and restoration of species and ecosystems, and control of agricultural problems.

UNEP Global Resource Information Data Base (GRID). http://www.grida.no/index.htm

Located in Arendal, Norway, they are charged with fostering improved State of the Environment Reporting data gathering. Its focus is, however, on Nordic countries and Newly Independent States. Of particular interest to baseline sustainability analysis is UNEP/GRID- Arendal's Cookbook for State of the Environment Reporting on the Internet, available at: http://www.grida.no/soe/cookbook/index.htm. It provides generic methodological guidance for the development of electronic environmental status reports and elaborates on the "Driving-Forces-Pressures-State-Impact-Response (DFPSIR)" Concept. Also, the site has links for UNEP/GRID Nairobi, http://www.unep.org/unep/eia/ein/grid/web/document/grid.htm, and Environmental Information Systems in Sub-Saharan Africa (EIS-SSA), http://www.grida.no/eis-ssa/index.htm.

UNEP. Capacity Building for Integrated Environmental Assessment & Reporting - Training Manual.

This capacity building manual describes DFPSIR as the heir to the OECD's Pressure-State-Response Framework. It also has a chapter section discussion and explanation of PoleStar as an example of a forecasting and scenario building tool. http://www.unep.org/dewa/africa/docs/en/IEA_Africa_training_manual.pdf It was developed primarily under IISD.

The World Bank standard set of environmental indicators in development of Country Assistance Strategies (CASs) is available at:
http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/0,,contentMDK:20120746~menuPK:51551~pagePK:41367~piPK:51533~theSitePK:40941,00.html.

World Economic Forum's Global Leaders for Tomorrow Environment Task Force, The Yale Center for Environmental Law and Policy, and the Columbia University Center for International Earth Science Information Network (CIESIN). The Environmental Sustainability Index. http://www.ciesin.columbia.edu/indicators/ESI/

The Environmental Sustainability Index (ESI) is a measure of overall progress towards environmental sustainability, developed for 142 countries. Scores are based upon a set of 20 core "indicators," each of which combines two to eight variables for a total of 68 underlying variables. The ESI permits cross-national comparisons of environmental progress in a systematic and quantitative fashion.