Consultants for Resources Evaluation

Vinod K. Shrivastava
Corporate Project Director
President and Chief Executive Officer

January 30, 2009

Mr. Siseho Simasiku
Chief Executive Officer
Electricity Control Board of Namibia
8 Bismarck Street
P.O. Box 2923
Windhoek, Namibia

cc: Mr. Gerrit Clarke: ECB Project Manager for the USTDA Grant

REFERENCE: Task 5 and 6 Report
Task 5: Development of Guidelines for Environmental Analysis of IPP Projects
Task 6: Analysis of Development Impacts

IPP Investment Market Framework and Technical Assistance Phase II

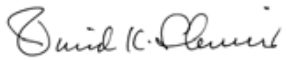
Dear Mr. Simasiku:

We are pleased to enclose our combined Task 5 and Task 6 Report as required under our contract with the Electricity Control Board.

On behalf of CORE International and the CORE Team I would like to express our very sincere appreciation to you and other ECB officials for supporting us as we progress on this study. We are especially grateful for the support that Mr. Clarke has provided us in getting the project off the ground.

On behalf of our Team, we wish to assure ECB of our continuing commitment to providing excellent services under this Project in a timely and efficient manner. Please do not hesitate to contact me if you need any additional information.

Yours sincerely,



Vinod K. Shrivastava
Corporate Project Director

Enclosure: Task 5 and Task 6 Combined Report

NAMIBIA IPP AND INVESTMENT FRAMEWORK TECHNICAL ASSISTANCE UNDER A GRANT BY THE U.S. TRADE AND DEVELOPMENT AGENCY

TASK 5: Development of Guidelines for Environmental Assessment of IPP Projects

TASK 6: Analysis of Development Impacts

PREPARED FOR

ELECTRICITY CONTROL BOARD, NAMIBIA

(INTERIM CONTRACTUAL MILESTONE REPORT)

PREPARED BY

CORE INTERNATIONAL, INC.

WASHINGTON, D.C. 20016

WEB SITE: WWW.COREINTL.COM

and

EMCON CONSULTING GROUP

WINDHOEK, NAMIBIA

January 30, 2008

TABLE OF CONTENTS

1. INTRODUCTION AND OBJECTIVES OF TASK 5 AND TASK 6

1.1 INTRODUCTION

In November 2007, the Government of Namibia passed Electricity Act 2007, which permits and encourages private sector investment in the country's power sector. The Electricity Control Board (ECB), the regulator in Namibia has been given the responsibility under the Act to implement the Independent Power Producer (IPP) regime in Namibia in accordance with the provisions of the Act and its own regulatory procedures approved by the ECB Board. Accordingly, ECB developed and posted a vast amount of information on its web site that would be of interest to prospective IPPs interested in Namibia's power sector.

In addition, ECB has developed a detailed procedure for the documentation and evaluation of the IPP applications. This procedure is currently being refined based on the experience ECB has had as a result of a number of application it has received for licenses for generation of power.

The U.S. Trade and Development Agency (USTDA) has provided a grant to the ECB as a follow-up to a previous grant that focused on developing various framework models for planning for an IPP regime in Namibia. The first USTDA grant completed by CORE International, Inc. supported the following key activities:

- Identification of barriers to IPP development in Namibia
- Market Model Recommendations
- Regulatory Recommendations
- Model document preparation for small and medium IPPs
- Policy Recommendations
- Barrier Mitigation

Since the completion of the first USTDA grant, Namibia has been forced to take concrete steps to address its power supply future. Key challenges facing the country include (i) the reduction in surplus electricity supply from South Africa; (ii) soaring prices for liquid and gas fuels; (iii) continuing increases in demand for mining products, and with that the electricity to process minerals; (iv) the long lead times involved in building new power plants; and (v) the desire to develop a secure power supply independently of South Africa.

Consequently, Namibia, through the ECB and NamPower, has taken several concrete steps to begin to tackle the electricity supply-side challenges facing the country. These steps include the following key ones:

- Construction of the Caprivi Link with Zambia
- Investment in rehabilitation of coal-fired station in Zimbabwe
- Encouragement of new IPP generators in Namibia

In the interim and prior to the current grant, ECB began receiving a number of IPP applications for licenses. The current project under the USTDA grant focuses on the provision of consulting services to ECB in the evaluation of IPP applications and providing capacity building to

ECB officials in the implementation of the IPP framework. ECB selected CORE International, Inc., an international management consulting company based in Washington, D.C., to provide technical advisory services in order for ECB to evaluate the various IPP applications in accordance with both the Government's policy and best international practices to ensure that the review process is transparent, fair, and accountable.

The Terms of Reference (TORs) for the USTDA Phase II Grant to ECB includes several tasks. Task 2 of the TOR focuses on providing assistance to the ECB in two key areas – (i) development of IPP framework implementation instruments for large and medium sized IPPs and (ii) capacity building and skills development support to ECB. This report is a contractually required interim milestone report for the activities conducted under Task 2.

1.2 TASK 5 OBJECTIVES

The Terms of Reference state the objectives of Task 5 as follows:

Namibian environmental laws and standards are consistent with international standards, and all projects, whether publicly financed or privately developed and financed, require the project sponsors/owners to conduct an environmental impact assessment. These environmental impact assessments will also be required of all IPPs, whether negotiated or invited through a tender. The Contractor shall review the environmental standards applicable in Namibia and those of potential lending agencies, and provide advisory support to the ECB on the standard language to be included in all IPP proposal requirements with respect to environmental impact assessment of the proposed power project.

Task 5: Deliverables:

The Contractor shall provide a detailed description of the type of environmental impact assessments that will be required of all IPPs as part of the condition for license. In addition, the Contractor shall provide standard guidelines for IPPs for conducting environmental impact assessments.

1.3 TASK 6 OBJECTIVES

The Terms of Reference and deliverables required under task 6 are as follows.

Subtask 6.1: **Analysis of Development Impacts on Namibia**

The Contractor shall report on the potential Development Impact of the project in Namibia. The Contractor shall focus on what the economic development outcomes will be if the project is implemented according to the recommendations of the technical assistance. While specific focus should be placed on the immediate impact of the project, the Contractor shall include, where appropriate, any additional development benefits to the project, including spin-off and demonstration effects. The analysis shall also include a description of any negative impacts. The analysis of the Contractor shall be as concrete and detailed as possible. The Contractor shall provide estimates of the project's potential benefits in the following areas:

> ***Infrastructure***: A statement on the infrastructure impact giving a brief synopsis. This shall include additions and improvements to electric power generation and transmission systems; roads and other transportation systems, water systems, housing, etc.
>
> ***Market-Oriented Reform***: A description of any regulation, laws, or institutional changes that are recommended and the effect they would have if implemented.

Human Capacity Building: The number and type of positions that would be needed by the Grantee to implement the recommendations, and more broadly, by the electric power industry, as well as the number of people who will receive training and a brief description of the training program. This also shall include identifying improvements in skill sets and in the knowledge base.

Technology Transfer and Productivity Enhancement: A description of any advanced technologies that will be implemented as a result of the project, and a description of any efficiency that will be gained.

Other: Any other development benefits to the project.

Subtask 6.2: Development Impact of IPP Projects

The Contractor shall identify the potential developmental impacts of a range of IPP projects, using as examples, some representative IPP projects currently being contemplated in Namibia. In consultation with the Grantee, the Contractor shall develop a list of development impact requirements that shall be included in all tenders for IPPs as well as required of all unsolicited IPP proposals.

Task 6: Deliverables:

In addition to the report on the potential development impact of the project in Namibia, the Contractor shall provide a set of development impact guidelines to be included as part of any IPP proposals or tenders for all IPP projects.

This report is in complete fulfillment of the requirements of Task 5 and Task 6.

2. KEY TASK 5 ACTIVITIES

2.1 OBJECTIVES OF AN ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

The objectives of an Environmental Impact Assessment (EIA) can be divided into two categories. The immediate aim of the EIA is to inform the process of decision-making by identifying the potentially significant environmental effects and risks of development proposals. The ultimate (long term) aim of an EIA is to promote sustainable development by ensuring that development proposals do not undermine critical resource and ecological functions or the well-being, lifestyle, and livelihood of the communities and peoples who depend on them.

Immediate objectives of EIA typically are to:

- Improve the environmental design of a project proposal;
- Ensure that resources are used appropriately and efficiently;
- Identify appropriate measures for mitigating the potential impacts of the proposed project; and
- Facilitate informed decision-making, including setting the environmental terms and conditions to be addressed by the developers as part of project implementation.

Long-term objectives of EIA typically are to:

- Protect human health and safety;
- Avoid irreversible changes and serious damage to the environment;
- Safeguard valued resources, natural areas and ecosystem components; and
- Enhance the social aspects of the proposal.

Environmental impacts can vary in a number of ways as follows:

- Type – biophysical, social, health or economic
- Nature – direct or indirect, cumulative, etc.
- Magnitude or severity – high, moderate, low
- Extent– local, regional, trans-boundary or global
- Timing – immediate/long term
- Duration – temporary/permanent
- Uncertainty – low likelihood/high probability
- Reversibility – reversible/irreversible
- Significance[1] – unimportant/important

2.2 KEY PRINCIPLES OF AN EIA

To date, EIAs have been applied primarily at the project-level. This 'first generation' process is now complemented by additional policies, plans and programs, and the newer generation of EIAs has become more comprehensive. These trends have brought new perspectives on what

[1] Impact significance is not necessarily related to the impact magnitude. Sometimes very small impacts, such as the disturbance of the nest of a pair of endangered birds, may be significant. When determining the significance of the potential impacts of a proposal, all of the above factors should be taken into consideration.

constitutes EIA good practice and effective performance. Recently, a number of reviews of these issues have been undertaken, including the International Study of the Effectiveness of Environmental Assessment. It described basic and operational principles for the main steps and activities undertaken in the EIA process. The International Association for Impact Assessment (IAIA) and the Institute of Environmental Management and Assessment (IEMA) have drawn on these to prepare a statement of EIA 'best practice' for reference and use by their members. The Effectiveness Study identified three core values on which the EIA process is based:

- **Integrity**– the EIA process should meet internationally accepted requirements and standards of practice;
- **Utility**– the EIA process should provide the information which is sufficient and relevant for decision-making; and
- **Sustainability**– the EIA process should result in the implementation of environmental safeguards, which are sufficient to mitigate serious adverse effects and avoid irreversible loss of resource and ecosystem functions.

Basic guiding principles of EIA good practice are listed below. These principles are applicable to all types of project proposals. When applying or referring to them, it is important to consider the principles as a single package, recognizing their varying interrelationships. For example, some principles overlap (e.g., transparent and participative); others may be counteracting if considered without reference to the broader framework (e.g. rigor and efficiency). The principles should be applied as part of a systematic and balanced approach, having regard to the context and circumstances. In addition, the level of detail and rigor of analysis should be determined on a project-by-project basis.

Guiding Principles of EIA Good Practice

Purposive– EIA should meet its aims of enhancing informed decision making and ensuring an appropriate level of environmental protection and human health.

Focused– EIA should concentrate on significant environmental effects, taking into account the issues that matter the most.

Adaptive– EIA should be adjusted to the realities, issues and circumstances of the project proposals under review.

Participative– EIA should provide appropriate opportunities to inform and involve all interested and affected parties, and their inputs and concerns should be addressed explicitly.

Transparent– Development of an EIA should be a clear, easily understood and open process, with early notification procedure, access to documentation, and a public record of decisions taken and reasons for them.

Rigorous– EIA should apply the 'best practicable' methodologies to address the impacts and issues being investigated.

Practical– EIA should identify measures for impact mitigation that work and can be implemented.

Credible– EIA should be carried out with professionalism, rigor, fairness, objectivity, impartiality and balance.

Efficient–EIA should impose the minimum cost burden on proponents consistent with meeting process requirements and objectives.

EIA Operating Principles of Good Practice and Performance

Operating principles describe how the basic principles of EIA good practice should be implemented. The 24 principles listed below provide initial guidance on how to undertake EIA and what results practitioners should aim to deliver.

EIA should be applied:

- To all proposals likely to cause potentially significant adverse impacts or add to actual or potentially foreseeable cumulative effects;
- So that the scope of review is consistent with the size of the proposal and commensurate with the likely issues and impacts;
- To provide timely and appropriate opportunities for public and stakeholder involvement, with particular attention given to indigenous peoples and other vulnerable minorities whose cultural traditions and way of life may be at risk; and
- In accordance with the legislation, procedure and guidance in force and with reference to international standards of EIA good practice.

EIA should be undertaken:

- Throughout the project cycle, beginning as early as possible in the pre-feasibility stage;
- With explicit reference to the requirements for decision-making and project approval and authorization consistent with the application of 'best practicable' science and mitigation techniques;
- In accordance with proposal-specific terms of reference, which should include clearly defined tasks, responsibilities, requirements for information and agreed timelines for their completion; and
- To gain the inputs and views of all those affected by or interested in the proposal and/or its environmental impacts.

EIA should address, as necessary and appropriate:

- All relevant environmental impacts, including land use, social, cultural, economic, health and safety effects;
- Cumulative effects and area-wide, ecosystem-level and global changes that may occur as a result of the interaction of the proposal with other past, current or foreseeable activities;
- Alternatives to the proposal, including design, location, demand and activity alternatives;
- Mitigation measures for each of the main impacts identified; and
- Sustainability considerations, including the effects of depletion of non-renewable resources, of exceeding the regenerative and assimilative capacity of renewable resources and of reduction of biological diversity, taking account of relevant international agreements and commitments.

EIA should result in:

- A systematic identification of the views and inputs of those consulted, including the balance of opinion on major issues and areas of agreement and disagreement;
- A comparison of the impacts of the main alternatives considered with an environmental justification for the preferred option;

- Best estimate prediction and evaluation of the potentially significant residual effects that cannot be mitigated;
- Feasible, cost-effective measures to mitigate the main impacts identified (often called an environmental management plan);
- The preparation of an EIA report that presents this information in form that is clear, understandable and relevant for decision-making, noting any important qualifications for the predictions made and mitigation measures proposed; and
- The resolution of problems and conflicts during the EIA process to the extent this is possible

EIA should provide the basis for:

- Informed decision-making and project approvals, in which the terms and conditions are clearly specified and implemented;
- Design of environmentally sound and acceptable projects that meet health and environmental standards and resource management objectives;
- Appropriate follow-up, including monitoring, management and auditing, to check for unforeseen impacts or mitigation measures that do not work as intended; and
- Future improvements in EIA process and practice, drawing on the information from follow up activities.

When applying these operating principles, reference should be made to the framework of EIA legislation, procedure and guidance that is in force in a country or jurisdiction. In certain countries, the relatively early stage of EIA process development or limited resources may constrain the application of some of the operating principles.

EIA systems can be described by reference to the following three components:

- The legal and institutional framework of regulation, guidance and procedure, which establishes the requirements for the conduct of EIA;
- The steps and activities of the EIA process, as applied to specific types of proposals; and
- The practice and performance of EIA, as evidenced by the quality of EIA reports prepared, the decisions taken and the environmental benefits

Legal and institutional framework

The provision for EIA may be made through legislation, administrative order or policy directive. Many countries have now enacted some type of EIA legislation, which generally can be classified into either a comprehensive or an enabling statute. Clear and specific legal provision is internationally accepted as the most appropriate basis for EIA. In many cases, regulations (mandatory rules) and procedural guidance (advisory interpretation) elaborate how EIA legislation is to be implemented.

Basic responsibilities

The proponent normally carries out the EIA in accordance with directions given by the competent authority (usually the agency which makes the final decision on the project proposal but in certain cases an independent commission or panel). An environment agency, a regulator, or in some cases a specialized EIA body, oversees the process and reviews the EIA with inputs from other government departments. Usually, EIA studies are carried out by an interdisciplinary team, which is appointed specifically to the task and has an appropriate range of scientific, economic and social expertise.

Scope of application
Some EIA systems are relatively narrow in coverage; e.g. limited to projects of a specified type and size. Others have a broader remit, for example encompassing all proposals that have potentially significant adverse environmental impacts. In addition, the environment is defined broadly; for example to include social, health and cumulative effects. The inclusion of these broader aspects of EIA is now accepted as the international standard of good practice and their coverage should be mandatory.

Consideration of alternatives
Consideration of alternatives is mandatory in some EIA systems but discretionary in others. Varied provision is made for including a range of alternatives to a proposal, and there are different requirements for the evaluation and comparison of alternatives as part of the EIA process. At a minimum, explicit provision should be made for the consideration of the main or 'reasonable' alternatives to a proposal (including no action). This component is a critical determinant of effective EIA.

Public involvement
This is a cornerstone of EIA and most systems include provision for public involvement. However, there are marked differences in specific requirements; e.g. regarding access to information, procedures for notification and involvement of the public, the stage of the EIA process at which these are applied and third party rights of appeal. At a minimum, public involvement should take account of the concerns of those directly affected by a proposal.

Quality control and assurance
Within EIA systems, the components described above provide a set of legal and institutional controls on the quality and effectiveness of the process. In addition, the main stages of the EIA process itself constitute a further set of procedural checks and balances. The respective functions of each stage are described below; however, they should be applied iteratively as part of a 'whole process' approach to provide EIA quality assurance.

EIA process
The particular components, stages and activities of an EIA process will depend upon the requirements of the country or donor. However, most EIA processes have a common structure (see flow chart on the next page) and the application of the main stages is a basic standard of good practice. Typically, the EIA process begins with screening to ensure time and resources are directed at the proposals that matter environmentally and ends with some form of follow up on the implementation of the decisions and actions taken as a result of an EIA report.

2.3 PUBLIC INVOLVEMENT

To inform the public about the proposal and to gain the inputs of those directly affected by or interested in the proposal. Public involvement in some form may occur throughout the EIA process, although it tends to be focused on scoping and review phases of EIA. The key goals of the public involvement in the EIA process are as follows:

- Inform the stakeholders about the proposal and its likely effects;
- Canvass their inputs, views and concerns; and
- Take account of the information and views of the public in the EIA and decision-making.

The key objectives of public involvement in the environmental assessment process typically are to:

- Obtain local and traditional knowledge that may be useful for decision making;
- Facilitate consideration of alternatives, mitigation measures and tradeoffs;
- Ensure that important impacts are not overlooked and benefits are maximized;
- Reduce conflict through the early identification of contentious issues;
- Provide an opportunity for the public to influence project design in a positive manner (thereby creating a sense of ownership of the proposal);
- Improve transparency and accountability of decision-making; and
- Increase public confidence in the EIA process.

The principles of public involvement mandate that the process should be:

- **Inclusive** – covers all stakeholders
- **Open and transparent** – steps and activities are understood
- **Relevant** – focused on the issues that matter
- **Fair** – conducted impartially and without bias toward any stakeholder
- **Responsive** – to stakeholder requirements and inputs
- **Credible** – builds confidence and trust

Experience indicates that public involvement in the EIA process can and does meet these objectives. Many benefits of public involvement are concrete such as improvements to project design. Other benefits are intangible and incidental and flow from taking part in the process. For example, as participants see their ideas are helping to improve project proposals, they gain confidence and self-esteem by exchanging ideas and information with others who have different values and views.

In practice, public involvement in EIAs largely corresponds to consultation. However, participation will be appropriate in many circumstances, for example, where a local population is displaced or relocated as a result of a project. A few countries also make provision for mediation or negotiation facilitated by a neutral third party. In principle, these approaches to public involvement in EIAs are distinctive and relatively separate. However, they may be used in combination; for example, consultation and participation can be appropriate at different stages of the same EIA process.

The levels and forms of public involvement can include the following:

- **Informing** – one way flow of information from the proponent to the public;
- **Consulting** – two way flow of information between the proponent and the public with opportunities for the public to express views on the proposal;
- **Participating** – interactive exchange between the proponent and the public encompassing shared analysis and agenda setting and the development of understood and agreed positions on the proposal and its impacts; and
- **Negotiating** – face to face discussion between the proponent and key stakeholders to build consensus and reach a mutually acceptable resolution of issues, for example on a package of impact mitigation and compensation measures.

The range of stakeholders involved in an EIA typically includes (i) the people – individuals, groups and communities – who are affected by the proposal; (ii) the project developer/proponent and other project beneficiaries; (iii) government agencies; (iv) NGOs and interest groups; and (v) others, such as donors, the private sector, academics, etc. The typical

roles played by these stakeholders are described below:

1. The People
Individuals or groups in the affected community will want to know what is proposed; what the likely impacts are; and how their concerns will be understood and taken into account. They will want assurances that their views will be carefully listened to and considered on their merits. They will want proponents to address their concerns. They will also have knowledge of the local environment and community that can be tapped and incorporated into baseline data.

2. Project Proponents/Developers
Understandably, proponents will wish to shape the proposal to give it the best chance of success. Often, this involves trying to create public understanding and acceptance of the proposal through the provision of basic information. More creatively, project design can be improved through using public inputs on alternatives and mitigation and understanding local knowledge and values.

3. Government Agencies
The government agencies involved in the EIA process will want to have their policy and regulatory responsibilities addressed in impact analysis and mitigation consideration. For the competent authority, an effective public involvement program can mean the proposal may be less likely to become controversial in the later stages of the process. For the responsible EIA agency, the concern will be whether or not the public involvement process conforms to requirements and procedures.

4. NGOs/Interest Groups
Comments from NGOs can provide a useful policy perspective on a proposal, for example, the relationship of the proposal to sustainability objectives and strategy. Their views may also be helpful when there are difficulties with involving local people. However, this surrogate approach should be considered as exceptional; it cannot substitute for or replace views, which should be solicited directly.

5. Other Interested Groups
Other interested groups include those who are experts in particular fields and can make a significant contribution to the EIA study. The advice and knowledge of government agencies and the industry sector most directly concerned with the proposal should always be sought. However, in many cases, substantive information about the environmental setting and effects will come from outside sources.

The different benefits provided for key groups by effective public participation are described in Table 2-1. However, these benefits may not be always realized or acknowledged by the participants. Each of the above groups may perceive the benefits gained from public involvement in the EIA process through the lens of their own experience and interests.

Table 2-1: Benefits of Effective Participation for Different Stakeholders

The Project Proponent	The Decision Maker	Affected Communities
Raises the proponent's awareness of the potential impacts of a proposal on the environment and the affected community	Achieves more informed and accountable decision-making	Provides an opportunity to raise concerns and influence the decision-making process
Legitimizes proposals and ensures greater acceptance and support	Provides increased assurance that all issues of legitimate concern have been addressed	Provides an opportunity to gain a better understanding and knowledge about the environmental impacts and risks that may arise
Improves public trust and confidence	Demonstrates fairness and transparency, avoiding accusations of decisions being made 'behind closed doors'	Increases awareness of how decision-making processes work, who makes decisions and on what basis
Assists by obtaining local information/data	Promotes good relations with the proponent and third parties	Empowers people, providing the knowledge that they can influence decision making and creating a greater sense of social responsibility
Avoids potentially costly delays later in the process by resolving conflict early	Avoids potentially costly delays later in the process by resolving conflict early	Ensures all relevant issues and concerns are dealt with prior to the decision

Source: Institute of Environmental Management & Assessment (1999).

In many EIA systems, public involvement centers on the scoping and review stages. This can be a response to procedural requirements or reflect accepted practices. More extended forms of public involvement occur when:

- Project proposals are formally referred to public review, hearings or inquiries;
- Project proposals seek to apply a 'best practice' process to their proposal;
- Project proposals depend upon gaining the consent or support of local stakeholders; and
- Project proposals have major social impacts and consequences, such as the relocation of displaced people.

A systematic approach to planning a public involvement program typically involves addressing the following key issues:

- **Who should be involved?** – Identify the interested and affected public (stakeholders), noting any major constraints on their involvement.
- **What type and scope of public involvement is appropriate?** – Ensure this is commensurate with the issues and objectives of EIA.
- **How should the public be involved?** – Identify the techniques, which are appropriate for this purpose.
- **When and where should opportunities for public involvement be provided?** – establish a plan and schedule in relation to the EIA process and the number, type and distribution of stakeholders.
- **How will the results of public involvement be used in the EIA and decision-making processes?** – Describe the mechanisms for analyzing and taking account of public inputs and providing feeding back to stakeholders.
- **What resources are necessary or available to implement the public involvement program?** – Relate the above considerations to budgetary, time and staff requirements.

When selecting public involvement techniques, the following points should be considered:

- The degree of interaction required between participants;
- The extent to which participants are able to influence decisions;
- The stage(s) of the EIA at which public involvement will occur;
- The time available for involvement;
- The likely number of participants and their interests;
- The complexity and controversy of the issues under consideration; and
- The consideration of cultural norms, which may influence the content of discussions, for example relating to gender, religion, etc.

When using public involvement techniques, the following principles can help to achieve a successful outcome:

- Provide sufficient, relevant information in a form that is easily understood by non-experts (without being simplistic or insulting);
- Allow enough time for stakeholders to review, consider and respond to the information and its implications;
- Provide appropriate means and opportunities for them to express their views;
- Select venues and time events to encourage maximum attendance and a free exchange of views by all stakeholders (including those that may feel less confident about expressing their views); and
- Respond to all questions, issues raised or comments made by stakeholders. This fosters public confidence and trust in the EIA process.

Principles that will help minimize conflict, particularly if applied consistently from the earliest stages of the planning of the proposal, include the following:

- Involving all those likely to be affected, or with a stake in the matter;
- Communicating the need for and objectives of the proposal, and how it is planned to achieve them;
- Actively listening to the concerns of affected people, and the interests which lie behind them;

- Treating people honestly and fairly, establishing trust through a consistency of behavior;
- Being empathetic, putting yourself in the shoes of the other party, and looking at the area of dispute from their perspective;
- Being flexible in the way alternatives are considered, and amending the proposal wherever possible to better suit the interests of other parties;
- When others' interests cannot be accommodated, mitigating impacts to the greatest extent possible and looking for ways to compensate for loss and damage;
- Establishing and maintaining open two-way channels of communication throughout the planning and implementation phase; and
- Acknowledging the concerns and suggestions of others, and providing feedback on the way these matters have been addressed.

2.4 PROJECT PROPOSAL SCREENING FOR THE PURPOSES OF EIA (S)

The screening process to decide whether or not an IPP project proposal should be subject to the EIA process can have one of four outcomes:

- No further level of EIA beyond that submitted by an IPP applicant in the application is required;
- A full and comprehensive EIA is required;
- A more limited EIA is required (often called preliminary or initial assessment); or
- A further study is necessary to determine the level of EIA required (often called an initial environmental evaluation or examination.

Screening establishes the basis for scoping, which identifies the key impacts to be studied and establishes the terms of reference for an EIA. Many EIA systems have formal screening and scoping procedures. In some cases, however, these terms may be used differently or applied at the discretion of the proponent (as with scoping in the European EIA Directive). Also, on occasion, the screening and scoping stages may overlap, for example, when a further study is undertaken to determine whether or not the potential impacts are significant enough to warrant a full EIA.

Thermal and hydropower projects require a full EIA because of their likely environmental effects and the World Bank has placed them under category A. Renewable energy power projects (other than hydro power) not requiring a full EIA but warranting a further level of assessment are typically place in Category B by the World Bank, requiring a reduced level of EIA.

Scoping of the detail for an EIA refers to the early, open and interactive process of determining major issues and likely environmental impacts that will be important in the decision-making on the project proposal, and would need to be addressed in an EIA. The requirements and procedures established for this purpose differ from country to country. In many EIA systems, the involvement of the public, as well as the competent authority and other responsible government agencies, is an integral part of the scoping process. Public input helps to ensure that important issues are not overlooked when preparing Terms of Reference and/or initiating an EIA study for a project.

The purpose of scoping is to identify:

- The important issues to be considered in an EIA;
- The appropriate time and space boundaries of the EIA study;

- The information necessary for decision-making; and
- The significant effects and factors to be studied in detail.

Typically, scoping begins after the completion of the initial screening process. However, these stages may overlap to some degree. Essentially, scoping takes forward the preliminary determination of significance made in screening to the next stage of resolution – determining which issues and impacts are significant and require further study. In doing so, the scoping process places limits on the information to be gathered and analyzed in an EIA and focuses the approach to be taken.

Scoping is completed when the Terms of Reference (TORs) or an equivalent document is prepared. This document sets out what the EIA is to cover, the type of information to be submitted and the depth of analysis that is required. It provides guidance to the project applicant/proponent on how the study should be conducted and managed. Experience shows that the TORs should be a flexible document. The terms may need alteration as further information becomes available, and new issues emerge or others are reduced in importance.

Key objectives of scoping are to:

- Inform the public about the proposal;
- Identify the main stakeholders and their concerns and values;
- Define reasonable and practical alternatives to the proposal;
- Focus on the important issues and significant impacts to be addressed by an EIA;
- Define the boundaries for an EIA in time and content;
- Set requirements for the collection of baseline and other information; and
- Establish the Terms of Reference for an EIA study.

Guiding principles for carrying out the scoping process for an EIA include the following:

- Recognize scoping is a process rather than a discrete activity or event;
- Design the scoping process for each proposal, taking into account the environment and people affected;
- Start scoping as soon as you have sufficient information available;
- Prepare an information package or circular explaining the proposal and the process;
- Specify the role and contribution of the stakeholders and the public;
- Take a systematic approach but implement flexibly;
- Document the results to guide preparation of an EIA; and
- Respond to new information and further issues raised by stakeholders.

The elements of scoping differ to some degree with the EIA requirements established by different countries and international agencies. A comprehensive scoping process includes all or a combination of the following functions:

- Identify the range of community and scientific concerns about a proposed project or action;
- Evaluate these concerns to identify the significant issues (and to eliminate those issues which are not important); and
- Organize and prioritize these issues to focus the information that is critical for decision-making, and that will be studied in detail in the next phase of EIA.

The scoping must cover the following types of issues for all power industry related projects:

Biophysical effects:

- Air quality;
- Waste water discharges;
- Hazardous materials;
- Groundwater (quality and quantity);
- Condition/state/sensitivity of ecosystems;
- Rare, endangered or valuable plant species and their habitats;
- Noise or vibrations;
- Solid waste disposal;
- Surface water (quality and quantity);
- Slope stability and erosion;
- Migratory species.

Socio-economic effects:

- Relocation or disturbance of settlements;
- Conflict with existing or potential land or natural resource uses;
- Employment (job loss/creation, special training needs, distribution of income or property values, newcomers, employment equity, etc.);
- Services and utilities (e.g. increase in demand in excess of local supply);
- Health and socio-economic conditions (e.g. quality of life, health and safety, property values, scenic views);
- Aboriginals and special groups;
- Lifestyle, livelihood or housing;
- Structure, thing or site of special significance (cultural, religious, aesthetic, archaeological, historical, paleontological, etc.).

While the above list of issues s commonly considered, authorities (e.g., governments, regulators, and others) may modify this list based on the national laws and other considerations.

2.5 IMPACT ANALYSIS

Environmental impact analysis can be divided into three overlapping phases:

- **Phase 1: Identification** — to specify the impacts associated with each phase of the project and the activities undertaken;
- **Phase 2: Prediction** — to forecast the nature, magnitude, extent and duration of the main impacts; and
- **Phase 3: Evaluation** — to determine the significance of residual impacts i.e. after taking into account how mitigation will reduce a predicted impact.

Table 2-2 provides a summary of the pros and cons of different methodologies for the assessment of environmental impacts of infrastructure and industry projects.

Impact predictions are made against a ‘baseline’ established by the existing environment (or by its future state). Known as baseline studies, the collection of data on relevant biophysical, social and economic aspects provides a reference point against which the characteristics and parameters of impact-related changes are analyzed and evaluated. In many cases, it is likely that the current baseline conditions will still exist when a project is implemented. However, certain projects have long lead times. In these cases, predictions may need to be made about the future state of the environment (the baseline condition for the no-development option).

Table 2-2: Main Advantages and Disadvantages of Impact Identification Methods

	Advantages	Disadvantages
Checklists	• easy to understand and use • good for site selection and priority setting • simple ranking and weighting	• do not distinguish between direct and indirect impacts • do not link action and impact • the process of incorporating values can be controversial
Matrices	• link action to impact • good method for displaying EIA results	• difficult to distinguish direct and indirect impacts • have potential for double-counting of impacts
Networks	• link action to impact • useful in simplified form for checking for second order impacts • handles direct and indirect impacts	• can become very complex if used beyond simplified version
Overlays	• easy to understand • focus and display spatial impacts • good siting tool	• can be cumbersome • poorly suited to address impact duration or probability
GIS and computer expert systems	• excellent for impact identification and spatial analysis • good for experimenting'	• heavy reliance on knowledge and data • often complex and expensive

When establishing a baseline, information is gathered on (i) current environmental conditions, (ii) current and expected trends, (iii) effects of proposals already being implemented, and (iv) effects of other foreseeable proposals. In practice, assembling baseline information can be time consuming and expensive. There can be difficulties in collecting appropriate and sufficient information. For example, there may be unforeseen circumstances in which the collection of data cannot be completed as required by the Terms of Reference. In such cases, the EIA team may have to revise the study strategy and/or use their judgment to make predictions. When this occurs it should be indicated in the EIA report with a short explanation of the reasons.

The characteristics of environmental impacts vary. Typical parameters to be taken into account in impact prediction and decision-making include:

- Nature (positive, negative, direct, indirect, cumulative);
- Magnitude (severe, moderate, low);
- Extent/location (area/volume covered, distribution);
- Timing (during construction, operation, decommissioning, immediate, delayed, rate of change);
- Duration (short term, long term, intermittent, continuous);
- Reversibility/irreversibility;

- Likelihood (probability, uncertainty or confidence in the prediction); and
- Significance (local, regional, global).

Table 2-3 summarizes areas that could experience adverse impacts of the projects.

Table 2-3: The Areas Affected by the Proposed Projects

Biological environment	Physical environment	Social environment
Forest	River regime	Public participation
Shrubland	Erosion/land stability	Employment
Grassland	Sedimentation	Settlement
Herbfield (alpine)	Surface water	Land value
Sand/shingle/rock	Ground water	Existing land uses
Cropland	Agricultural soil	Risks and anxieties
Urban land	Foundation materials	Personal and social values
Lakes	Climate/atmosphere	Historical/cultural
Rivers	Nuisance (noise, dust, smell)	Landscape/visual
Estuaries	Landform	Recreation
Inter-tidal		
Marine		
Wetlands		

Nature

The most obvious environmental impacts are those that are directly related to the project proposal, and can be connected (in space and time) to the actions that caused them. Typical examples of direct impacts are: loss of wetlands caused by agricultural drainage; destruction of habitat caused by forest clearance; relocation of households caused by reservoir impoundment; increased air particulate emissions caused by operation of a new power station, etc. Indirect or secondary impacts are changes that are usually less obvious, occurring later in time or further away from the impact source. Examples of these types of impacts are: the spread of malaria as a result of drainage schemes that increase standing water and thereby create new vector habitat; bio-accumulation and bio-magnification of contaminants in the food chain through take up of agricultural pesticides; and anxiety, stress and community disruption associated with increased traffic volumes and noise caused by road development.

Cumulative effects, typically, result from the incremental impact of an action when combined with impacts from projects and actions that have been undertaken recently or will be carried out in the near or foreseeable future. These impacts may be individually minor but

collectively significant because of their spatial concentration or frequency in time. Cumulative effects can accumulate either incrementally (or additively) or interactively (synergistically), such that the overall effect is larger than the sum of the parts.

Magnitude
Estimating the magnitude of the environmental impact is of primary importance. Typically, it is expressed in terms of relative severity, such as major, moderate or low. Severity, as opposed to size, also takes account of other aspects of impact magnitude, notably whether or not an impact is reversible and the likely rate of recovery. Often, the significance of a particular environmental impact is compared against an internationally accepted best practice or baseline.

Extent/location
The spatial extent or zone of impact influence can be predicted for site-specific versus regional occurrences. Depending on the type of impact, the variation in magnitude will need to be estimated; for example, alterations to range or pattern of species or dispersion of air and water pollution plumes. This is much easier for direct impacts but can be attempted for other types of impacts as well.

Timing
Impacts arising from all of the stages of the life cycle of the project should be considered (i.e. during construction, operation and decommissioning). Some impacts will occur immediately, while others may be delayed, sometimes by many years. These impact characteristics should be noted in the EIA report.

Duration
Some impacts may be short-term, such as the noise arising from the operation of equipment during construction. Others may be long-term, such as the inundation of land during the building of a reservoir. Certain impacts such as blasting may be intermittent, whereas others, such as electromagnetic fields caused by power lines, may be continuous. Impact magnitude and duration classifications can be cross-referenced; for example, major but short term (less than one year), low but persistent (more than 20 years).

Significance
The evaluation of significance at this stage of EIA will depend on the characteristics of the predicted impact and its potential importance for decision-making. Significance is usually attributed in terms of an existing standard or criteria of permissible change, for example as specified in a standard, policy objective or plan. This concept is discussed further later in this report.

Methods for predicting the characteristics of impacts include the following:

- 'Best estimate' professional judgment;
- Quantitative mathematical models;
- Experiments and physical models; and
- Case studies as analogues or points of reference.

Health impacts

Health impacts can be a significant aspect of certain types of development. These impacts can be beneficial as well as adverse; for example, water infrastructure projects eradicate or drastically reduce the occurrence of cholera, diarrhea and other gastro-intestinal diseases that are endemic in less developed countries. However, adverse health impacts can also occur as a result of development projects, either directly from changes to the biophysical environment (such as exposure to pollutants) or indirectly as a secondary result of other changes; for example, the creation of habitat conditions favorable to the spread or intensification of disease vectors, such as mosquitoes (malaria) or water snails (schistosomiasis).

To date, insufficient attention has been given to health impacts in comparison to coverage given to biophysical or even other social impacts. In many cases, health impact assessment (HIA) is carried out separately and independently; for example in the chemical, nuclear and other hazardous industries. The World Health Organization, the World Bank and other international agencies recommend that, where necessary and appropriate, HIA should be integrated with the EIA process. Both use similar information, approach and methods; for example, when identifying the health and environmental impacts of exposure to air particulate emissions from a proposed power plant.

2.6 MITIGATION AND IMPACT MANAGEMENT

Mitigation is the stage of the EIA process when measures are identified to avoid, minimize or remedy impacts. These measures are implemented as part of the process of impact management, together with any necessary adjustments to respond to unforeseen impacts. Both elements are integral to ensuring that the EIA process leads to practical actions to offset the adverse environmental impacts of proposed projects.

Mitigation is a critical component of the EIA process. It aims to prevent adverse impacts from happening and to keep those that do occur within an acceptable level. Opportunities for impact mitigation will occur throughout the project cycle.

The objectives of mitigation should be as follows:

- Find better alternatives and ways of doing things;
- Enhance the environmental and social benefits of a proposal;
- Avoid, minimize or remedy adverse impacts; and
- Ensure that residual adverse impacts are kept within acceptable levels.

The objectives of impact management should be as follows:

- Ensure that mitigation measures are implemented;
- Establish systems and procedures for this purpose;
- Monitor the effectiveness of mitigation measures; and
- Take any necessary action when unforeseen impacts occur.

Key principles for the application of mitigation consistent with the above framework include the following:

- Give preference to avoid and prevent measures;
- Consider feasible alternatives to the proposal and identify the best practicable environmental option;

- Identify customized measures to minimize each of the main impacts predicted;
- Ensure they are appropriate, environmentally sound and cost-effective; and
- Use compensation or remedial measures as a last resort.

EIA good practice in mitigation requires a relevant technical understanding of the issues and the measures that work in the circumstances.

Mitigation can be carried out by (i) structural measures, such as design or location changes, engineering modifications and landscape or site treatment, and (ii) non-structural measures, such as economic incentives, legal, institutional and policy instruments, provision of community services and training and capacity building.

Structural measures are well established for certain types of projects, such as dams, roads, and oil and gas exploration and development. In some cases, industry codes of good practice will be available. However, these need to be applied with regard to the nature and severity of environmental impacts; for example taking account of nearby protected areas, patterns of wildlife mitigation or constraints imposed by natural hazards. Other projects involving new technology may require non-standardized or even untried measures to mitigate the adverse impacts. These need to be given special attention during impact management.

Non-structural measures are used increasingly. They can be applied to reinforce or supplement structural measures or to address specific impacts. For example, many types of social, community and health impacts are addressed by non-structural measures and their use is becoming broader.

A three-step process of mitigation can be applied to relate the hierarchy of elements in Exhibit 2-1 to the stages of the EIA process when they are typically applied. Generally, as project design becomes more detailed, the opportunities for impact avoidance narrow, and the concern is to minimize and compensate for unavoidable impacts. However, these distinctions are not rigid and opportunities for creative mitigation should be sought at all stages of EIA and project planning. The following steps are typically helpful in this process:

- First, avoid adverse impacts as far as possible by use of preventative measures;
- Second, minimize or reduce adverse impacts to 'as low as practicable' levels; and
- Third, remedy or compensate for adverse residual impacts, which are unavoidable and cannot be reduced further.

Brief discussion of these steps follows:

Step One: Impact avoidance. This step is most effective when applied at an early stage of project planning. It can be achieved by:

- Not undertaking certain projects or elements that could result in adverse impacts;
- Avoiding areas that are environmentally sensitive; and
- Putting in place preventative measures to stop adverse impacts from occurring, for example, release of water from a reservoir to maintain a fisheries regime.

Step Two: Impact minimization. This step is usually taken during impact identification and prediction to limit or reduce the degree, extent, magnitude, or duration of adverse impacts. It can be achieved by:

- Scaling down or relocating the proposal;
- Redesigning elements of the project; and
- Taking supplementary measures to manage the impacts.

Step Three: Impact compensation. This step is usually applied to remedy unavoidable residual adverse impacts. It can be achieved by:

- Rehabilitation of the affected site or environment, for example, by habitat enhancement and restocking fish;
- Restoration of the affected site or environment to its previous state or better, as typically required for mine sites, forestry roads and seismic lines; and
- Replacement of the same resource values at another location, for example, by wetland engineering to provide an equivalent area to that lost to drainage or infill.

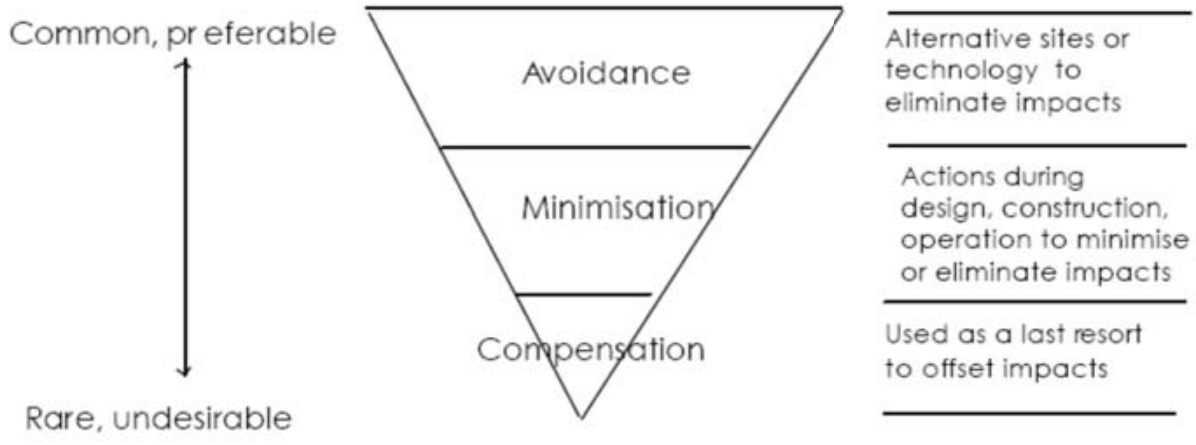
Depending on the timing of the project cycle and the nature of impacts, a number of approaches can be taken to achieve the objectives of mitigation. These include:

- Developing environmentally better alternatives to the proposal;
- Making changes to project planning and design;
- Carrying out impact monitoring and management; and
- Compensating for impacts by
  - Monetary payment
  - In kind measures
  - Site remediation bonds
  - A resettlement plan.

An environmental management plan (EMP) should contain the following:

- Summary of the potential impacts of the proposal;
- Description of the recommended mitigation measures;
- Statement of their compliance with relevant standards;
- Allocation of resources and responsibilities for plan implementation;
- Schedule of the actions to be taken;
- Program for surveillance, monitoring and auditing; and
- Contingency plan when impacts are greater than expected.
-

Exhibit 2-1: Elements of Environmental Impact Mitigation



The main components of an environmental management plan (EMP) as typically practiced under projects funded by the World Bank are described below:

Summary of Impacts: The predicted adverse environmental and social impacts for which mitigation is required should be identified and briefly summarized. Cross-referencing to the EA report or other documentation is recommended.

Description of Mitigation Measures: Each mitigation measure should be briefly described with reference to the impact to which it relates and the conditions under which it is required (for example, continuously or in the event of contingencies). These should be accompanied by, or referenced to, project design and operating procedures, which elaborate on the technical aspects of implementing the various measures.

Description of Monitoring Program: The monitoring program should clearly indicate the linkages between impacts identified in the EIA report, measurement indicators, detection limits (where appropriate), and definition of thresholds that will signal the need for corrective actions.

Institutional Arrangements: Responsibilities for mitigation and monitoring should be clearly defined, including arrangements for co-ordination between the various actors responsible for mitigation.

Implementation Schedule and Reporting Procedures: The timing, frequency and duration of mitigation measure should be specified in an implementation schedule, showing links with overall project implementation. Procedures to provide information on the progress and results of mitigation and monitoring measures should also be clearly specified.

Cost Estimates and Sources of Funds: These should be specified for both the initial investment and recurring expenses for implementing all measures contained in the EMP, integrated into the total project costs, and factored into loan negotiations.

The EMP should contain commitments that are binding on the proponent. It can be translated into project documentation and provide the basis for a legal contract that sets out the responsibilities of the proponent. In turn, the proponent can use the EMP to establish environmental performance standards and requirements for those carrying out the works or providing supplies. An EMP can also be used to prepare an environmental management system for the operational phase of the project.

Annex I provides the guidelines for the assessment of environmental impacts of infrastructure projects that are used by international financial institutions – the World Bank, Asian Development Bank, Inter-American Development Bank, and others.

Examples of Mitigation Measures

Typically, the following mitigation measures should be considered in an EIA for an infrastructure project.

- Avoiding sensitive areas, such as fish spawning beds or areas known to contain rare or endangered species;
- Establishing wild lands or other protected habitats within the area affected by the project or elsewhere in the region to offset loss of habitat in the project area;
- Providing buffer zones, wildlife corridors and other elements to maximize the benefits of the wildlife management areas or minimize the project's impact on wildlife;
- Restoring damaged habitats or creating new habitats, such as wetlands;
- Strengthening existing agencies to ensure effective implementation of the

project;
- Offering compensation and/or concessions to groups adversely affected by the conservation measures;
- Establishing an environmental education and community involvement program;
- Managing soil and water conservation;
- Monitoring construction operations;
- Installing pollution control devices, such as scrubbers and electrostatic precipitators, in new and existing facilities;
- Modifying manufacturing processes or technologies and waste management practices, for example, by replacing hazardous chemicals with harmless substances, or re-cycling and re-using by products;
- Adopting energy conservation practices and energy-efficient technologies;
- Preparing an occupational health and safety plan and an emergency response plan or improving existing measures;
- Providing training and ensuring continuous maintenance.

While these mitigation measures will be widely applicable to traditional power projects – conventional energy sources, other considerations apply to power projects based on renewable energy. Annex II discusses specific environmental impacts that may be associated with different renewable energy technologies and resources.

2.7 REPORTING ON EIA (S)

The purpose of the EIA report is to provide a coherent statement of the potential impacts of a project proposal and the measures that can be taken to reduce and remedy them. It contains essential information for:

- The proponent to implement the proposal in an environmentally and socially responsible way;
- The responsible authority to make an informed decision on the proposal, including the terms and conditions that must be attached to an approval or authorization; and
- The public to understand the proposal and its likely impacts on people and the environment.

A successful EIA report that meets these aims should be:

- Actionable – a document that can be applied by the proponent to achieve environmentally sound planning and design;
- Decision-relevant – a document that organizes and presents the information necessary for project authorization and, if applicable, permitting and licensing; and
- User-friendly – a document that communicates the technical issues to all parties in a clear and comprehensible way.

An EIA report typically includes many or all of the following headings and items:

- Executive or non-technical summary (which may be used as a public communication document);
- Statement of the need for, and objectives of, the proposal;
- Reference to applicable legislative, regulatory and policy frameworks;
- Description of the proposal and how it will be implemented (construction,

operation and decommissioning);
- Comparison of the proposal and the alternatives to it (including the no action alternative);
- Description of the project setting, including the relationship to other proposals, current land-uses and relevant policies and plans for the area;
- Description of baseline conditions and trends (biophysical, socioeconomic etc), identifying any changes anticipated prior to project implementation;
- Review of the public consultation process, the views and concerns expressed by stakeholders and the way these have been taken into account;
- Consideration of the main impacts (positive and adverse) that are identified as likely to result from the proposal, their predicted characteristics (e.g. magnitude, occurrence, timing, etc.) proposed mitigation measures, the residual effects and any uncertainties and limitations of data and analysis;
- Evaluation of the significance of the residual impacts, preferably for each alternative, with an identification of the best practicable environmental option;
- An environmental management plan that identifies how proposed mitigation and monitoring measures will be translated into specific actions as part of impact management*; and
- Appendices containing supporting technical information, description of methods used to collect and analyze data, list of references, etc.

2.8 REVIEW OF EIA QUALITY

The review of the quality of an EIA report is one of the main 'checks and balances' built into the EIA process. It helps to ensure that the information submitted is credible and sufficient for decision-making purposes. Often, the quality of EIA reports can be significantly improved by a detailed review, resulting in more informed approvals and better environmental outcomes.

Key objectives of an EIA review process should be as follows:

- Assess the adequacy and quality of an EIA report;
- Take account of public comment;
- Determine if the information is sufficient for a final decision to be made; and
- Identify, as necessary, the deficiencies that must be addressed before the report can be submitted.

A comprehensive review of the adequacy and quality of an EIA report would address many or all of the following issues:

- Does the report address the Terms of Reference?
- Is the necessary information provided for each major component of the EIA report?
- Is the information correct and technically sound?
- Have the views and concerns of affected and interested parties been taken into account?
- Is the statement of the key findings complete and satisfactory, e.g. for significant impacts, proposed mitigation measures, etc.?
- Is the information clearly presented and understandable by decision-makers and the public?
- Is the information relevant and sufficient for the purpose of decision-making and condition setting? The response to the last question is the most significant aspect

for review conclusions, and will largely determine whether or not an EIA can be submitted as is or with minor revisions.

Specific procedures for EIA review can be divided into two main types:

- ***Internal Review*** – undertaken by the responsible authority or other government agency, with or without formal guidelines and procedure; and
- ***External Review*** – undertaken by an independent body, separate from and/or outside government agencies, with an open and transparent procedure for public comment.

In many cases, internal review is informal and characterized by:

- Relatively low operating costs;
- Discretionary guidance on the conduct of review;
- Lack of transparency on process and factors considered; and
- Absence of documentation on outcomes and results, e.g. advice tendered to decision-makers.

External review procedures are more formal and characterized by:

- Higher levels of quality assurance;
- Independence from the responsible authority (to varying degrees);
- Transparent and rigorous process;
- Use of guidelines and/or review criteria and methodology;
- Documented outcome or statement on the sufficiency or deficiency of an EIA report; and
- Separate commission, panel, inter-agency or expert committee or other review body.

The review can be carried out in three steps:

- **Step 1:** identifies the deficiencies in the EIA report, using the Terms of Reference, relevant guidelines and criteria and information from any comparable EIA reports and their reviews.

- **Step 2:** focuses on any shortcomings in the EIA report and separate crucial deficiencies, which may directly impede decision-making, from less important ones. If no serious omissions are found, this should be stated clearly. Remarks about less important deficiencies can be placed in an appendix.

- **Step 3:** recommends how, and when, any serious shortcomings are to be remedied to facilitate informed decision-making and appropriate measures for project implementation.

Note: *The framework for EIA review comprises a list of questions to check that the EIA process was satisfactorily completed (e.g. in accordance with legal requirements and terms of reference in force) and then consider the quality of the EIA report. (Source: Sadler B (1996) Environmental Assessment in a Changing World. Final Report of the International Study of the Effectiveness of Environmental Assessment. Canadian Environmental Assessment Agency and International Association for Impact Assessment, Ottawa.)*

The following rating scale may be used to rate EIAs:

A. Excellent (thoroughly and competently performed)

B. Good (minor omissions and deficiencies)

C. Satisfactory (some omissions and deficiencies)

D. Poor (significant omissions and deficiencies)

E. Very poor (fundamental flaws and weaknesses)

F. No opinion (insufficient basis/experience on which to judge)

2.9 DECISION-MAKING PROCESS

Decision-making is the process of choosing between alternative courses of action. This process is essentially political in nature. It involves weighing the benefits and costs and making trade-offs among a range of considerations. Often, the views of interested parties are represented directly and decisions are made through an incremental process of negotiation, bargaining and compromise. For major proposals, a number of formal instruments can be used to develop the information necessary for sound decision-making.

In this context, an EIA is an information gathering process, which is intended to facilitate environmentally sound decision-making. This process culminates in a final decision on whether or not a project proposal is acceptable, and under what conditions. When the term 'decision-making' is used in EIA it is usually taken to mean the final approval of a proposal. However, a series of 'interim' decisions about the proposal are made throughout the EIA process; examples include the selection of a preferred alternative and making planning and design modifications to the initial proposal.

Depending upon the environmental laws and regulations that are in place in a country, these interim decisions may be made by different parties. For example, at the screening and scoping stages, the responsible authority usually decides the disposition of the proposal. During EIA preparation, the proponent often modifies the proposal to make it more environmentally and socially acceptable. The final approval of the major proposal is normally a political decision, often taken by the national government planning authority, the regulator, or other equivalent body. In some EIA systems, the approval is a pre-requisite to gaining other necessary authorizations, such as licenses and permits, which are issued by regulatory agencies.

Table 2-4 summarizes information necessary for sound decision making on EIAs.

Some or all of the following rules and conventions for decision-making have been adopted by leading EIA systems:

- No decision will be taken until the EIA report has been received and considered
- The findings of the EIA report and review are a major determinant of approval and condition setting
- Public comment on the EIA report is taken into account in decision-making
- Approvals can be refused or withheld, conditions imposed, or modifications demanded at the final decision stage
- The decision is made by a body other than the proponent
- Reasons for the decision and the conditions attached to it are published, and
- There is a public right of appeal against the decision (where procedures have not been followed or they have been applied unfairly)

Table 2-4: Information Necessary for EIA Decision Making

Background
• Project background and the most important environmental issues involved
Policy context
• Basic development issue or problem being addressed (e.g. flooding, water shortage, etc)
The relationship to environmental policies and plans **Alternatives**
• Alternatives to the proposal (including the best practicable environmental option (BPEO) or equivalent designation)
Public involvement
• Key public views • Concerns of affected communities • Areas of agreement and disagreement
Impact analysis
• Costs and benefits • Distribution of gains and losses
Mitigation and monitoring
• Adequacy of proposal measures
Conclusion and recommendations
• Main economic benefits, significant environmental effects and proposed mitigation measures • The extent to which the proposal conforms to the principles of sustainable development • Design and operational changes to improve the environmental acceptability of the project.

The responsibility of decision-makers to consider the findings and recommendations of an EIA report varies from one jurisdiction to another. Normally, there are limited qualifications

placed on the discretion of the decision-maker to approve or reject a proposal. Depending on the arrangements in place, the decision-maker may have to:

- Meet no further requirements;
- Take account of information in the EIA report;
- Provide written reasons for the decision; or
- Act in accordance with recommendations of an EIA review body, unless these are explicitly overturned.

There can be a number of different outcomes from decision-making:

- The proposal can be approved;
- The proposal can be approved with conditions;
- The proposal can be placed on hold pending further investigation;
- The proposal can be returned for revision and resubmission; and
- The proposal can be rejected outright.

2.10 IMPLEMENTATION AND FOLLOW-UP

After project approval, implementation and follow up complete the EIA process. Monitoring, auditing and other tools are used to 'close the loop' of impact prediction and condition setting. They are important for several reasons: to identify the impacts that occur; to check that these are within the levels predicted and required by legislation; to determine that mitigation measures are properly implemented and work effectively; to ensure the environmental benefits expected are being achieved; and to provide feedback to improve future applications of the EIA process.

Key objectives of EIA implementation and follow up should be as follows:

- Confirm that the conditions of project approval are implemented satisfactorily;
- Verify that impacts are within predicted or permitted limits;
- Take action to manage unanticipated impacts or other unforeseen changes;
- Ensure that environmental benefits are maximized through good practice; and
- Learn from experience in order to improve EIA process and practice.

The main components and tools of EIA implementation and follow up include:

- Surveillance and supervision – to oversee adherence to and implementation of the terms and conditions of project approval;
- Effects or impact monitoring – to measure the environmental changes that can be attributed to project construction and/or operation and check the effectiveness of mitigation measures;
- Compliance monitoring – to ensure that applicable regulatory standards and requirements are being met, e.g. for waste discharge and pollutant emissions;
- Environmental auditing – to verify the implementation of terms and conditions, the accuracy of the EIA predictions, the effectiveness of mitigation measures, and the compliance with regulatory requirements and standards;
- Ex-post evaluation – to review the effectiveness and performance of the EIA process as applied to a specific project; and
- Post-project analysis – to evaluate the overall results of project development and to draw lessons for the future.

These elements are briefly described below.

Surveillance and supervision

Surveillance of the implementation of EIA terms and conditions can be undertaken by regular or periodic site inspections to check on compliance, observe progress and discuss issues. Supervision implies a more intensive direction of the environmental performance of on-site activities, ensuring they are carried out in accordance with the environmental management plan and/or contract specifications.

Monitoring

Monitoring refers to the collection of data through a series of repetitive measurements of environmental parameters (or, more generally, to a process of systematic observation). The main types of EIA monitoring activities are:

- Baseline monitoring – the measurement of environmental parameters during a pre-project period for the purpose of determining the range of variation of the system and establishing reference points against which changes can be measured.
- Effects monitoring – the measurement of environmental parameters during project construction and implementation to detect changes which are attributable to the project.
- Compliance monitoring – the periodic sampling or continuous measurement of environmental parameters to ensure that regulatory requirements and standards are being met.

Auditing

Auditing is a term borrowed from accounting to describe a systematic process of examining, documenting and verifying that EIA procedures and outcomes correspond to objectives and requirements. This process can be undertaken during and/or after project construction, and draws upon surveillance reports and monitoring data. The main types of EIA related audits are:

- Implementation audits – to verify that EIA implementation met the conditions of project approval.
- Impact audits – to determine the impact of the project and the accuracy of EIA predictions.
- Compliance audits – to verify that project impacts complied with environmental standards and regulatory requirements.
- Effectiveness or policy audits – to check the feasibility of mitigation measures and the consistency of EIA practice.

Evaluation

Ex-post evaluation involves a policy-oriented review of the effectiveness and performance of the EIA process. It is concerned with the overall 'balance sheet' of an EIA, looking at what it achieved, which aspects were influential, and how the process could be improved. The guiding concepts are:

- Effectiveness – the extent to which the EIA process has achieved its purpose(s). Depending on how these are defined, an effectiveness review can be conducted against the terms of reference, the information provided to decision-makers or principles and criteria of EIA good practice
- Performance – the success of the EIA process as measured by its outcomes and results, e.g. the environmental benefits achieved or the effectiveness of

mitigation in avoiding or reducing impacts. Surveillance, monitoring and auditing data are necessary for this purpose.

Post project analysis

Usually, a post-project analysis is undertaken once the project has been constructed and is about to enter the operational phase. The term implies a focus on project specific EIA experience, e.g. in relation to dams, highways, waste disposal sites or power generation. In this context, post-project analysis can include aspects of effectiveness and performance review, using impact and mitigation data from surveillance, monitoring and auditing.

Guiding principles for carrying out the process of EIA implementation and follow up include the following:

- The project should be carried out in accordance with conditions of approval and the commitments made in the EIA report/EMP;
- Surveillance and inspection should be a routine elements for this purpose;
- The scope of other follow up activities should be commensurate with the significance of the potential impacts; and
- Monitoring, auditing and evaluation should be undertaken when potential impacts are likely to be significant, mitigation measures are untried or their outcome is uncertain, and/or new aspects of EIA process and practice have been introduced.

A comprehensive approach to EIA implementation and follow up would include many or all of the following steps and elements:

- Inspect and check the implementation of terms and conditions of project approval;
- Review the environmental implications of any changes that are required;
- Monitor the actual effects of project activities on the environment and the community;
- Verify compliance with regulatory requirements and applicable standards or criteria;
- Take action to reduce or rectify any unanticipated adverse impacts;
- Adjust the EMP, project specifications and related schedules as necessary;
- Audit the accuracy of the EIA predictions;
- Evaluate the effectiveness of the mitigation measures; and
- Provide feedback to improve EIA process and practice in the future.

Key criteria for determining the need for and scope of EIA implementation and follow up include:

- The degree of confidence or uncertainty attached to impact predictions;
- The level of risk and damage if unanticipated impacts occur;
- The significance of losses if controls are not properly implemented; and
- The opportunity to gain information that will add value to EIA practice.

Aspects and issues that need to be considered when designing and carrying out an EIA implementation and follow up program include:

- What is required? – Identify the scope and components of the program, and, if necessary, provide a justification and prioritize follow up actions.
- Who will carry out the activities? – Indicate the roles and responsibilities of key agencies and individuals, noting how these will be coordinated and emphasizing any research aspects that may have been added subsequent to the project approval, EMP or other core documents.
- How will the program be carried out? – Specify the resources, expertise and arrangements necessary to give effect to EIA follow up and to report the results.

Monitoring is a cornerstone of EIA implementation and follow up. Other components are dependent on the scope and type of monitoring information that is provided. The primary aim of monitoring is to provide information that will aid impact management, and, secondarily, to achieve a better understanding of cause-effect relationships and to improve EIA prediction and mitigation methods. Both the immediate and long-term benefits from undertaking monitoring as part of EIA are widely recognized, although not always realized.

Monitoring is used to:

- Establish baseline trends and conditions;
- Measure the impacts that occur during project construction and operation;
- Check their compliance with agreed conditions and standards;
- Facilitate impact management, e.g. by warning of unanticipated impacts; and
- Determine the accuracy of impact predictions and the effectiveness of mitigation measures.

The following points need to be agreed as part of the EMP and conditions of project approval:

- Major impacts to be monitored;
- Objectives of monitoring and data requirements;
- Arrangements for the conduct of monitoring;
- Use of the information to be collected;
- Response to unanticipated or greater than predicted impacts; and
- Measures for public reporting and involvement.

Monitoring requirements should focus on the significant impacts predicted in the EIA report, taking account of:

- The environmental values to be safeguarded;
- The magnitude of each potential impact;
- The risk or probability of each impact occurring;
- The pathways and boundaries of each impact; and
- The confidence in the prediction of each impact.

Monitoring program need to be constantly reviewed to make sure that relevant information is being supplied, and to identify the time at which they can be stopped. Monitoring program result in time series data, which can be analyzed by:

- Assembling the data in tabular or graphic format;
- Testing for variations that are statistically valid;

- Determining rates and directions of change; and
- Checking these are within expected levels and comply with standards (e.g. water quality).

Annex III summarizes the Environmental Act of Namibia 2007. ECB's approach to requiring IPP project developers to conduct environmental assessment of proposed projects will need to comply with the provisions of this Act.

3. KEY TASK 6 ACTIVITIES

All USTDA funded grants for technical assistance and feasibility studies require that the Grantee ensure that the selected Contractor conduct a development impact assessment of the grant in accordance with a detailed guideline prepared by USTDA. The following are specific activities that are required of the Contractor under the Contract between the Contractor and the ECB:

- Follow USTDA Development Impact Assessment Criteria
- Assess impacts on: human capacity building, institutional capacity building, market reforms, and productivity
- Assess impacts on macro issues, including: overall sector efficiency, technology transfer, national income, employment, income distribution, labor skills, etc.
- Assess social and micro impacts such as population dislocations, land-use issues, environmental effects, etc.

The current project is a Technical Assistance Grant to the ECB to develop an IPP market framework and provide model documents in order to (i) encourage the entry of IPPs into Namibia's power market and (ii) prepared the ECB to discharge its regulatory responsibilities in accordance with the Namibian Law and the Government's energy policies. In this sense it is different from a typical grant by USTDA for the engineering and financial feasibility of a high priority infrastructure project such a new power plant, modernization of a refinery, or rehabilitation and expansion of an airport.

USTDA routinely requires that all Grantees receiving USTDA grants require the Contractor selected to perform the Terms of Reference under the Grant to conduct a development impact assessment of the project in accordance with USTDA guidelines. While this would be a straight forward task for a defined project, estimating such impacts for a technical assistance such as the grant to ECB must utilize a process that would measure both qualitative impacts of the technical assistance and quantitative impacts if the technical assistance leads to actual implementation of any infrastructure projects.

The proposed technical assistance to ECB is devoted to preparing the ECB to exercise its regulatory role in a reforming power market in Namibia. In keeping with Vision 2030, it is clear that Namibia will need to add significant new power capacity, much of which has to come from IPPs. Accordingly, the development impact of the technical assistance needs to be measured at two levels as follows:

1. **Direct Impact on the Capacity and Human Resources of ECB –** These include impacts such as increased skill levels, improved regulatory governance, improved environment for private participation in Namibia's power sector, improved transparency and accountability in the power sector, greater investor confidence, increase in customer satisfaction in terms of quality of service, and related tangible governance improvements creating a better climate for large private sector investments in the country's power sector.

2. **Downstream Impacts of any IPP Investments** – These will include impacts such as additional employment, contribution to the country's GNP, and increased business

investment. Increase in urban and peri-urban development and infrastructure investments leading to further new jobs, enhanced energy security and quality of life, benefits to consumer resulting from market competition and improved sector efficiency, and other direct and indirect economic benefits.

The methodology used by most analysts and the development finance institutions such as the World Bank, African Development Bank (AfDB), Asian Development Bank (ADB), and the European Union (EU), albeit different in the levels of detail, are similar in terms of the approach used to classify the various types of development impacts. In the energy sector, a large number of stakeholders are involved and therefore, the methodology for assessing development impacts should take into account all stakeholder groups that will be affected, directly or indirectly, by the improved environment for IPPs, and then examine what the impact on that group will be beyond what can readily be captured in project financial feasibility study's financial rate of return (FRR) analysis. Impacts are typically described as costs or benefits. Where quantification is impossible, as in assessing the value to others from the current USTDA technical assistance to ECB, qualitative judgments of value based on other similar initiatives elsewhere need to be made.

Developmental impacts of the current technical assistance to Namibia on key stakeholders in addition to the ECB as an institution will be as follows:

Financiers:
A part of the current TA has addressed the barriers on the banking system and its ability to participate in financing upcoming IPPs in Namibia. As a result of the TA, specific recommendations have been made that will significantly improve the market rules and regulatory oversight. This will provide the financial institutions a level of comfort that is expected to induce new investments in the power sector in the country.

Employees of Enterprises:
Net benefits of more power plant construction and operation likely to result from the entry of IPPs in Namibia's power sector will include increased wages received by employees as compared to alternative employment as well as health, pensions, special housing or access to special schools or similar fringe benefits. Other benefits to employees include training received as a consequence of employment in an IPP project company. Additional benefits will come from improved sector performance resulting from manger training as well as training in the use of new technology and new business methods by the power sector workforce.

Customers:
As ECB moves forward with many of the recommendations resulting from this TA, significant benefits to consumers from increased access to power are anticipated. Both the consumers that previously did not have access to electricity as well as those with improved services and more reliable supply of power will benefit in terms of both improved quality of life and enhanced economic activity.

The benefit to new consumers is how much they would be willing to pay for the electricity, that is, the area under the market demand curve. What they in fact pay is the market price, but this portion of the benefits is already counted as the revenues accruing to the project financiers from electricity sales. Better quality power to existing customers will bring additional benefit, if sold at the same price that is not included in the financial rate of return. Since the Project will add to

the supply of the electricity in the market, the price of electricity may be reduced for additional benefit.

Producers of Complementary Products:
A complementary good is one whose value to the consumer increases when the supply of the good it is complementary to increases. Power sector improvements typically trigger significant increases in agricultural, commercial and industrial production. These are discussed below. Two diverse prime examples of complementary products are mining equipment and mobile telephony. Cell phone use is skyrocketing in Africa and electric power is needed critically to recharge batteries, operate microwave transmission towers and for other purposes. Crushing and heating rock for extraction of ores or stones requires a great deal of electricity. The more of such energy that can be supplied at a reasonable price, the greater will be the growth of that sector of the Namibian economy.

Suppliers:
Maintenance and operation of the power plant will increase demand for suppliers of these goods and services and hence produce higher profits. Similarly, the increase in wages (beyond what they would have been receiving elsewhere) of the additional workers employed by the suppliers will also be a direct development benefit of additional new power plants in the country.

The creation of new supplier networks can be extremely important to the development of Namibia. Quantifying their value to society will probably be too difficult, but at a minimum the value would include the extra profits they are now earning plus the extra wages of additional workers employed.

Competitors and New Entrants:
Some existing competitors—for example, the suppliers of back up diesel generator sets, suppliers of on-site power for mining operations—may see a reduced demand for their products. Positive impacts on competitors also exist and these might include demonstration effects. The project may demonstrate to others:

- The viability of some new technology, such as energy-saving or efficiency enhancing power equipment, renewable energy resource utilization for new power generation, etc.
- The viability of reorganizing a business that is inherent to this change in the power system structure
- The viability of some market that previously had been of uncertain size or strength
- Corporate best practice
- The availability of finance, perhaps in the innovative way IPPs will be financed.
- Positive effects of supplier or other networks.

New entrants may be drawn into the power market because of the value of these demonstration effects and network effects. In contrast to old competitors, there can be no doubt that new entrants benefit as they were not in the market at all before. Arriving at a quantifiable social value for this is not possible in the absence of a concrete project.

Neighbors:
“Neighbors” is used here as a loose term for all those who may be affected by an IPP Project,

but who do not have a direct market relationship with the Project, i.e., they are not investors, employers, employees, customers, suppliers, or competitors. Impacts on neighbors that will be considered include environmental externalities, new infrastructure made possible by the availability of reliable electric power, and the development of social infrastructure. The construction of new IPP plants will impact the further development of the social infrastructure of the community: theaters, restaurants, community centers, and so on, some of which might not have been viable before an IPP investment came into operation.

An excellent paper on the subject is a Discussion Draft Paper: Independent Power Production – Benefits to Local Communities, prepared by R. Guy Heywood, Renaissance Power Corporation. This paper discusses the case of British Columbia Hydro and focuses on small IPPs. For a 7 MW IPP project, for example, the development impacts are quantified as follows:

- Total Capital Cost — CAN $15 Million
- Employment Person Years — 90 per year averaged over the construction and operation period
- GDP Contribution — CAN $5,750 per year
- Provincial and Local Tax Revenues — CAN $1,176 per year

The Draft Discussion Paper goes on to indicate that the small IPP industry can lead to many positive social and community development impacts in small communities throughout British Columbia.

The next section takes this discussion a bit further in terms of the types of development impacts that can be expected by Namibia as new IPPs enter the power market in the country.

Expected Development Impacts from the Entry of IPPs into Namibia's Power Market

There is no question that sooner rather than later, IPPs will enter the power market in Namibia. Electricity demand and Gross National Product (GNP) have a strong correlation; the more developed the economy greater the level of correlation. Similarly, the relationship between increase in energy use and corresponding increase in productivity offers a good measure of the economic benefits of increased availability of reliable and affordable energy. To foster increased productivity and development in Namibia, policy should stimulate increased efficiency of electricity use.

At a gross level, Namibia can expect the following types of direct impacts from the entry of IPPs in the country's power sector:

Impact of Independent Power Production of 1MW

1.	Primary Employment	4 Employees
2.	Secondary Employment	8 Employees
3.	Temporary Employment	10 Employees
4.	LT Line Construction	5 Kilometers
5.	GNP Added (Direct from IPP)	$10,000 Per Year
6.	GNP Added (Indirect from Other Activities)	$50,000 per Year

Note: These figures are indicative only and will vary widely depending upon individual country characteristics, technology, market factors, etc.

At a minimum, USTDA requires the development impacts to be characterized within the following broad categories of impacts:

- Infrastructure Related Impacts
- Market-Oriented Reform
- Human Capacity Building
- Technology Transfer and Productivity Enhancement
- Other Development Impacts.

Exhibit 3-1 categorizes the expected development impacts from future IPP constructions in Namibia that are expected as a result of overall sector reform and the establishment of an enabling environment for private power investment, the focus of the USTDA technical assistance to the ECB.

EXHIBIT III-1: POTENTIAL DEVELOPMENT IMPACTS OF THE IPP AND INVESTMENT MARKET FRAMEWORK TECHNICAL ASSISTANCE TO THE ELECTRICITY CONTROL BOARD OF NAMIBIA

NO.	USTDA FUNDED GRANT ACTIVITY	TYPE OF DEVELOPMENT IMPACT	DESCRIPTION OF THE DEVELOPMENT IMPACTS
1.	Namibia IPP Investment and Market Framework Technical Assistance Phase II	***Infrastructure Related Impacts***	The support provided under this Technical Assistance will result in energy sector reform and improved regulatory governance. A direct result of the grant will be to create an enabling environment for encouraging the entry of private investors into Namibia's power sector. As IPPs enter the Namibian market, there will be considerable impact on the infrastructure of the country. The direct and indirect infrastructure impacts will include the following: • Construction of power plants, additional transmission lines, distribution lines, substations, and electricity delivery networks to endues customers • Additional construction of roads, housing, communities service entities, and industrial facilities • Regional infrastructure developments related to regional interconnections needed for power exchange and trading in the Region • Other site-specific infrastructure impacts such as water supply systems, institutional buildings, etc. • Environmental effects – air quality, water quality, land use, etc.

NO.	USTDA FUNDED GRANT ACTIVITY	TYPE OF DEVELOPMENT IMPACT	DESCRIPTION OF THE DEVELOPMENT IMPACTS
		Market Oriented Reform Impacts	This TA will cause significant market-oriented impact on the power market both within Namibia and in the Southern Africa Region in terms of power trading. Currently, Namibia seems to be operating on the basis of a single buyer (SB) model. As more and more IPPs are constructed, Namibia may move to a multiple seller multiple buyer (MSMB) model. This will create market competition in generation and will lead to efficiency gains and cost reduction. In a competitive market, the consumer will be the ultimate beneficiary as the quality of service and supply will improve whereas the cost of service and thus the tariffs will go down. As a result of transparent market rules to be promulgated by the ECB, Namibia will also strengthen its position in the regional electricity market and will be a stronger and more effective player. Enhanced Security of power supply will lead to the overall energy security of the country, reduce its vulnerability to interruptible sources of supply, and lead to a more robust economy and a generally more peaceful society. Increased competition in the power generation sector will likely result in the following types of impacts on the sector as a whole: • Increased sector efficiency • Improved prices • Better energy and resource utilization balance • Improved and increased industrial activity • Increased investments in the economy Finally, increased diversity of prime movers in the power market will reduce Namibia's exposure to external price risks.

NO.	USTDA FUNDED GRANT ACTIVITY	TYPE OF DEVELOPMENT IMPACT	DESCRIPTION OF THE DEVELOPMENT IMPACTS
		Human Capacity Building Impacts	This TA included a number of workshops for not only ECB officials but also other energy sector stakeholders. Officials from NamPower, the Ministry of Mines and Energy, consumer associations, Regional Electricity distributors (REDs), industry associations, the NGO community, and other ministries in the Government participated in the various workshops on (i) Market Models, (ii) Regulatory Models, (iii) IPP Barriers and Mitigation Measures, (iv) Cost Allocation, Cross Subsidies, and Rate Design, and (v) various working sessions throughout the performance of the TA. These workshops served as mini on-the-job training sessions and the human capacity building effect is clearly evident in the sense that ECB, the enterprises, and the Government are moving forward with the specific recommendations of the TA. The officials from these entities have greater knowledge and enhanced skills in designing processes and procedures that will significantly strengthen the governance of the sector. Specific areas of human capacity building include the following: • Energy sector policy reform • Regional energy pricing and world-class PPAs and IPP tendering process • A fair and transparent regulatory regime leading to greater market and investor confidence • Improved licensing procedures and contracts • Improved customer relations management by utilities • Fair market and trading rules • Improved overall sector planning and linage with national economic development planning. As new IPP projects are constructed, the developers will employ and train hundreds of new engineers and technicians resulting in additional capacity building.

NO.	USTDA FUNDED GRANT ACTIVITY	TYPE OF DEVELOPMENT IMPACT	DESCRIPTION OF THE DEVELOPMENT IMPACTS
		Technology Transfer and Productivity Enhancement Impacts	There will be considerable technology transfer impacts as a result of the implementation of modern electric power technology and systems that will be brought into Namibia by the IPPs. The introduction of new power generation technology will lead to overall power sector productivity enhancement as well. Specifically, technologies such as IGCC, Combined Cycle Gas, Cogeneration, wind power, etc., will not only diversify the generation mix but also result in substantial technology transfer and productivity enhancement.
		Other Development Impacts	Availability of reliable electricity will lead to considerable satellite industry and secondary development in the country. Also, availability of electricity to rural communities will lead to greater rural development and poverty alleviation.

4. RECOMMENDATIONS

Sector Context and Developments

The Environmental Management Act 2007 of Namibia provides ECB the basis for developing specific requirements for environmental impact assessment of any IPP project proposals that it receives. Under this TA, CORE has developed a comprehensive matrix for the evaluation of applications submitted by various project developers for the license issuance decision. This matrix also includes a detailed section on the requirements for environmental and development impact assessments of IPP project proposals.

To date the ECB has received 11 formal generation license applications. Under this TA, CORE assisted the ECB in the evaluation of all of these proposals by utilizing the above-mentioned matrix. The final project proposal evaluation results were submitted to ECB under a separate report. Based on the support provided under this TA, the ECB took the following decisions on the various IPP project applications:

- Three of the 11 applications were withdrawn by the applicants for unknown reasons
- Three project applications were rejected by the ECB for a variety of reasons including incomplete applications and the lack of viability of the proposed IPP projects
- ECB granted five generation licenses

In addition, ECB is awaiting a further 5 new generation license applications following their recommendations to the preliminary applications and potential new projects by NamPower. Many of the IPP projects are moving forward.

Additional 80MW generator at the Ruacana hydropower station (US$45million), a 600MW interconnector with Zambia (US$400million, increased regional trade) and a 50MW HFO emergency power station (US$140million) are currently being procured (total of US$585million).

Due to a projected doubling of electricity demand in the next 5 years (from 500 to 1000MW) as a result of new mining projects especially uranium, additional power projects will be required to meet this demand. In addition Namibia is gearing itself to become a net exporter of electricity to take advantage of the current power supply crisis in the region.

Due to time constraints a full quantitative assessment of the developmental benefits for 500MW of additional power generation capacity could not be made. However, based on the development impacts for a 1 MW power plant as detailed in the TA 1, main report, section V, the following would be typical direct benefits for 500MW:

- Primary Employment 2000 employees
- Secondary Employment 4000 employees
- Temporary Employment 5000 employees
- GDP added US$30million/per year

A big obstacle to fast-track movement of IPP projects in Namibia is that Namibia is currently operating without a National Integrated Resource Plan (NIRP). The cost of such a NIRP is estimated to be around US$1million, which was too much to be covered by either the TA 1 or 2. In the absence of a NIRP, the ECB has been proceeding with an unsolicited licensing process due to the urgent need for new power supply whereas NamPower followed with a solicited

bidding process for specific projects resulting in differences between ECB and NamPower, which led to delays in the negotiations of power purchase agreements. A NIRP would have made the method and responsibilities for the bidding process for specific new generation projects clear. In the current TA, CORE has developed an action plan and TORs for an NIRP. This was submitted to the ECB as Task 3 Report under this TA. ECB is investigating sources of funding (ECB, Government and grants). The ECB intends to complete a NIRP in 2009.

NamPower requires US$1.25 billion funding for their proposed projects over the next 5 years. It should be noted that NamPower currently has net assets of US$750million, from which the loans and equity injection for their current projects must still be subtracted when capitalized. Thus NamPower will not be able to execute these projects on their own, IPPs including equity injection from other investors will have to play a role.

Recommendations Regarding Environmental Assessment of IPP Projects

Based on the provisions of Environmental Management Act of 2007 Namibia and the IPP Project Evaluation Matrix developed as part of this TA, ECB should develop two sets of specific environmental assessment requirements of any IPP projects. The burden for this assessment should be on the project developers and implementers and this should be a condition of license to any project developer. The first set of requirements should be for major conventional power generation projects and the second set of requirements should be for renewable energy based IPPs (typically smaller). World Bank guidelines should also be considered as some of the IPP project developers may approach the World Bank and the International Finance Corporation, the private sector arm of the World Bank, for equity or debt financing for specific components of the project. In addition, if the developer proposes export credit financing from the export-import banks in various countries, these institutions may have their own guidelines for environmental assessment. Therefore, ECB should require that the environmental impact assessment should conform to not only Namibian environmental requirements but also those of financial institutions proposed by the developers as sources of debt and equity financing for the proposed project.

In order to facilitate a smooth process, it would be appropriate for ECB to post these environmental assessment requirements for IPP projects on its web site and as part of the applications requirements. Prior to the finalization of these requirements, ECB will need to coordinate with various concerned ministries, NamPower, and the public in order to ensure that the requirements are not too restrictive on one hand and represent the public's interest on the other.

Recommendations Regarding Development Impact Assessment of IPP Projects

The Task 1 and Task 4 Reports submitted by CORE provided preliminary development impacts of the 11 IPP project proposals submitted to ECB by various IPP developers. This Task 5 and Task 6 Report provides the details of the methodology used by CORE to evaluate the development impact of IPP projects. Based on these, CORE recommends that ECB adapt a standard methodology for evaluating the development impacts of IPP projects. This standard methodology should be finalized based on coordination with relevant government agencies and through a public comment process and posted on ECB's web site as a standard requirement of all IPP project applications.

ANNEX I: EIA REQUIREMENTS OF INTERNATIONAL FINANCIAL INSTITUTIONS

The World Bank and the regional development banks listed above now have well-established EIA procedures, which apply to their lending activities and projects undertaken by borrowing countries. Although their operational policies and requirements vary in certain respects, the development banks follow a relatively standard procedure for the preparation and approval of an EIA report. This procedure generally follows the stages outlined in the flow chart shown on the verso of the topic divider. Borrowing countries are responsible for the preparation of the EIA, and this requirement possibly more than any other has influenced the introduction and development of EIA in many developing countries.

The EIA policies and arrangements of the development banks remain important, especially in countries that have weak or non-existent domestic arrangements. Recently, the World Bank has made a number of changes to make the application of its EIA procedure more systematic, notably through its linkage to new environmental and social safeguard policies. In addition, the Bank's broader environmental policy has moved from a 'do no harm'

World Bank. 1991. Environmental Assessment Sourcebook. Washington, D.C.
Vol. 1: Policies, Procedures, and Cross-Sectoral Issues.
World Bank Technical Paper 139.
Vol. 2: Sectoral Guidelines. World Bank Technical Paper 140.
Vol. 3: Guidelines for Environmental Assessment of Energy and Industry Projects. World Bank Technical Paper 154.

Key elements of the EIA process used by the World Bank and other international financial institutions are summarized in the box below.

THE WORLD BANK EIA PROCESS

The World Bank EIA Process

Executive Summary: The Executive Summary should consist of a concise discussion of significant findings of the EA and recommended actions in the project.

Project Description: In this section, one should provide concise description of the project's geographic, ecological, social and temporal context, including any off-site investments that may be required by the project, such as dedicated pipelines, access roads, power plants, water supply, housing and raw material and product storage materials.

Baseline Data: For EA purposes, baseline data includes an assessment of the study dimensions and a description of relevant physical, biological, and socio-economic conditions, including any changes anticipated before the project begins, and current and proposed development activities within the project area, even if not directly connected to the project.

Impact Assessment: This section includes identification and assessment of the positive and negative impacts likely to result from the proposed project. Mitigation measures, and any residual negative impacts that cannot be mitigated, should be identified. Opportunities for environmental enhancement should be explored. The extent and quality of available data, key data gaps, and uncertainties associated with predictions should be identified/estimated. Topics that do not require further attention should be specified.

Analysis of Alternatives: A key purpose of EA work is to assess investment alternatives from an environmental perspective. This is the more proactive side of EA - enhancing the design of a project through consideration of alternatives, as opposed to the more defensive task of reducing adverse impacts of a given design. The Bank's EA 0D calls for the systematic comparison of the proposed investment design, site, technology, and operational alternatives in terms of their potential environmental impacts, capital and recurrent costs, suitability under local conditions, and institutional, training and monitoring requirements. For each alternative, the environmental costs and benefits should be quantified to the extent possible, economic values should be attached where feasible, and the basis for the selected alternative should be stated.

Mitigation or Management Plan: A mitigation plan consists of the set of measures to be taken during implementation and operation to eliminate, offset, or reduce adverse environmental impacts to acceptable levels. The plan identifies feasible and cost-effective measures and estimates their potential environmental impacts, capital and recurrent costs and institutional, training and monitoring requirements. The plan should provide details on proposed work programs and schedules to help ensure that the proposed environmental actions are in phase with construction and other project activities throughout implementation. The plan should consider compensatory measures if mitigation measures are not feasible or cost-effective.

Environmental Monitoring Plan: This plan specifies the type of monitoring, who will do it, how much it will cost, and what other inputs, such as training, are necessary.

Public Consultation: Consultation with affected communities is recognized as key to identifying environmental impacts and designing mitigation measures. The Bank's policy requires consultation with affected groups and local NGO's during at least two stages of the EA process: (1) at the scoping stage, shortly after the EA category has been assigned, and (2) once a draft EA report has been prepared. Consultation throughout EA preparation is also generally encouraged, particularly for projects that affect peoples' livelihood and for community-based projects. In projects with major social components, such as those requiring involuntary resettlement or affecting indigenous people, the consultation process should involve active public participation in the EA and project development process and the social and environmental issues should be closely linked.

ANNEX II: ENVIRONMENTAL IMPACTS OF RENEWABLE ENERGY TECHNOLOGIES

(This briefing paper was adapted from material in the UCS book Cool Energy: Renewable Solutions to Environmental Problems, by Michael Brower (MIT Press, 1992), 220 pp. (Source http://www.ucsusa.org/clean_energy/technology_and_impacts/impacts/environmental-impacts-of.html)

To combat global warming and the other problems associated with fossil fuels, the United States must switch to renewable energy sources like sunlight, wind, and biomass. All renewable energy technologies are not appropriate to all applications or locations, however. As with conventional energy production, there are environmental issues to be considered. This paper identifies some of the key environmental impacts associated with renewable technologies and suggests appropriate responses to them. A study by the Union of Concerned Scientists and three other national organizations, America's Energy Choices, found that even when certain strict environmental standards are used for evaluating renewable energy projects, these energy sources can provide more than half of the US energy supply by the year 2030.

Wind Energy

It is hard to imagine an energy source more benign to the environment than wind power; it produces no air or water pollution, involves no toxic or hazardous substances (other than those commonly found in large machines), and poses no threat to public safety. And yet a serious obstacle facing the wind industry is public opposition reflecting concern over the visibility and noise of wind turbines, and their impacts on wilderness areas.

One of the most misunderstood aspects of wind power is its use of land. Most studies assume that wind turbines will be spaced a certain distance apart and that all of the land in between should be regarded as occupied. This leads to some quite disturbing estimates of the land area required to produce substantial quantities of wind power. According to one widely circulated report from the 1970s, generating 20 percent of US electricity from windy areas in 1975 would have required siting turbines on 18,000 square miles, or an area about 7 percent the size of Texas.

In reality, however, the wind turbines themselves occupy only a small fraction of this land area, and the rest can be used for other purposes or left in its natural state. For this reason, wind power development is ideally suited to farming areas. In Europe, farmers plant right up to the base of turbine towers, while in California cows can be seen peacefully grazing in their shadow. The leasing of land for wind turbines, far from interfering with farm operations, can bring substantial benefits to landowners in the form of increased income and land values. Perhaps the greatest potential for wind power development is consequently in the Great Plains, where wind is plentiful and vast stretches of farmland could support hundreds of thousands of wind turbines.

In other settings, however, wind power development can create serious land-use conflicts. In forested areas it may mean clearing trees and cutting roads, a prospect that is sure to generate controversy, except possibly in areas where heavy logging has already occurred. And near populated areas, wind projects often run into stiff opposition from people who regard them as unsightly and noisy, or who fear their presence may reduce property values.

In California, bird deaths from electrocution or collisions with spinning rotors have emerged as a problem at the Altamont Pass wind "farm," where more than 30 threatened golden eagles and 75 other raptors such as red-tailed hawks died or were injured during a three-year period. Studies under way to determine the cause of these deaths and find preventive measures may have an important impact on the public image and rate of growth of the wind industry. In appropriate areas, and with imagination, careful planning, and early contacts between the wind industry, environmental groups, and affected communities, siting and environmental problems should not be insurmountable.

Solar Energy

Since solar power systems generate no air pollution during operation, the primary environmental, health, and safety issues involve how they are manufactured, installed, and ultimately disposed of. Energy is required to manufacture and install solar components, and any fossil fuels used for this purpose will generate emissions. Thus, an important question is how much fossil energy input is required for solar systems compared to the fossil energy consumed by comparable conventional energy systems. Although this varies depending upon the technology and climate, the energy balance is generally favorable to solar systems in applications where they are cost effective, and it is improving with each successive generation of technology. According to some studies, for example, solar water heaters increase the amount of hot water generated per unit of fossil energy invested by at least a factor of two compared to natural gas water heating and by at least a factor of eight compared to electric water heating.

Materials used in some solar systems can create health and safety hazards for workers and anyone else coming into contact with them. In particular, the manufacturing of photovoltaic cells often requires hazardous materials such as arsenic and cadmium. Even relatively inert silicon, a major material used in solar cells, can be hazardous to workers if it is breathed in as dust. Workers involved in manufacturing photovoltaic modules and components must consequently be protected from exposure to these materials. There is an additional-probably very small-danger that hazardous fumes released from photovoltaic modules attached to burning homes or buildings could injure fire fighters.

None of these potential hazards is much different in quality or magnitude from the innumerable hazards people face routinely in an industrial society. Through effective regulation, the dangers can very likely be kept at a very low level.

The large amount of land required for utility-scale solar power plants-approximately one square kilometer for every 20-60 megawatts (MW) generated-poses an additional problem, especially where wildlife protection is a concern. But this problem is not unique to solar power plants. Generating electricity from coal actually requires as much or more land per unit of energy delivered if the land used in strip mining is taken into account. Solar-thermal plants (like most conventional power plants) also require cooling water, which may be costly or scarce in desert areas.

Large central power plants are not the only option for generating energy from sunlight, however, and are probably among the least promising options. Because sunlight is dispersed, small-scale, dispersed applications are a better match to the resource. They can take advantage of unused space on the roofs of homes and buildings and in urban and industrial lots. And, in solar building designs, the structure itself acts as the collector, so there is no need for any additional

space at all.

Geothermal Energy

Geothermal energy is heat contained below the earth's surface. The only type of geothermal energy that has been widely developed is hydrothermal energy, which consists of trapped hot water or steam. However, new technologies are being developed to exploit hot dry rock (accessed by drilling deep into rock), geo-pressured resources (pressurized brine mixed with methane), and magma.

The various geothermal resource types differ in many respects, but they raise a common set of environmental issues. Air and water pollution are two leading concerns, along with the safe disposal of hazardous waste, siting, and land subsidence. Since these resources would be exploited in a highly centralized fashion, reducing their environmental impacts to an acceptable level should be relatively easy. But it will always be difficult to site plants in scenic or otherwise environmentally sensitive areas.

The method used to convert geothermal steam or hot water to electricity directly affects the amount of waste generated. Closed-loop systems are almost totally benign, since gases or fluids removed from the well are not exposed to the atmosphere and are usually injected back into the ground after giving up their heat. Although this technology is more expensive than conventional open-loop systems, in some cases it may reduce scrubber and solid waste disposal costs enough to provide a significant economic advantage.

Open-loop systems, on the other hand, can generate large amounts of solid wastes as well as noxious fumes. Metals, minerals, and gases leach out into the geothermal steam or hot water as it passes through the rocks. The large amounts of chemicals released when geothermal fields are tapped for commercial production can be hazardous or objectionable to people living and working nearby.

At The Geysers, the largest geothermal development, steam vented at the surface contains hydrogen sulfide (H2S)-accounting for the area's "rotten egg" smell-as well as ammonia, methane, and carbon dioxide. At hydrothermal plants carbon dioxide is expected to make up about 10 percent of the gases trapped in geo-pressured brines. For each kilowatt-hour of electricity generated, however, the amount of carbon dioxide emitted is still only about 5 percent of the amount emitted by a coal- or oil-fired power plant.

Scrubbers reduce air emissions but produce a watery sludge high in sulfur and vanadium, a heavy metal that can be toxic in high concentrations. Additional sludge is generated when hydrothermal steam is condensed, causing the dissolved solids to precipitate out. This sludge is generally high in silica compounds, chlorides, arsenic, mercury, nickel, and other toxic heavy metals. One costly method of waste disposal involves drying it as thoroughly as possible and shipping it to licensed hazardous waste sites. Research under way at Brookhaven National Laboratory in New York points to the possibility of treating these wastes with microbes designed to recover commercially valuable metals while rendering the waste nontoxic.

Usually the best disposal method is to inject liquid wastes or redissolved solids back into a porous stratum of a geothermal well. This technique is especially important at geo-pressured power plants because of the sheer volume of wastes they produce each day. Wastes must be injected well below fresh water aquifers to make certain that there is no communication between

the usable water and wastewater strata. Leaks in the well casing at shallow depths must also be prevented.

In addition to providing safe waste disposal, injection may also help prevent land subsidence. At Wairakei, New Zealand, where wastes and condensates were not injected for many years, one area has sunk 7.5 meters since 1958. Land subsidence has not been detected at other hydrothermal plants in long-term operation. Since geo-pressured brines primarily are found along the Gulf of Mexico coast, where natural land subsidence is already a problem, even slight settling could have major implications for flood control and hurricane damage. So far, however, no settling has been detected at any of the three experimental wells under study.

Most geothermal power plants will require a large amount of water for cooling or other purposes. In places where water is in short supply, this need could raise conflicts with other users for water resources.

The development of hydrothermal energy faces a special problem. Many hydrothermal reservoirs are located in or near wilderness areas of great natural beauty such as Yellowstone National Park and the Cascade Mountains. Proposed developments in such areas have aroused intense opposition. If hydrothermal-electric development is to expand much further in the United States, reasonable compromises will have to be reached between environmental groups and industry.

Biomass

Biomass power, derived from the burning of plant matter, raises more serious environmental issues than any other renewable resource except hydropower. Combustion of biomass and biomass-derived fuels produces air pollution; beyond this, there are concerns about the impacts of using land to grow energy crops. How serious these impacts are will depend on how carefully the resource is managed. The picture is further complicated because there is no single biomass technology, but rather a wide variety of production and conversion methods, each with different environmental impacts.

Air Pollution

Inevitably, the combustion of biomass produces air pollutants, including carbon monoxide, nitrogen oxides, and particulates such as soot and ash. The amount of pollution emitted per unit of energy generated varies widely by technology, with wood-burning stoves and fireplaces generally the worst offenders. Modern, enclosed fireplaces and wood stoves pollute much less than traditional, open fireplaces for the simple reason that they are more efficient. Specialized pollution control devices such as electrostatic precipitators (to remove particulates) are available, but without specific regulation to enforce their use it is doubtful they will catch on.

Emissions from conventional biomass-fueled power plants are generally similar to emissions from coal-fired power plants, with the notable difference that biomass facilities produce very little sulfur dioxide or toxic metals (cadmium, mercury, and others). The most serious problem is their particulate emissions, which must be controlled with special devices. More advanced technologies, such as the whole-tree burner (which has three successive combustion stages) and the gasifier/combustion turbine combination, should generate much lower emissions, perhaps comparable to those of power plants fueled by natural gas.

Facilities that burn raw municipal waste present a unique pollution-control problem. This waste often contains toxic metals, chlorinated compounds, and plastics, which generate harmful emissions. Since this problem is much less severe in facilities burning refuse-derived fuel (RDF)-pelletized or shredded paper and other waste with most inorganic material removed-most waste-to-energy plants built in the future are likely to use this fuel. Co-firing RDF in coal-fired power plants may provide an inexpensive way to reduce coal emissions without having to build new power plants.

Using biomass-derived methanol and ethanol as vehicle fuels, instead of conventional gasoline, could substantially reduce some types of pollution from automobiles. Both methanol and ethanol evaporate more slowly than gasoline, thus helping to reduce evaporative emissions of volatile organic compounds (VOCs), which react with heat and sunlight to generate ground-level ozone (a component of smog). According to Environmental Protection Agency estimates, in cars specifically designed to burn pure methanol or ethanol, VOC emissions from the tailpipe could be reduced 85 to 95 percent, while carbon monoxide emissions could be reduced 30 to 90 percent. However, emissions of nitrogen oxides, a source of acid precipitation, would not change significantly compared to gasoline-powered vehicles.

Some studies have indicated that the use of fuel alcohol increases emissions of formaldehyde and other aldehydes, compounds identified as potential carcinogens. Others counter that these results consider only tailpipe emissions, whereas VOCs, another significant pathway of aldehyde formation, are much lower in alcohol-burning vehicles. On balance, methanol vehicles would therefore decrease ozone levels. Overall, however, alcohol-fueled cars will not solve air pollution problems in dense urban areas, where electric cars or fuel cells represent better solutions.

Greenhouse Gases

A major benefit of substituting biomass for fossil fuels is that, if done in a sustainable fashion, it would greatly reduce emissions of greenhouses gases. The amount of carbon dioxide released when biomass is burned is very nearly the same as the amount required to replenish the plants grown to produce the biomass. Thus, in a sustainable fuel cycle, there would be no net emissions of carbon dioxide, although some fossil-fuel inputs may be required for planting, harvesting, transporting, and processing biomass. Yet, if efficient cultivation and conversion processes are used, the resulting emissions should be small (around 20 percent of the emissions created by fossil fuels alone). And if the energy needed to produce and process biomass came from renewable sources in the first place, the net contribution to global warming would be zero.

Similarly, if biomass wastes such as crop residues or municipal solid wastes are used for energy, there should be few or no net greenhouse gas emissions. There would even be a slight greenhouse benefit in some cases, since, when landfill wastes are not burned, the potent greenhouse gas methane may be released by anaerobic decay.

Implications for Agriculture and Forestry

One surprising side effect of growing trees and other plants for energy is that it could benefit soil quality and farm economies. Energy crops could provide a steady supplemental income for farmers in off-seasons or allow them to work unused land

without requiring much additional equipment. Moreover, energy crops could be used to stabilize cropland or rangeland prone to erosion and flooding. Trees would be grown for several years before being harvested, and their roots and leaf litter could help stabilize the soil. The planting of coppicing, or self-regenerating, varieties would minimize the need for disruptive tilling and planting. Perennial grasses harvested like hay could play a similar role; soil losses with a crop such as switchgrass, for example, would be negligible compared to annual crops such as corn.

If improperly managed, however, energy farming could have harmful environmental impacts. Although energy crops could be grown with less pesticide and fertilizer than conventional food crops, large-scale energy farming could nevertheless lead to increases in chemical use simply because more land would be under cultivation. It could also affect biodiversity through the destruction of species habitats, especially if forests are more intensively managed. If agricultural or forestry wastes and residues were used for fuel, then soils could be depleted of organic content and nutrients unless care was taken to leave enough wastes behind. These concerns point up the need for regulation and monitoring of energy crop development and waste use.

Energy farms may present a perfect opportunity to promote low-impact sustainable agriculture, or, as it is sometimes called, organic farming. A relatively new federal effort for food crops emphasizes crop rotation, integrated pest management, and sound soil husbandry to increase profits and improve long-term productivity. These methods could be adapted to energy farming. Nitrogen-fixing crops could be used to provide natural fertilizer, while crop diversity and use of pest parasites and predators could reduce pesticide use. Though such practices may not produce as high a yield as more intensive methods, this penalty could be offset by reduced energy and chemical costs.

Increasing the amount of forest wood harvested for energy could have both positive and negative effects. On one hand, it could provide an incentive for the forest-products industry to manage its resources more efficiently, and thus improve forest health. But it could also provide an excuse, under the "green" mantle, to exploit forests in an unsustainable fashion. Unfortunately, commercial forests have not always been soundly managed, and many people view with alarm the prospect of increased woodcutting. Their concerns can be met by tighter government controls on forestry practices and by following the principles of "excellent" forestry. If such principles are applied, it should be possible to extract energy from forests indefinitely.

Hydropower

The development of hydropower has become increasingly problematic in the United States. The construction of large dams has virtually ceased because most suitable undeveloped sites are under federal environmental protection. To some extent, the slack has been taken up by a revival of small-scale development. But small-scale hydro development has not met early expectations. As of 1988, small hydropower plants made up only one-tenth of total hydropower capacity.

Declining fossil-fuel prices and reductions in renewable energy tax credits are only partly responsible for the slowdown in hydropower development. Just as significant have been public opposition to new development and environmental regulations.

Environmental regulations affect existing projects as well as new ones. For example, a series of large facilities on the Columbia River in Washington will probably be forced to reduce their peak output by 1,000 MW to save an endangered species of salmon. Salmon numbers have declined rapidly because the young are forced to make a long and arduous trip downstream through several power plants, risking death from turbine blades at each stage. To ease this trip, hydropower plants may be required to divert water around their turbines at those times of the year when the fish attempt the trip. And in New England and the Northwest, there is a growing popular movement to dismantle small hydropower plants in an attempt to restore native trout and salmon populations.

That environmental concerns would constrain hydropower development in the United States is perhaps ironic, since these plants produce no air pollution or greenhouse gases. Yet, as the salmon example makes clear, they affect the environment. The impact of very large dams is so great that there is almost no chance that any more will be built in the United States, although large projects continue to be pursued in Canada (the largest at James Bay in Quebec) and in many developing countries. The reservoirs created by such projects frequently inundate large areas of forest, farmland, wildlife habitats, scenic areas, and even towns. In addition, the dams can cause radical changes in river ecosystems both upstream and downstream.

Small hydropower plants using reservoirs can cause similar types of damage, though obviously on a smaller scale. Some of the impacts on fish can be mitigated by installing "ladders" or other devices to allow fish to migrate over dams, and by maintaining minimum river-flow rates; screens can also be installed to keep fish away from turbine blades. In one case, flashing underwater lights placed in the Susquehanna River in Pennsylvania direct night-migrating American shad around turbines at a hydroelectric station. As environmental regulations have become more stringent, developing cost-effective mitigation measures such as these is essential.

Despite these efforts, however, hydropower is almost certainly approaching the limit of its potential in the United States. Although existing hydro facilities can be upgraded with more efficient turbines, other plants can be refurbished, and some new small plants can be added, the total capacity and annual generation from hydro will probably not increase by more than 10 to 20 percent and may decline over the long term because of increased demand on water resources for agriculture and drinking water, declining rainfall (perhaps caused by global warming), and efforts to protect or restore endangered fish and wildlife.

ANNEX III: ENVIRONMENTAL MANAGEMENT ACT, 2007 OF NAMIBIA

Environmental Management Act, 2007 is to promote the sustainable management of the environment and the use of natural resources by establishing principles for decision making on matters affecting the environment; to establish the Sustainable Development Advisory Council; to provide for the appointment of the Environmental Commissioner and environmental officers; to provide for a process of assessment and control of activities which may have significant effects on the environment; and to provide for incidental matters.

The act sets out the following principles of environmental management:

- Renewable resources must be used on a sustainable basis for the benefit of present and future generations;
- Community involvement in natural resources management and the sharing of benefits arising from the use of the resources, must be promoted and facilitated;
- The participation of all interested and affected parties must be promoted and decisions must take into account the interest, needs and values of interested and affected parties;
- Equitable access to environmental resources must be promoted and the functional integrity of ecological systems must be taken into account to ensure the sustainability of the systems and to prevent harmful effects;
- Assessments must be undertaken for activities which may have a significant effects on the environment or the use of natural resources;
- Sustainable development must be promoted in all aspects relating to the environment;
- Namibia's cultural and natural heritage including, its biological diversity, must be protected and respected for the benefit of present and future generations;
- The option that provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term must be adopted to reduce the generation of waste and polluting substances at source;
- The reduction, re-use and recycling of waste must be promoted;
- A person who causes damage to the environment must pay the costs associated with rehabilitation of damage to the environment and to human health caused by pollution, including costs for measures as are reasonably required to be implemented to prevent further environmental damage;
- Where there is sufficient evidence which establishes that there are threats of serious or irreversible damage to the environment, lack of full scientific certainty may not be used as a reason for postponing cost-effective measures to prevent environmental degradation; and
- Damage to the environment must be prevented and activities, which cause such damage, must be reduced, limited or controlled.

The functions of the Environmental Commissioner are to:

- Advise organs of state on the preparation of environmental plans;
- Receive and record applications for environmental clearance certificates;
- Determine whether a listed activity requires an assessment;

- Determine the scope, procedure and methods of an assessment;
- Review the assessment report in accordance with this Act;
- Issue environmental clearance certificates in terms of this Act;
- Maintain a register of environmental assessments undertaken in terms of this Act;
- Maintain a register of environmental clearance certificates issued and environmental plans approved in terms of this Act;
- Conduct inspections for monitoring compliance with this Act; and
- Perform any other duty or function, which the Minister may assign or prescribe.

More details are found in the official Gazette of Namibia on this subject.