Nile Basin Initiative (NBI) - Water Resources Planning and Management Project (WRPMP)

PROJECT PLANNING AND MANAGEMENT

TRAINING TOPIC 2

PROJECT FEASIBILITY STUDY

Project No. 606516

June 2010

NILE BASIN INITIATIVE
Initiative du Bassin du Nil

Table of Contents

List of Figures

List of Abbreviations and Acronyms

ADB	Asian Development Bank
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
COP-3	Third Conference of the Parties
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
GAA	Government and Aid Agency
GHG	Greenhouse Gas
GDP	Gross Domestic Product
GIS	Geographic Information System
GPS	Global Positioning System
IFC	International Finance Corporation
IFI	International Financing Institutions
ILO	International Labor Organization
IWRM	Integrated Water Resources Management
LDP	Local Development Plan
LFA	Logical Framework Analysis
O&M	Operation and Maintenance
MPF	Maximum Probable Flood
NBI	Nile Basin Initiative
NGO	Non-Governmental Organization
PAP	Project-Affected People
ppm	Parts per million
RAP	Resettlement Action Plan
UNFCCC	United Nations Framework Convention on Climate Change
USD	United State Dollar
WRPMP	Water Resources Planning and Management Project
WB	World Bank

Preface

This training is part of the Water Resources Planning and Management Project (WRPMP) of the Nile Basin Initiative (NBI), more specific of the Project Planning and Management (PPM) part of this project. The Project Feasibility Study course is the second of a series of eight training sessions as depicted in the following Strategic Planning and Management Process diagram, where each topic is highlighted by its order number.

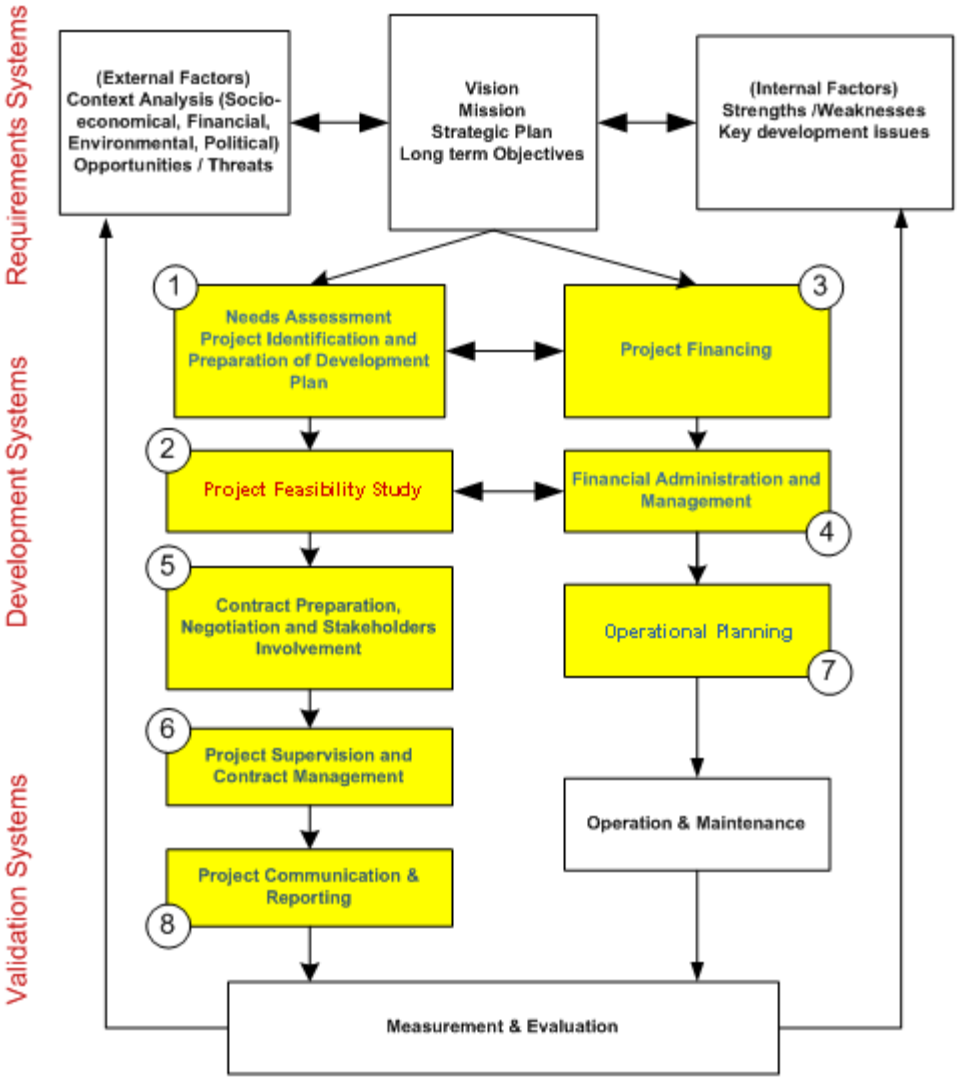


FIGURE A
GENERAL LAYOUT OF THE TRAINING TOPICS WITHIN THE FLOW-CHART MODEL OF THE STRATEGIC PLANNING AND MANAGEMENT SYSTEM

1. INTRODUCTION

1.1 GENERAL

The Water Resources Planning and Management Project (WRPMP) is working to ensure that the water resources of the Nile Basin are developed and managed in a way that is equitable for Nile Basin Initiative (NBI) countries, optimizes mutual benefits wherever possible, and is sustainable for generations to come.

The sustainable development of water resources on a basin-wide scale is critical to alleviating poverty and promoting economic growth in the Nile Basin. The development of mutually acceptable and environmentally sound investment projects in water resources will support sustainable economic growth and help improve the lives of the people of the Nile Basin.

This project is specifically designed to help countries collectively identify and prepare multi-country water resources projects based on sound information and decision-making tools for potential investment.

Developing and managing the Nile Basin as an ecosystem that traverses national boundaries requires a common understanding of the relationship among national policies and regional needs, and an information and coordination framework through which to work.

This project seeks to lay this foundation by supporting basin-wide dialogue on good practice in water policy formulation and implementation and to build skills in each country to formulate and implement effective national policies and strategies for integrated water resources management (IWRM) in Nile Basin countries.

The project is also working to enhance skills and abilities in Nile Basin countries for planning and managing multi-country projects. These skills will become particularly important as NBI cooperation grows and cooperative investment projects are developed through the NBI's subsidiary action programs. This will complement the work undertaken in the Applied Training project and other SVP projects and programs to maximize synergies.[1]

1.2 PROJECT PLANNING AND MANAGEMENT

As part of its aim to enhance skills and abilities in Nile Basin countries for planning and managing multi-country projects, a series of short introductions in project preparation and management for senior decision makers/senior managers are setup. Such short introductions aim to familiarize the participants with the different steps in the Project-cycle – including important details (for instance on project financing) – as well as how it is applied in the concerned Subsidiary Action Program (SAP) project. These short introductions cover the following topics:

1. Need Assessment, Project Identification and Preparation of Development Plan;
2. **Project Feasibility Study;**
3. Project Financing;
4. Financial Administration and Management;

5. Contract Preparation, Negotiation and Stakeholder Involvement;
6. Project Supervision and Contract Management;
7. Operational Planning;
8. Project Communication and Reporting.

1.3 PURPOSE OF THE MANUAL

Although the importance of proper assessment of needs, project identification and preparation of development plans in the management of international watersheds are readily demonstrated and increasingly understood, many of the players who need to make such projects a reality are not familiar with the process for doing so. This manual serves as a practical tool for anyone interested in water resources planning and management in large international watersheds. Therefore, the primary audience for this manual consists of senior decision makers/senior managers of each of the NBI countries who will be involved in developing programs and projects aimed at improving the lives of their countrymen, but that also impact multiple sectors of the economy and other countries in the watershed.

This present manual is intended for public sector decision makers who want to learn about project feasibility study in the whole without the technical details.

1.4 STRUCTURE OF THE MANUAL

The terms of reference indicate that "the training on feasibility study will incorporate, but not limited to, Project Logic Framework, Technical Studies, Environmental studies, Project Costing (including utilization of COSTAB Model) and Financing, Socio-Economic Study, Financial and Economic Analysis, and Project Sustainability Study. The training will equip the trainees with the tools necessary to prepare a project feasibility study in accordance with the requirement of donor agencies/ international financial institutions. It also indicates that the duration shall be 10 days.

The manual is structured to respond to these terms of reference and does so in three parts, including the present introduction.

- Section 2 – Project Management: overview of the requirements to manage the work of the feasibility study including the logic framework analysis and Project Sustainability Study. It includes material additional to the terms of reference including transfer of technology issues and quality assurance issues.
- Section 3 – Feasibility Study: describe the core topic of the manual, including the Technical Studies, Environmental studies, Project Costing (including utilization of COSTAB Model) and Financing, Socio-Economic Study, Financial and Economic Analysis.

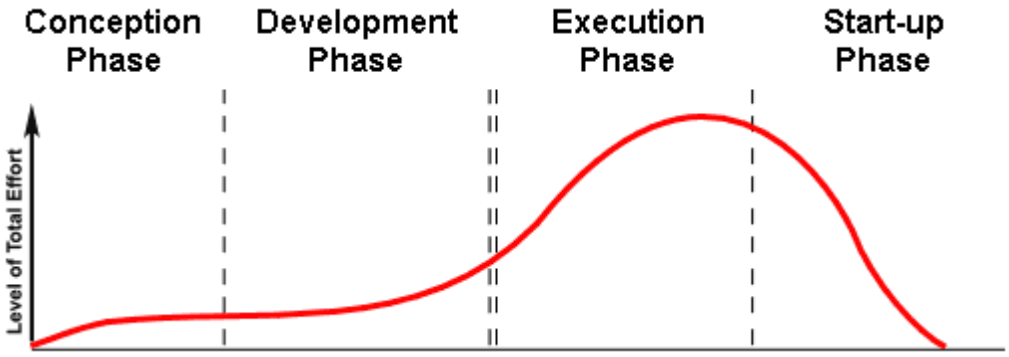
This manual plus the training course associated with this manual will provide the trainees with the tools necessary to prepare a project feasibility study or to supervise its preparation in accordance with the requirement of donor agencies/ international financial institutions.

2. MANAGEMENT OF A FEASIBILITY STUDY

2.1 PROJECT LIFE CYCLE

There are four distinct phase in a typical project life cycle as shown below:

Figure 1: Project Life Cycle



Conception phase Reconnaissance, prefeasibility and master plan):

- Data collection;
- Need's assessment;
- Objectives;
- Technology assessment and options;
- Economic assessment;
- Resource assessment;
- Strategies;
- Qualitative Risk assessment;
- Evaluation of Alternatives;
- First cost estimate & project schedule (-10% to +40%);
- Approval: initial gate review.

Development phase (feasibility study):

- Project objectives;
- Preliminary engineering;
- Work breakdown structure (WBS);
- Resource, team;
- Schedule;
- Budgetary procurement;
- Cash flow;
- Overview of financial plan;
- Further assessment of risks;
- Health, safety and environment plan for project implementation;
- Preliminary cost and schedule (+/-10% as per client's request);

- Go/No go decision.

Execution phase:

- Mobilize team;
- Planning and scheduling;
- Technical requirement;
- Work package;
- Detail design and specifications;
- Procurement;
- Execution of work;
- Testing;
- Resolve issues;
- Progress monitoring;
- Forecasts;
- Report;
- Deliver facility.

Start-up (commissioning) phase:

- Assemble start-up team;
- Training;
- Finalize/test all systems;
- Review and acceptance;
- Transfer responsibilities;
- Settle all accounts;
- Project review;
- Re-assign remaining team;
- Archive lesson learned;
- Close all records;
- Deliver final report.

Every project should have Executive Control Points acting like closed gates which only open following Executive Approval. Undoubtedly, the most important control point in the project life cycle is reached at the conclusion of the development phase because this marks the project's transition from feasibility to implementation. At this point, a project "go" decision must be based on sound and well documented information.

2.2 DEFINITION OF A FEASIBILITY STUDY

A feasibility study is a detailed investigation of a project's viability in terms of its operation, schedule, technology and resource. Following the collection of data and the selection of the most viable option, the feasibility study provides an in-depth viability investigation of the selected option (or alternative). It is a management-oriented activity to make the final "go/no-go" decision before the executed of a project.

2.3 LOGISTICAL ISSUES

For an agency such as the Nile Basin Initiative to carry out a feasibility study, or to initiate, control and supervise such a study, specific logistical issues need to be put into place. Because of the specialized nature of such studies and the wide range of expertise required an organization such as the NBI would normally contract out the feasibility study to an internationally-known firm of consultants. Often two separate firms are selected; one for the technical studies and one for the environmental and social studies. In such cases, the organization needs to set up a separate group within the Client's management to be responsible for the proper execution of the study. This group (Project Office) would be responsible for the day-to-day activities in having a feasibility study carried out. In addition, an oversight committee often called a steering committee would be set up to provide guidance to the management group. The Steering Committee is often composed of key stakeholders; in the case of transboundary power development project, this steering Committee might be composed of representatives of the electric utilities and of the ministries of energy in each of the countries involved. For projects other than power or multi-purpose projects, the composition of the group would change accordingly. The key activities of the Project Office and of the Steering Committee include:

Project Office	Steering Committee
• Select from a series of prefeasibility studies or a master plan, the project that the organization is considering	
• Carry out a logic framework analysis to ensure that the project fits within the vision of the organization and that it will help support the goals of the organization, that the intervention logic is sound, that objectively measurable indicators have been selected and that these indicators can be verified	
• Provide a clear definition of the project	• Review and accept the definition of the project, ensuring that it meets the needs of the stakeholders they represent
• Prepare the terms of reference for a consultant	
• Derive a budget for the study and have it approved	
• Issue a notification requesting expressions of interest for the project	
• Assess the responses received and develop a short-list of firms	• Review and assess the short list of consultants

Project Office	Steering Committee
• Issue a request for proposals to the short-listed firms	
• Receive and evaluate the proposals received	•
• Select the preferred consultant and	• Review and assess the selection of the preferred consultant
• After obtaining the opinion of the Steering Committee, obtain approval for negotiations with that consultant	
• Ensure that the required funding is in place for the work to be done by the consultant	
• Negotiate a contract with the consultant and obtain the official signature from the consultant	
• Send the copies of the contract signed by the consultant to the organization's signing authority for its signature	
• Once the contract is signed by both parties, advise the consultant to proceed	
• Monitor the progress of the contract through regular written progress reports from the Consultant as well as face-to-face meetings at key milestones during the execution of the consultancy (milestones will differ from contract to contract)	• Provide guidance to the Project Office on the direction of the feasibility study, ensuring the interests of the stakeholders are met
• Ensure that the outputs required are properly executed and delivered as schedules and within budget.	• Assess the validity of the outputs of the Consultant's work in terms of the needs of the Stakeholders

This manual will assist with some of the mechanical issues involved in this process, particularly the logic framework analysis and the definition of the terms of reference

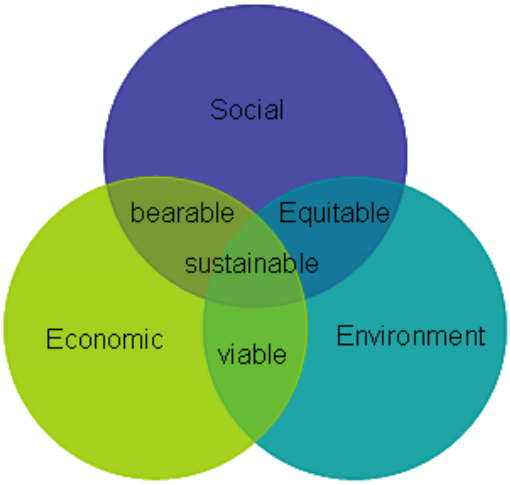
2.4 IMPACT OF SUSTAINABILITY ON A FEASIBILITY STUDY

For developing countries, the process of building knowledge and capacity within the basin organization or within the relevant government agencies is critical to ensure sustainability of the project. In this regard, the purpose of the feasibility study is to collect and assess economic, social and environmental data, such that better decision could be made regarding the project sustainability.

A sustainable project represents a "win'win" situation for the investor, the community and the environment. A sustainable project is one the is commercially viable and financially rewarding for its investors ande owners while minimizing its environmental footprint and maximizing its social and economic benefits, particularly for local communities.

Project sustainability for basin wide management requires an acceptable balance or trade-off among economic, environmental, and social issues. The trade-offs always prove to be very difficult. The objective is for water management decision making to address each of the three categories of policy interest– economy, environment, and society – in a manner that is considered to be fair. Representatives or lobby groups of each policy area will naturally push strongly for their views to take precedence. The better the quality of the information they can provide and the more comprehensive the policy agenda of a government, the smaller will be the scope for debate and argument. In developing countries where data and information are not comprehensive, the margins within which decisions are made tend to be quite large and the emphasis given to the three policy areas varies significantly. In other words, they are to provide the governments with the best information and process outcomes so that well-informed, principled, and pragmatic decisions can be made. In the end, the governments are the ones who make the decisions.

Figure 2: Project Sustainability



Environment Sustainability

The principal interest of environmental managers is to ensure a sustainable environment over a long-term perspective. They prevent excessive, shortsighted development and call for the restoration of the natural environment.

The environmental sector pursues the maintenance of the environment in its natural ecological state, striving for the preservation of forests or rivers without human influence.

From the NBI's perspective, over-extraction of water or drainage from and to rivers causing insufficient water for the environment, or dams or weirs changing flow-variability in rivers, are considered to be problems.

In areas where communities developed slowly around irrigation agriculture, environmental ecology has established within the interaction between nature and human activities. Such an environment is not without human influence but a harmony or a balance exists between human activities and nature. There are opinions such that environments with some level of human influences should be conserved in their present state. For example, shallow riparian waters, tributaries and streams, or networks of irrigation channels and the surrounding agricultural land can be considered as forms of ecological habitats for fauna and flora.

In recent years focus on the added value of the environment has increased through the concept of ecosystem services. It is in the interest of the environmental sector to raise the overall value of the environment in a basin-wide manner, together with eco-tourism and environmental education.

Environmental conservation is important for developing a sustainable society. Environmental perspectives should exist in every sector and should be coordinated within the water-related sectors.

Social Sustainability

Development interventions can fail to deliver sustainable benefits due to lack of attention to social, gender and cultural issues. A sustainable project must taking into account the local decision-making systems, gender division of labour, and cultural preferences. For example, the design of rural water and sanitation systems must take in to account the traditional attitudes to managing human waste and the roles of men and women in collecting and using water. The following social aspects need to be considered during a feasibility study:

Behavioural change: watershed projects tend to introduce or influence behavioural change. There is evidence that a long period of time is often needed to make such changes sustainable. Longer term planning horizons may therefore be required, and visible and tangible benefits must be delivered to target groups if benefits are to be supported after donor assistance is completed.

Gender: A greater participation by women in identification, design and decision-making is a key part of a sustainability strategy. Their participation in all parts of the activity cycle is essential for almost all programs and projects. Ensuring that collected sex disaggregated data is analyzed during the feasibility study is undertaken to determine the differential impact of costs and benefits on men and women will help to achieve sustainability. For sustainable outcomes, poverty reduction objectives must specifically address the needs of women given that they are over-represented in the poorest sections of many societies.

Cross-cultural awareness and training: donor agency staff and contractors must be cross-culturally aware if they are to effectively contribute to providing relevant and sustainable

solutions to development problems. Contractors should be able to provide appropriate cross-cultural training and in-country mentoring for new or inexperienced staff.

Economic Sustainability

If a program or project does not deliver clear and equitable financial or economic benefits, which are apparent to the stakeholders, it is most unlikely to be sustained after donor funding finishes. For example, health service users will not pay for government health services (either directly or through other taxes) if the service is poor, or their expectations of benefits are extremely limited. Benefits are not sustainable if the net benefit arising is negative or very small when all the costs are considered. During a feasibility study the following aspects need to be considered:

Counterpart contributions: counterpart contributions, either in cash or in kind (like counterpart staff and office space) from the Partner Government or communities, are a sign of commitment to the program or project objectives. It demonstrates, in a tangible way, that partners place value on the expected benefits. The commitment and responsibility of the counterpart contributions need to be clearly determined.

Recurrent cost financing: Donors have traditionally been reluctant to cover recurrent costs, which are generally seen as the responsibility of the Partner Government, or other stakeholders, and treated as a sign of their commitment to the program or project objectives. However, it is increasingly clear that this policy requires reassessment with respect to its impact on both implementation and sustainability of benefits, particularly in countries with very limited budgetary resources. If donors wish to see benefits sustained, they should, on a case-by-case basis, also consider taking on responsibility for contributing to solving operation and maintenance cost problems in a more direct way.

An additional point is that programs and projects should not be designed or equipped with excessive amounts of equipment, or types of equipment, or deliver benefits, that are beyond the financial capacity of the stakeholders to operate and maintain.

User-pays: payment is an expression of value. If people are willing to pay for a good or service, then they want it. Demonstrated demand is a strong indicator of likely sustainability, both for economic and social sector programs and projects. User pays approaches also generate revenue that can be used to continue the service.

Even in very poor communities, user pays approaches can work, and may be the only sustainable solution to service delivery if the government is unable or unwilling to provide adequate operating funds.

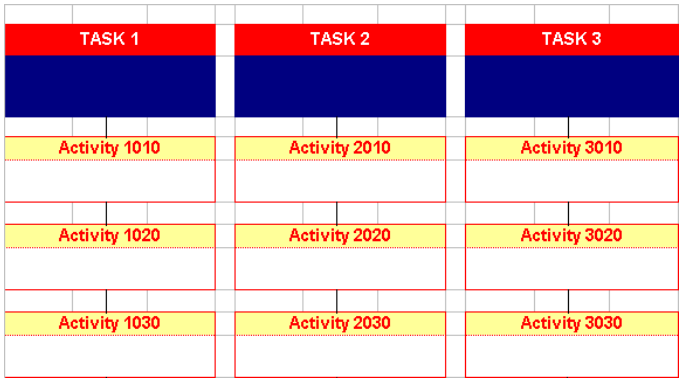
Private sector involvement: there are many examples of mutually beneficial private sector involvement in development: this includes the role of private firms in construction and maintenance and the role of NGOs and the churches in community development and education.

The key is to identify complementarities between the program or project and the private sector (e.g. small-scale irrigation, food production and markets, training needs, health and veterinary services). In this context, there is significant scope for donors to be more active in encouraging private sector involvement in development. Approaches can include: (i) contracting local companies or trained individuals to directly provide services; (ii) funding some of the research and development costs of new commercial technologies; (iii) involving small business in development and providing training and management support services; (iv) extending appropriate credit facilities; (v) training NGOs and communities in local fund raising; and (vi) promoting policy reform beneficial to business activity.

2.5 WORK BREAKDOWN STRUCTURE

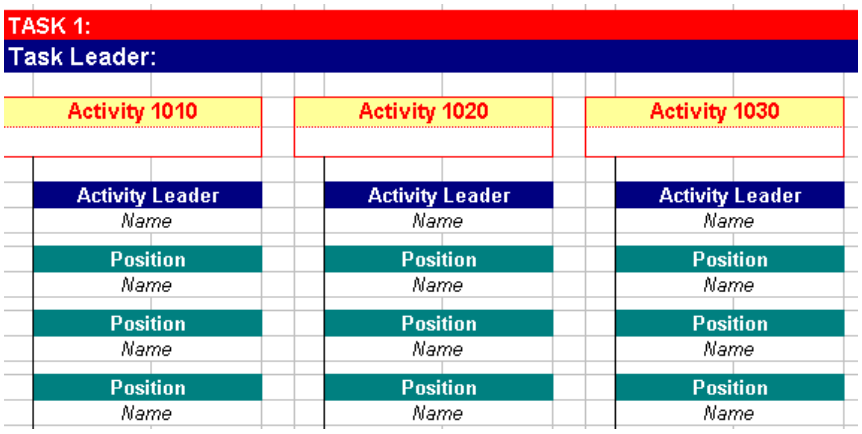
A work breakdown structure (WBS) in the management of a feasibility study is a tool that follows the "divide and conquer" strategy to break work into manageable tasks in a way to help organize, define and control the total work scope of a project. Under each task, a list of detailed activities (or deliverables) is provided.

Figure 3: Top View of a WBS Example



The WBS is an exhaustive, hierarchical (from general to specific) tree structure. Once all tasks and deliverables are identified, it is a good practice to start identifying task leaders and assigning responsible experts to each activity/deliverable.

Figure 4: Human Resource Assignment



The details of each activity are usually filled out by the expert accountable for the activity with the help of the Task Leader. A typical WBS activity sheet has the following elements:

Activity header: include activity number, task and activity title, person responsible, leader, and the duration;

Objective/description: describe the goal and scope of the activity;

Deliverable: list what will be delivered at the completion of the activity;

Approach/methodology: a brief summary of how work will be performed;

Resource breakdown: list of staff who are contributing to the activity and their expect effort.

A template for such a structure is shown below.

Figure 5: Example of WBS Activity Sheet

WBS - ACTIVITY SHEET

1000	Task title					Project Name
WBS CODE	Analysis of Reports					Responsible: Leader:
1010 (1.1)						Duration:
OBJECTIVE/DESCRIPTION						
SCOPE:						
DELIVERABLES						Task Completion
APPROACH/METHODOLOGY						
RESOURCE BREAKDOWN						
PERSONNEL						EXPENSES
Position	Person's Name	Firm	Person-Day			Days in field assignment
TOTALS						
COMMENTS						
M1 =	M10 =					

One must keep in mind that the WBS is a dynamic tool that needs to be revised and updated as required throughout the project.

A well prepared WBS can provide the necessary framework for project control which include detailed cost estimating and control as well as guidance for schedule development and quality control.

A continuous project control usually takes place during the feasibility study, during which the forecasted plan (e.g. WBS data and framework) are compared to the actual plan. Deviations must immediately receive management attention, either by reallocation of resources or modifications to the Plan (with Executive approval if the project objectives are affected). Without a detailed forecasted plan, there is no baseline for comparison, no determination of deviation, and hence no satisfactory basis for corrective action.

The Logical Framework Analysis method, which will be introduced in the next section, can provide useful guidelines for project control by providing expected results and progress monitoring indicators.

2.6 Quality Assurance and Quality Control

Quality control and quality assurance are important concepts, yet most project managers have only a vague understanding of the meanings and the differences between these terms.

Quality Control refers to quality related activities associated with the creation of project deliverables. Quality control is used to verify that deliverables are of acceptable quality (e.g. Client's feedbacks) and that they are complete and correct. Quality Assurance, on the other hand, refers to the process used to create the deliverables, and can be performed by a manager, client, or even a third-party reviewer (auditor).

Quality Planning is a critical part of any project. It enables you to agree a set of quality targets with your customer. It then helps you to monitor and control the level of quality produced by the project, to ensure that you meet the quality targets set.

To ensure that all aspects of QA/QC are followed accordingly, a project QA/QC team is required; such a team is likely to be quite small for a project feasibility study. The team will be responsible of ensuring that necessary systems are in place to maintain the maximum level of quality during the lifespan of this project. The particular functions and duties of the QA/QC team include:

- Reviewing and approving of QA policies and procedures;
- Reporting the adequacy, status and effectiveness of the QA/QC status on a regular basis to the project management;
- Maintaining responsibility for documentation of corporate QA/QC records, documents and communications;
- Conducting field audits;
- Coordinating with the Lead staff, as needed, to ensure QC procedures are followed and documented.

The project manager is usually responsible of monitoring technical progress, reviewing and approving all work products, reviewing and approving all project deliverables prior to their submittal to the client. He is also responsible of monitoring the financial and schedule control and implementing corrective action, if necessary.

The final deliverables/reports are reviewed by the client and final corrective action, if necessary, is implemented.

2.7 TRANSFER OF TECHNOLOGY AND CAPACITY BUILDING

As an integral part of international best practice in project management, efforts should be made to establish, maintain and strengthen an organizational structure that defines roles and responsibilities to the implementation of a project. Key responsibilities should be well defined and communicated to the relevant personnel and to the organization responsible for implementing the project.

In order to promote the establishment of effective administration in the project area, the developer should promote measures in order to mitigate the project's impact on the administration of the territory and to build capacity of local partners which include the transfer of technology. These measures aim at supporting stakeholders and potential subcontractors in their role as service providers and agents of the proposed development.

Employees and contractors with direct responsibility for activities relevant to the project performance should be provided with adequate training, so that they have the knowledge and skills necessary to perform their work. This should include training in regards to current knowledge of each host country's regulatory requirements. Training should also address the specific actions and measures required under the management program and the methods required to perform actions items in a competent manner.

Training of local people and a micro-credit could also be offered to help the local population and subcontractors to qualify for employment. The training programs can take many forms, namely, functional literacy training, scholarships for their studies specialized techniques, an apprenticeship functional company. The implementation of training programs and micro-credit should be done well before the start of construction the project. Training activities can also be started early by establishing partnerships with NGOs and obtaining funds from international development aid, which undoubtedly contribute to that goal.

The two key areas for capacity-building concern:

1. The capacity and capabilities of those responsible for the project implementation;
2. The capacity governmental management and staff.

The exact training requirements for those responsible for the project implementation will depend on the background and caliber of staff involved. Key aspects of their responsibilities that all or some of the team will require training in are:

- Monitoring of the compliance of the contractor with the construction management plan, health and safety requirements, and employment and workforce policies;
- Community development and liaison with stakeholders;
- Environmental monitoring, including the use of equipment for flow, sediment, and groundwater quality monitoring.

Those responsible for implementing the project will be required to become fully familiar with the project requirements. The construction contractor, and the community support NGO, will address the capacity and training requirements of their staff in order that they may comply with the project requirements. The responsible party should provide "induction sessions" to all incoming staff, including the contractor's workforce, the community support NGO, and any other relevant personnel.

These issues need to be carefully considered and explicitly covered in the definition of a feasibility study. Various approaches to training are defined below.

2.7.1 IN-HOUSE TRAINING

Organizing special in-house training periods at a foreign consultant's head office is a common method used to allow trainees to have a better understanding of the foreign organizations and their way of leading projects. This is a great opportunity to expose trainee to the senior experts and managers of the foreign organization who are normally time constrained. These training programs, which are adjusted to meet the specific needs of each client, are usually for the transfer of managerial skills, where the number of trainees is limited.

2.7.2 ON-SITE TRAINING

Most often, technical specialists are assigned to transmit knowledge to clients' personnel in their own place of work by means of hands-on training, workshops and use of computer models. It organizes overseas technical training sessions specifically designed for utility companies. The method used in such cases is a comprehensive seminar which integrates lectures by our experts, workshops for discussions and case studies, and distribution of background material. This is a common method used for sharing technical expertise with a larger number of local staff.

2.7.3 PARTICIPATION OF LOCAL STAFF IN PROJECT

One should promote capacity building of stakeholders in particular, by involving them in the development and implementation of project related activities and by providing them with material support. The participation of local staff throughout the project life span does not only foster local economy but also give locals the opportunity to share their in-region knowledge with foreign experts in exchange of the latter's knowledge on new technology. Locals will also get real time experience out of the project. Thus, the participation of locals is a key element for a sustainable transfer of technology and capacity building.

2.7.4 TRAIN-THE-TRAINER

For the purpose of capacity building in the NBI region, project should also include a train-the-trainer topic such that project participants will be able to adequately transfer their knowledge and experience learned from the project to others to accomplish sustainable growth and development in the region.

Topics include, but are not limited to the following:

- Developing general language skills (reading, writing and speaking);
- Learning Styles;
- Training Structure;
- Developing instruction and training skills;
- Evaluation skills.

2.8 LOGICAL FRAMEWORK ANALYSIS

As mentioned in Section 2.3, a logic framework analysis needs to be carried out to ensure that the feasibility study fulfils an objective that fits with the organizations overall goals. Such an analysis is provided below.

2.8.1 INTRODUCTION TO LOGICAL FRAMEWORK ANALYSIS

The Logical Framework Analysis (LFA) was developed in the late 1960s. This objective-oriented master tool is not only used for project planning and design, but also for project implementation, control and evaluation. The LFA should however not be, by any means, considered as an end as it is a dynamic tool that needs to be re-assessed, revised, and further detailed regularly as required.

The LFA process involves the participation of all stakeholders to set out objectives logically and systematically. The tool should add clarity to the cause-effect relationship of the objective hierarch, provide verifiable checklist for the achievement of the latter, include reasonable assumptions and outline risks.

The LFA should be seen as a summary of the stakeholder interaction and analysis that took place during the process. The results of the entire process are often summarized in a Logical Framework Matrix (or Logframe), which forms the basis of a good planning and effective management. For many organizations and donor agencies (including NGOs and GAAs), the Logframe is mandatory. Although the process and format may vary from one organization to another, the principles underpinning the analysis are the same.

A good understand of LFA is essential in getting proper project funding from organization and donor agencies. The subsequent sections will cover in detail each step of the Logical Framework Analysis.

2.8.2 Advantages of Logical Framework Analysis

The LFA is required by many organizations and donor agencies for many reasons, including the following:

- Foster reflection: enhance internal consistency and logic by clarifying underlying causality of project design, providing progress measurement indicators, and identifying risks and assumptions;
- Stakeholder involvement: shared understanding of the overall framework and objectives. The participation of stakeholder in the project in a transparent way also fosters their commitment to that project;
- Provide overall framework and monitoring indicators: avoid confusion between design (evaluation) and implementation (monitoring and supervision) issues and link the design phase to the supervision phase to provide early warnings such that appropriate corrective measures could be taken. It also provides a better supervision based on intended outcomes rather than expenditure.

2.8.3 Logical Framework Analysis Methodology

Drawing up a Logframe involves two (2) main stages: the analysis and the planning.

2.8.3.1 Analysis Stage

At this stage, four elements will be analyzed: stakeholders, problems, objectives and strategies.

Stakeholder Analysis

Ultimately, all projects depend on selecting stakeholders with whom they can jointly work towards goals that will reduce or reverse the threats to your key conservation targets.

A stakeholder analysis can help a project or program identify:

- The interests of all stakeholders who may affect or be affected by the program/project;
- Potential conflicts or risks that could jeopardise the initiative;
- Opportunities and relationships that can be built on during implementation;
- Groups that should be encouraged to participate in different stages of the project;
- Appropriate strategies and approaches for stakeholder engagement; and
- Ways to reduce negative impacts on vulnerable and disadvantaged groups.

The full participation of stakeholders in both project feasibility study and implementation is a key to – but not a guarantee of – success. Stakeholder participation:

- Gives people some say over how projects or policies may affect their lives;
- Is essential for sustainability;
- Generates a sense of ownership if initiated early in the development process;
- Provides opportunities for learning for both the project team and stakeholders themselves; and
- Builds capacity and enhances responsibility.

Project management depends on the input and involvement of a range of stakeholders operating at different levels, including government agencies, industry, and Non-Governmental Organizations (NGOs).

Stakeholder involvement ensures that those reliant on water resources will be involved in water management decisions, and that information will be readily exchanged

Problem analysis

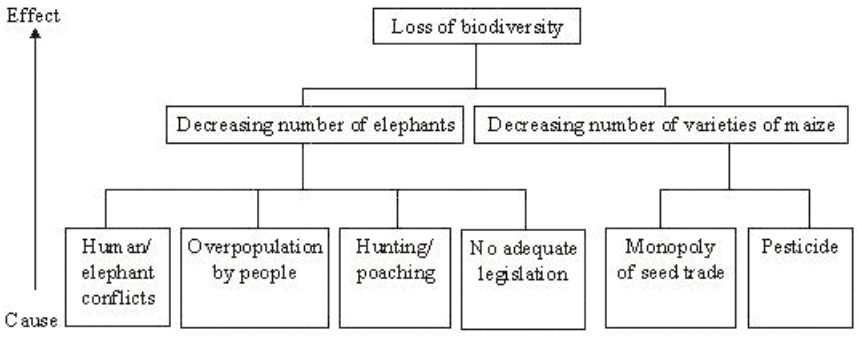
Problem analysis identifies the existing situation and establishes the 'cause and effect' relationships between the problems that exist. It involves three steps:

1. Precise definition of the framework and subject of analysis
2. Identification of the major problems and dangers faced by target groups
3. Visualisation of the situation in form of a diagram, called "problem tree" to establish cause – effect relationships.

The Problem Tree

The analysis is presented in diagram form showing the effects of a problem on top and its causes underneath.

Figure 6: Example of Problem Tree: one main problem (EFFECT) a series of lower order problems (CAUSE)



The above example highlights that the effect (loss of biodiversity) is the problem. Below it are lower order causes such as decreasing numbers of elephants and decreasing numbers of varieties of maize. These in turn are the effects of other causes, perhaps root causes including hunting, and the use of pesticides.

It starts by focusing on the problems and as such it:

- Analyzes only those issues which are identified to be problematic, be guided by problem view i.e. -Which are the problems the project is addressing?
- Narrows the focus with respect to the scope of analysis and at the same time digging deep into these problems and their causing factors, i.e. What are the root causes of those problems?

In connection with the focus on problems is the system those problems exist in. Understanding a system means one can:

- Understand how the system (in which the problem and its causing factors occur) operates i.e. What is the larger picture in which those problems and their root causes exist?
- Widen the view with respect to analyzing the inter-linkages and feed-back mechanisms between components of the system i.e. - What are the links between the problems?

Objective Analysis

An objectives analysis in a wide sense is a procedure for systematically identifying, categorizing, specifying and - if required – balancing out objectives of all parties involved in a specific situation for which those objectives apply.

The objectives analysis and the problems analysis influence each other: the more information one has about the problem situation, the more specifically one can formulate objectives; the kind and outline of the objectives analyzed influence the perception of problems.

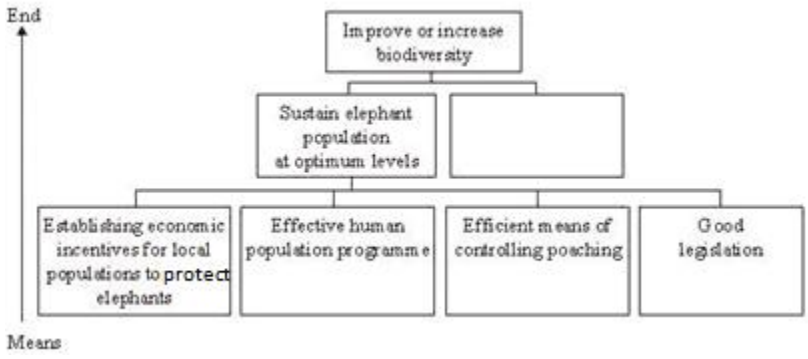
The Objectives Tree

The problem tree is transformed into an objectives tree by restating the problems as objectives. The objectives tree can be viewed as the positive mirror image of the problem tree. It is usually necessary to reorder the position of objectives as you develop the tree.

The objectives tree can be considered as an 'ends - means' diagram. The top of the tree is the end that is desired and the lower levels are the means to achieving the end. Based on this objectives tree, certain means are feasible and some are perhaps outside the scope of the problem.

Nonetheless, these means provide the foundation for developing programs, projects or strategies to address the problems discussed earlier.

Figure 7: Example of Objective Tree: top of the tree is the END desired and the lower level are the MEANS to the end



1. Problems are restated as objectives;

2. Positive mirror image of the problem tree.

Analysis of objectives is necessary to:

- Describe the situation which shall be re-established;
- Verify the hierarchy of objectives;
- Illustrate the means-end relationships in a diagram.

The 'negative situations' of the problem tree are converted into solutions, expressed as 'positive achievements'. For example, 'agricultural production is destroyed' is converted into 'pre-conditions for agricultural production are re-established'.

These positive achievements are objectives, and are presented in a diagram of objectives showing a means / end hierarchy. Often such a diagram shows some objectives that cannot be achieved by the aid intervention and so will have to be addressed by other donors, actors in the field. Some objectives may be unrealistic, so other solutions need to be found.

Strategy Analysis

After completing the situation analysis, the next major step in the LFA is the strategy analysis. A strategy analysis or analysis of alternatives is a systematic way of searching for and deciding on problem solutions. It follows the problems and objectives analysis and is a prerequisite to designing action strategies.

The strategy analysis phase involves the selection of a strategy to achieve the desired results. The strategy comprises the clusters of objectives to be included in the project. The main objective becomes the project purpose and the lower order objectives become the outputs or results and activities.

In addition to examining the logic, strategy analysis also looks at feasibility of different interventions. As such, it is a continual process throughout the life of the project.

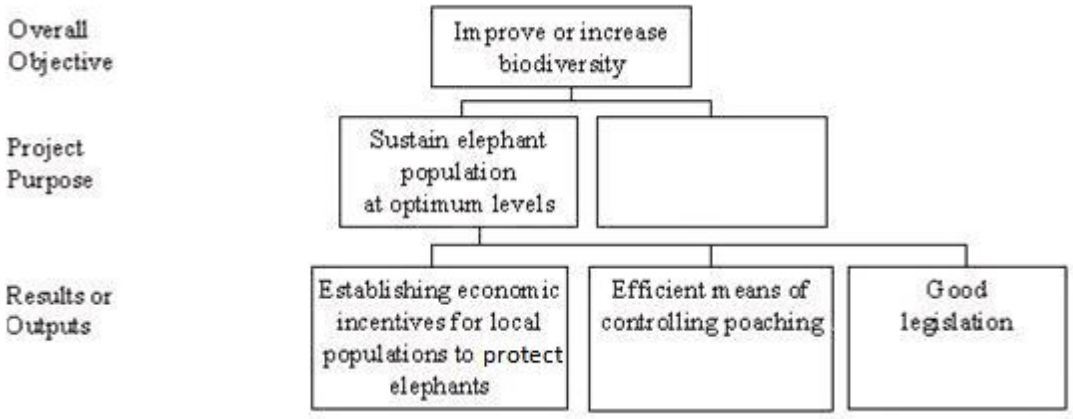
All alternative strategies considered must contribute to solving a problem, or in other words: they must be suitable steps towards the attainment of identified guiding objectives (=relevance).

Choices among different solutions to problems may concern:

- overall concepts, strategic plans, objectives
- people, target groups, organizations, agencies
- methods, procedures, processes
- technologies, services, products, outputs
- measures, actions, materials, inputs

An example of a strategy analysis is provided. In this example it is unlikely to choose "efficient human population program" (identified in the objectives analysis) but rather one or all of the other means. The process of making choices should be carried out in a very methodical way, giving due consideration to the ends/means relationship in the objectives tree.

Figure 8: Example of strategy analysis



- Main objective is the project/program/activity purpose

- Lower order objectives are outputs

LFA should be complemented by other analytical tools such as institutional capacity assessment, economic analyses, gender analysis, etc. Developing a project logframe without having effectively gone through the participatory planning exercises described above is the quickest way to develop a project that is unsustainable and does not adequately address real concerns among the stakeholders. One of the pitfalls of the logical framework is that it is quite possible to prepare highly structured projects which appear to meet the logical framework requirements, but which are neither well focused, nor needs oriented.

2.8.3.2 Development Stage

Logical Framework Matrix

The Logical Framework Matrix (logframe) is the *product* of the LFA process. It helps defining a project structure, its internal logic and the consequent measureable objectives base on the results from the analysis stages.

The *Figure 9* on next page illustrates a commonly used format of logframe. One should keep in mind that the LFA must be adapted to the different terms and formats required by organizations and donors. For instance, some donors prefer having the Activities row in a separate chart and/or having the Results section in a column rather than presenting it in a row.

Figure 9: Example of a Logframe

Elements	Intervention logic	Objectively Measurable/ Verifiable Indicators	Means/ Sources of Verification	Important Assumptions
VISION	*Description of what an organization would like to achieve or accomplish in the mid-term or long-term future. It is intended to serves as a clear guide for choosing current and future courses of action.*			
GOAL: ***(Goal to Vision)***	*Wider problem the project or program will help to resolve.*	*Quantitative ways of measuring or qualitative ways of judging timed achievement of goal.*	*Cost-effective methods and sources to quantify or assess indicators.*	*External factors necessary to sustain objectives in the long run.*
OPERATION PURPOSE: ***(Purpose to Goal)***	*The immediate impact on the project area or target group i.e. the change or benefit to be achieved by the project.*	*Quantitative ways of measuring or qualitative ways of judging timed achievement of purpose.*	*Cost-effective methods and sources to quantify or assess indicators.*	*External conditions necessary, if achieved, project purpose is to contribute to reaching project goal.*
OUTPUTS/ RESULTS: ***(Outputs to purpose)***	*These are the specifically deliverable results expected from the project to attain the purpose.*	*Quantitative ways of measuring or qualitative ways of judging timed production of outputs.*	*Cost-effective methods and sources to quantify or assess indicators.*	*Factors out of project control which, if present, could restrict progress from outputs to achieving project purpose.*
ACTIVITIES: ***(Activity to output)***	*These are the tasks to be done to produce the outputs.*	**INPUTS/ MEANS:** *This is a summary of the project budget.*	*Financial out-turn report as agreed.*	*Factors out of project control which, if present, could restrict progress from activities to achieving outputs.*

Vertical logic

The Intervention Logic column and the External Factors column (assumptions, hypothesis and risks) represent the vertical logic of a project. The latter identify what will achieved and specify external factors beyond the operation management's control.

I. Development objectives (goal): long-term objective, which is usually not achievable by a single project, but rather by multiple projects that contribute toward the same wide goal. Thus these objectives are more difficult to measure;

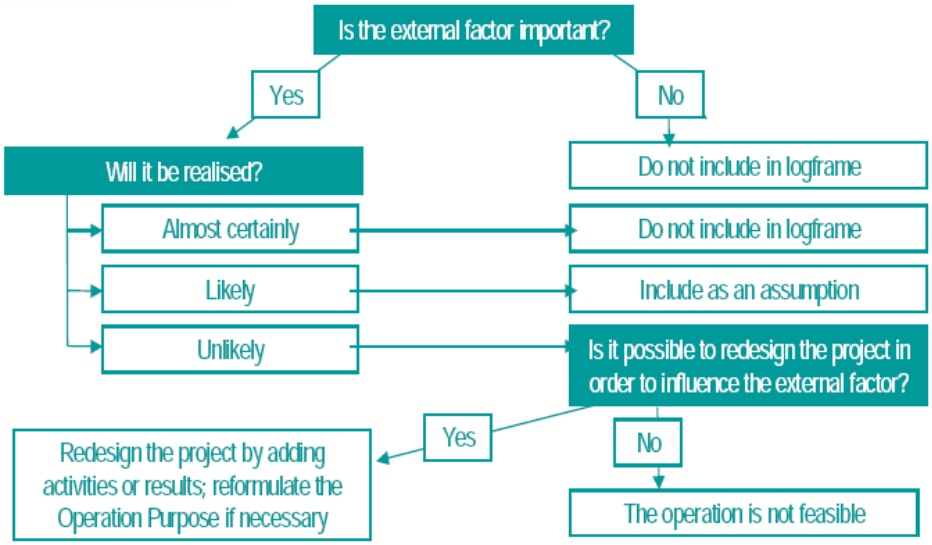
II. Immediate objectives (operation purpose): benefits resulted from the outputs. These benefits are the impact achieved by the project and linked to the target group.

III. Output: deliverable produced by responsible implementation agencies in a measurable and timely manner;

IV. Activities: state actions required to achieve outputs (e.g. baseline survey, training courses, development, etc);

V. External factors (assumptions/hypothesis/risks): these factors are assessed according to their importance and probability of occurrence as shown in the following chart:

Figure 10: Assumption Selection



The higher the impact and probability of a factor, the higher will be the risk. The external factors link different levels of the causal chain as follow:

- Management assumptions: link activities to outputs. These assumptions usually have minimal risk and are rare or the first link of the causal chain may break down;
- Implementation assumptions: link outputs to immediate objectives. These assumptions are critical since they map outputs to resulting benefits for the target population. They cover project feasibility and incentives for stakeholder involvement. Implementation assumptions have higher risks than management assumptions because of their inherent uncertainty. Thus, they need to be reviewed regularly through lesson learned and clarification of the project;

- Development hypothesis: link immediate objectives to development objectives. These assumptions should be informed by and consistent with the mission and strategies of organizations or agencies as well as with the strategy of the country;
- Sustainability assumptions: link long-term goals to development objectives.

Horizontal logic

The horizontal logic establishes progress monitoring using indicators. Project monitoring is often focused at the activity/input level as higher level objectives are usually left as aspirations. The logical framework analysis fosters project team to develop higher-level indicator and, thus, ensures a more realistic project design. Traditionally, indicators also monitor assumptions. However, it is not rare to see some logframe formats that have separate column for assumptions.

A good indicator needs to be:

1. Measurable: have an unambiguous definition of quality, quantity and timing;
2. Sensitive to change;
3. Achievable;
4. Related to objectives;
5. Easy to verify.

One should keep in mind that the method presented above must be adapted to the different terms and formats required by organizations and donors. For instance, some donors prefer having the Activities row in a separate chart and/or having the Results section in a column rather than presenting it in a row.

2.8.4 LIMITS OF THE LOGICAL FRAMEWORK ANALYSIS

The LFA is an excellent tool for each phase of the project cycle. It helps stakeholders and the project team in sharing, structuring and formulating their ideas and then setting them out in a logical and systematic way. One should however be aware of its potential weaknesses as the quality of the LFA depends on the following:

- Dependence on available information: without a previous detailed analysis of situation and stakeholders, it rarely produces good results;
- Ability of stakeholder and the project team: danger of idealistic over-planning and unrealistic expectation beyond what the project can deliver. Plus, if a strategy is misconceived or if the logic is poor, the Logframe should reveal the contradictions, but it cannot of itself design better strategies;
- Relevance of the consulted stakeholder sample: problem/objective framework could be impractical or unrealistic depending on the sample of stakeholders that have participated in the analysis; and

- Cooperation of stakeholders: sometimes, it is difficult to get a consensus on project priorities. The problem analysis may conflicts with some cultures where problem discussion is inappropriate.

In overall, the LFA is very time consuming process which requires significant commitment from stakeholders and the project team. The LFA provides a linear view of changes whereas in real life, changes are more complex: they involve iterative and cyclic processes, as well as different parallel processes which are inter-dependent. Plus, it readily enables monitoring of intended consequences only. Thus, by no means, it should become a tool for rigid control: it is not a formal "blueprint" exercise. The LFA should instead be considered as a tool to involve stakeholders and increase their commitment to support the project management. The participatory aspect of the process is as important as the resulting Logframe.

2.8.5 EXAMPLE OF LOGICAL FRAMEWORK ANALYSIS

Two examples of Logframe are provided below. They are based on SNC-Lavalin's Logframe template.

Energy Infrastructure Services Project - Kerala Component			
Narrative Summary	**Expected Results**	**Performance Indicators**	**Critical Assumptions**
GOAL: ■ Enhance the ability of Kerala to deal with the restructuring of the electricity sector required as a result of the economic liberalisation policy.	IMPACTS: Kerala power sector able to finance own development projects Legislation, procedures and structures in place to promote efficiency, effectiveness and relevance ■ Effective planning capability	■ Discussion / position papers ■ Workshops / study tours ■ Model documents ■ Prefeasibility report format ■ Project financing plan ■ Draft legislation ■ Draft KSEB organizational structure	■ Continued project support by GoK, GoI, KSEB and CIDA ■ Availability of qualified, trainable counterpart staff
PURPOSE	**OUTCOME**		
■ To assist Kerala with the organizational restructuring and policy reforms required in the electricity sector ■ To examine the need for an independent regulatory mechanism to promote and regulate the electrical power sector. ■ To evolve norms, procedures, and related documentation to associate the private sector in the development of various facets of the power industry.	■ Establishment of an appropriate power sector organization in Kerala State ■ Rationalized tariffs ■ Enhanced IPP capacity to negotiate investment proposals and to negotiate / administer contracts ■ Appropriate draft policies and legislation drafted ■ In-house capacity for development planning created in GoK, KSEB and other stakeholders ■ Sector development plan prepared ■ Training needs assessed and personnel trained ■ A financially viable Kerala Power Sector	Draft revised organizational structure for KSEB and Kerala Power Sector ■ Tariff study and financial analysis ■ Papers on tariff reform and financial planning ■ Trained personnel ■ Model IPP project agreements ■ Draft legislation and policies ■ Trained personnel in accord with defined needs ■ Written sector development plan ■ Needs assessment report ■ New KSEB organizational structure and procedures ■ New HRM structure and procedures	■ Continued support for liberalization policy ■ Effective organization development team ■ Support for legislative changes ■ Continued support for restructuring ■ Private sector interest in investing in the electricity sector
INPUTS	**OUTPUTS**		
■ Technical assistance: • # person years of long term advisors • # person-years of short term advisors ■ Material and equipment: • $xxx materials • $500,000 computing and training equipment ■ Monitoring and Evaluation • $xxx	■ Inception report ■ Various task reports ■ Interim and final activity reports ■ Project technical report ■ Annual work plans ■ Quarterly progress and financial reports ■ Improved in house capacity for HRD planning and management	■ Production of written reports ■ Trained personnel ■ Strengthened, upgraded environment unit ■ Provision of technical assistance	■ Continued timely provision of project inputs by CIDA ■ Continued support by GoK in fielding counterpart staff ■ Timely clearance of equipment and materials

Private Sector Investment - WBS 300			
Narrative Summary	**Expected Results**	**Performance Indicators**	**Critical Assumptions**
GOAL: ■ To develop the capacity of the KSEB and the Kerala Ministry of Power to solicit, achieve, and manage private sector investment in the Kerala State Power Sector.	**IMPACTS**: ■ Increased private sector financing in the Power Sector. ■ Effective management by KSEB of private sector participation. ■ Improved power supply in Kerala.	■ Successful financial closure of at least one IPP contract ■ KSEB personnel able to negotiate favourable contracts with the private sector. ■ Significant progress in reducing the supply / demand gap in Kerala	■ Continued project support by the GoK, the GoI, KSEB, and CIDA. ■ Timely availability of qualified KSEB Counterparts. ■ Private Sector interest in Power Sector Investment. ■ Continued support for economic liberalisation.
PURPOSE	**OUTCOME**		
■ Upgrade the capacity of KSEB and the State Power Ministry to deal/negotiate with the private sector. ■ Develop a KSEB Strategy for private sector participation in the power sector ■ Develop an evaluation process. ■ Develop model agreements ■ Upgrading an existing hydel study to bankable level	■ KSEB staff with expertise in dealing/negotiating with private sector organisations. ■ Effective solicitation by KSEB staff of private sector investment. ■ Effective completion by KSEB staff of prefeasability studies of Thermal and hydel projects. ■ Effective PPAs and PIAs and other agreements completed.	■ KSEB staff are conducting negotiations with private sector. ■ Private sector investment finalised. ■ Studies completed by KSEB staff. ■ Agreements completed by KSEB staff.	■ KSEB trainees and counterparts available as required. ■ Appropriate technical assistance available when required. ■ Private sector interest in hydel and thermal generation.
INPUTS	**OUTPUTS**		
■ Long and short term technical assistance totaling 58.3 person months. ■ Training workshops, courses, seminars, internships, and attachments. ■ Materials and equipment	■ Discussion papers ■ Position papers ■ Model agreements ■ Format for prefeasability report ■ Prefeasibility report for a hydel power plant. ■ Evaluation guidelines. ■ Workshops and study tours.	■ Written papers discussed ■ Workshops and study tours held. ■ Guidelines developed. ■ Model agreement designed. ■ Report format completed and accepted. ■ Hydel prefeasability report completed and accepted.	■ Continued support by GoK, KSEB, CIDA ■ Timely clearance of materials and equipment. ■ Timely availability of technical assistance and counterparts. ■ Private sector interest in hydel power plant financing. ■ Private sector interest in thermal power plant financing

2.9 WORK PLANS

A workplan is a short-term schedule for implementing an action, monitoring, or operational plan. Workplans typically list tasks required, who will be responsible for each task, when each task will need to be undertaken, and the amounts of human and other resources required to carry out each task.

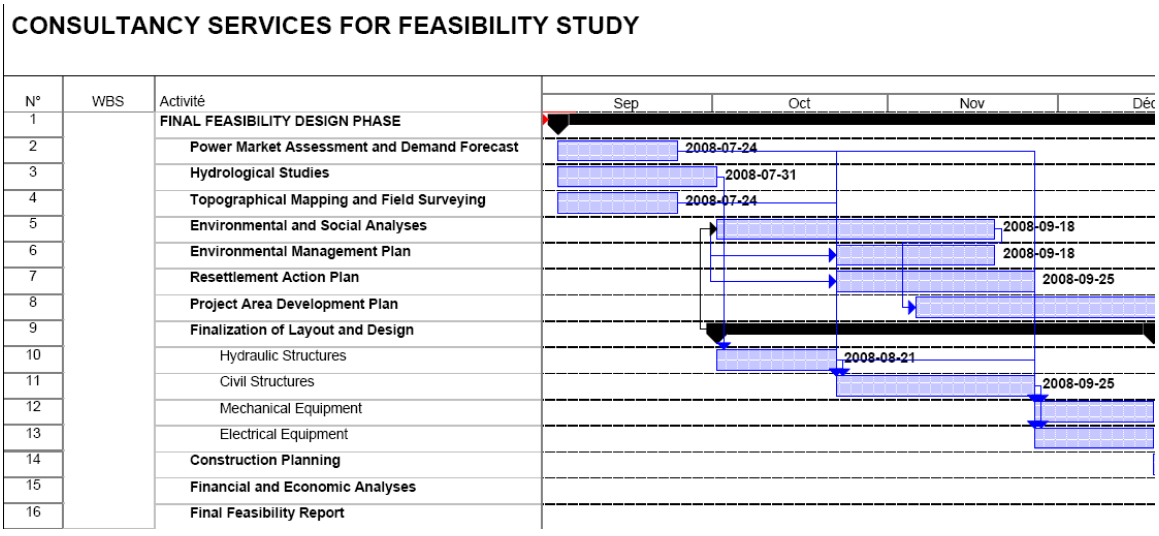
In a workplan, each activity from the monitoring or operational plans is turned into much more specific short-term plans. A workplan normally covers the next few months or at most, a year – there is no point in developing this level of detail for time periods in the more distant future because the situation will undoubtedly change before then.

The workplan is essentially a calendar or schedule that links the tasks to be done to the resources needed to do them. The workplan identifies:

- **What** specific tasks are required;
- **Who** will be responsible for helping to complete each task;
- **When** each task will be undertaken and the sequence of linked tasks; and
- **How much** each task will cost and how it will be funded/ financed.

These workplans can be recorded in a table, Gantt chart, and/or project calendar. Depending on the size and scale of the program or project, the overall workplan can be further developed into workplans for sub-projects, actions, teams or even individuals.

Figure 11: Example of Feasibility Study Workplan

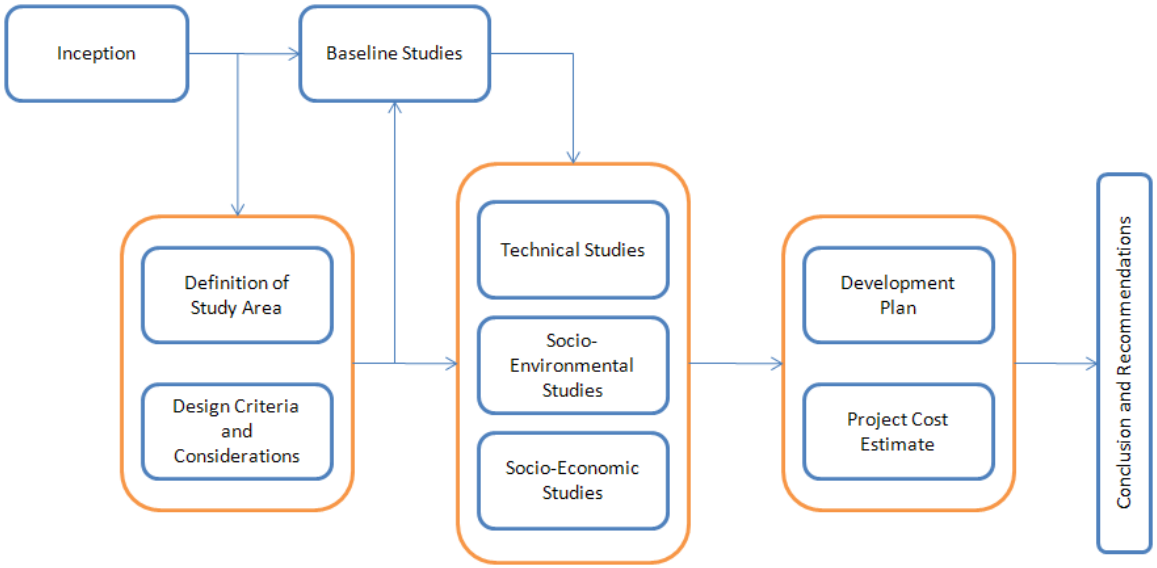


3. COMPONENTS OF A FEASIBILITY STUDY

3.1 DEVELOPMENT CONTEXT

It is essential to have a good understanding of the project, strong knowledge of the context and scope work, and brief summary description of the project, including information about the development area, project site, and development alternatives. All these preliminary analysis are required before starting a project feasibility study.

Figure 12: Overview of Feasibility Study



3.2 STUDY INCEPTION

The study inception or start-up phase covers all the preliminary works, including data collection and planning, that need to be carried out before starting any feasibility studies. This work typically includes:

- A familiarization by the study team of the data supplied by the client
- A literature and internet search for additional relevant information
- Meetings with the client
- Visits to the project site
- Meetings with local agencies, ministries, NGOs, etc to expand upon the knowledge base
- Meetings with local contractors

An inception report will be produced and submitted to the client that summarizes the status of the databank (what is available, what is missing and the plan to collect the missing data), provides an update on the proposed work schedule and work program. These elements are discussed below.

3.2.1 DATA COLLECTION AND ANALYSIS

Data collection is one of the most critical steps as it will be the foundation for the whole feasibility study. During this phase, all existing data are collected from the Client, related national authorities and/or utilities. These data include existing reports from previous studies, available bibliographies, maps, satellite images at different scale, and existing relevant database. This data collection takes place in the home office before the inception mission as well as during that mission.

Following the collection activity, an analysis of the following data is performed:

- Topographical data:
  - Topographical map of the study area;
  - Satellites Images;
  - Site topography.
- Geological and geotechnical data:
  - Region tectonic and geologic settings;
  - Structural geology and geologic structure of the site;
  - Roc surface formation and alteration;
  - Structure foundation description;
  - Outcrops cartography;
  - Investigation by seismic refraction and drilling;
  - In-situ drill hole tests;
  - Water table;
  - Seismic activity;
  - Construction materials;
  - Laboratory testing;
  - Water supply of the construction phase;
- Hydrological data:
  - Time series of monthly flow;
  - Flood flows;
  - Sediment transport.
- Hydraulic and civil engineering structures
  - Design criteria;
  - Analysis of project structures.
- Electrical, mechanical and hydro-mechanical equipments:
  - Review of existing documents pertaining to equipments design criteria and selection;
  - Main observations.
- Existing systems and structures:
  - Description existing systems and structures;
  - Development and operation of existing systems and structures.

The summary of the collected data and their analysis must be included in the inception report.

3.2.2 SITE FIELD VISIT

Following the compilation of data available from in-house data-banks, the Internet and other sources available from the home base,, a kick-off meeting with the client should be organized to discuss the work plan and the preparation of the inception report. It is also a good opportunity to handshake with different local authorities, management of relevant organizations and important stakeholders. A field visit is then recommended to familiarize with and investigate the project and flood area.

The objectives of this field visit are to:

- Obtain an overview of the site's status;
- Confirm the suitability of the location and the alignment of the structures in relation to geological and topographical conditions;
- Ensure that the further studies suggested in this report cover all the aspects to be considered in relation to the project;
- Collect data from local agencies and institutions;
- Photograph the various locations of the structures: these photographs will be used as reference during design.

During the field investigation (which is subsequent to the inception mission and forms part of the technical studies), issues regarding the physical and human environment and geological and technical aspect of the project are identified. This will result in implementation restraints and construction constraints which need to be addressed. Reports should then be generated accordingly.

3.2.3 PUBLIC CONSULTATIONS

An effective and sound feasibility study requires consultation with stakeholders, with all persons, individuals or groups and host communities that are directly affected by the project as well as with local authorities. Consultation of stakeholders allows for:

1. Exchange of information:
    - Providing information on project components and details and addressing doubts, fears, misunderstandings, etc.;
    - Collecting information, reactions, impressions and inputs that will help to fine tune the study to stakeholders' needs.
2. Promotion of participation (the greater the participation the less hurdles to be encountered in the implementation process);
3. Direct consultation with affected populations (their input on important issues is important for project appraisal).

Again, some initial consultations will take place during the inception mission; however, such consultations are intended to assist with the planning of the more formal consultations that takes place during the socio-economic studies.

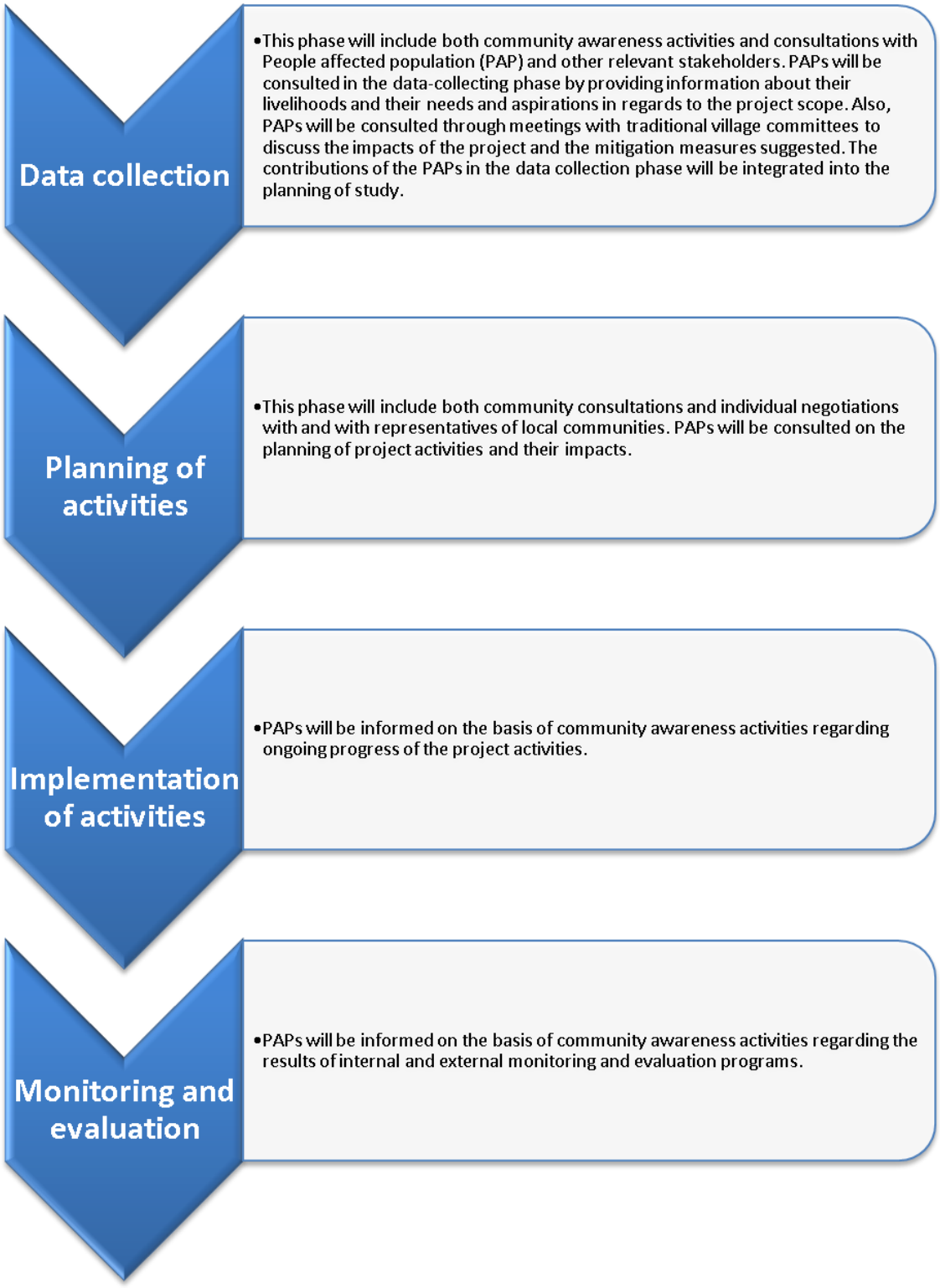
3.2.3.1 Information and consultation process

A feasibility study implies communication or dialogue with the stakeholders. Public consultation will take place on a number of levels and at several stages of the feasibility study process. In so doing, it will ensure that there is open and interactive communication between stakeholders, that disadvantaged groups and women are fairly represented, and that there is a framework for effective disclosure to all relevant stakeholders.

Persons and organizations that will be consulted should include, but are not limited to:

- People who are affected by the project, both those who are potential beneficiaries and/or those who are at risk of suffering losses as a result of the project;
- Officials from relevant ministries and government agencies;
- Officials from regional and local administration: relevant bureaus and departments, municipalities, local administration offices, and/or farmer associations;
- Local elders who are familiar with the social and economic environment and cultural traditions;
- Women as local users of natural resources;
- Local NGOs and Community Based Organizations (CBOs).

The information and consultation process will include four phases:



3.2.3.2 Gender issues

Gender equity issues constitute another element that plays an important role in local sustainable development. It has long been a major element of the international human rights system, but since the UN Millennium Declaration (2000), the global commitment to gender equity rights has become more and more integrated into project design. To meet donors' criteria, the project should promote the importance of both women and men equally owning and controlling their resources such as land, housing and money.

Women should be fully integrated in the public consultation process. Measures should also be developed to ensure that women have equal access to project benefits – such as land, tenure, cash or in-kind compensation, facilities and information.

3.2.4 Social, Environmental, Legal and Administrative Frameworks

The legal, policy and administrative frameworks within which a project is planned and implemented is a vital consideration as they have a strong bearing on the social acceptability of the project as well as on its environmental and social performance. It is well known that the levels of impacts and the distribution of benefits of any major infrastructure project are strongly influenced by the regulatory environment and by the capacity of the relevant institutions and agencies to monitor and enforce their application. The legal and policy frameworks also influence how suitable a particular jurisdiction is for attracting investment, particularly in a regional or multinational context.

At the inception phase, the data related to the national legal and institutional frameworks of the environment and social issues are briefly reviewed for completeness so that they can be reviewed in detail during the socio-economic studies:

- Environmental Impact assessment procedures and legal requirements;
- Land ownership and use rights;
- Resettlement policy and regulations;
- Constraints to development in National parks and protected areas;
- Water management, including irrigation;
- Forestry and international environmental commitments.

Among the overall set of Operational Policies guiding the operations of financial institutions, there are some that are critical to ensuring that potentially adverse environmental and social consequences of projects are identified, minimized, and mitigated. These policies may vary from one institution to another, but they essentially cover the same aspects. The following policies are required by the World Bank and are commonly used in watershed project:

- Environmental assessment;
- Natural habitats;
- Pest managements;
- Involuntary resettlement;
- Indigenous people;

- Physical cultural resources;
- Safety on Dams;
- Projects on International Waterways;
- Projects in Disputed Areas.

Finally, basing on project's compatibility with international and institutional requirements conclusions and recommendations will be provided and reported.

3.2.5 SCOPING OF ENVIRONMENTAL AND SOCIAL IMPACTS ASSESSMENTS STUDY

The initial scoping of the Environmental and Social Impact Analysis (ESIA) is required to assess key environmental and social issues and questions that might affect the project design and to define the survey/data collection programs required to establish environmental and social conditions prior to construction, during construction, and subsequent operation.

The scoping of the ESIA will serve as the basis for developing appropriate methods for the assessment and management of environmental and social impacts in accordance with the relevant safeguard policies of involved financing institutions, the standards of the directly concerned countries and the international best practices.

The main potential environmental and social impacts of the project are identified by analyzing the interactions between the activities to be carried out in the project areas and the environmental and social components. Activities during construction and operation that are considered as sources that could potentially cause changes one or several sensitive environmental and social components (lines) should be anticipated and summarized in a table.

The scoping of the ESIA will also provides guidance for baseline survey programming, which will be discussed more detail in the Baseline Study section of the present document.

3.2.5.1 Biophysical Issues

Based on available data at the Inception phase, one needs to identify biophysical issues in the following area:

- Geomorphology and topography;
- Geology and seismic activity;
- Pedology;
- Climate and microclimate;
- Hydrology;
- Erosion and sedimentation;
- Water quality;
- Noise and vibration;
- Risk of natural disasters;
- Aquatic habitats;
- Ichtyofauna;
- Herpetofauna;

- Macrofauna;
- Terrestrial Habitats and Fauna;
- Special Status Species and Enhanced Space for Wildlife;
- Natural Resources with Commercial Value;
- Potentially Harmful or Dangerous Resources.

3.2.5.2 Social Issues

At this stage, the description of the project's social issues was mainly based on existing documentation. The investigations should be conducted to complement the information available and to obtain a detailed description of the characteristics of the region, including the collection of additional data on the following:

Socio-economic parameters of the project area;

- Agriculture;
- Population densities;
- Level of education;
- Population income;
- Industrialization;
- Fishing activities;
- Health conditions of the population in the project area, and the health services available;
- Presence of people in the project area and, where appropriate, their lifestyle;
- Infrastructure and services, including banking and micro-credit;
- Development programs both existing and planned.

The project's major social issues will then be identified and reported. These issues could be:

- The project's social acceptability;
- The resettlement of people displaced by the project;
- The influx of migrant workers;
- The impacts on fishing and agricultural activities downstream the dam;
- The health risks facing the populations;
- Sharing the benefits of the project;
- The preservation of archaeological and cultural heritage;
- Economic Activities in the Area (agriculture, animal breeding, fishing, logging, hunting, tourism, etc.);
- Loss of Lands and Infrastructure Modification;
- Landscapes.

3.2.6 PLAN FOR THE CONTINUATION OF THE FEASIBILITY STUDY

The start-up field visit may identify needs for additional inventories to be carried out to supplement the information obtained for the main environmental and social issues.

Furthermore, the general design criteria for subsequent studies, the schedule and the cost should be revised and updated accordingly.

3.3 Definition of the Study Area

The study area is established to include all the environments likely to be affected (or influenced) by the implementation of the project. The variety of environments calls for a variety of study areas, the size of which varies depending on the social or environmental component considered. However, when evaluating nuisances caused during construction such as noise, the study area is limited to the immediate vicinity of the construction site.

As necessary, the study area specific to either the social or environmental component considered in the survey will be respectively defined. It is possible, however, to describe the general study areas to be considered for the major environmental components, be they biophysical or social.

3.3.1 Biophysical Environment

The biophysical environment includes:

Direct impact area

- It encompasses the construction site of the project's structures, including access roads, borrow pits, construction facilities, and the area downstream of the proposed construction site.

Secondary Impact Area

- It represents the area that may be indirectly affected by the changes that take place in the direct impact area.

Extended Study Area

- For some environmental components, an extended study area will be required to identify regional issues or cumulative impacts. This extended study area might then include the surrounding watershed or countries bordering the project area.

3.3.2 Socio-Economic Environment

In regards to the project's socio-economic aspects, the study area corresponds to communities directly and indirectly affected by the project whether it is by its construction and operation per say or generated socio-economic impacts. This area, as much as possible, respects the boundaries of the jurisdictions responsible for economic and social development and for the

administration of public services at local level. These jurisdictions will be impacted by the project's socio-economic components. They will also be directly involved in the implementation of mitigating measures, compensation and the maintenance and improvement of socio-economic conditions recommended within the framework of the project. The level of jurisdiction corresponds to the district level in target countries, and when applicable to national level.

The socio-economic environment includes:

Direct impact area

- The area housing communities who will be affected by the project, mainly those who need to be relocated and/or compensated. Despite favorable mitigation measures (monetary or land), it is obviously the area where impacts will be most acutely felt and socio-economic disturbances will be the highest.

Secondary Impact Area

- The area that may be affected by the changes that take place in the direct impact area. The area is also affected by the project, though communities in that case might not have to be relocated and may potentially benefit from the project in terms of employment or regional development. Lifestyles may also be slightly affected but only by the connection to the direct impact area.

Extended Study Area

- For some environmental components, will be necessary to adopt an extended study area to better analyze the impacts beyond the physical boundary of the project. In that category are all socio-economic benefits to a vast population as well as communities further away which were nonetheless socio-economically connected with project-affected communities for cultural or economic reasons. It can represent a whole district including up to countries associated with the project depending of the studied component.

3.3.3 Database and Land Use

To manage spatial information a GIS (geographic information system) database is usually chosen. For that purpose, SNC-Lavalin used The ESRI ArcGIS application in some of their past studies. This system makes it possible to integrate and overlay all the data available, regardless

of the subject, depending on their actual location on the ground. This allows data from multiple countries to be integrated uniformly. The geographic database contains information on bio-physical and socio-economic elements, airborne images in addition to basic cartographic elements such as roads, river systems, etc. The application can be used to cross-examine data, create maps, analyze phenomena, measure changes, help make decisions and disseminate information to the project's various partners and stakeholders.

3.3.3.1 Structure and Cartographic Database

A large number of existing maps of the study area must be incorporate into the GIS for use as reference documents. The integration of maps from past studies represents an interesting enhancement of the information already available, as it provides more important details. In addition, large-scale geological, lithologic and soil survey maps as well as satellite images should also be incorporated into the GIS whenever required.

3.3.3.2 Geo-referenced Data

Throughout the project, as much information as possible will be assigned a geographic location so that information is available for analysis in the spatial database.

Using GPS during the surveys, it was possible to assign a location to various physical elements (geology, topography, etc.), biological elements (terrestrial and aquatic environments) and human elements (data on population, health, etc.), observed in the area. In addition, using district or commune maps, statistics from governments or organizations may be spatially analyzed to determine the spatial patterns of various social phenomena such as sources of income or the education level of the populations affected by the project. The GIS database will allow for the cross-examination, analysis and representation of the following data:

- Physical environment: including geology and seismic activity; topography and bathymetry; pedology; climate and micro-climate; hydrogeology; hydrology; erosion; and water quality.
- Biological environment: including vegetation; wildlife; resources that could potentially become dangerous or harmful; species of concern for conservation; and ecosystems at risk, valued and/or protected.
- Social baseline: household population and characteristics; occupations and income; health; and sites of tourist interest.
- Displacement of populations.

3.3.3.3 Land Use

Near infrared satellite images are normally used with a mosaic of color as a baseline for a classification used to determine the various types of land uses within the study area. Near infrared images allow for a better interpretation of vegetation because they can enhance the presence of chlorophyll. These images can have a ground resolution of 1 meter and can, therefore, identify elements on the ground very accurately.

A validation system based on check points captured by GPS on the ground can be used to validate the interpretation of the images to ensure the best possible quality for image

classification. In addition, satellite multispectral images are a good base to determine delimitation and the identification of land use.

3.4 Design Criteria and Considerations

With limited knowledge of construction materials, the design can be advanced according to general principles and results of surveys and studies only. Design criteria and considerations may include the following:

- Geology and geotechnics:
  - Grouting;
  - Foundation;
  - Tunnel;
  - Open cut excavation in rock;
  - Rock mass classification;
  - Slope stability;
  - Seepage and erosion maintenance;
  - Slope protection.
- Hydrology and hydrotechnics:
  - Inflow design flood (IDF);
  - Construction flood;
  - Energy evaluation;
  - Hydraulics.
- Civil:
  - Codes;
  - Standards.
- Mechanical equipment:
  - Spillway gates;
  - Water turbine;
  - etc.
- Electrical criteria:
  - Keep the redundancy of critical components at 100%;
  - Reduce to minimum all effects of external faults for safe operation of the powerhouse;
  - Minimize potential damages on the equipment caused by the electrical faults by designing adequate grounding system to international standards;
  - Assure that failure of a single equipment does not cause the failure of the overall system;
  - Assure that the design foresees an appropriate protection and control level in case of disturbances of the system;
  - Provide sufficiently reliable source of power for the operation and safety of the powerhouse.
  - Select the substation voltages and fault levels according to transmission grid requirements.
  - For the safety of the personnel, ensure that step and touch potentials of the grounding system remains within the limits of ANSI/IEEE 80 or other equivalent international standard.

Information regarding the above mentioned requirements will be collected through surveys and studies.

3.5 BASELINE STUDIES

A baseline study aims at providing a detailed characterization of the initial situation in the study area (at the beginning of the feasibility study) against which the characterization of the final situation (results of the feasibility study) can be compared.

Typically, baseline studies are carried out by analyzing available information and data gathered from field studies with respect to defined criteria and considerations. All major existing studies as well as material from the client, financial institutions and national authorities are taken into account.

Baseline studies could include the following aspects:

- Legal and administrative framework;
- Environmental assessment:
  - Physical environment: topology, geology, hydrology, sedimentation, climate, water quality, etc);
  - Biological environment: vegetation and wildlife, including endangered species and protected ecosystem.
- Social assessment:
  - Communities in study area;
  - Primary information sources: population, education, and health;
  - Socio-economic development;
  - Preliminary resettlement plan.

3.6 TECHNICAL STUDIES

3.6.1 GEOLOGY AND GEOTECHNICS

Information on regional geology as well as site geology from previous studies (site visit during the inception phase and baseline surveys) needs to be reviewed prior to a detailed reconnaissance site visit. Additional documentation reviews also have to be carried out subsequently. Site topographical survey is usually completed during the Inception/baseline surveys phase, but site investigations usually requires more time and need to be carried out during the feasibility study phase.

The purpose of the current round of geological and geotechnical studies is to complement the previous studies in the characterization of the foundations and the reservoir rim (in the case of a hydropower project), to establish the design criteria for foundation and excavation treatments and for the design of earth structures. Additional site investigations will lead to the assembly of a data base sufficient to complete the final feasibility study.

Geology and geotechnics studies may include the following:

- Regional geology: geology and tectonic;
- Geology of the project site: geomorphology, lithology, structural geology, engineering geology, foundation water tightness, and more;

- Reservoir basing (in the case a hydropower project): reservoir water tightness and stability of reservoir slopes;
- Construction material;
- Detailed topography of the construction area;

Seismicity of the project area also needs to be assessed because it can influence the choice of design parameters depending on the level of the risk. To do so, past earthquake data in the study area is collected during a baseline survey are analyzed and validated.

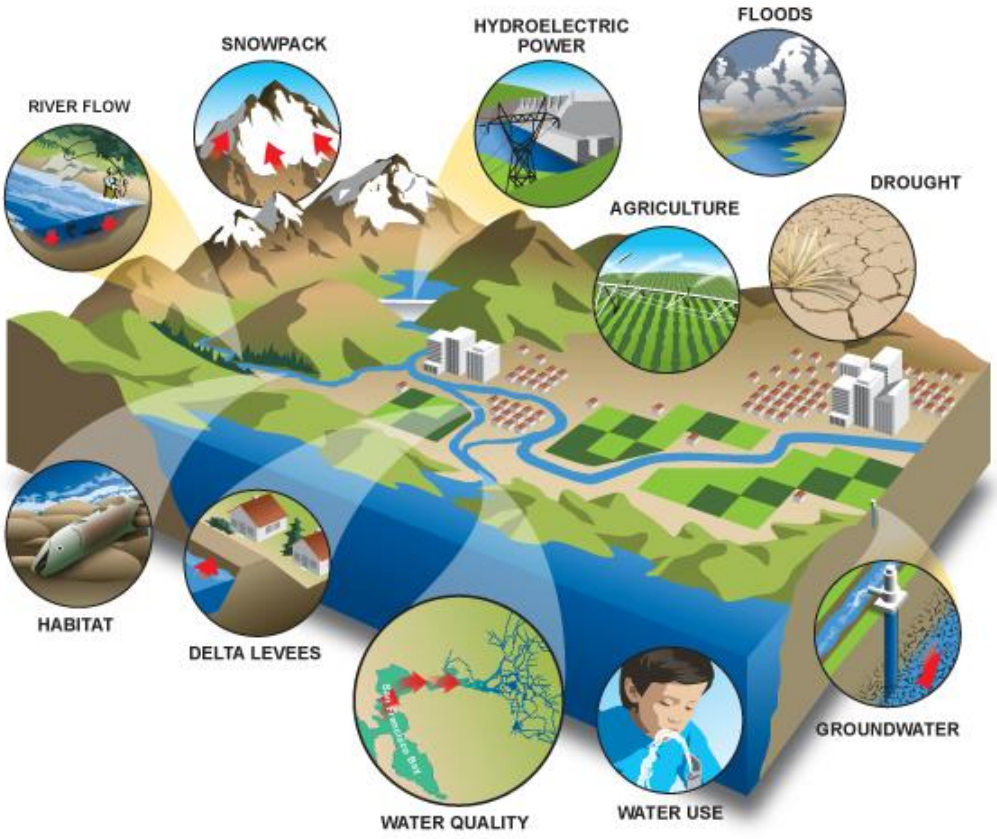
3.6.2 HYDROLOGY

The Hydrology is the study of the movement, distribution, and quality of water throughout Earth.

Hydrological study is useful in watershed projects as it allows us to better assess water resources. Observations of hydrologic processes are used to make predictions of the future behaviour of hydrologic systems (water flow, water quality). One of the major current concerns in hydrologic research is the Prediction in Ungauged Basins (PUB), i.e. in basins where no or only very few data exist.

The study of hydrologic records, such as rainfall or river flow, provides estimation for future hydrologic phenomena, assuming the characteristics of the processes remain unchanged. These estimates are important for engineers and economists so that proper risk analysis can be performed to influence investment decisions in future watershed projects and to determine the yield reliability characteristics of water supply systems. Statistical information is used to formulate operating rules for large dams forming part of systems which include agricultural, industrial and residential demands.

Figure 13: Hydrology



In general, a hydrological study includes:

- Hydrologic characteristics of the study area;
- hydrometeorological data collection (precipitation, existing streamflow, etc) and analysis;
- Flood flow estimation:
  - Flood frequency analysis;
  - Probable Maximum Flood (PMF);
  - Construction flood.
- Sedimentation:
  - Sediment load observation;
  - Reservoir sedimentation rate;
  - Type and shape of reservoir;
  - Grain size distribution;
  - Petrographic analysis.
- Backwater and storage:
  - Water surface profile;

- Storage characteristics.

3.6.2.1 Climate change and Greenhouse Gas Emission

In response to the climate change alert provided by scientists all over the world, policy makers gathered together to sign an international agreement known as the United Nations Framework Convention on Climate Change (UNFCCC). The parties of the Convention meet periodically to agree upon reduction objectives and develop compliance mechanisms. The Third Conference of the Parties (COP-3) held in 1997 resulted in the Kyoto Protocol where industrialized countries agreed on fixing binding greenhouse gas (GHG) emission reductions. To allow these countries to attain their reduction commitments the parties created flexibility mechanisms. The only mechanism allowing the participation of developing countries is the Clean Development Mechanism (CDM). As stated in Article 12, the purpose of the CDM is two-fold: "to assist Parties not included in Annex I to the Convention in achieving sustainable development and contributing to the ultimate objective of the Convention, and to assist Parties in achieving compliance with their quantified emission limitation and reduction commitments".

The GHG emission reduction/avoidance unit of the CDM is known as a Certified Emission Reduction (CER). Under the CDM, countries (including developed countries and those whose economies are in transition) will be able to use CERs from project activities in developing countries to contribute towards their compliance of national GHG emission reduction targets during the first commitment period (2008- 2012). With the conclusion of the Seventh Conference of the Parties (COP-7) held in Marrakech, Morocco, in November 2001, and the finalization of procedures and modalities (guidelines for implementation) for the CDM, the need for developing countries to establish their CDM National Authorities in order to participate in the CDM is clear.

Because GHGs blend homogeneously into the atmosphere, reducing GHG emissions anywhere in the world is equivalent regardless of political jurisdiction, from an environmental perspective. From the developing country perspective, the CDM offers the following opportunities: enhance ability to attract capital for projects that assist in the shift to a more prosperous but less carbon-intensive economy; facilitate and encourage active participation from different sectors of the economy; provide provisions for technology transfer, and assist in defining investment priorities in projects that meet their sustainable development goals.

This substitutability enabled the creation of a carbon market, one of the few markets for environmental services currently in operation and probably the only one with international scope.

As defined by the Prototype Carbon Fund (PCF), carbon transactions are contracts whereby a party pays another party in exchange for a given quantity of GHG emission credits that the buyer can use to meet its objectives vis-à-vis climate mitigation. The majority of the trades are from project-based transactions which can be broken down into two types of assets: projects intended for compliance with the Kyoto Protocol i.e. under the Joint Implementation or the Clean Development Mechanism, and projects not intended for Kyoto compliance. The greater the

guarantee the seller can provide regarding the robustness of the Emission Reduction (ER) purchased, the higher the price is likely to be. Other key determinants of the price can be for instance: the creditworthiness and experience of the project sponsor and the viability of the project, the structure of the contract, the cost of validation and potential certification, the host country support and willingness, additional environmental and social benefits, etc.

3.6.2.2 Climate Change Analysis

The goal of a climate change analysis is to use the best available general circulation model (GCM) output to assess the potential changes in temperature and precipitation in the project area. Outputs from various climate models can be examined to determine the degree to which models agree or disagree on the sign (increase or decrease) and magnitude of change in temperature and precipitation in the region.

SNC-Lavalin uses the NCAR model MAGICC/SCENGEN, which readily enables users to specify greenhouse gas emissions scenarios and climate sensitivities, and to evaluate how well models simulate current patterns of climate, to select specific models, and determine degree of model agreement or disagreement on regional climate change projections.

The NCAR model is loaded with simulations from some 16 global models (General circulation models), and thus can be used to determine which models best simulate the climate of East Africa, by assessing how well they matched the observed patterns and values for temperature and precipitation.

3.6.3 ENERGY STUDIES

For power station feasibility study, energy studies are carried out by simulation to provide an estimate of the generation potential of the proposed plant for different installed capacities. Energy studies include four important elements:

- Time series for economic optimization;
- Reservoir evaporation;
- Head losses and tail water levels;
- Generation capabilities.

Certain assumptions can be made regarding the power generation in the project area to schematize the reservoir and power plant for simulation:

- The reservoir would be operated as a stand-alone installation in the hydrographic network, i.e., there would be no other plant hydraulically linked to it (upstream or downstream, or on a tributary);
- There would be no electrical linkage for joint operation with a plant on another river system;
- All the generated power would be absorbed, i.e., the demand would be such that there would be no wasted energy generation.

The HEC-3 reservoir simulation program, developed by the U.S. Army Corps of Engineers, Hydrologic Engineering Center [Ref. HY19], is a commonly used tool to simulate the reservoir operation.

HEC-3 is a general, multipurpose, multi-reservoir simulation program which can be used to represent reservoir water resources systems which incorporate the following physical processes:

- Natural inflows (net basin runoff);
- Precipitation and evaporation associated with reservoirs;
- Storage and releases of water by reservoirs;
- Physical discharge controls at the outlet of reservoirs;
- Water flow in natural and man-made channels;
- Consumptive demands, including agricultural, industrial and municipal water requirements;
- Non-power releases such as those required for environmental considerations;
- Hydropower releases.

HEC-3 simulates the water resources system on a month-by-month basis. Therefore, all tabulated inflows, discharges, energy generation, etc., are assumed to be average quantities for the monthly period.

For a reservoir system with seasonal storage, a target firm monthly energy requirement is specified and, in its simplest configuration, the program will try to satisfy this requirement if water is available from the reservoir. If the inflow is larger than this required release for firm energy, the excess water is stored in the reservoir until the full supply level (FSL) is reached. With the reservoir at FSL, any excess inflow, over and above the firm requirement, will be passed through the turbines to produce extra power up to the plant capacity. If the inflow exceeds the plant capacity, this excess, which can neither be stored nor used to generate power, is spilled or wasted from a power generation point of view.

3.6.4 Power Market Assessment & Load Forecast

The objective of a power market Assessment is to study the role of the interconnection in the regional power exchange, initially for the bilateral transactions and secondly for the regional power exchange.

3.6.4.1 Regional Context

To assess the power market, it is important to have a strong understanding of the regional context regarding power interconnection, generation capacity, and load forecast of the current situation and the future when the project will be completed.

3.6.4.2 Load forecast

The objectives of the load forecast activity are to provide set of forecasts for both short and long terms. The forecast will form the basis in the planning of generation and transmission facilities. The forecast must explicitly account for changed economic background, government

development objectives in the power sector in addition to specific issues concerning the power demand.

A load forecast needs to take into consideration the follow factors:

- National economy;
- Institutional framework;
- Current power system and suppressed demand;
- Interconnected grid system development;
- Recent development in power sector;
- Load characteristics, tariffs, electrification and losses.

Strategy

The basic premise taken in a load forecast is that it will provide an estimate of the needs of the customers and NOT an estimate of what can be supplied to the customer. This implies that:

- The base year of the forecast will be adjusted to the level of demand estimated under an unconstrained system (i.e. where there is adequate capacity to supply all needs);
- If there had been constraints on the delivery of power, this will generally slow down economic growth, which is measured by the Gross Domestic Product (GDP)and its components. Since it is assumed that these constraints will disappear, the assumptions for the GDP must also be consistent, which implies higher than normal growth than the average rates experienced in the past to reflect the removal of the constraints on growth in the economy that was caused by the lack of plentiful and reliable electric power;
- Population growth will follow the trend observed in the past five years.

The forecast of unconstrained sales is equal to the forecast of sales for each category taking into account the underlying trends in each category plus the estimated impact of the shortages of capacity.

These sales forecasts may need to be adjusted to take account of corporate and political policies such as the planned and programmed reduction in technical and non-technical losses, the introduction of demand-side management and the promotion of rural electrification.

Often two load forecasting approaches are considered; one such as a macro-economic approach applied to the country as a whole and another, bottom-up approach for the regional forecasts.

Regional Forecast

Load forecast for the load centres and regions is carried out in four steps:

1. Derive a forecast of sales for the load centres area using a trend-line approach in which the trends in number of customers and the unit consumption in each category of load are studied and projected;
2. Assess the impact of the issues specific to project area;

3. Estimate the losses and derive the energy required;
4. Estimate the load factors that would apply in an unconstrained system.

In this approach, the basis of judgments in applying future growth rates to the unit consumption is considered. The methodology accounts explicitly for the expected future industries and target level of rural electrification.

National Forecast

A key factor in the development of the forecast is to consider sales and consumption as two separate aspects. Sales are required for an assessment of the revenues that the forecast can generate at specific tariffs. The consumption is required to assess the level of power purchases required to supply the needed sales.

In general, the approach used in a national forecast is to:

1. Forecast the underlying trend in unconstrained sales for specific categories;
2. Assess the impact of the issues specific to project area;
3. Estimate the losses and derive the energy required;
4. Estimate the load factors that would apply in an unconstrained system;
5. Derive a forecast of the unconstrained energy and peak demand for the sector;
6. Estimate the transition in energy and peak demand between the current constrained situation and the unconstrained forecast.

If the above approach does not yield a relationship that is acceptable, an end-use approach is then used in which the number of customers is estimated for the forecast period and the specific consumption is also estimated.

This approach explicitly takes account of the Government development agenda through the stated target growth rates in the various components of the Gross Domestic Product. On the other hand, the level of rural electrification and the new industries are handled outside the model.

General Assumptions

When information is not available, reasonable assumption should be made. In general, assumptions are provided for the following factors:

- Period of forecast;
- Customer categories retained;
- Historic period retained;
- Tariff projections and their impact on demand;
- Projections of economic and demographic parameters;
- Impact of Demand-Side Management;
- Estimates of load shed;

- Additional electrification;
- Mining loads;
- Losses;
- Load factor;
- Diversity factor.

Specific Assumptions for each Region

Specific assumptions for each region can be adopted for the following factors:

- Population growth;
- Number of people per household;
- Rate of increase in customers under the electrification program;
- Rate of increase in customers;
- Unit consumption;
- Amount and timing of new industrial loads;
- Amount and timing of major expansions of existing customers.

3.6.5 PROJECT IMPLEMENTATION SCHEME

The implementation of a project requires detailed design and layout of all the installations/structures and equipments. Geological and topographical data and details of the project implementation organization need to be studied at the feasibility stage. During the construction period, the site would also require a temporary infrastructure to support the contractors and construction staff. The infrastructure that needs to be considered in the design and layout includes:

- Transport infrastructure:
  - Access to ocean ports;
  - Envisioned transport infrastructure for the project's Requirements.
- Temporary and permanent town sites;
- Construction facilities;
- Quarries and borrow areas;
- Spoil disposal;
- Water supply;
- Power supply.

In addition, the implementation scheme must take into consideration the needs to split a project into multiple contracts depending on its complexity. In order to attract qualified contractors, there should not be too many contracts. Contract strategy should also taking into account the Project implementation strategy which is likely to be adopted further to exploration of financial and implementation options by the Project Management.

Finally, previous preliminary schedule, if available, need to be updated to reflect any changes. At this stage, a detailed work schedule can be prepared.

The subsequent sections list some structures and equipments which need to be taking in to consideration during the design and layout phase of the feasibility study.

3.6.5.1 Civil works

Civil works greatly depend on available geotechnical and topographical data, which often are lacking or unreliable. These data include information regarding the type of dam (concrete, rock filling, or earth filling) the project will use and the availability of the material to do so. The civil works of a project include the design of following civil structures:

- Diversion arrangement;
- Dam and spillways;
- Water intake;
- Headrace tunnel;
- Surge shaft and chamber;
- Power station;
- Tailrace canal;
- Substation;
- Access road;

3.6.5.2 Hydro-mechanical equipment

Hydro-mechanical equipment of a project could include the following:

- Spillway gates and stoplogs;
- Intake gates and equipment;
- Draft tube gates and equipment.

Some equipment need special care during transportation and/or is too large to be transported to the destination with the currently available infrastructures. Thus, all these details need to be considering during the design phase.

3.6.5.3 Hydroelectric plant

For a hydropower project, the following elements are considered:

- Number of generating units;
- Water turbines;
- Main inlet valves;
- Powerhouse overhead travelling crane;
- Auxiliary mechanical plant;
- Electrical equipment;
- Control, protections, instrumentation and communication.

3.6.5.4 Substation and transmission system interconnections

Generally, a feasibility study for a power development project includes the transmission facilities required to evacuate the power from the project to the main grid. Considering the

generated power will be interconnected with the NBI countries, the following structures are required:

- Substation;
- Grounding grid;
- Interconnection with transmission lines.

3.7 SOCIO-ENVIRONMENTAL STUDIES

The baseline study assessed the existing studies, report and database which are needed to provide an overview of the latest current information on the socio-economic aspects of the study area. In feasibility study, baseline studies are updated by taking into consideration the impacts of the project.

Data for the environmental baseline are compiled from:

- The review of previous studies;
- The interpretation of available maps and satellite images acquired within the framework of the project;
- The interpretation of data contained in various available databases.

Base on these information, the environmental and social analyses at the feasibility stage include a qualitative and quantitative assessment of potential impacts of the project on the components of the physical, biological and human (social) environments which are previously assessed. Its objective is to give a description of the project and the mitigation measures generally put in place to minimize these impacts. For each of the environmental components considered, the impacts anticipated during the construction, impoundment of the reservoir and operation of the facilities need to be identified, described and discussed on the basis of the relative impact caused by the project.

3.7.1 METHODOLOGY

The project's environmental impacts are presented in two phases, i.e. identification and description. The environmental and social impacts of the project are identified by analyzing the interactions between each of the pieces of equipment to be put in place or the activities to be carried out in the project area's and the environmental components. The equipment and anticipated activities are therefore considered as sources that could potentially cause changes to one or several sensitive environmental components.

Each element of the project is reviewed on the basis of its potential impacts, both positive and negative, on each component of the environment during the construction and operation periods. The possible interactions between the different social and environmental components (indirect impacts) are also considered. The elements of the project related to the survey, construction, operation and maintenance, disassembling and decommissioning phases are also taken into consideration.

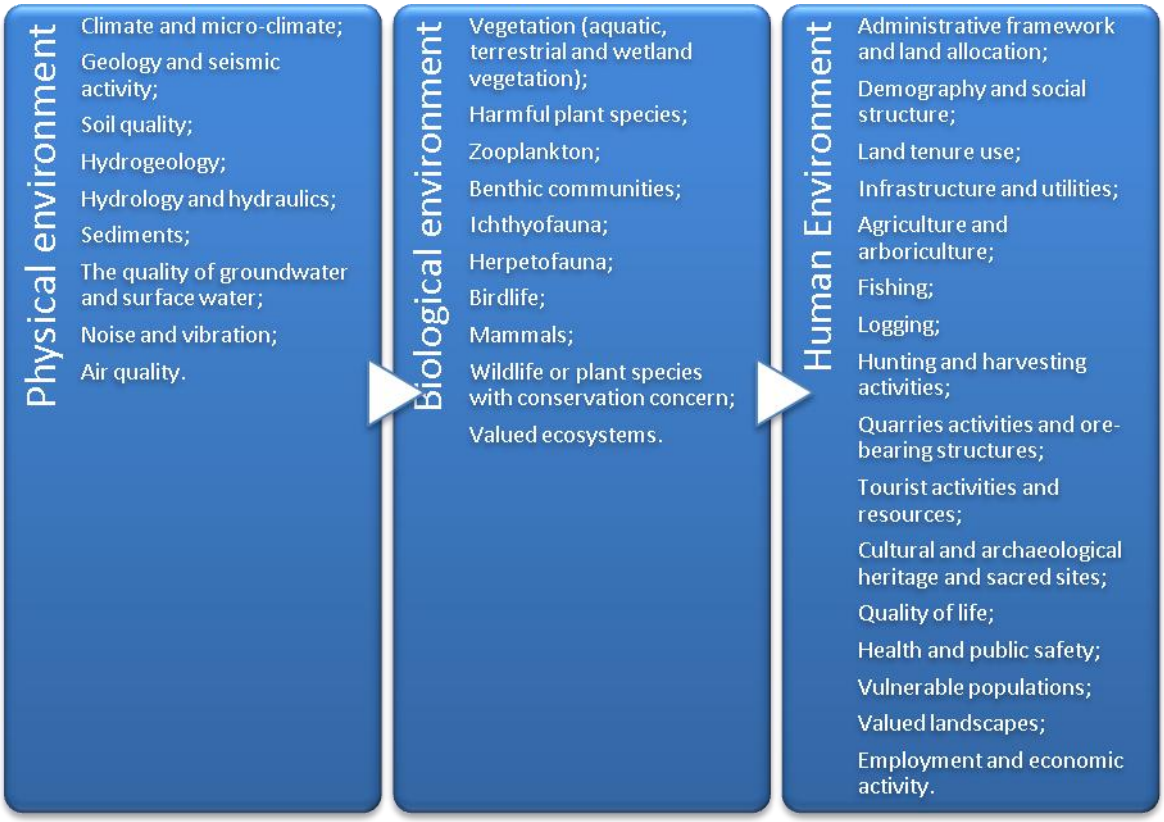
In the **construction period**, the main potential sources of impact may include:

- Land acquisition and displacement and compensation of the populations;
- Land clearing at the site and management of wood residues;
- The development of building site facilities including reception facilities for the workers and their families;
- The construction of temporary and permanent access roads for transportation and traffic associated with the movements of labor, construction machines, and construction materials;
- Clearance of the contractors' camp site for the storage of plant equipment, medical clinic, workshop, field laboratory, construction materials and related equipment storage;
- Clearance of the vegetation and the overburden materials off the material supply sites, to be stockpiled for the restoration of borrow pits after road works;
- The transportation of the project construction materials by trucks and lorries. The routes to be used by the trucks are either existing or are to be constructed;
- Establishment of stone quarries for the processing and supply of stone aggregates;
- The installation of cofferdams, the diversion canal, the tailrace canal and other inwater works;
- Earthmoving and excavation works, including blasting;
- The withdrawal and disposal of excavated material;
- The management of wastewater and drainage water from the site;
- The manufacture of concrete (concrete plant);
- The movement of heavy machines;
- The construction and development of the project's structures and related facilities;
- The purchase of goods and services;
- The supply of drinking water to the worksite;
- The presence of workers;
- Induced migration;
- The impoundment of the reservoir.

During the **operation**, maintenance and decommissioning phase, the sources of potential impacts may be related to:

- Water management;
- The operation of installations and operation of equipment (noise, liquid discharges, management of plant residue inputs, management of waste and hazardous materials, purchases of goods and services, and job creation);
- Equipment maintenance works and possible reparation of equipment during their service life;
- Energy production;
- The presence of workers and their families;
- Dismantling of equipments at the end of their service life.

The components of the physical, biological and human environments likely to be affected by the project correspond to the sensitive components of the study area, i.e. the elements likely to be modified or affected by project-related components or activities or by the components of the environment that may have impacts on the project such as seismic activity. The environmental components selected for the project may include the following:



The identification of the social and environmental impacts associated with the project is usually presented in a matrix. Each case of the matrix represents a social and environmental impact affected by a given component of the project. A brief description of the nature of the impact is provided in each of these cases.

3.7.2 CUMULATIVE IMPACTS

Cumulative impacts take into account the effects of multiple activities that add up incrementally to affect resources of regional or national significance associated with the implementation of a proposed option or set of options, regardless of who is responsible for the other identified activities. Cumulative impact assessment focuses on resources sustainability, within determined geographic and time boundaries.

Assessing the cumulative environmental and socio-economic consequences of an action requires delineating the cause-effects relationship, within these predetermined boundaries,

between the multiple activities and the resources, ecosystems and human communities impacted.

Cumulative impacts refer to impacts that are additive or interactive in nature and result from multiple activities over time, including the option being assessed:

- They are caused by the aggregate of past, present and reasonably foreseeable future actions;
- They are the total impact, including both direct and indirect impacts, on a given resource, ecosystem and human community of all actions taken, no matter who has taken the actions;
- They need to be analyzed in terms of the specific resource, ecosystem and human communities being affected;
- They cannot be practically analyzed beyond a reasonable boundary; the list of impacts must focus on those that are truly meaningful;
- They correspond to geographical or natural boundaries;
- They may result from the accumulation of similar impacts or the synergistic interaction of different impacts;
- They may last beyond the life of the project that caused the impacts;
- They should be assessed in terms of the capacity of the affected resource, ecosystem or human community to accommodate additional impacts.

The criteria for judging the significance of cumulative impacts are not different from those for other types of environmental assessment, but threshold effects and irreversible changes in the use of critical resources will generally be key concerns.

The approach used to determine the most significant cumulative impacts can be summarized as follow:

- **Scoping:** Establish the geographic scope for the analysis and the timeframe;
- **Describing the Baseline Conditions:** Identify the main/regional trends/issues and Analyze the "Independent development approach" strategy;
- Determining the Magnitude and the Consequences:
    - Estimate the significant cumulative impacts in terms of their magnitude, geographic scope, duration, frequency, reversibility and likelihood of occurrence and highlight differences with emphasis on technological diversification and geographical diversification.
    - Make recommendations to modify, or add measures to, investments making up to the development portfolio in order to avoid or minimize significant cumulative impacts.

3.7.3 ENVIRONMENTAL MANAGEMENT PLAN

The EMP includes guidelines for measures, actions and means to be implemented in the design, construction and maintenance phases of the project, in order to eliminate or reduce to acceptable levels the key project impacts in regards to the biophysical, socio-economic and health contexts. The scope of these measures and/or actions is in direct relationship with the nature of the proposed work but also must ensure that the environmental performance of the

project is upheld. It also aims to ensure, in a complementary manner to the Resettlement Action Plan (RAP), that the concerns and expectations of local people about the project are taken into account in a fair and equitable manner.

The following principles need to be taken into consideration for the preparation of the EMP:

- The protection of health and safety and the prevent environmental hazards;
- Compliance with standards, regulations, know-how and best practices, as well as the implementation of appropriate technology;
- The implementation of measures and of activities in accordance with the principles of sound management and use of equipment in good operating condition;
- The implementation of surveillance and control measures for environmental risk management and the development of preventative and correctional measures in the case of an event that may be dangerous to human health and/or the environment;
- Construction of the hydropower facility should meet relevant international standards that ensure sufficient technical levels of safety.

3.8 SOCIAL-ECONOMIC STUDIES

The baseline study assessed the existing studies, report and database which are needed to provide an overview of the latest current information on the socio-economic aspects of the study area. In feasibility study, baseline studies are updated to take into consideration the impacts of the project.

3.8.1 SOCIO-ECONOMIC CHARACTERISTICS

The potential/expected impacts of the project on the following major socio-economic characteristics of the study area will be assessed:

- Population:
  - Demographics: population density, growth rate, distribution, etc;
  - Vulnerable population: minority groups, landless peasants, displaced people, orphans heading their households, females heading their households, people affected by HIV-AIDS, etc.
  - Gender issues: social and economic status of women, education, health, violence, poverty, law.
- Education:
  - Level of education: pre-school, elementary school, high school, and post-high school;
  - Availability of educational staff and infrastructures.
- Health:
  - Overview of the health situation;
  - Infrastructures and conditions in study area.
- Economic activities:
  - Agriculture and animal breeding: main characteristics, production systems, cultivated species, crop cycles, farming techniques and animal breeding;
  - Fishing: consumption and generation of income for fishermen;

- Logging: impacts on agro-forestry practice, accelerated deforestation, degradation of natural forests, tree planting activities, artificial woodlands, and wood industry (furniture, heating, construction);
- Use of vegetation by locals: for house construction, decoration, handicrafts and fishing;
- Mines and quarries: mineral potential;
- Industries and handicrafts: impact on activities, including agribusiness, industrially-oriented crafts, service-oriented crafts and fine arts, in study area;
- Tourism and hotel industry: factors that attract tourism including beautiful landscapes and climate;
- Commerce and the banking sector: impacts on market, infrastructures, institutions and trading activities.

3.8.2 SURVEYS IN THE STUDY AREA

3.8.2.1 Socio-Economic Surveys

Socio-economic and health surveys are aimed at assessing the impact on the living conditions of communities that are likely to be affected by the project. Sample communities are selected for these surveys. Socio-economic survey is most often in the form of household survey and individual/group Interviews.

Household Survey:

A socio-economic survey is commonly conducted among a sample of households within the study area to gain a better understanding of local social conditions due to the project.

It is also a good opportunity to collect their comments regarding the project development constraints that they must cope with and the project's potential impacts on their livelihoods and living environment.

Systematic statistical sampling of households can also be undertaken if: the precise location and number of project-affected communities is known as well as the current population of surveyed communities.

Individual and Group Interviews

Individual and group interviews with stakeholders are usually conducted with administrators, local elected representatives, representatives of agricultural extension services or of social, education or health care services, representatives of trade associations (farmers, fishermen, small traders, etc.), and representatives of local civil society associations(women, youth, etc.), in order to identify the potential/expected impact of the project on:

- Local economic conditions, (agriculture, fishing, trade, crafts, industry, tourism, etc.);
- Infrastructure and services (housing, roads, energy, water and sanitation, educational, health, agricultural extension or social services, markets, places of worship, etc.).

Results

The results of the household survey carried out in study area include:

- Overview of changes in socio-demographic characteristics (some by gender) :
  - Population: demographic, education, survival of parents, marital status, monthly household expenditures, main economic activities, secondary economic activities, employment status;
  - Social organization;
  - Land tenure;
  - Access to service.
- Impacts on economic activities:
  - Agriculture;
  - Cultivated fields;
  - Livestock breeding;
  - Fishing: type of practiced, estimated monthly income, etc;
  - Household who operate a shop and mean of acquiring it.
- Access to services:
  - Household access to market and the time required to access it;
  - Household access to a elementary school and the time required to access it;
  - Household access to a high school and the time required to access it;
  - Household access to a health center and dispensary, and the time required to access them;
- Project as seen by the population and by key stakeholders.

3.8.2.2 Health Surveys

The aim of the health survey is to conduct interviews with the national and regional administrators in charge of the health system and to conduct interviews in the same local communities as those selected for the socio-economic survey. It is meant to help collect data from the hospitals and HCs concerned with a visualization of the expected health situation in the study area and to conducting an analysis of health conditions in communities due to the project.

3.8.2.3 Surveys Specific to Fishing Activities

The surveys specific to fishing activities determine the impact on the location of the main villages or associations of fishermen in the study area. Data can also be collected from fishermen and leaders of associations in order to evaluate the evolution of fishing yields in terms of fish numbers and sizes. Finally, the impacts on the use of fishing products (consumption, sale, processing) is evaluated.

3.8.3 PROJECT-RELATED SOCIO-ECONOMIC DEVELOPMENT

When a project is integrated into an existing development plans in the study region, the potential impacts on the socio-economic development need to be assessed. How the project limits or facilitates the development activities within the study area are also considered.

Typically, the study must assess the impacts of the project on national poverty reduction, for most development projects are embedded in country-specific poverty reduction strategies, which represent a very defining document at national level and supported by international development institutions.

3.8.4 Potential Socio-Economic Impacts

The following list represents some potential categories of socio-economic impacts, which depending on the development of a project:

- Loss of dwellings and other buildings and structures (including granaries and wells);
- Loss of agricultural land along the slopes of river valleys (including land used for fruit tree plantations);
- Loss of agricultural land and grazing areas in marshlands in the middle of river valleys;
- Loss of formal or informal business activities and related employment (if applicable);
- Loss of access to pasturelands and woodlands along the slopes of river valleys (including fallow lands, lands used for grazing and lands used for plant collection and hunting activities);
- Loss of access to fishing resources (in the event of relocation of fishing villages);
- Loss of access to water sources (if applicable);
- Loss of access to cultural sites (if applicable);
- Loss of access to quarries and brick works (if applicable).

3.8.5 Resettlement Action Plan

The Resettlement Action Plan (RAP) needs to be developed and modeled according to the safeguard policies and guidelines of financial institutions on population and resettlement.

The first section presents the strategic approach and socio-economic survey conducted as well as the identification of the project impacts and affected populations. The national legislation and policies relevant to land use, expropriation and compensation in each target country are described in the next section. It is followed by the resettlement and compensation plan and it concludes with a Local Development framework. It will incorporate the elements presented herewith and describe the major steps to follow in order to implement a just and equitable action plan for the people, homes and communities affected by the project.

3.8.5.1 Affected Communities

The RAP must identify people affected by the project and the adverse impacts on their livelihoods associated with the project's land acquisition. Project-affected people (PAPs) are defined as persons who lose assets and/or usage rights (e.g., land ownership or usufruct, housing and structures, crops, businesses or others) because of the project. Some of these people, but not all, will need to be relocated as a result of the project impact (e.g. construction of the dam and flooded lands). Those PAPs whose losses are such that they must be relocated are considered as Project-Displaced People. They may be either physically or economically displaced. The two categories are described as follow:

- Physically-Displaced Persons: persons that have to relocate because they reside within land that must be acquired to construct or operate the project.
- Economically-Displaced Persons: persons that do not reside within the land required to construct or operate the project, but who will lose their ability to maintain their livelihood because of the loss of land or other assets that are taken for the project and who therefore also need to be relocated.

Persons who do not reside within the land required constructing or operating the project but that own or cultivate lands and/or assets that will be lost following the project impact, and that will require to be compensated are also considered PAPs, but as non-displaced persons.

3.8.5.2 Organizational Responsibilities

Based on the essential elements of the RAP as well as on the scale of the resettlement required according to the retained technical option, it will be necessary to define which governmental bodies and/or organizations – public, private, governmental or non-governmental – will be responsible for the detailed planning and implementation of the required activities. An organizational chart needs to be established in collaboration with the project authority, client and representatives of concerned governments.

3.8.5.3 Special Assistance for Women and Vulnerable Groups

Expropriation and involuntary resettlement affect poor and vulnerable groups more severely then the rest of the population because they are often less able to reconstruct their lives after the resettlement. Women constitute, according to international development standards, a vulnerable group and this for various reasons. First, because gender discrimination limits women's access to resources, opportunities and public services necessary to improve the standard of living for themselves and their families. In addition, they are often exposed to greater risk of impoverishment and are sometimes excluded from participation. Therefore, special assistance to women and vulnerable groups is needed.

Without special assistance, these groups, who in most countries also constitute the largest share of poor people, might be deprived of the rights to improve their livelihoods or at least to restore them to what it was before the displacement. The World Bank's OP 4.12 emphasizes the underlying development objectives of resettlement activities and the need to assist vulnerable groups in achieving those objectives: "To achieve the objectives of this policy, particular attention is paid to the needs of vulnerable groups among those displaced, especially those below the poverty line, the landless, the elderly, women and children, indigenous peoples, ethnic minorities, or other displaced persons who may not be protected through national land compensation legislation[1]".

[1] Involuntary Resettlement Sourcebook, Planning and Implementation in Development Projects, World Bank, 2004, p.73.

Vulnerable groups or households may have different economic needs from most households or needs. They must therefore be identified and consulted. Special mitigation measures and initiatives will be proposed, as for instance specific accommodations integrated in the grievance procedures to ensure that they have equal access to grievance redress system. The objectives are to ensure these groups will have the same opportunities as the others to improve their living standards rather than staying in the same state of poverty and vulnerability.

Acknowledged vulnerable groups are constituted of:

- Women and especially single-female headed family, widow, unmarried women and non-farming females;
- Households victimized by HIV/AIDS (households headed by children);
- Children;
- Handicapped people;
- Indigenous people.

3.8.5.4 Monitoring and Evaluation

Internal and external monitoring and evaluation are important to ensure that the goals set forth in the RAP are met and that agreed upon procedures are properly implemented in a transparent and fair manner. Different options will be considered for external monitoring, either through the establishment of a monitoring commission (that could be independent or governmental), or the hiring of independent experts in charge of monitoring and reporting on the effectiveness and compliance of the compensation process. The monitoring objectives and indicators and the suggested agency with overall responsibility for monitoring the resettlement process need to be defined in the RAP.

On a preliminary basis, the monitoring and evaluation system to be defined should be based on a common set of performance indicators that apply across all three countries and enable the comparison of results obtained from one area to another.

3.9 LOCAL DEVELOPMENT PLAN

Local development plan is required to foster improvement of livelihoods and poverty reduction – with poverty being understood to relate to all forms of human deprivation, including income poverty, lack of safe water, lack of electricity, lack of productive assets, etc. This section will use the example of a watershed project (e.g. hydropower plant) to illustrate the Local Development Plan (LDP) which aims to support two potential objectives:

- Investment in hydropower;
- Investment in sustainable livelihoods.

A Local Development Plan (LDP) is required for the project study area, with a range of planned and quantified activities aimed at enhancing development and alleviating poverty in order to sustain the livelihoods of communities surrounding the project's installations during construction and operation. The main objective of an LDP is to take advantage of the indirect benefits derived from the project. For example, the presence of a hydroelectric power plant can

support rural electrification and contribute to the sustainable development of the region surrounding the project.

The long-term goal of the LDP is to contribute to poverty alleviation and sustainable development. For the given example, the LDP could include: improving livelihoods in project-affected and host communities; and improving quality of life in communities; and offering greater food security to vulnerable populations.

The LDP is usually prepared in conformity with national poverty reduction strategies and regional development plans in host countries. It includes:

- Specific development objectives and action plans for each of the following categories:
  - Public infrastructure (including power distribution, road access, water supply and recreational/tourism facilities);
  - Public health services;
  - Management of watershed and fishery resources; and d) socio-economic interventions (including agricultural irrigation, fish farming and improved credit facilities).
- Cost estimates for implementation of the LDP in each of the three countries, including training and capacity building costs as well as recommendations with respect to a revenue sharing mechanism that could be used in view of providing long term funding for the implementation and follow-up of the LDP;
- Recommendations in regards to implementation procedures and stages, monitoring and evaluation programs and performance indicators;
- Identification of partner agencies, NGOs and stakeholder associations that will be responsible for implementation of the LDP.

3.10 PROJECT COST ESTIMATES

3.10.1 COMPONENTS

A project Cost estimate is divided into multiple sections as follows:

- Direct cost:
  - Access;
  - Civil works;
  - Mechanical works;
  - Electrical works.
- Indirect cost:
  - Engineering ;
  - Contingencies;
  - Administration.

The following table illustrates the project cost sections for a hydro plant project.

Figure 14: Example of Project Cost Table

Account	Item	Quantity	Unit	Price	Amount
0	**Reservoir Clearing**				
002	**Access Roads**				
	Permanent site roads				
	Upgrade roads				
	Permanent roads				
	Total Access				
003	**Diversion**				
	Earth excavation				
	Rock excavation - open cut				
	Rock face stabilization				
	Portal concrete				
	Rock excavation - tunnel				
	Concrete plug				
	Fill				
	Steel reinforcement				
	Total diversion civil work				
004	**DAMS**				
	Main Dam				
	Earth excavation				
	Rock excavation				
	drilling				
	grouting				
	Fill				
	Shotcrete				
	Steel mesh				
	Concrete				
	Steel anchors				
	Auxiliary Dam				
	Earth excavation				
	Fill				
	Total Dams				

005	**SPILLWAYS**				
	Main Spillway				
	Earth excavation				
	Rock excavation				
	Concrete				
	Steel anchors				
	Drilling				
	Grouting				
	Bridge				
	Auxiliary Spillway				
	Earth excavation				
	Gabions				
	Steel mesh				
	Total Spillway Civil				
006	**INTAKE & PENSTOCK**				
	Intake				
	Earth excavation				
	Rock excavaton				
	Concrete				
	Drilling				
	Grouting				
	Bridge				
	Penstock				
	Earth excavation				
	Rock excavation (tunnel)				
	Concrete lining - horizontal section				
	Concrete lining - inclined section				
	Concrete behind lining				
	Steel pipe				
	Steel wye				
	Total Intake & Penstock				
007	**POWERHOUSE**				
	Earth excavation				
	Rock excavation				
	Concrete				
	Architectural				
	Total Powerhouse				
008	**TAILRACE**				
	Earth excavation				
	Rock excavation				
	Concrete				
	Steel				
	Canal improvement				
	Total Tailrace				
	TOTAL CIVIL COST				

009	**Construction Camp**				
011	**GATES & HOISTS**				
	Diversion gate				
	Intake gates & trashracks				
	Draft tube gates				
	BF valves butterfly valve				
	Total gates & Hoists				
012	**GENERATING EQUIPMENT**				
	Turbines, generators, aux.mech/elect equip				
	Transformers, switchyard				
	Total Generating Equipment				
	TOTAL MECHANICAL / ELECTRICAL COST				
	TOTAL DIRECT COST				
020	**INDIRECT COSTS**				
	Engineering				
	Civil Contingencies				
	Tunnel Works Contingencies				
	Mech / Elect Contingencies				
	Administration				
	TOTAL INDIRECT COST				
	TOTAL COST				

3.10.2 CONTINGENCIES

Project contingencies can be classified into two categories:

Physical Contingency. The physical contingency is a provision for uncertainty associated with quantities and categories of expenditures. Therefore, the greater the uncertainty, the greater the physical contingency allowance. Given that uncertainty may vary significantly between project components and subcomponents, or between expenditure categories, different allowances can be applied on this basis. Uncertainty also typically varies over the project preparation cycle. As the project design is refined over the preparation process, uncertainty regarding the quantities of inputs should decline. By appraisal, the project design should have been refined to a level whereby physical contingences can be set in the range of 5–15%. However, cases may arise where more significant levels of uncertainty remain and, therefore, a greater physical contingency provision may be required. The physical contingency is calculated as a percentage of base cost for each component, subcomponent, and expenditure category. As for base costs, physical contingencies should be estimated separately for foreign exchange and local currency costs, where applicable.

Price Contingency. The price contingency is a provision for potential inflationary increases in costs over the implementation period of the project. Therefore, the price contingency provides for the conversion of the base costs, which are expressed in real prices, to a nominal price basis. The price contingency is comprised of a foreign and domestic component. The foreign price contingency reflects the potential impact of international inflation rates on foreign sourced procurement prices. The domestic price contingency reflects the potential impact of domestic inflation rates on domestically sourced procurement prices.

The price contingency is calculated as a percentage of the sum of the base cost and physical contingency for each component, subcomponent, and expenditure category, where the percentage is the compounded inflation rate applicable to foreign exchange and local currency costs.

3.10.3 METHODOLOGY AND LEVEL OF ACCURACY

3.10.3.1 Investment Costs

There are several approaches to derive an estimate of the cost of a project:

1. Prorate from internal data banks; usually for reconnaissance or prefeasibility level studies. This requires the least effort and is the least accurate
2. A combination of using in-house databanks and manufacturer's information. This is usually used for feasibility studies and often provides reasonable results
3. To build up the costs based on all the elements needed and a detailed schedule of the work required. Such an estimate is usually prepared at the detailed design stage.

At the feasibility level, the investment costs can be separated into 3 groups:

- Costs for civil works, including access costs;
- Mechanical/electrical equipment cost; and
- Indirect costs.

The civil costs tend to consist of structures or parts of structure made from locally-produced materials such as sand, gravel, rock, concrete, which are measured and depend upon the topography of the site of the project. For these structures, the usual approach is to calculate the quantities of each material (whether for its excavation (digging of foundations) or its use in a structure (earth fill dam) and to apply unit prices to those quantities.

The areas of uncertainty in this approach are:

- The estimate of the quantities;
- The adjustments required to the unit price which will depend upon:
  - The source of the prices (in-house basic data or bids from contractors for structures similar to the project
  - How current the estimates are and the level of inflation that needs to be added;
  - The state of the construction market (are all contractors fully loaded or are they desperately looking for more work?).

The electrical and mechanical work consists of several very large and expensive items (turbines, generators, transformers) as well as material required to connect and control them (cables, control panels, switchgear, etc.). The process used in for these items is to ask two or three manufacturers for budget prices for the main equipment to which a percentage is added to cover the ancillary equipment and the installation of all of the electro-mechanical equipment. It must be stressed that the dealings with the manufacturers do not imply any commitment in either direction. The basis for this approach is that the manufacturers of the large equipment are in a better position to judge the market for their equipment than a consultant. The manufacturers have an interest in cooperating as they wish to be, as a minimum, put on the short list of firms invited to submit a firm bid at the appropriate time. A secondary benefit is that the manufacturer may be able to influence to some extent the design of the equipment.

A key direct cost is the cost of mitigating environmental and social impacts of the project. Major costs in this area include:

- Resettlement action plans for example: for the resettlement of population involuntarily displaced from the reservoir at a hydro plant);
- Building a stack or chimney sufficiently high that the emissions from a thermal plant will be dispersed to an acceptable level before they fall to ground level;
- The installation of flue-gas desulphurization for thermal plants;
- The provision of schools, clinics housing, roads, etc. for the population affected but not displaced by the project.

These costs would be provided by the consultant responsible for the environmental and socio-economic analyses related to the project.

The indirect costs are a function of the uncertainties surrounding the project, the *complexity* of the project and the policy of the owner regarding his involvement with the development of the project. The uncertainties are reflected in the size of the contingencies used. Usually tunneling work will have the highest contingency; the other extreme will be the electromechanical work based on manufacturers' budget estimates. Thus the configuration of the project will have a significant impact on the level of contingency used.

Engineering costs are often estimated as a percentage of the direct cost. This percentage will vary depending upon the size and complexity of the project as well as the level of input required by the owner. For instance, the engineering fees would be low if all that is required is to monitor a contractor with a turn-key contract. It would be high if the project were composed of a large number of small contracts, requiring significant day-to-day coordination.

Sometimes the owner of the project wishes to include its own costs in the overall cost estimate and sometimes the funds come from different accounts and would not be reflected in the overall project cost. Where costs are to be included, the owner can monitor the project at different levels varying from virtually duplicating the site staff of the supervising engineer to requiring only monthly progress reports.

3.10.3.2 Project Timing

A key element to the study is an assessment of the earliest that the project can be commissioned. To do so, approximate lead times are estimated based on the level of preparedness of the project and the following generic times for each of the individual activities leading up to implementation and on-power.

Activity	Time in months
Prefeasibility study, following a reconnaissance level project identification	6-12
Feasibility study (including consultant selection)	12-24
Feasibility study update (where required)	6-12
Environmental study and approval	12
Preparation of IPP process and tendering (where applicable)	12
Project financing (IPP or public ownership)	12
Final design (including consultant selection) – depending on size/complexity	12-18
Tendering	6-12
Construction (depending on size/complexity)	36-60

Actual times will vary considerably, depending on environmental approval process, private or public ownership, commitment of the host government, feasibility of financing, size and complexity of the project, and the extent to which activities may be fast tracked (i.e., carried out in parallel, such as final design and preparation of the EIA).

The following are the minimum timeframes required for the overall implementation of projects, expressed in years.

Minimum On-power Lead Times for Hydroelectric Plants (in years)

Present project status	Project preparation	Tender/Construct	Total
Reconnaissance/preliminary			
less than 70 MW	3	4	7
70 to 150 MW	4	5	9
more than 150 MW	4	6	10
Prefeasibility			
less than 70 MW	2	4	6
70 to 150 MW	3	5	8
more than 150 MW	3	6	9
Feasibility			
less than 70 MW	2	4	6
70 to 150 MW	2	5	7
more than 150 MW	2	6	8
Design/tender documents			
less than 70 MW	1	4	5
70 to 150 MW	1	5	6
more than 150 MW	1	6	7

These values allow no margin for delays between successive development stages. They also do not provide for additional delays for approval and financing activities. **At least one year should be added to the above values for any project that is not being fast tracked.**

Based on the above, a hydro plant will require about five to six years to construct after completion of the feasibility study.

The following table provides similar information for the construction of new thermal and nuclear plants.

Minimum On-power Lead Times for Thermal Plants

Technology	Project preparation	Procure/Construct	Total
Nuclear	4	4	8
Coal steam	3	3	6
Oil steam	3	3	6
Conventional diesel	1	1	2
Gas fired engines	2	1	3
Combined cycle gas turbine	2	1	3

3.10.4 Environmental and Social Risk Analysis

The environmental and social risk is an important factor that needs to be taken into account during the evaluation of the project cost. Its impact on cost varies depending on the probability of occurrence and the level of impact.

A risk analysis can determine provide a more realistic cost for the total project. In addition, it can compute the contingency needed to provide the project explicitly with different measures of protection against cost overruns. It can also provide the project manager with a list of the most risky elements leading to better risk management strategies.

Two categories of risks will be explained the following sections.

3.10.4.1 Endogenous risks

Endogenous risks include all risks that are directly related to the project, either generated by its construction and operation or by the implementation of the various mitigation measures.

These risks may include:

- Risk of structure break: sudden breakdown of a project structure;
- Institutional risks: dependence on the capacity and responsiveness of local and regional institutions.
- Local opposition to the project: failure to meet expectations could result in general disappointment which could in return cause a local opposition to the project;
- Probability of success in implementing the mitigation measures;
- Political risk over the Loss of lands in impoverished countries.

3.10.4.2 Exogenous risks

Exogenous risks would include all risks that are very difficult to predict and mitigate such as international NGOs, political unrest in surrounding countries or climate change. These risks may include:

- Political instability in the study area;

- Opposition by international environmental NGOs: when consultation process fails or that the mitigation measures are not fully implemented as promised
- Climate Change;
- Risks for investors: Investors evaluate risks, first and foremost, on the basis of the costs level.

3.10.5 Environmental and Social Mitigation Measures

According to the IFC, management programs and mitigation measures consist of operational policies, procedures and practices that address the identified impacts and risks. Management programs and mitigation measures should favor the avoidance and prevention of impacts over their minimization, mitigation and compensation, wherever technically and financially feasible. In the case where certain risks and impacts cannot be avoided or prevented, mitigation measures and actions should be identified in the Environmental Management Plan (EMP) so that the project operates in compliance with applicable laws and regulations. The dynamic nature of the project development and implementation process should also be recognized, so that the program is responsive to changes in project circumstances, unforeseen events and the results of monitoring.

The EMP, which is to be developed during the feasibility study as part of the Environmental and Social Impact Assessment, should include the following minimum requirements:

- A description of the Project proponent's organization, the responsibilities of each stakeholder in relation to the environment and how each actor must cooperate with each other to ensure that the works conform to environmental guidelines;
- The skills and training, which are necessary for the various stakeholders (responsible environmental liaison officer, Inspector, construction superintendent, workers, etc., including awareness training to be provided to all workers);
- The environmental requirements for the work site must include at least the following subjects:
  - Environmental monitoring and assessment;
  - Preservation of air, water and soil;
  - Ambient noise and vibration monitoring;
  - Biodiversity monitoring and management;
  - Respect of local communities and community engagement;
  - Transportation, traffic and infrastructure management;
  - Site remediation;
  - Waste management;
  - Health and safety plan;
  - Training of employees and relevant stakeholders;
  - Emergency plan in case of accident or spill.

3.10.6 Cost of Resettlement

It is critical to ensuring that potentially adverse social consequences of projects are identified, minimized, and mitigated.

Involuntary resettlement may cause severe long-term economic, social and environmental damage unless appropriate measures are carefully planned and carried out. Whenever feasible, involuntary resettlement should be avoided by exploring all viable options and designs before any action is taken to resettle people. In cases where involuntary resettlement cannot be avoided, A Resettlement Action Plan (RAP) should be prepared to minimize and mitigate its adverse social and economic impacts by providing sufficient investment resources to enable affected parties to share in project benefits.

3.10.6.1 Legal and Institutional Framework for Resettlement and Compensation

The Resettlement Action Plan needs to consider national laws, decrees, policies and regulations relevant to the resettlement activities associated with the project. It also provides an analysis of the gaps between these procedures and applicable international policies and standards in view of setting out the objectives and principles to be followed for the project. In general there is very little explicit treatment of involuntary resettlement, relevant to the preparation of a RAP, in the legal frameworks. However some laws and regulations regarding land acquisition and compensation do exist and vary from one country to another.

3.10.6.2 Compensation Framework

The impacts due to involuntary resettlement from development projects, if left unmitigated, often give rise to adverse socio-economic and environmental impacts. The World Bank's OP 4.12 is applicable where the project requires acquisition of land and/or where people may be affected by denial of access to and use of land for their social, economic, cultural and even spiritual undertakings. It is applicable even if all or some of the affected people may not be physically displaced as such.

According to applicable international standards such as the World Bank's OP 4.12, project-affected populations (PAPs) are all those who are directly affected socially and economically by the project activities. PAPs include individuals and institutions with various interests in the land that is to be affected by the project. They include all economically or physically displaced persons regardless of the total number affected, the severity of impact and whether or not they have legal title to the land. The World Bank's OP 4.12 stipulates that a Resettlement Action Plan (RAP) must prepared by the project proponent in order to address the needs of all physically and/or economically displaced persons, including those who may not be eligible for compensation or assistance under applicable national land compensation legislation.

The RAP, which sets out the commitments ensuing from the resettlement and compensation process, should be completed once public consultations have been carried out in order to incorporate the views and opinions of PAPs. The RAP should specify the method and forms for delivering compensation, depending on the assets to be compensated. Such methods include either in kind compensation or land-for-land compensation, especially for people and households who's livelihood are based on use of the land, or cash compensation for crops, structures, trees, etc., or a combination of one of these methods. The RAP should also specify

applicable compensation options for each category of eligible PAPs, including resettlement assistance and livelihood restoration activities.

Preparation and implementation of a detailed RAP in each of the concerned countries in conformity with applicable international standards involves a number of steps. These steps would take as their point of departure the results of baseline land use inventories and socio-economic surveys.

3.10.6.3 Eligibility

Defining eligibility is an essential part of the resettlement and compensation process. The World Bank defines categories of eligibility in terms of land ownership and severity of impact. Land ownership includes titled lands, lands held under customary and traditional rights and lands held under informal contractual rights. The severity of impact may range from minor to severe.

According to the World Bank's OP 4.12 and to applicable IFC performance standards, the eligibility to compensation of PAPs encompasses the following three groups:

1. Those who have formal rights or legal rights to land (including customary and traditional rights recognized under the laws of the country);
2. Those who do not have formal legal rights to land at the time the census begins but have a claim to such land or assets – provided that such claims are recognized under the laws of the countries; and
3. Those who do not have recognizable legal right or claim to the land they are occupying.

Persons falling under categories 1 and 2 must be compensated for loss of land and of other property and assets in accordance with the country's regulations. Persons falling under category 3 are not entitled to compensation but should receive resettlement assistance and other assistance as necessary when evicted from the land they occupy, if they occupy the land prior to the agreed to cut-off date for eligibility. All persons under categories 1, 2 and 3 are provided compensation for loss of assets other than land.

The World Bank's OP 4.12 and applicable IFC performance standards also require that fair compensation and/or livelihood restoration measures be provided to persons who are affected by the loss of natural resources – or of access to natural resources – that support their livelihoods. Such resources may for instance include fishing grounds, woodlands or pasturelands, marshlands, surface or groundwater resources or quarries.

3.10.7 Basis of Calculation and Value of Assets

Individual compensation of PAPs will be required for loss of:

- Residential buildings, structures or fixtures;
- Land;
- Cultivated crops (both cash and food crops), plants and trees (forest products);
- Productive activities such as fishing, business or employment.

There are no internationally accepted standards for the setting of compensation rates as they are not established by law but essentially guided by principles and generally accepted methods of calculation, and usually based on the set of compensation tariffs established at national level in each country. Countries concerned usually have policies, ministerial decrees or orders that set the value and tariffs for compensation of lands, crops and cultures and for housing and infrastructure in case of expropriation. People affected by expropriation losses must receive fair and just compensation. For the purpose of the compensation process, each affected country's order and/or decree will be examined and compensation will be based on land status and usage, as well as on official compensation rates established in each country. The process should also meet with the requirements of the World Bank's OP 4.12 concerning compensation, or which ever is higher between applicable national and international standards. As a general rule, in-kind compensation (or "land for land" compensation) is a preferred method of compensation in areas where livelihoods are heavily dependent upon the land. In such cases, financial compensation for lost land should be considered as a last resort. With regard to land and structures, "replacement cost" is defined by the World Bank's OP 4.12 as follows:

- For agricultural land, it is the pre-project or pre-displacement, whichever is higher, market value of land of equal productive potential or use located in the vicinity of the affected land, plus the cost of preparing the land to levels similar to those of the affected land, plus the cost of any registration and transfer taxes.
- For land in urban areas, it is the pre-displacement market value of land of equal size and use, with similar or improved public infrastructure facilities and services and located in the vicinity of the affected land, plus the cost of any registration and transfer taxes.
- For houses and other structures, it is the market cost of the materials to build a replacement structure with an area and quality similar to or better than those of the affected structure, or to repair a partially affected structure, plus the cost of transporting building materials to the construction site, plus the cost of any labour and contractors' fees, plus the cost of any registration and transfer taxes.
- In determining the replacement cost, depreciation of the asset and the value of salvage materials are not taken into account, nor is the value of benefits to be derived from the project deducted from the valuation of an affected asset.
- Where domestic law does not meet the standard of compensation at full replacement cost, compensation under domestic law is supplemented by additional measures so as to meet the replacement cost standard. Such additional assistance is distinct from livelihood support measures to be provided under other clauses in OP 4.12.

The RAP should include a compensation matrix, describing levels of compensation and the basis of calculations to be applied in each affected country, in the case of:

- **Loss of property:** compensation at replacement value, recognition of and compensation for usufruct and customary rights, compensation provided before eviction of property;
- **Loss of dwelling:** provision of a new dwelling, of at least equivalent standard, and before eviction; and/or

- **Loss of income:** compensation for temporary loss of income, improve or, at a minimum, restore standard of living.

The cost of the compensation needs to be taking into account in project cost.

3.10.8 ECONOMIC ANALYSIS

The purpose of the economic analysis is to:

- To provide an assessment of the economic viability of the project, taking into account the current load and supply conditions in the study region;
- To derive the economic indicators that will be used to assess the relative economic value of the project.

In order to meet above objectives, the approach has consisted in the following steps:

- Deriving the lifetime cost of the Project based on the key characteristics;
- Defining the value of power benefits based on avoided costs from the project (displaced) power generation option;
- Deriving the economic indicators of the project;
- Comparing the costs and the benefits of the project
- Carrying out sensitivity studies on key parameters to assess the impact.

In specific terms, the first step consists in summarizing all costs resulting from the implementation and operation of the project over its economic life, including the initial investment, the cost of all socioeconomic and environmental mitigation measures, the annual cost for operation and maintenance (O&M), insurance charges, interim replacement costs, and decommissioning. The Project direct benefits will also be defined in terms of the expected power output, and the unit cost of energy will be derived and compared for each one of the alternatives.

A review of the load-supply balance in the region power output needs to be carried out based on studies previously undertaken, with the objectives of:

- Identifying probable off-takers in the region, their projected demand and assumed willingness to pay, in order to get an appreciation of the market for the project output; and
- Reviewing the existing and committed supply, and identifying other sources of electricity available that could provide the same service as project in order to assess the avoided cost for these off-takers, which will be used as a proxy to put a value on the benefits estimated for the Project

The economic indicators will then be derived based on a comparison of the project costs, as previously defined, and the project benefits, estimated on the basis of the displaced (avoided) alternate generation costs, over the economic life of the Project. These economic indicators will include the Net Present Value (NPV), the cashflow, the Benefit/Cost (B/C) Ratio, the Economic Internal Rate of Return (EIRR) and the payback period.

Finally, sensitivity analysis will be carried out on the following key parameters to verify the robustness of the preferred solution from an economic perspective:

- Discount rate;
- Estimated value of power benefits (avoided costs);
- Fuel costs;
- Project investment cost;
- Energy (hydrology); and
- Firm capacity.

3.10.9 FINANCIAL ANALYSIS

The earlier chapters indicate whether the project being studied is technically feasible and the above subsection indicates whether it is economically viable from the point of view of the national economy. The next step is to assess whether it can be financed. This implies an assessment of:

- The amount of the investment that can be borrowed from various lenders,
- The costs of that borrowing
- The repayment conditions of the loan
- The amount that must be provided from the owner as owner's equity
- The operating and maintenance costs of the project
- The return available to the owner.

To carry out such an analysis, a financial forecast is required that uses as input all of the above assumptions. This forecast will provide an estimate of the profitability of the project under different assumptions regarding the selling price of the output of the project (electric power in the case of a hydroelectric power plant or amount of irrigation water available from an irrigation project.

In some cases, the profitability is not clear. As an example, a project installed for flood control has as a benefit the reduction of damages and loss of life. Putting values on these elements is nebulous at best.

International financing institutions are known for providing funds for projects in developing countries that have very low interest rates and long repayment periods, which make them very attractive as compared to local lending agencies. They, however, tend to have very stringent requirements for the derivation and presentation of cost estimates. Presented below is information that is helpful in discussions with such institutions.

3.10.10 COST ESTIMATES FOR LENDING INSTITUTIONS

3.10.10.1 Preparation of cost estimates

Detailed cost estimates can be prepared on specialized softaware such as COSTAB[2] or a spreadsheet software such as Microsoft Excel. COSTAB (Standard Project Cost Table) was

[2] COSTAB (Standard Project Cost Table) was originally developed by the World Bank in the early 1980s. ADB has updated the software to run in a Windows 2000 environment. This update will also allow COSTAB to run in Windows XP. The current version of COSTAB can be downloaded from www.adb.org/Projects/costab.asp.

originally developed by the World Bank in the early 1980s. ADB has updated the software to run in a Windows 2000 environment. This update will also allow COSTAB to run in Windows XP. The current version of COSTAB can be downloaded from www.adb.org/Projects/costab.asp. COSTAB has been specifically designed to generate project cost tables, financing plans, and disbursement tables.

Therefore, the use of COSTAB ensures that the presentation of the cost estimates meets ADB requirements for project preparation and appraisal. It also ensures that the various calculations required for the preparation of the costs, such as contingencies and interest and other charges during construction, are undertaken correctly. However, COSTAB does not provide the flexibility of Excel to prepare project specific tables and other outputs that may be required. This may be a particular disadvantage in preparing non-traditional projects, such as those financed under ADB's multi-tranche financing facility and its private sector financing window. Although COSTAB can generate output in Excel format, only the output values are exported to Excel. This can limit the ease in linking the cost estimates to other spreadsheets used for project preparation, such as the project entity financial projections. Furthermore, because COSTAB was originally designed on a DOS platform, even in its updated form, it is less user-friendly than Excel. For these reasons, a well-designed Excel based cost model can be superior to COSTAB, particularly for non-traditional projects. However, the use of COSTAB does provide an assurance that the calculation and presentation of the cost estimates will be undertaken properly and in accordance with ADB requirements.

These programs, for the purposes of lending agencies need to take account of financial charges during implementation. These comprise all financing charges during the project implementation period on loans or other forms of credit extended by ADB and by cofinanciers to an ADB financed project. At a borrower's request, ADB may finance interest during construction (IDC), and the ADB loan will include an amount corresponding to the interest and other charges payable by the borrower to ADB and cofinanciers during the construction of the project. IDC financing is not available for policy-based lending that does not involve project components or project construction periods. Each of these financing charges is discussed below.

Interest. IDC can be applied to project loans, sector loans, supplementary loans, the investment component of sector development program loans, and loans to development finance institutions. IDC is calculated on the basis of the maximum of: (i) the rate of relending to the project entity; and, (ii) the rate of interest applied by ADB and by cofinanciers, if any. Interest expense incurred during the construction period is considered to be a project cost regardless of whether it is paid by the project entity in each current period or capitalized. However, IDC should be calculated only up to the point at which the constructed facilities are anticipated to be completed and begin to produce benefits. At this point, interest becomes an expense charged against current operations. IDC is not necessarily charged over the full project implementation period because certain components within a project may enter service prior to the completion of the overall project.

In the case of ADB's London Interbank Offered Rate (LIBOR)-based lending from its ordinary capital resources for loans approved or negotiated on or after 1 October 20079, the interest rate should be taken as the LIBOR rate corresponding to the project implementation period plus the standard ADB spread of 0.20% (20 basis points). Therefore, given a typical project implemented over a five year implementation period, the appropriate rate to be applied would be the 6-month forward LIBOR rate for the next 5-year period plus the ADB spread less the sub-LIBOR rebate where applicable. The rates were maintained by the Treasury Department and found at the following:

www.adb.org/Documents/Brochures/Libor/indicative_rates.pdf

For the purposes of the cost estimates, IDC can be calculated on the basis of the average outstanding loan balance in each year over the project implementation period. The average outstanding balance can be estimated as the average of beginning year and ending year loan balance. Where IDC is capitalized, the loan balance would include the original principal drawdowns as well the capitalized interest from prior periods. The calculated as follows:

$$IDC_t = \frac{B_{t0} + B_{t1}}{2} \times i$$

Where:

IDC	=	Interest during construction in Year t
B_0	=	Loan balance at beginning of Year
B_1	=	Loan balance at end of Year
i	=	Interest rate

Total IDC is the sum of the annual IDC over the project implementation period. In cases where the proceeds of a foreign currency ADB loan are relent to the project entity in local currency at an interest rate exceeding the rate on the ADB loan, there is both a foreign exchange and local currency component to IDC. Total IDC is calculated on the relending rate.The foreign exchange component is the rate applied by ADB. The local currency component is the difference between total IDC and the foreign exchange component.

Front-End Fee. ADB normally charges a front-end fee of 1% on its ordinary capital resources loans to cover the administrative costs incurred in loan origination. This represents a one time fee paid by borrowers once loans become effective. ADB has waived 100% of the front-end fee since 2004. On December 2007, ADB Board of Directors approved the elimination of front-end fees. For the purpose of this technical note, which may also be used as guidance in 9 As defined in Treasury Department Memorandum dated 7 December 2007, Revised Loan Charges for OCR Sovereign Loans. reviewing PCRs, the front-end fee, where applicable is calculated on the total loan amount, which includes the front-end fee.

Therefore, the fee was previously calculated as follows:

$$FEF = \frac{L_x}{1 - FE} - L_x$$

Where:

FEF	=	Monetary amount of front-end fee
L_x	=	Loan amount excluding front-end fee
FE	=	Front-end fee as a fraction of 1.00; therefore 1% fee expressed as 0.01

Commitment Fees. ADB applies a commitment fee on undisbursed loan balances. Program and project loans negotiated on or after 1 October 2007 will be charged a commitment fee of 0.15% (15 basis points). For the purposes of the cost estimates, the undisbursed balance can be estimated as the average of the projected undisbursed balance at the beginning and end of each year over the project implementation period. On this basis, the estimated annual commitment fee is calculated as follows:

$$CF = \frac{U_{t0} + U_{t1}}{2} \times R$$

Where:

CF	=	Commitment fee
U_0	=	Undisbursed loan balance at beginning of Year
U_1	=	Undisbursed loan balance at end of Year
R	=	Rate

The total commitment fee is the sum of the annual commitment fee amounts due over the project implementation period. In the case of ADB LIBOR-based loans, the commitment fee is considered a foreign exchange cost.

Premium on Cap and Collar. Should the borrower purchase a cap or collar, either on the ADB loan or on loans from cofinanciers on ADB funded projects, the estimated premium payable, if any, is to be included in interest and other charges during construction. As for IDC, the estimated premium amount for each year over the project implementation period is calculated on the basis of projected average outstanding loan balance. This average balance can be estimated as the average of the beginning and ending balance in each year.

Exchange Rates. Unless otherwise instructed by EREA, cost estimates should be prepared under the assumption that exchange rate movements are determined entirely by the purchasing power parity (PPP) theory. Given this assumption, the annual change in the rate of exchange between the domestic and foreign currency is the same as the ratio of the domestic and foreign

inflation rates. For example, if the foreign inflation is 4% while the domestic rate is 7%, purchasing power parity is maintained if the domestic currency depreciates against the foreign currency as follows:

$$\left[\frac{1.07}{1.04}\right] - 1 = 2.9\%$$

Given PPP, the projected exchange rate in each year over the project implementation period is calculated as follows:

$$ER_{t+1} = ER_t \times \left[\frac{1 + D_{t+1}}{1 + F_{t+1}}\right]$$

Where:

ER_t = Exchange rate in Year t

ER_{t+1} = Exchange rate in Year t+1

D_{t+1} = Domestic inflation in Year t+1

F_{t+1} = Foreign inflation in Year t+1

The inflation rates to be used should be those maintained by EREA and posted on the intranet site at the following:

http://lnadbg1.asiandevbank.org/erd0004p.nsf/

Projecting future exchange rates on the basis of PPP may not be appropriate in all cases. Exchange rates often do not move precisely in line with PPP, particularly over the shorter-term. PPP is based on the assumption that goods and services are tradable between countries, but project inputs actually consist of a mix of tradable and non-tradable goods and services. The theory also assumes that exchange rates are entirely market determined, but exchange controls and other forms of currency management by governments and their central banks limit the role of the market in determining rates. As a result, inflation rate differentials often do not fully determine exchange rate movements.

Inflation. Cost estimates should be prepared in nominal terms, taking into account the potential impact of domestic and international inflation and foreign exchange gains and/or losses which may occur as a result of projected exchange rate fluctuations.

3.10.10.2 Review of Estimates

If the base cost estimates are prepared by borrowers and/or Project Preparatory Technical Assistance (PPTA) Consultants, they should be carefully reviewed by staff. The quality and reliability of these estimates can vary widely. Significant variations between costs estimated at appraisal and those actually incurred have been a major issue in ADB operations for years. A 2004 study of ADB projects completed since 1995 indicated that 35% had cost underruns of at least 20%, while 9% had cost overruns of at least

20%.8. The same study found that an inaccurate estimation of base costs was cited by one third of the Project Completion Reports (PCR) as a reason for cost underruns.

The base cost estimates need to be prepared using actual market prices for the various project inputs prevailing at the time of preparation. Where possible, unit cost estimates should be checked against contract prices for ongoing or actual projects. While such information is generally available in larger countries for basic infrastructure projects, it may be less available in smaller countries or for less typical projects. Where contract prices are available, staff may need to assist PPTA consultants in accessing this information.

A particular cause for concern is when unit cost estimates are based on standard rates, prescribed by government or other authorities, because these may vary significantly from actual prices. Country specific factors may also create a bias toward the over or underestimation of costs. For example, in countries where the budgetary process for addressing cost overruns is complex and/or lengthy, there can be a bias toward cost overestimation. There can also be a bias toward the overestimation of base costs by PPTA consultants because there is a tendency to view overestimates as creating less project risk than underestimates. Therefore, base costs should be reviewed to assess whether they may actually incorporate an implied physical contingency allowance.

The projected expenditure profile should also be carefully reviewed to ensure that it reflects a realistically achievable implementation program. Reviewing the actual experience of past and ongoing projects funded by ADB or other donors provides one basis for such a review. In general, there is a bias toward the preparation of implementation schedules that are optimistic relative to actual experience. Expenditure profiles based on overly optimistic implementation schedules can result in an underestimation of the price contingency component of total project costs. This will also create project administration issues if actual loan or grant disbursements significantly lag behind the projected disbursements prepared at appraisal.

3.10.10.3 Presentation of Estimate

Cost estimates in the main body of the feasibility study report are to be summarized and must include the following:

- Cost components (i.e., Irrigation Component, Agriculture Extension Component, Project Management Component, etc.,).
- Contingencies. Presented separately by physical and price contingencies.
- Part C–Financial Charges during Implementation. Presented as a single line item incorporating all applicable financing charges during project implementation.

Only total costs should be shown in this summary table. There is no requirement to present the breakdown between foreign exchange and local currency costs in this table. Footnotes to the table should be provided indicating the basis for the cost estimates, the amount of taxes and duties included in the local currency costs, the assumptions used to compute physical and price contingencies and the basis for computation of interest and other charges during construction. Appendix 3 provides a sample.

As taxes and duties are a cost expenditure category, rather than a specific component, they should not be presented in the main table but should be disclosed by way of a footnote.

In addition to the summary cost estimates in the main body study report, more detailed cost estimates should be presented in a core appendix of the report. To ensure that the detailed cost estimates provides additional and meaningful information to the reader of the report, they should be presented by expenditure category (civil works, equipment, land acquisition, consulting services, taxes and duties, etc.). Categories used in the detailed cost estimates should directly correlate to the disbursement schedules—Schedule 3 in the loan agreement and Schedule 2 in the grant agreement. In addition, the costs should be presented in both domestic currency units and their USD equivalents to enable the reader to track cost estimates to the financial projections and/or Financial Internal Rate of Return computation, if applicable. Footnotes are not needed for the appendix, as the information has already been provided in the main body of the report.

For the detailed cost estimates, taxes and duties are treated as an expenditure category and therefore must be presented as a separate line item within the total base cost line.

3.10.10.4 Other Presentation Requirements

Detailed cost estimate tables, either produced by COSTAB or standalone project specific Excel spreadsheets should be attached to the Project Administration Memorandum. The Mission may also wish to make these available by way of Supplementary Appendix.

These cost estimates, and the models used to prepare them should be retained as part of the official project preparation documentation. Digital copies of relevant Excel models and COSTAB files and printouts should be retained on CD ROM in the project files and should be available to support project implementation, PCR preparation and Project Performance Audit Report preparation.

3.11 CONCLUSION AND RECOMMENDATIONS

The feasibility study of a project assesses the requirements and impacts of the project through detailed technical studies. The social and environmental sustainability is assessed in parallel and planned through surveys, environmental management plan and resettlement action plan. Base on the collected information and performed studies, a development plan will be developed as in the case of the local development plan mentioned previously. Finally, the feasibility study also assesses the economic viability of a project through the analysis of the project costs.

The feasibility study should end with a set of conclusions and recommendations that reflect the above and also provides a “way forward” or implementation plan. This should indicate, year by year:

The action required at a detailed level (e.g. ‘begin detailed design,” “complete detailed design,” “begin negotiations with lenders,” “issue request for tenders for transformers,” ”sign contract for civil works”).