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List of abbreviations

ALARA	As low as reasonably achievable
CBA	Cost benefit analysis
CVM	Contingent valuation method
DENR	Department of environment and natural resources
ECA	Environmentally critical areas
ECP	Environmentally critical projects
EIA	Environmental impact assessment
MCA	Multi criteria analysis
NEDA	Netherlands Development Assistance
TCM	Travel cost method
ToR	Terms of Reference

1. INTRODUCTION

The Netherlands Embassy in the Philippines requested on June 18, 1998 the Netherlands Commission for Environmental Impact Assessment (the Commission) to prepare an advise on (generic) Guidelines for environmental impact assessment of land reclamation projects in the Philippines (see appendix A). The Government of the Philippines (Department of Environment and Natural Resources / DENR) requested the Commission to incorporate the draft ToR[1]], prepared by DENR, into the advice of the Commission.

This request for advice can be considered as a follow-up activity of an advice of the Commission on three project proposals in Wider Manila bay area which has been submitted to the Netherlands Embassy in the Philippines on 11th of May 1998. With respect to the guidelines project the Commission recommended to include the following sections in the guidelines document:

A) guidelines on environmental impact assessment of land reclamation projects;
B) information on so-called "good practice" in land reclamation projects;
C) additional sections, in the form of checklists, reviews and technical notes that can be added as and when required.

The objective of the advice is:

- to provide guidelines for managing and executing environmental impact assessment of land reclamation projects in the Philippines (section A). A distinction is made between guidelines for an EIA on site selection and guidelines for an EIA at project level;
- to provide an outline for specific guidelines for evaluating environmental aspects and socio-economic aspects for the following activities: land reclamation by filling, drainage or poldering, dredging of bottom materials, mining of materials on land. An outline for these guidelines have been presented in appendix E but these have to be elaborated, by the consultant responsible for the finalisation of the guidelines document, before they can be applied.

In the Philippines land reclamation projects are nearly always located in coastal areas which are sensitive for the impacts of such a project. An EIA on site selection offers the opportunity to study the impacts of land reclamation for different sites (more or less sensitive to impacts) and therefore this type of EIA gives more added value to the decision making process than an EIA at project level. For this reason guidelines on EIA for site selection have been elaborated in this advice.

This advice has been prepared by a working group of the Netherlands Commission for EIA in close collaboration with DENR, who will be the main user of the guidelines. The composition of the working group is presented in appendix B. For the preparation of this advice use has been made of a number of documents, see the list of references.

2. SCOPE AND AIM OF THE GUIDELINES

2.1 Aim and usage of the guidelines document

Users of the document

This document provides assistance in preparing EIAs for land reclamation projects for:

- competent authority / government personnel occupied with the coordination and coaching of parties which are responsible for the EIA procedure, the execution and review of the EIA study and the report, and the coordination of the involvement of the stakeholders including the public (beneficiaries as well as non-beneficiaries), see section 3 and 4, and appendices C, D, E, F and G;

1 Department of Environment and Natural Resources (February 16th, 1998): Terms of Reference. Development of guidelines for environmentally and socially acceptable reclamation projects in coastal and lakeshore areas.

- proponent; It is assumed that the proponent is familiar with the existing procedures of the EIA system in the Philippines, see section 3, 4, and 5, and appendices D, E, F and G;
- parties (consultancy firms, universities etc.) which are responsible for the execution of the EIA study and the preparation of the EIA report, and the participation of stakeholders, see section 4 and 5, and appendices C, D, E, F and G.

Type of EIA
This document provides guidelines for the following two types of EIA studies:
- EIA for site selection and;
- EIA for project level.

These EIAs should be applied respectively for decisions on selection of a number of potential sites for land reclamation / dredging and for the design of the land reclamation projects.

Outline of this advice
In section 3 of this advice the common environmental and social impacts caused by land reclamation projects are described. Section 4 provides guidelines on planning and managing of the EIA process. In section 5 guidelines are provided for the execution of the EIA study for site selection and project level. Although these sections are already tailored to land reclamation projects, more detailed information and guidelines on specific environmental and socio-economic aspects of land reclamation projects are provided in the attached series of appendices. This structure will allow for easy selection of only the project relevant guideline components. In addition it will simplify future updating and enclosure of new information based on practical experience with both this guidelines document as well as land reclamation projects.

2.2 Defining land reclamation

Land reclamation is defined as:
- an activity aiming at the change of a permanent open water body (sea, lakes, rivers, estuaries, lagoons) or areas which are temporarily / seasonally flooded by water (tidal areas, flood plains, marshes, swamps) into permanent land.

The following activities, with respect to land reclamation are considered in this advice:
- **reclamation of land by filling**; (sand, clay, rocks, waste material etc. from borrow areas are transported and deposited at the area to be reclaimed), e.g: construction of land adjacent to the coast, construction of an island in open water, construction of abutments for a road or railway;
- **reclamation of land by drainage**; e.g. dewatering of lakes and other water bodies or parts of water bodies;
- **reclamation of land by poldering**; e.g. construction of dikes, dams, sluices and drainage systems.

An outline for guidelines for these different type of activities are provided in appendix E. These guidelines are strictly related to selection of the site / location for reclamation and the borrow areas and design of the reclaimed land.

It will be clear that at the reclamation area and its direct surroundings, environmental and social impacts are to be expected. The effects of the transformation of a water area into a land area can be directly related to the reclamation works. In addition, the future function / destination of the area may have serious consequences for the environment as well. Known examples of possible functions for newly created land include: city development (construction of large numbers of offices, public facilities and houses), an airport, an industrial area and or recreational area, etc. The environmental and social impacts linked to the future function should form part of the EIA study. However, in view of the wide variety of possible functions or destinations, no function-related guidelines have been included in this advice.

In case of reclamation by filling, environmental and social impacts may also be caused in the so-called borrow areas and along the transport route of the fill materials. This can be land based, e.g. one or more borrow areas on land (sand, gravel or stone quarry areas), but fill materials can also be extracted from the aquatic environment, e.g. off shore sand and gravel dredging. An outline for specific guidelines for dredging, land mining of fill materials and transport of dredged materials have been included in this document as appendix E.

In the specific guidelines for land reclamation projects as presented in appendix E, a distinction is made between the following types of areas:

- Fresh water areas, all open water bodies containing fresh water, such as: natural / man made lakes, rivers and canals, reservoirs, wetlands.
- Saline or brackish water areas, all open water bodies containing saline or brackish water which are subject to the tide, such as: open sea, tidal flats (mangrove areas, lagoons), estuaries and coastal wetlands.

This distinction is made because abiotic and biotic processes in these systems may react differently to impacts of the activity. In the Guidelines document the different types of areas and the consequences for the EIA study should be addressed.

3. ENVIRONMENTAL IMPACTS CAUSED BY LAND RECLAMATION

This section highlights some of the common environmental and social impacts caused by land reclamation projects.

3.1 Land reclamation by filling

The two most common methods for retrieval of fill material sediments in the borrow area are:

- Dredging of a deep pit by a suction dredger. This method influences only a limited bed surface area. The specific environmental impact is the development of a salinity or temperature induced stratification in the pit. This stratification may lead to anaerobic conditions in the deeper parts of the pit. Under certain circumstances the anaerobic layer may be mixed with the overlying water reducing its oxygen content. The influence of this phenomenon normally is restricted to the immediate surrounding of the pit.
- Dredging a 1-2m thick sediment layer from the sea bottom by a hopper dredger. This method affects a much wider area. Normally the top bed layer comprises the highest concentration of species and biomass. This so-called life layer will be removed in the dredged areas. This is a temporal and local effect; after some time it is possible that the environmental conditions and the associated flora and fauna will be restored by recolonisation.

As a consequence of dredging important fishing and or spawning areas may be destroyed. A common problem is the dispersal and settlement of resuspended sediments on sensitive aquatic ecosystems like coral reefs and sea grass areas, as a consequence of nearby dredging operations. Depending on the scale of the effect the reef structure may be damaged irreversibly. Serious problems may also result from dredging in an estuary if it permits the salt wedge intrusion to travel higher upstream than previously. A shift of the salt wedge may lead to changes in the characteristics of the bankside wetlands as well as in river ecology.
Depending on the location of the borrow area, dredging can result in increased shoreline wave action with consequent accelerated erosion of the coast. This may seriously influence the structure of the coastline and consequently the capability of the coast to protect the hinterland against storms and waves.

The transformation of water into land at the reclamation site will lead to a complete loss of the existing ecological functions and values of the area, which may be serious in case of specific values (e.g. coral reefs, mangrove forest, seagrass areas, spawning or nursery areas, wetlands, fishing areas, etc).
During the reclamation works water quality at the site will be affected in the same way as at the dredging site (resuspension and dispersion of sediments).
The newly developed land will change the coastal currents with possible effects on sedimentation and erosion processes and coastline development. In addition ground water flows may alter.

3.2 Land reclamation by drainage

Also in this case the transformation of water into land will lead to a loss of the existing ecological and social functions and values of this area, e.g. fresh water fisheries and existing wetlands may be lost.
Land reclamation by drainage will result in a land area with its surface level at or below the former bottom level. This will be lower than the surrounding land areas and will have an impact on ground water flows both in and surrounding the reclamation site. In addition, soil-compacting processes in and around the reclamation area will take place with possible effects on existing constructions.

3.3 Land reclamation by poldering

Land reclamation by poldering is a mix of the other two forms of land reclamation. After construction of a dike (e.g using dredged materials) the enclosed area will be drained. Consequently the effects of reclamation by poldering can comprise elements of the other two types of land reclamation.

4. PLANNING AND MANAGING THE EIA PROCESS

The purpose of this chapter is to provide guidelines for the competent authorities to manage the EIA procedure and process.

4.1 Screening, type of EIA required

Screening is the process to determine whether a proposal, project, plan or programme requires an EIA and if so at what level.

! Is an environmental impact assessment required?

In the Philippines EIA system projects are categorized as: environmentally critical projects (ECPs) and projects located in environmentally critical areas (ECAs)[2]], see appendix C for a list of these two categories. According to the list of ECPs an EIA must be executed for:
- major mining and quarrying projects and
- major reclamation projects.

Due to the characteristics of land reclamation projects these projects are nearly always located in ECAs. In most cases the process starts with the development of a master plan (e.g. coastal zone or river development plan). On basis of this plan decisions are made with respect to the necessity, the site selection and size of the land reclamation projects. If the site and size are determined a more project specific design study will have to be executed.

! The question arises: What is a major reclamation project?

A major reclamation project is to be understood as a project with significant impacts on local hydrological, ecological and socio-economic patterns and according to DAO 96-37 those projects involve areas equal to or exceeding 25 hectares. For reclamation projects involving less than 5 hectares, an Initial Environmental examination is required. For reclamation projects involving 5 to 25 hectares an EIA is required but processing is done by the region.

As stated before the following two types of EIA can be distinguished;
! EIA for site selection; This type of EIA should be executed in those cases where there are site alternatives for land reclamation and in those cases in which the site has not yet been determined and decided upon;
! EIA for project level; This type of EIA should be executed for all land reclamation projects in case the site has been determined already.

These types of EIA should be applied sequentially. In case a site has been determined, the selection of this site should be justified in the project EIA.

In case an EIA for site selection has been executed properly and the site has been selected only limited additional information has to be gathered and analysed for the execution of a project EIA for the selected site.

2 An Environmentally critical project is one that has a high potential for negative environmental impacts.
An Environmentally critical area is an area that is considered ecologically sensitive. The Commission is of the opinion that the criteria 50 percent coralline cover for the selection of coral reefs as an ECA should be adapted towards 10 percent coralline cover because coral reefs with this coverage are internationally assessed as valuable and sensitive.

4.2 Timing and tuning of EIA and other (planning)studies

In general, the added value of an EIA (independent on the type of EIA) is potentially larger if:

- **!** An EIA study is executed as early as possible in the decision making process.
  This is caused by the fact that a lot of partial and informal decisions are taken during the planning process. Due to these decisions the opportunities to incorporate alternative solutions, which can be developed in the EIA study, decrease as the process proceeds.
- **!** An EIA study is executed in connection with other relevant studies that are made in the course of the decision making process, e.g. master plan or feasibility study.

Guidelines for tuning of EIA and other (planning) studies:

- the terms of reference for the execution of the EIA study and other studies must be tuned;
- it is advised that one person or one committee is responsible for co-ordination between the EIA study and other studies;
- the study teams working on the different studies will have workshops on a regular basis in which ideas, suggestions and findings are exchanged and discussed;
- the planning of the EIA study and other studies must be co-ordinated;
- the results of the EIA study and other studies are preferably published in one report, or if that is not feasible, be properly co-referenced;
- the results of the EIA study and other studies must be published in a summary which should be easily accessible to the public both in terms of readability of the contents and of distribution.

4.3 Scoping

Scoping is the process in which it is determined which information should be gathered and analysed in the EIA study. Scoping is necessary because:

- **!** the guidelines are generic and therefore they are not site and project specific. Scoping can help in the preparation of site and project specific terms of reference for the EIA study;
- **!** if scoping is executed properly only essential / relevant information will be gathered, analysed and assessed, thus saving time and money.

The principle of scoping is explained with an example in table 1.

To prepare site and project specific guidelines for the EIAs the guidelines in the Guidelines document should be used as a starting point for scoping.

Table 1: The principle of scoping

Project 1: A land reclamation project by filling to create e.g. an 500 ha area for city development. The fill material will be dredged at sea. The dredging area occupies more than 1500 ha. Project 2: A land reclamation project by filling to create a 300 ha area for waste disposal and future park development.			
Areas	Item	project 1	project 2

Reclamation area including affected areas	**Reclamation works:** - baseline environmental conditions - baseline social conditions - functions of the water area - construction methods - type and quality of the fill materials - planning of the works in time - etc.	yes	yes
	Presence of new land: - drainage aspects - water currents and quality - sedimentation and erosion processes - etc.	yes	yes
	Function of new land: - city planning - sewage systems - transport links (road, rail, water) - ground water quality and usage - capping and after care - air quality - etc.	 yes yes yes yes no no	 no no no yes yes yes
Borrow / mining area including affected areas	**Mining / dredging works:** - baseline environmental conditions - functions of the water area - water currents and quality - etc.	yes	no

4.4 Agency and public involvement and the role of non governmental organisations

The Philippines EIA system emphasizes the importance of public participation and a transparent EIA process in gaining understanding and achieving social acceptability for a project. The general guidelines[3]] on public participation and social acceptability should also be applied for land reclamation projects. According to DAO 96-37 (p.7-4) stakeholders to be involved concerning reclamation projects are the following:

- persons living or working within or adjacent to the identified impact/study area;
- persons within the peripheries of the impact/study area.
- persons with properties in the impact/study area.
- local government with jurisdiction over the project site;
- governmental organisations with concerns in the project site;
- indigenous communities present in the area;
- interest groups operating in the area;
- local institutions (church, school);
- community leaders;
- persons or groups representing the future generations of stakeholders;
- other relevant members of the public who may be indirectly or potentially affected and / or have been traditionally excluded from these consultations such as women, the elderly, youth etc.

3 Department of Environment and Natural Resources (January 1997): Procedural Manual for DAO 96-37.

5. EXECUTING THE EIA STUDY FOR SITE SELECTION AND PROJECT LEVEL AND PREPARING THE EIA REPORT

The purpose of this chapter is to provide guidelines for EIA practitioners like institutes and consultancy firms as to the information to be gathered and how to structure this information.

5.1 Introduction

This section provides:
- guidelines for the execution of an EIA study for site selection and;
- guidelines for the execution of an EIA study at project level.

Most of the guidelines presented in this chapter can be applied for both types of EIA because these cover the methodology to execute an EIA for land reclamation. If the guidelines are specific for one of the two types of EIA this is shown in the layout by a heading.

In appendix D a draft table of contents for the structure and presentation of the EIA report is presented which can be used for both types of EIA.

5.2 Description of the intended initiative

The purpose of describing the intended initiative is to enable determination of potential impacts (the mitigating measures and possibly alternative solutions).

EIA for site selection
The proposed sites must be described and the following issues have to be addressed:
- location of land reclamation site;
- location of borrow areas;
- location of temporary stock pile areas.

Additional information and guidelines for specific information to be gathered should be elaborated in the Guidelines document.

EIA at project level
It must be described on basis of which information the site(s) for land reclamation have been selected. If a site selection EIA has been executed the justification can be limited. If a site selection EIA has not been executed it should be justified on basis of which information / criteria the site has been selected and the role that environmental issues played in the selection. The proposed activity must be described by its different components and related activities. Additional information and guidelines for specific information to be gathered is presented in appendix E.

5.3 Project problems and objectives

The purpose of describing the problem analysis and objectives is to assess if the proposed activity does solve the observed problem and to assess if the project objectives will be achieved.

Problem analysis
In the EIA report the problems which are assumed to be solved by realisation of the project should be stated in clear terms and the underlying causes should be analysed.

Project objectives
The EIA report must contain a clear definition of the objectives of the proposed activity to enable identification and formulation of alternatives and to furnish criteria for monitoring and evaluation.

These objectives should logically ensue from the problem analysis, mentioned in the preceding section. Objectives should be formulated in such a way that identification of alternative initiatives – meeting the same objectives – remains possible. Finally, the objectives should be specific and if possible quantified.

5.4 Legal and administrative framework

The purpose of describing legislation, regulations and policies is: (i) to check if the intended initiative with this complies and (ii) to get insight in the opportunities and constraints concerning the development of alternatives.

5.4.1 Legislative and regulatory considerations and policies

The EIA report must describe national laws, rules, regulations and policies governing the proposed activity and if relevant international conventions and regulations. These include the following:

- policies, legislation, regulations and standards on environmental quality (water, soil, air, noise and solid waste), health and safety, protection of sensitive areas (at regional and / or local level) and land control or land administration[4]];
- EIA laws and regulations related to the proposed activity;
- a description of policies on the development of the selected site;
- a description of existing and proposed programmes for physical planning and management.

An outline of environmental standards is provided in appendix F.

Furthermore, an assessment of the probability of compliance of the intended activity with the existing national legislation, regulations and policies, and if relevant international conventions and regulations should be executed.

5.4.2 EIA procedure and institutional capacity

The EIA report must give a clear description of the legal and administrative framework on the national and local level, including competent authorities directly involved in the execution of the project and in the control of the executed works. The authorities responsible for the management of the project area have to be described as well. A description of the procedures to be followed in preparing the EIA report for DENR is presented in the Procedural Manual for DAO 96-37 of the Philippines Department of Environment and Natural Resources.

5.5 Development of alternatives

The purpose of describing the development of alternatives is to investigate any potential alternative sites or design alternatives that may present environmentally more friendly (or socially acceptable) solutions.

EIA for site selection

Site or location alternatives for the following issues should be developed: location of land reclamation site, location of borrow areas on sea or on land and location of temporary stocking areas.

EIA at project level

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4 The following laws, rules and regulations apply during the selection of reclamation sites for saline and fresh water areas:

- PD 389 (1974): Retention of 50-metre wide strip of mangrove forest cover as permanent forest facing the sea and other water bodies for coastline protection;
- PD705 (1975): retention of 40-metre wide strip of mangrove forest along river embankments and of 100-metre wide belt facing the sea for coastline protection;
- CIR 13 (1986): Prohibition of processing of application for land within mangrove and other forest reservation areas.

Alternatives should be developed concerning the design of the borrow-, the reclamation-, the stocking site and the mode of transport.

5.5.1 Step 1: Search for potential alternatives

The purpose of this step is to develop on headlines all potential alternatives.

The search process starts with the exploration of a range of all potential alternatives. The scope for development of potential alternatives is often limited according to the proponent or competent authority. Frequently, this is a result of a limited problem analysis or political / policy constraints. Despite these problems it is worthwhile to investigate alternatives which could solve the identified problem and achieve the objectives in another, more sustainable way.

Therefore, the problem(s) and their underlying causes to be solved should be analysed thoroughly. This process mostly results in a lot of partial solutions, called variants, for different parts of the activity. These variants should be put together into a full-fledge alternative.

The potential alternatives should be reviewed on the basis of the following criteria. They should:
- solve the identified problem;
- achieve the objective of the proponent (assessment if the objective is not too narrowly defined);
- cover the total range of possible solutions.

At least the following two alternatives must be elaborated:
- The preferred alternative or the intended activity which is developed by the proponent. In most cases it offers a direct and financially attractive solution towards achieving the objective based upon the principle of best practical means.
- The reference situation is used as a basis for the description of the existing state of the natural environment and socio-economic environment and as a reference for comparing impacts of the alternatives elaborated.

It is recommended to develop a so-called alternative most favourable for the natural environment.

Box 1: Characteristics of the alternative most favourable for the natural environment

In some countries e.g. the Netherlands and New Zealand it is legally obligatory to develop an alternative most favourable for the natural environment. The development of such an alternative may stimulate the government and the consultancy firms involved in their creativity. The characteristics of this alternative are as follows:
- it should contribute maximum to sustainable development;
- it should be a realistic and a full-fledge alternative;
- the ALARA principle should be applied, which means that emissions / impacts are as low as reasonable achievable;
- the Wise Use principle should be applied.

5.5.2 Step 2: Selection and elaboration of alternatives to be studied

The purpose of this step is selection of a number of potential alternatives and elaboration of these alternatives.

Promising alternatives must be studied more in detail in the EIA study. Therefore, a limited number of potential alternatives should be selected. For the selection use can be made of the following criteria. Alternatives to be selected must:
- not be conflicting with national and international laws and regulations;
- be realistic from a technical point of view;
- be economically feasible;
- socially acceptable;

- environmentally sound;
- differentiate sufficiently (discriminating potential).

The selected alternatives must be elaborated at the same detail as the preferred alternative in order to enable full comparison.

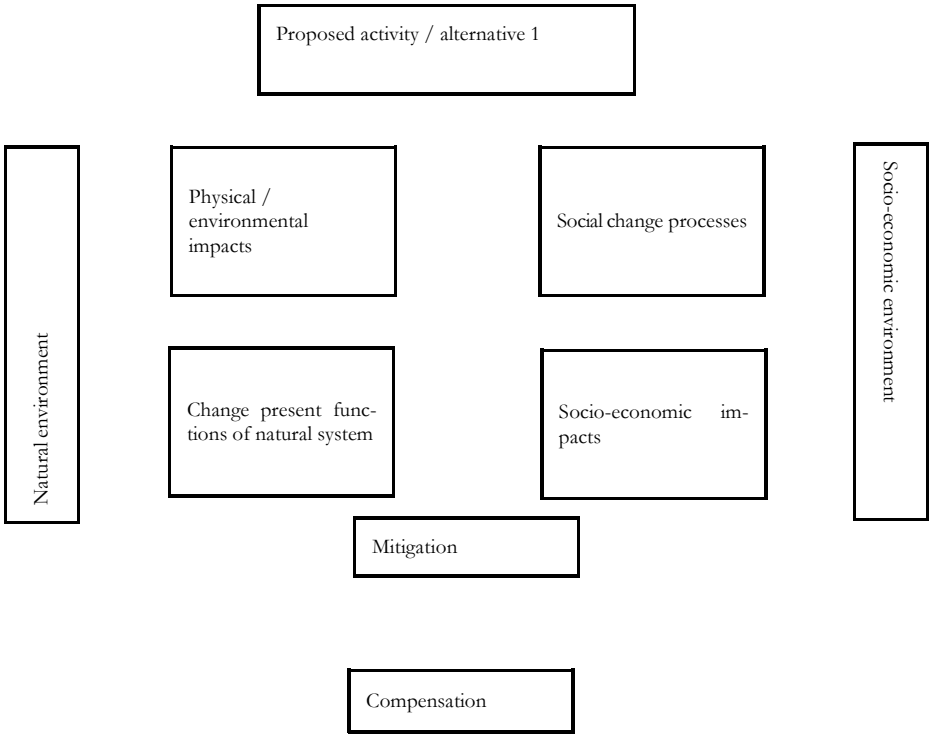
5.6 Method for impact determination / analysis

In this section guidelines are provided for a method to determine impacts of the alternatives studied, a step by step approach, see figure 2 for the conceptual framework. It is recommended to make use of the function value method to determine the impacts. A subject of this method is valuing which is explained in section 5.7. In appendix G this method is explained more extensively.

Function value evaluation method
It is recommended to make use of the function evaluation method to determine and value the impacts of land reclamation projects. The function evaluation method identifies functions of the natural system from an anthropocentric point of view and categorizes them into four categories of functions:
Production functions are limited to those goods that are produced by nature and for which man only needs to invest time and energy to harvest them (e.g. wood from a forest, fish from the sea and sand from a borrow area). So cultivated plants and animals are not included.
Carrier functions are related to a space and substrate that is suitable for certain activities and for which there may be a demand (e.g. agriculture, housing, water transport). In this sense nature also requires space.
Regulation functions relate to the maintenance of life support systems. The interactions between biotic and abiotic components result in complex processes which influence conditions for life (e.g. flood protection, water retention). These functions are often not recognised until they are disturbed.
Information functions relate to opportunities for spiritual enrichment, cognitive development and recreation. Although it is often very difficult to measure or quantify the value that is derived from these functions. It is important to realise that the world's largest economic sector, tourism, is largely based on this function (i.e. man's appreciation of nature and landscape).

This method identifies the users groups and attributes economic, social and ecological value to the functions. Values are represented in a matrix directly showing the links between the socio-economic and the natural system.

Figure 1: Conceptual framework for determination of impacts



Explanation:
A land reclamation project causes direct physical / environmental impacts. These may lead to changes of the present functions of the natural system. Changes of functions may indirectly lead to changes in social processes which causes socio-economic impacts.
A proposed activity can lead to direct changes of social processes and these causes socio-economic impacts.
Mitigating measures can be determined to reduce or prevent negative physical / environmental impacts as well as socio-economic impacts.

Box 2: Examples of direct and indirect environmental and social impacts.

Direct environmental impacts

- Coastal habitat and fishing grounds are lost due to reclamation of a certain land area in front of an existing coastline.
- The flood regulation capacity of wetlands is lost through drainage of an area for agricultural purposes.

Direct social impacts due to a change of functions of the natural system

- Shrimp and milkfish pond farmers lose their jobs and income because their ponds are becoming part of an area used for land reclamation.
- A fishing village must be moved to another area and fishermen have to look for new fishing grounds.

Indirect environmental impacts due to a change in social processes

- The people who have been moved to a new village develop new small industries and start producing polluted waste water.
- Fishermen start developing a new area for shrimp pond aquaculture for which a mangrove area is deforested.

Indirect social impacts due to a change of functions of the natural system

- The new developed land attracts upper class businesses and the original, local and poor population, does not get the promised jobs and impoverishes under the new conditions.
- Urban development on the reclaimed land starts producing much polluted wastes killing local fish stocks and driving local fishermen out of their trade.

5.6.1 Step 1: Determination of the study area

The purpose of this step is to delimitate the scope (geographically and in terms of the content) of the EIA study area

The study area is determined by the area which is affected by the environmental and socio-economic impacts of the intended activity and the impacts of the alternatives. This area is much wider than the project area where the intended activity has been planned. The study area may differ per aspect and must be indicated on maps. The delimitation of the study area is important because the location and size of this area determines the scope of the EIA study and as a result the time and budget required to execute the study.

Preliminary determination of (significant) impacts
In order to determine the study area it is necessary to obtain a first impression of the potential impacts which might occur as result of the implementation of the proposed activities and the alternatives. It is recommended to make use of the checklists for environmental and socio-economic aspects presented in the appendix E. The list contains many relevant aspects known from earlier projects, but it is necessary to realize that the list is not a complete summing up of all possible events. On the basis of the checklists a preliminary impact analysis for the study area can be performed which will result in a summing up of the major issues to be studied.

On basis of this preliminary impact analysis the study area can roughly be determined for most of the aspects to be studied.

5.6.2 Step 2: Description of the present natural and socio-economic environment

The purpose of this step is to gather base line information to describe the autonomous development which functions as a reference situation.

The EIA report must contain a description of the present situation of the natural and the socio-economic environment of the study area, as far as relevant for the forecasting of the environmental impacts of the intended activities and alternatives.

Box 3: Definitions of natural and socio-economic environment

The natural environment: comprises of a combination of living and non-living resources and their interactions. Resources which are characterised by their attributes, perform functions in providing goods and services in demand and used by the society.

The socio-economic environment: encompasses all human activities. Through these activities, goods and services and consequently the functions of the natural system receive a value in a societal context. Values represent a mixture of economic, social and ecological aspects.

Natural environment

The functions of the natural environment and the interactions between the functions should be determined and quantified, see appendix E for a list of potential functions. This information serves as basis for comparison of the environmental impacts of the different alternatives. The description must be limited to those aspects that may be influenced by the activity and must cover the entire affected area.

Socio-economic environment

The direct and indirect use of the natural system by the different usergroups in the study area should be described. Therefore, information on the following issues should be gathered: demography, economic situation, legal situation, health and living conditions. For the specific socio-economic aspects to be determined, see appendix E.

5.6.3 **Step 3: Description of the autonomous development of the natural and socio-economic environment**

The purpose of this step is to describe a reference situation which enables comparison with the impacts of the proposed activity.

The development of the study area should be described in case the intended activity will not be executed. This means that in theory different development scenarios and their impacts on the present natural and socio-economic environment could be described. This description will serve as a reference situation for the comparison with the impacts of the alternatives.

5.6.4 **Step 4: Description of potential impacts**

The purpose of this step is to identify and assess the scope and significance of potential impacts.

Two main groups of impacts are distinguished, which are environmental and socio-economic impacts. Environmental impacts are assumed to occur as a direct consequence of physical changes that result from an activity. Social impacts are assumed to occur as a result of the changes in the social structure which follow from changes in the physical environment.

Environmental impacts

Environmental impacts may occur as a direct consequence of the execution of the proposed activity. They also may occur indirectly as a consequence of changes in social economic conditions, see box 2.

The implementation of activities under a proposed project will create a chain reaction of physical changes (e.g. drying of former wetlands, closing off of a bay), which in term will lead to environmental impacts (e.g. polluted waters, loss of natural habitat for fish and shrimp, changing current patterns). The end result is seen as changes to the natural system. The sequence of planned activities, physical changes caused by these activities and the possible environmental and socio-economic impacts occurring as a result of the activities and changes must be elaborated.

The execution of a proposed activity will create a chain of physical / environmental impacts. These impacts cause changes of the existing functions of the natural system. The following cause impact chains should be described.

- determination of physical impacts;
- determination of the impacts;
- change of present function due to impacts.

These steps / chains should be elaborated for both direct and indirect links.

Socio-economic impacts

Socio-economic impacts are nearly always the result of change in social processes. They may occur as a direct consequence of the execution of the proposed activity. Indirectly these impacts may occur as a consequence of change in functions of the natural system.

The following cause-impact chains should be described; see box 4 for an example:

- determination of social change processes;
- determination of social impacts due to the social change processes.

These steps / chain should be elaborated in case of a direct link and in case of an indirect link.

Impacts in general

The potential physical / environmental and socio-economic impacts must be described per alternative considered and must cover the entire affected area. For each impact the following characteristics have to be determined:

- nature (positive / negative, direct / indirect, reversible / irreversible, cumulative / synergistic);
- magnitude;
- extent / location (area / volume covered, distribution);
- timing (during construction, operation, decommissioning, immediate, delayed, rate of change);
- duration (short term, long term, intermittent, continuous);
- likelihood (risk, uncertainty or confidence in the prediction);
- significance (local, regional, global).

There are a number of ways in which the impacts can be predicted:

- professional judgement;
- quantitative mathematical modelling;
- experiments and models;
- case studies, similar projects in similar ecosystem.

For the description of relevant impacts three methods can be used:

- Checklist. Potential impacts are listed in the form of a checklist. Impacts of first, second and third order are listed indiscriminately and causal relations between the impacts of different order are not presented.
- Matrix. A matrix is used to indicate cause and effect by listing activities along the horizontal axis and environmental parameters along the vertical axis.
- A network diagram. This is a more elaborate approach illustrating potential causal relations between impacts of different order, see box 1 of appendix E. This way provides insight in environmental processes and it links these processes to final variables or functions which can be valued.

It is preferred to make use of the second and third method while the checklists can be used to check if all potential impacts are considered.

5.6.5 Step 5: Description of mitigating measures

The purpose of this step is to get insight in the opportunities to prevent or reduce negative impacts.

Mitigating measures to prevent or reduce negative physical / environmental or socio-economic impacts during the implementation of the project must be described. For each type of activity suggestions for mitigating measures are provided in the respective appendices.

5.6.6 Step 6: Description of compensating measures

The purpose of this step is to get insight in the necessity and opportunities (i) for compensation of natural habitats which are lost or deteriorated due to land reclamation and (ii) for compensation in cash of kind of people who lost income or houses due to land reclamation.

Compensation is the development of new values which are comparable with the values which are completely or partially lost. Compensation can be applied in cases where negative environmental impacts can not be mitigated.

Two opportunities for compensation of natural habitats can be applied:

- development of new natural habitats or development of natural habitats which are deteriorated;
- selection and preservation of an existing valuable natural habitat by taking protective / conservation measures in order to avoid deterioration or loss of this type of habitat in the future.

Concerning compensation of people who lost income or their houses two opportunities can be applied:

- financial compensation for people who lost direct or indirect income (e.g. due to loss of fishing grounds);
- people who have to be resettled should be compensated. This means that in close cooperation with the affected people a resettlement plan should be developed, including building of new houses, provision of services and development of job opportunities.

5.7 Comparison of the impacts of alternatives

The purpose of comparing the impacts of alternatives is to get insight in the differences of the impacts of the alternatives in order to enable the selection of the preferred alternative.

Environmental and socio-economic impacts of alternatives must be compared mutually and with the current environmental situation, including expected autonomous developments (and if elaborated the alternative most friendly to the environment). It is recommended to present the comparison in the

form of tables and diagrams. All alternatives must be compared according to international and commonly accepted standards as much as possible.

5.7.1 **Step 1: Selection and valuing of criteria / final variables**

The purpose of this step is to select the main (discriminating) criteria in order to enable a comparison of the impacts between the alternatives.

In most cases, there will be a need to further structure and aggregate the information in order to bring out the differences between alternatives more clearly. There are many methods to choose from such as: tables, graphic presentations, cost-benefit analysis (CBA) and multi criteria analysis (MCA).

Valuation, and more in particular economic valuation of changes in supply of products and services as a consequence of changes in functions of the natural environment, is a difficult exercise. At least a qualitative comparison of the alternatives must be performed. The function value evaluation method and in particular the function value matrix can be a very useful instrument to support this analysis (see appendix G).

Economic valuation of the multi functional natural environment is required and many new methods for their assessment and evaluation have been developed recently or are still being developed. The use of these methods is important because (more or less) extended cost benefit analysis of projects play an important role in the definition of their socio-economic sustainability and acceptability. Hence, it is necessary to place a project in a proper socio-economic cost benefit analysis (CBA) framework, including time horizon and evaluation techniques.

Extended literature is available on the CBA approach. Only some of the more important methods and techniques for cost valuation in the relation to the identified functions are mentioned in these guidelines. The basic approach to value functions and / or resources is first to determine their marginal productivity (e.g. use value as additional harvested yield per unit), which can be done directly (forest products, fish, agriculture) or indirectly (tidal energy, ground water recharge, sediment retention, storm protection). Non use (preservation) values and option values are more difficult. Methods available include techniques such as contingent valuation (willingness to pay) and travel cost method. The following table provides an overview of the more important valuation techniques related to the specific functions.

Table 2: Valuation techniques related to specific functions of the natural environment

Carrier Functions and Production Functions	**Regulation Functions**	**Information Functions**
techniques used: · market price · shadow price · price of substitute · TCM (travel cost method) · CVM (contingent valuation method / willing-ness to pay) · replacement cost	*techniques used:* · damage costs avoided · value of productivity changes · replacement costs	*techniques used:* · CVM (contingent valuation method / willingness to pay) · Cost / value calculated elsewhere for similar situations

In order to be able to identify a number of important relationships between functions and their economic, ecological and social values a so called function-value matrix can be used (see appendix G).

5.7.2 Step 2: Presentation of comparison of alternatives

The purpose of this step is to prepare overviews in which the impacts of the alternatives are presented in such a way that alternatives are informative and easy to read for decision makers and interested parties

For the comparison of the impacts of the alternatives use should be made of accessible tables and maps.

5.8 Gaps in information and knowledge

The purpose of describing gaps in information and knowledge is to verify the risks involved in the implementation of a project as a consequence of: (i) gaps in knowledge and information; (ii) more or less uncontrollable events that will influence the future functioning and sustainability of the project.

Large scale, public sector, infrastructure projects should specifically account for long term aspects related to irreversibility (irreversible change of the environment), vulnerability (sensitivity to future exogenic changes) and sustainability (maintenance of planned outputs). These concepts require the decision makers to assess the risk of certain long term developments (inter generational equity change) and take into account possible alternatives to proposed solutions. Three types of agents of change are usually considered:

- Societal (demographic) changes which may result in changing demands for goods and services both within the scope of the project as well as outside.
- Natural system processes such as ecological, hydrological and morphological processes and stochastic characteristics of natural conditions such as seasonal weather patterns and local wave and currents conditions
- Climate change factors which need to include all structural changes (adjustments) in climate related boundary conditions for the project

The combination of uncertainty with the possibility of decisions which may result in irreversibilities requires the importance of certain risk-averse behaviour if sustainability is the leading principle. The lack of knowledge about cumulative and / or synergistic impacts of environmental changes in general is reason to recommend that the "precautionary principle" of environmental management be adopted in the EIA process in the Philippines.

The EIA report should make use of adequate risk assessment tools and principles in the case that a lack of information and knowledge may significantly influence impacts and the consequent need for mitigating measures.

List of relevant literature

- Asian Development Bank (1988): Environmental Guidelines for Selected Infrastructure Projects Environmental Unit

- Commission for Environmental Impact Assessment (1994) Advisory review of the Environmental Impact Statement Kerawalapitiya reclamation project, Sri Lanka.

- Commission for Environmental Impact Assessment (1995): Advice for the Terms of Reference for the environmental impact statement for the land reclamation and drainage project Guayaquil, Ecuador.

- Commission for Environmental Impact Assessment (1996): Advies voor richtlijnen voor de aanvulling op de Etude d'Impact Lac Sud, Tunesië.

- Commission for Environmental Impact Assessment (1996): Toetsingsadvies over de Etude d'Impact Lac Sud, Tunesië.

- Commission for the European Communities (1993): Environmental manual. Sectoral Environmental Assessment Sourcebook.

- United Nations / Economic and social Commission for Asia and the Pacific (1996): Environmental Impact Assessment: Guidelines for Water Resources Development.

- World Bank (1990): Technical paper no.126. Transport and the environment series. Environmental Considerations for Port and Harbour Developments.

- World Bank (1993): Technical paper no. 140. Environmental assessment source book. Volume II. Sectoral Guidelines.