Arab Republic of Egypt

Cabinet of Ministers

Egyptian Environmental Affairs Agency (EEAA)

Environmental Management Sector

Environmental Impact Assessment

GUIDELINES FOR LAND RECLAMATION PROJECTS

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1 INTRODUCTION

This guideline identifies the main factors to be considered when preparing an EIA for Land Reclamation Integrated Developments, which are associated with diverse exchange of the existing habitats and development of settlements accompanied with masses of emigrants with all their outputs (e.g. drainage effluents, wastewater effluents, solid waste…). These outputs will affect the ecological balance of the region and the adjacent regions (soil, water, and air).

Not all matters in this guideline will be applicable to every proposal, and this checklist is not exhaustive. The EIA must be tailored to suit the potential impacts of the specific proposal at the specific proposed location(s), and it is essential to focus on relevant key issues.

Use of this guideline alone will not be sufficient to prepare an EIA. Reference should be made to relevant laws and other guidelines, such as Law 4/1994 for the Environment, Law 48/1982 protecting the River Nile and its waterways from pollution, Law 93/1962 concerning disposal of wastewater to municipal sewers, relevant ministerial decrees, EEAA Guidelines for Egyptian Environmental Impact Assessment, and other guidelines. Developers should be fully aware of their obligations under all laws and guidelines applicable to their situation.

The aim of Environmental Impact Assessment (EIA) is to enable the approving authority, the public, local and central government and the developer to properly consider the potential environmental consequences of a proposal, and to make recommendations to reduce the environmental consequences if necessary. It is important to provide sufficient information for the approving authority to make a decision on whether to approve a proposal and if so, under what conditions. The EIA provides the basis for sound ongoing environmental management.

2 THE EIA PROCESS

The EIA process should proceed logically through a number of steps. These steps work at two levels:

- technical work undertaken by specialist contributors to the assessment;
- a guiding principle for the EIA overall, providing a structure for the EIA report and co-ordinating the technical contributions;

Each step in the EIA process requires consultation to ensure that all relevant views are being taken into account throughout the EIA process. Ideally consultation should be maintained throughout the EIA process with the developer and designer of the proposed scheme, so that modifications to the design to reduce potential environmental impacts may be introduced before completion of the final design. Consultation with the regulatory authorities, and also with the public, should be initiated at the Scoping stage of the EIA, and thereafter carried out as appropriate. The steps in the EIA process are broadly as follows, and are outlined in following sections of this guideline.

2.1 Description of the project: What type of development, its size, components and processes expected at all stages of implementation?

2.2 Screening: is an EIA required?

2.3 Scoping: What has to be covered and in what detail?

2.4 Baseline: What are the existing environmental conditions?

2.5 Prediction: What environmental effects will the development have?

2.6 Evaluation: How significant are the predicted effects?

2.7 Mitigation: Can significant negative effects be avoided or made acceptable?

The developer is ultimately responsible for ensuring compliance with the statutory requirements for EIA preparation. A developer may employ a firm of consultants to carry out the assessment. The developer should verify the competence of the firm recruited to prepare the EIA.

The EIA should be prepared by a team with expertise appropriate to the study of the different aspects of the development site. The team should be headed by a project manager, whose ultimate responsibility is to co-ordinate the inputs of individual specialists and to provide an overview.

For EIAs of Land Reclamation Integrated Developments, members of, or advisors to, the team may include, but not necessarily be limited to, the following specialisation:

- Soil;
- Hydrology;

- Drainage & Irrigation Expert
- Geology;
- Meteorology;
- Civil engineering;
- Agriculture engineering;
- Genetic engineering;
- Plants production;
- Plants protection;
- Agro-industry;
- Agro-economics;
- Urban planning;
- Sociology;
- Desert ecology;
- Fauna and flora;
- Air quality;
- Solid waste;
- Wastewater treatment;
- Freshwater biology , microbiology;
- Health (waterborne diseases).

Some team members may fulfil several of the above roles if suitably qualified and experienced.

Each member of the team, for their specialist subject(s), will follow the basic processes identified above: scoping, consultation, baseline data collection, prediction and evaluation of impacts, and identification of mitigation measures.

The following sections outline the basic steps in the EIA process:

2.1 Outline of important characteristics of the proposed project

Details of the proposed project will need to be obtained in order to assess potential impacts of the different elements and processes of the project. The basic minimum in order to complete the following parts of the EIA process will need to include:

- Location and site of the project;
- Development master plan and land uses;
- Project components and processes;
- Irrigation sources and systems;
- Drainage system;
- Size in terms of land, new settlements and population;
- Number and type of connected agroindustries;
- Anticipated influent and effluent characteristics, annually or monthly discharge;
- Project phasing;
- Required off site investments;
- Time-schedule;
- Life expectancy of major components;

2.2 Screening

This is the task of deciding whether or not an EIA is required for a particular project. Basic details of the proposed development will be needed for the project to be screened. For Land Reclamation projects, the area of the development, its location and the required size of settlements, the irrigation water intake and drainage location are the critical information required to determine whether an EIA is necessary.

Relevant legislation and guidelines (Law 4/1994 on the Environment, EEAA Guidelines on Egyptian Environmental Impact Assessment) identify projects, which must have an EIA, and those projects where an EIA is discretionary or not required. Reference to the Competent Administrative Authority (Ministry of Agriculture and Land Reclamation) may be necessary where the requirement for an EIA is not clear. Law 4 and the EEAA guidelines classify projects into two groups, reflecting severity of possible environmental impacts:

- Grey list projects: those, which may result in significant environmental impact. Land Reclamation projects of 400 feddans or less and aquaculture farms fall within this category. The developer applies to the Ministry of Agriculture and Land Reclamation (as Competent Administrative Authority) before the land preparation is initiated, with a letter of intent, accompanied by Environmental Screening Form 'B'. A scoped EIA for such projects or for parts of such projects may be required at the discretion of the EEAA.
- Black list projects: those projects, which require full-fledged study EIA due to their potential impacts. Land Reclamation projects of more than 400 feddans fall within this category. The developer applies to the Ministry of Agriculture and Land Reclamation (as Competent Administrative Authority) before the land preparation is initiated, with a letter of intent, accompanied by the scoped EIA.

The EEAA Guidelines include in Annex 1 sectional guidelines for projects that need full EIA.

Further details regarding the procedures to be followed can be found in the EEAA Guidelines.

2.3 Scoping

Scoping, or identification of potential environmental impacts, is an important early stage of the EIA process to ensure that the EIA is properly carried out. For a project to be properly scoped, a site visit and preliminary consultations with relevant regulatory authorities must be included (e.g. Ministry of Agriculture and Land Reclamation, Governorate and City/Town/Village authorities) at the scoping stage. Ideally public consultation should also be carried out at the scoping stage, but it may be more suitable to postpone consultation with the public until more detailed assessment of potential impacts has been completed. Consultations should involve exchange of information about the characteristics of the proposed project, and assistance to the consultant in identifying regional and local issues and/or sources of information of relevance to the EIA.

From consultations and a preliminary assessment of baseline conditions the consultant must:

- identify the characteristics of the proposed project that are likely to give rise to impacts;
- identify what type of impacts may arise, and;
- determine which environmental resources and people in the vicinity of the proposed site are likely to be particularly sensitive to the above impacts, and what categories of impacts are likely to be a problem in this respect.

If either the project characteristics or the boundaries of the proposed site should change, then the potential impacts may also change, and the scope of the EIA will need to be reviewed.

The EIA process will generally benefit from focusing attention on the key issues of concern. Not all issues identified will have the same degree of relevance for all proposals.

The identification and prioritisation process should result in:

- a list of all issues with a preliminary estimate of the relative significance of their impacts;
- identification of the key issues;
- an explanation as to why other issues are not considered to be key.

The EIA should address the key issues as fully as practicable. However the level of analysis should reflect the level of significance of the impacts and their importance for the proposal. Lesser attention should be given to those issues, which have lesser significance. For these latter issues, there should be sufficient analysis to develop a sustainable mitigation strategy for any potential adverse impacts.

The consideration of alternatives, particularly alternative sites or processes, during the scoping stage is often a good idea, as the amount of information on alternatives is often very limited. The scoping exercise can report why the preferred alternative was chosen on environmental grounds. The main part of the EIA can then concentrate on the preferred option. Alternative processes within the scheme may be dealt with as mitigation.

2.4 Baseline Environmental Conditions

Collecting existing data is always the first step in collection of baseline information. It can then be reviewed for its relevance to the proposed site, its accuracy, and used as a basis for determining what onsite investigation may be necessary to "fill the gaps".

Original site surveys are almost always bound to be required for most categories of effect, such as existing topography, soil characteristics, water quality, aquatic biology, terrestrial ecology; landscape, socio-economic situation, air quality, and noise. Published information usually does not exist at a suitable scale, or is not generally applicable to the development in question. Original surveys should be conducted initially at a general level to identify whether more detailed survey will be required.

Where baseline data is to be collected first hand, careful consideration must be given to the design of the survey and sampling programme. Data collection must focus on the key issues needing to be examined for the EIA (identified during the Scoping process), and should be collected at the appropriate time(s) of year. Consideration of likely monitoring requirements should be borne in mind during survey planning, so that the data collected is suitable for use as a baseline to monitor impacts or success/failure of mitigation measures in the future. The possibilities of

using geographical information system (GIS) in this respect is highly recommended. The need for long-term sampling should also be assessed as early as possible. This will maximise the time available for this to be carried out.

Data needs to be collected over a sufficiently wide area to make sure that any effects likely to be caused by the development can be assessed. The area involved will not only vary for different proposals, but for the same proposal, will vary for each specialist type of data collected. For example, effects on watercourses or waterbodies should be assessed as far up and downstream as necessary to assess and monitor beneficial or deleterious changes in water quality or aquatic biota. The distances involved will depend on the characteristics of any existing discharge, of the watercourse(s) in question, and on the location and characteristics of other discharges affecting the watercourse(s).

2.5 Prediction of Impacts

Impact prediction must encompass land preparation, reclamation, and cultivation and associated development settlement stages. Impacts should be quantified wherever possible, or fully described if not quantifiable. The following should be considered:

- magnitude of impact;
- duration and extent;
- whether impacts are reversible or permanent;
- direct and indirect effects.

Beneficial as well as adverse impacts on the following specific aspects of the physical, sociocultural and biological environment must be assessed:

- Water quality;
- Soil properties
- Social, economic and cultural environment;
- Waste management;
- Air quality;
- Flora and fauna;
- Transport and access;
- Hydrology and groundwater;
- Risk and hazards.

Impacts of the project as proposed (i.e. assuming no mitigation) should be clearly identified, so that if for any reason mitigation is not implemented, the consequences will be clearly identified in the EIA. Impacts of the scheme assuming recommended mitigation is implemented ('residual' impacts) should be identified separately. If mitigation has already been incorporated into the design of the scheme by the developer during the EIA process, then the relevant identification of impacts without mitigation may be omitted from the EIA report.

2.6 Evaluation of impacts

Criteria for evaluation of impacts must be stated. Where possible, legislative standards or international standards should be followed (e.g. Egyptian Law 48 water quality standards for discharges to the River Nile and its waterways, US EPA guidelines for sludge reuse in agriculture, etc.). If no suitable standards exist, descriptive criteria may be used, but must be fully explained. Evaluation of significance of impacts should take account of the magnitude, duration and extent of impact, and whether the impact is temporary or permanent.

All predictions of impacts have an element of uncertainty associated with them. The consultant should identify and, where possible, quantify the level of uncertainty associated with these predictions. Some indication of probability of occurrence of impacts should also be included.

2.7 Mitigation

Mitigation strategies must be considered both in relation to individual impacts and collectively for all impacts. Many mitigation measures can be incorporated into the early design stages of the project by regular communication between the consultant and developer/designer of the works - mitigation should be an iterative process.

Reporting of mitigation should include such specific features, which have been incorporated during the EIA process into the planning, and design of the proposed project.

Where mitigation has not already been incorporated into the design or siting of the proposed project during the EIA process, or specific commitment to mitigation measures from the developer has not been obtained, mitigation measures should be included as recommendations, and should be clearly identified as such.

Recommendations for monitoring impacts in the form of an environmental management plan

(EMP) should be included. It is not expected that a detailed EMP be prepared for the EIA however an outline of the content and structure and commitment to prepare an EMP is required.

3 GUIDELINES FOR THE EIA REPORT

The information provided should be clear, succinct and objective. It should include maps, satellite images, drawings, photos, or other descriptive detail. Only data relevant to the decision-making process should be included.

The following sections outline chapters, subsections and contents for EIA statement on proposed Land Reclamation projects. These guidelines include all the information required for land preparation, reclamation, cultivation and associated settlements as described in EEAA Guidelines for Egyptian Environmental Impact Assessment.

Writing a good report of EIA is a difficult task - it must be technically robust, but at the same time it must be clear, intelligible and unambiguous. Those making a decision on the benefits and disadvantages of a proposed development will not be technically experts in all the areas covered by the EIA report. The principal advice is to keep the report short, and avoid use of technical terms unless absolutely necessary. Technical appendices may be included as appropriate. Suggested contents list for the EIA report:

Table of Contents

A. Non technical or Executive summary
B. Description of the proposed project
C. Legislative framework
D. Potential impacts (scoping), alternatives and consultation
E. Description of the existing environmental conditions within and surrounding the site
F. Prediction and evaluation of significant environmental impacts
G. Mitigating measures and alternative processes
H. Residual impacts
I. Monitoring Plan
J. Environmental Impact Statement
K. Technical appendices (optional)

The non-technical summary should be around 4 pages, and certainly no longer than 10 pages (excluding plans). The main text of the EIA report should be around 60-70 pages, and certainly no longer than 100 pages. For more technically complex projects, technical appendices can be used to achieve this. Any individual technical appendix should be no longer than 20 pages (excluding plans, photos, and drawings). The non-technical summary may be presented as a separate report.

Refer to the list of review topics in Part B of Lee & Colley[1] for what information should be included in each section of the EIA report (or Environmental Statement).

A. NON TECHNICAL OR EXECUTIVE SUMMARY

The summary must be written in non-technical language to facilitate understanding by all readers. It should be succinct and must give an overview of:

- What the project is;
- What the significant environmental impacts will be;
- What has been done or is recommended to minimise these impacts;
- What significant residual impacts will remain after mitigation?

The content and structure of the summary should broadly follow the heading structure of the EIA report.

B. DESCRIPTION OF THE PROPOSED PROJECT

This section of the report should be brief, and may refer to a feasibility study carried out by the developer or their agent. Such a feasibility report should be summarised within the main EIA report, and could be incorporated as a technical appendix. The following should be covered briefly:

B.1 Objectives and Scope of the Proposal

There should be a clear statement of the objectives of the proposal, including rationale and/or need for the project.

B.2 The Location

The following information should be provided:

- title details and land tenure;
- site characteristics;
- land use constraints;
- macro scale maps (1:50000 & 1:25000), plans or photographs or satellite images, clearly identifying the location of the proposed project relative to:
  - waterbodies;
  - other land;
  - natural vegetation communities;
  - infrastructure (canals, roads, electricity, pipelines ;
- compatibility of the proposal with :
  - any strategy such as local management plans;
  - existing land and water uses both on the site and on adjacent land and waterbodies;
  - historical sites or environmental protected areas.

B.3 Description and land use plan of the Proposed Project and Associated Facilities

The following information should be provided:

- land use plan;
- proposed irrigation water quality source
  - (surface or ground water), irrigation system (surface irrigation , sprinkler, or drip irrigation), irrigation layout, drainage locations and layout;
  - maps with appropriate scale (1:10000 or 1:2500 or 1:1000 …etc) showing:
    - *land features, contour lines and slopes
    - *run-off paths and catchment areas
    - *proposed infrastructure layout (canals, drainage locations, roads, electricity, pipelines);
    - military sites (if any);
    - protectorates;
    - historical and antiquity sites;
    - settlements locations and sizes;
    - plant and livestock production;
    - quality, quantity and locations of drainage discharge;
    - agro-industry (location, inputs, outputs)
    - agro-chemicals used (fertilisers, pesticides);
    - number and size of settlements and population expected;
    - expected solid waste and wastewater treatment;
    - power supply requirements.

B.4 Site Preparation and Civil Works

Describe the works required prior to commencement of land reclamation including:

- proposed construction work methods including temporary works, the equipment to be used;
- methods and route of transport of the equipment to the site;
- import or export of material to/from the site, including method and route of transport;
- earthworks including dredging, reclamation, excavation or landfill, quantities of material to be moved out of or into the site, the method of disposal of excess material, the sources of material to be brought to site;
- details of the workforce, including source, expected numbers and distribution throughout construction;
- details of potential land contamination, which may constrain work on the site or disposal of excess material.

B.5 Other Services in the Locality

Where applicable, outline:

- the size and nature of any adjacent projects;

- the relationship of the proposed development to any existing development in the neighbourhood.

C. LEGISLATIVE FRAMEWORK

This chapter refers to the laws and their executive regulations considered during the planning of the project, e.g. Law 4/1994 on the environment, Law 48/1982 as it relates to limits of certain substances in effluent discharges to the Nile or its waterways, Law 102/1983 concerning natural reserves, Land master plan of the Ministry of Agriculture and Land Reclamation (LMP) 1986, and other relevant laws, Governorate orders, guidelines, etc. A list of all approvals and licences is required under any legislation. This list should also identify the relevant authorities involved in the assessment and regulation of the proposal.

D. POTENTIAL IMPACTS (SCOPING), ALTERNATIVES AND CONSULTATION

The section summarises the outcome of the process of identification and prioritisation of potential impacts, it should include:

- all issues identified;
- the key issues which will need a full analysis in the EIA;
- the issues which will not need a full analysis in the EIA, and the reasoned assessment of why they do not need full analysis.

A summary of the general alternatives (e.g. alternative locations, irrigation and drainage systems) should be given, with the reasons for the selection of the preferred option.

The section should include details of who has been consulted, and the outcome of such consultations.

D.1 Potential Impacts (Scoping)

Scoping of the EIA should develop from a preliminary investigation of baseline conditions, consultation with regulatory bodies, and a preliminary site visit.

For land Reclamation projects, the land preparation and civil work stage is likely to give rise to negative impacts regarding dust due to movement into and off the site equipment e.g. (scrappers, bulldozers, loaders, graders...) and due to excavated soil. Negative impacts of temporary workforce, Impacts on fauna and flora, historic and cultural sites may occur.

During Land Reclamation negative impacts will be due to drainage problems e.g. soil waterlogging, increasing salinity of existing water and wastewater effluents. Other impacts will be on soil properties, subsoil, and underground water, nearby lakes and waterways.

The final stages i.e Land Cultivation and associated Settlement may have positive impacts as well as negative impacts.

Positive impacts expected are on the increase of work opportunities, population resettlement and increase in productivity.

Negative impacts may occur due to agrochemical wastewater effluents, agroindustrial wastewater effluents, wastewater and solid waste.

Other impacts, both positive and negative, will occur, but will depend on the particular site, and circumstances.

The procedures or methodology used to identify and prioritise issues should be outlined. This should include:

- relevant guidelines issued by government authorities, provisions of any relevant environmental protection legislation, and relevant strategic plans or policies;
- relevant research or reference material, effluent or waste water treatment studies, and relevant preliminary studies or pre-feasibility studies.

D.2 Alternatives

The EIA should include an assessment of the environmental impacts or consequences of adopting alternatives, including:

- alternative location(s);
- alternative schemes and land use, irrigation system and layout, drainage location and layout;
- alternative management or operational practices (these may be further developed under mitigation section);
- the ‘no development’ alternative.

The scoping exercise can explicitly report on what grounds the preferred alternative was chosen. The main part of the EIA can then concentrate on the preferred option.

D.3 Consultation

The EIA report should include details of consultation undertaken as part of the EIA

process. Consults should include relevant government agencies, NGOs, and the public. A brief description of the reason for and the outcome of consultation should be included.

For Agricultural Land Reclamation projects, agencies with regulatory powers or responsibilities concerning planning control, land use, irrigation and drainage, waste disposal, discharge limits to fresh waters; emissions to air and application of sludge to land must be consulted. Other agencies or departments might include those responsible for historic monuments, conservation of natural resources etc. as appropriate. These might include, as appropriate, the Egyptian Environmental Affairs Agency (EEAA), Ministry of Agriculture and Land Reclamation, Ministry of Public Works and Water Resources, Governorate representatives, Ministry of Health, and relevant Community Development Associations (CDAs).

E. DESCRIPTION OF THE EXISTING ENVIRONMENTAL CONDITIONS WITHIN AND SURROUNDING THE SITE

An overview of the existing environment should be provided in order to place the proposal in its local and regional context, and to provide baseline data which may be used for subsequent monitoring.

General information to be provided for specific issues identified as potentially important in the assessment of impacts from Land Reclamation projects is discussed in the following subsections, and includes:

E.1 Hydraulics and water quality;
E.2 Socio-economic and cultural environment;
E.3 Waste management;
E.4 Climatic norms and air quality;
E.5 Flora and fauna;
E.6 Transport and access;
E.7 Hydrology and groundwater;
E.8 Risk and hazards.

Data must be specific to the proposed site, rather than general information on a particular area, and the EIA should only deal with issues relevant to the proposal being assessed. Each issue and the level of detail should match the level of importance of the issue in decision-making. To make the EIA report easier to read, it may be sensible to include the specialist detail for each of the following sections as a technical appendix to the report, with a summary of each section in the main EIA report.

E.1 Hydraulics and Water Quality

As sustaining the water quality of the existing water bodies (lakes, waterways, rivers canals,..) is usually the driving force for the whole development, this aspect of the environment is one of the primary importance in the EIA. The quality of discharges from the drainage system could cause serious damage to the existing water quality (physical, chemical and biological), thus affecting the aquaculture, people and other activities in these water bodies. Discussion should focus on those water quality characteristics that may alter, and on the assimilation capacity of the water body to which the proposed drain will discharge.

Both positive and negative changes in water quality will need to be quantified, and therefore baseline data will be required. The existing hydraulic, microbiological, chemical and biological conditions in the water body, to which the drain will discharge should the development be approved, must be assessed. Baseline data collected should be sufficient that predicted conditions should the development be approved may be calculated.

The following hydraulic conditions and water quality indicators must be assessed for the proposed effluents, and for both watercourses to which the drain will discharge.

- Water quantity (daily discharge),
- total soluble salts TSS,
- chemical contaminants from likely agricultural sources and agroindustry such as metals, biocides and hydrocarbons;
- aquatic biological indicators (invertebrates);
- nutrients (nitrogen and phosphorus).

Data should be obtained from sufficiently far upstream of the proposed discharge location(s) to be able to estimate background conditions for the area/length of the watercourse affected, or likely to be affected should the project be approved. Care should be taken that no other discharges exist between the proposed discharge point and the point used for sampling background conditions. Samples should be taken as far downstream to permit assessment of the distance over which the discharge will be assimilated by the watercourse, or to the next discharge downstream if any.

Scoping should identify what may be likely sources of industrial or municipal waste water contaminants which discharge in the drains of the catchment area of each drain, which may then require baseline measurement or monitoring.

As well as the obvious direct changes in water quality due to a changed or new effluent discharge, changes could result from secondary or cumulative effects of the development (during construction and/or operation). Points to consider include:

- accidental, deliberate or managed discharge or release of materials,
- individual sources of change from works construction (e.g. spillage of fuels, suspended solids such as cement dust, lubricants, detergents,….etc.),
- activities that alter flow regimes, erosion and sedimentation patterns and water chemistry,
- run-off from site and road areas.

E.2 Social and Economic Issues

Social impacts of Land Reclamation projects are often indirect and complex to assess, and consequently often not adequately addressed in EIA. Baseline data collection should cover the following:

- existing potable water quality, which may be affected by the project's drainage and wastewater effluents;
- impacts of waste water disposal systems which may be affected by provision of different activities;
- projected water treatment facilities for potable supply, which may be affected by provision of different waste water collection and treatment systems;
- local employment conditions which may be affected during land preparation, reclamation, cultivation and associated settlements;
- existing economic situation which will be affected by the Land Reclamation Project, especially concerning:
  - land values,
  - agriculture products,
  - job opportunities;
- identification of items or sites of cultural or historical significance likely to be affected by the project, and an assessment of their cultural and/or financial importance.

Areas or sites of particular social or cultural importance or sensitivity should be plotted on maps or diagrams, shown in relation to the proposed development.

E.3 Waste Management

Disposal of waste products is an important aspect of EIA for Land Reclamation projects. Data on proposed waste management systems should include:

- likely opportunities for re-use of sewage sludge and/or effluent (e.g. attitudes towards use of sewage sludge in agriculture, ease of distribution of sludge to end users, legislative requirements for such re-use);
- potential sites for solid waste dumping or recycling processes suggested;
- potential sites and routes for disposal of sewage sludge if unsuitable for re-use in agriculture, and quality required of sludge for disposal;
- potential sites and routes for disposal of screenings waste;
- opportunities for re-use of agriculture waste (poultry and livestock manure) as fertiliser;
- potential disposal sites and routes for excess material from the site during land preparation and civil work.

E.4 Air Quality

Air quality is likely to be significantly affected by Land Reclamation projects especially during land preparation and construction of civil work. Likely major issues include dust sources during construction.

Assessment of baseline conditions should include:

- identification of sources of dust generated which may affect the proposed site;
- collection of meteorological data which will affect distribution and severity of air quality impacts, in particular (heat inversion, dew):
  - strength and direction of prevailing wind
  - rainfall frequency, duration and quantity.
- collection of topographical information which will affect distribution of air quality (e.g. steep slopes, hills, land profiles and wadis)

- identification of sensitive receptor (e.g. protectorates or existing settlements which may be affected by dust) within the area likely to be affected.

Consideration should be given to providing modelling studies to determine the likely distribution of dust during land preparation and civil work.

E.5 Flora and Fauna

Terrestrial and/or aquatic flora and fauna or their habitats, which are likely to be disturbed or obliterated during land preparation, reclamation and cultivation of the project, must be identified and their importance evaluated. As a general rule, distribution data should be presented as habitat or species location maps, shown in relation to position of the proposed project. Data collection and surveys should include:

- identification, description and distribution of areas of terrestrial and aquatic habitats that may be directly or indirectly affected especially those:
  - supporting threatened or protected species or habitats;
  - of commercial importance (e.g. for aquaculture or fisheries);
  - of nature conservation or scenic importance.
- assessment of the importance of the habitats or species identified above, in terms of International, National, Regional or Local importance.

E.6 Transport and Access

Information to allow assessment of potential transport and access impacts should include:

- assessing condition and size of roads on route(s) to be used during land preparation, reclamation and cultivation of the project;
- assessing existing traffic levels on these routes, at different times of year and times of day;
- assessing suitability of access to the site for vehicle sizes and types likely to be used during land preparation, reclamation and cultivation;
- investigation for the presence of particularly sensitive developments on routes likely to be affected, e.g. schools, gas stations, ongoing constructions, etc….

A detailed traffic study may be required where vehicle movements are likely to significantly affect the community.

E.7 Hydrology and Groundwater

Hydrological issues to consider which may either be affected by the development, or affect the development itself include:

- existing drainage patterns, including the location of wadis and identification of areas prone to flash floods, the range of water heights/depths in the area, daily flushing regime, storm surge or flood levels;
- groundwater regime and quality, e.g. depth to groundwater level, whether groundwater is used for water supply and its quality, whether control of groundwater is already exercised in the area;
- presence and importance of structures likely to be affected by changes in groundwater levels (such as buildings, bridges, flood mitigation works).

It is highly recommended that the hydraulic and ground water conditions be analysed on the basis of a numerical model.

E.8 Risk and Hazards

Existing potential hazards to identify, and if possible to quantify, which may affect or be affected by the proposals, include:

- storage and handling of hazardous materials;
- likelihood of release of chemicals, natural occurrences such as floods, storms, landslide, fire, and explosion.

F. PREDICTION AND EVALUATION OF SIGNIFICANT ENVIRONMENTAL IMPACTS

This chapter should include a discussion of impacts during land preparation, reclamation, cultivation and associated settlement of the proposed project. Impacts of different elements and processes of the proposed project on the above sectors of the environment should be considered separately.

Criteria for evaluation of the significance of impacts should distinguish between impacts, which are:

- positive and negative;

- reversible and irreversible;
- short term and long term;
- direct, indirect or cumulative.

Criteria should be based on local legislative standards wherever possible. Where these are not available, acceptable international standards should be used (e.g. WHO, USEPA, etc. guidelines). In all cases the choice of the appropriate standard must be robust and defensible. If no suitable standard is available, then the criteria developed and used must be clearly explained in the EIA.

Use of matrices can be very helpful in co-ordination and summarising information for this section of the EIA report.

For this section of the report, impacts should be considered before or without mitigation, unless particular mitigation is already incorporated into the design and development description included in the earlier part of the EIA report.

Examples of potentially significant impacts of Land Reclamation projects include (but are not restricted to):

- negative impacts on water quality by untreated or inadequately treated discharges;
- negative impacts on water quality due to pollution by agrochemical and incident water-borne and water-related diseases;
- Negative impacts on soil e.g. water logging and salification;
- negative impacts on flora and fauna during land preparation, reclamation and cultivation by removal of habitats of nature conservation or destroying the aquaculture;
- positive impacts by provision of sewage sludge for use in agriculture, or this impact could be negative if the sludge is not adequately treated;
- negative indirect effects, e.g. dust generated during land preparation and civil work affecting air pollution;
- positive effects on local economy allowing rapid development, by provision of job opportunities and new cultivated land.

G. MITIGATING MEASURES AND ALTERNATIVE PROCESSES

This section considers mitigation measures and strategies to reduce negative impacts on different sectors of the environment. Mitigation must be sustainable, integrated and feasible.

Some mitigation measures should be implemented at a very early stage of design of the project easily, but are difficult or expensive to implement once early design has been completed. Therefore it is vital that any mitigation should be discussed and developed in consultation with the developer and regulatory authorities throughout the EIA process.

This section of the EIA report should therefore be a summary of any mitigation already implemented in the ongoing design of the project, and also include any recommended mitigation strategy to be implemented during the different stages of the project i.e. land preparation, reclamation and cultivation.

This section may also include any enhancement measures for which there is a commitment from the developer, which will enhance any positive impacts of the development.

Suitable mitigation for Land Reclamation projects will depend on the design and land use of the project, as well as the local environment, and location. Examples of measures to reduce negative impacts may include, but will not be restricted to:

- use of organic fertilisers;
- provision of large areas for oxidation ponds;
- provision of larger areas for sludge drying beds to ensure adequate drying so that sludge can be safely re-used in agriculture;;
- re-routing of construction traffic to avoid sensitive developments such as hospitals;
- provision of water treatment systems to avoid untreated or partially treated effluent being discharged to watercourse;
- re-use of treated wastewater in irrigation of wood trees which could be used in the fixation of moving sand dunes and as wind protection;
- restrictions to working hours or changes to methods of working to avoid dust impact on air pollution.

H. RESIDUAL IMPACTS

This section should give a summary of those impacts, which will remain assuming mitigation has been implemented. It will therefore include those impacts for which there are no suitable or only low levels of mitigation, and positive

impacts. Assuming all suitable mitigation has been incorporated into the design, or recommended and will be implemented, for Land Reclamation projects these are likely to include, but not be limited to:

- improvements to water quality of receiving waters;
- availability of treated sewage sludge for use as fertiliser;
- improvements in local health due to reductions in water borne diseases;
- slightly increased local employment ;
- occupation of land formerly occupied by natural environment;
- temporary disruption during land preparation and civil work;

I. MONITORING PLAN

This program should be carefully designed and related to the predictions made in the EIA and the key environmental indicators. This should be designed to demonstrate the potential ecological sustainability of the proposal. The EIA should outline the need for, and use of any proposed monitoring plan, its duration and reporting procedures, define suitable criteria for monitoring, and actions to be taken in the event of non-compliance with these criteria.

Parameters, which may be relevant, include:

- Performance indicators in relation to critical operational issues including:,
  - quality of irrigation water and drainage effluents,
  - hydrogeology and ground water quality,
  - system performance and salinity control,
  - sludge quality (from oxidation ponds) ,
  - noise and air quality,
  - public health indicators,
  - flora and fauna,
  - crop and animal disease.
- monitoring of complaints received.

Commitment to monitoring may be demonstrated by production of an environmental management plan. This is a document designed to ensure that the commitments in the EIA, subsequent assessment reports, and approval or licence conditions, are fully implemented. This should demonstrate that sound environmental practices would be followed during the land preparation, reclamation, cultivation and settlement of the development. It should cover the:

- management of land preparation impacts, (e.g. disposal of waste material;
- management of land reclamation impacts, (e.g. water logging and salination of soil and drainage effluents management);
- management of land cultivation and settlement(e.g. drainage effluents management, wastewater and solid waste management);
- strategies and action plans to feed information from the monitoring program into the management practices;
- public awareness and training programmes for operational staff;
- indicators of compliance with licensing and approval requirements.

The Environmental Management Plan should describe the following monitoring details:

- the key information that will be monitored, its criteria and the reasons for monitoring ;
- the monitoring locations, intervals and duration of monitoring;
- actions to be undertaken if the monitoring indicates a non-compliance with the defined criteria or an abnormality;
- internal reporting procedures and links to management practices and action plans;
- reporting procedures to relevant authorities and, if appropriate, to the consent authority or the community.

J. Environmental impact statement

This should be a summary of sections F, G and H of the report (prediction and evaluation of impacts, mitigation and alternative processes, and residual impacts), to emphasise:

- the impacts which after mitigation are likely to be significant;
- how significant they will be;
- which parts of the environment are likely to be affected;
- whether mitigation is possible;

- the likely success of mitigation measures adopted or recommended to alleviate those impacts.

This information can be presented either as text, or as summary tables if desired.

After mitigation measures have been assessed, residual effects may remain. It is useful to set these out in a table in which the level of significance of each effect is given.