EIA Guidelines

For

Fish Farming in the sea

Department of Environment

Ministry of Environment and National Development Unit

March 2009

This paper is not a legal document. It serves only as a guideline, which provides recommended approaches and formats for the preparation of a comprehensive EIA report for fish farming in the sea.

These guidelines have been prepared jointly by the Ministry of Agro Industry, Food Production and Security (Fisheries Division) and the Ministry of Environment and National Development Unit in consultation with relevant stakeholders. It should be used with flexibility, as a solid base to stimulate developer innovation. It is also meant to be used alongside various other Government advices that set out policy and guidance relating to environment and fish farming in the sea.

Copies of these guidelines can be requested from the Environment Assessment Desk of the Department of Environment or can be downloaded from the website of the Ministry of Environment and National Development Unit, Ministry of Agro Industry, Food Production and Security (Fisheries Division) and of the Board of Investment

http://environment.gov.mu

http://investmauritius.com

http://fisheries.gov.mu

STAKEHOLDERS CONSULTED DURING PREPARATION OF THIS GUIDELINE:

Ministries / Authorities

1. Prime Minister's Office
2. Ministry of Finance and Economic Empowerment
3. Ministry of Housing and Lands
4. Ministry of Renewable Energy and Public Utilities
5. Ministry of Health and Quality of Life
6. Ministry of Public Infrastructure, Land Transport and Shipping
7. Ministry of Local Government Rodrigues and Outer Islands
8. Wastewater Management Authority
9. Ministry of Business, Enterprise and Cooperatives
10. Central Water Authority
11. Water Resources Unit
12. Board of Investment
13. AHRIM
14. MOI

NGOs

1. Mauritius Marine Conservation Society
2. Eco-Sud

EIA Consultants

1. Sigma Consultant
2. Scene – Ries

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1 INTRODUCTION

1.1 PURPOSE AND SCOPE OF THE GUIDELINES

Environmental Impact Assessment (EIA) is a process having the ultimate objective of providing decision makers with an indication of the likely environmental consequences of a proposed activity.

The objectives of an EIA are:-

- To determine environmental compatibility of the project
- To evaluate and select the best project alternative from the feasible options available
- To identify and evaluate the significant environmental impacts of the project and propose mitigating measures.
- To incorporate environmental management plans and monitoring mechanisms
- To assess the environmental costs and benefits of the project to the community

In presenting a clear and comprehensive statement of those components which need to be included in an EIA report for fish farming in the sea in Mauritius, the guidelines will not only assist developers and their consultants prepare better quality Environmental Impact Assessment reports but will also ensure that sufficient information is available for a proper assessment and for good decision making.

The objectives of these guidelines are namely:-

- To assist in the preparation of reports that are comprehensive in their content and to reduce cost of EIA
- To protect the environment
- To assist in review of the reports
- To avoid time delays and cost overruns

These guidelines are by no means exhaustive and are subject to continuous

updating in light of improvement in knowledge and understanding of such development. Proponents and consultants are advised to also consult other relevant documents such as the National Development Strategy (2004), Planning Policy Guidance by the Ministry of Housing and Lands and relevant regulations and acts (listed at section 1.5) as well as to consult the general guidelines "A Proponent's Guide to Environmental Impact Assessment" prepared by the Ministry of Environment and National Development Unit in consultation with relevant stakeholders and is available on the following website http://environment.gov.mu.

The proponent checklist presented at Section 4.0 is designed as a method for reviewing the adequacy of the EIA in terms of compliance to the requirements of the EPA 2002 and generally accepted good practice in EIA.

1.2 PROJECT PROFILE FOR FISH FARMING IN A FISH FARMING ZONE IN THE SEA

1.2.1 Need for Fish Farming in the Sea

World aquaculture has been growing at a rapid pace and is indeed the fastest growing food industry with a growth rate of around 10% per annum. Total capture fisheries is declining and it is forecast that increase in the production of farmed fish in the world would surpass that of captured fisheries in the near future.

The potential to develop fish farming at sea in Mauritius has been identified in the "Developpement de L'Aquaculture à L'ile Maurice, Etude du Potentiel Aquacole" (Aquaculture Master Plan 2007). According to the Aquaculture Master Plan 21 sites have been identified for potential aquaculture development. Out of the 21 sites only 8 fish farming zones have been selected under the Fisheries and Marine Resources Act 2007 (amended) for the development of marine aquaculture. Development of these zones will increase fish production from the lagoon and contribute to food security. The Code of Conduct for Responsible Fisheries includes responsible practices to be observed with a view to ensuring the effective protection, conservation, management and development of living aquatic resources, with due respect to the ecosystem and biodiversity.

1.2.2 Project *Description*

Fish culture shall be undertaken in floating cages at sea in the region of Mahebourg lagoon. The Project may consist of land-based facilities such as hatchery and/or processing plant. Fish species namely Red drum (*Sciaenops ocellata*) and Cobia (*Rachycentron canadum*) highlighted in the Aquaculture Master Plan are recommended for marine aquaculture. Production is meant for local and export markets. According to the plan an annual production of 29,000 tonnes of fish in the short term and 39,000 tonnes of fish in the long term could be envisaged. The structure at sea will be of the submersible types in marked off areas and will be in compliance with international, national legislations and the guidelines.

1.2.3 Environmental Aspects

1.2.3.1 Fish health and bio security measures at farm level

Bio security measures at farm level should be implemented and need to focus on the following aspects:

- Protection of the aquaculture industry, through the establishment of safeguards to fish health, the facilities in which fish are reared and the environment.

For improving general animal health and assisting in the prevention and control of animal diseases through improved traceability, the movement of eggs, gametes, sexually mature aquacultured fish from one farm to another should be recorded and notified to the Competent Authority in Mauritius. Such movements will be subjected to animal health certification by the Competent Authority.

- Prevention of the entry of any disease agents into farm and hatchery stocks and facilities, including not only non-native species, but also pathogens and parasites that are normally found in the natural waters of the area.

- Emerging diseases and diseases which are exotic to Mauritius and which could have serious impact on the fish stocks in the Mauritius.

- Introduction and spread of contagious diseases transmissible to humans through farmed fish.

- Transport of imported live fish of aquaculture origin, their eggs and gametes should be directed to the farm, as stated on the health certificate mentioned in 2 (b).

- Quarantine facilities.

1.2.3.2 Disease monitoring and reporting

- Necessary precautionary measures should be taken by aquaculture production business operators when introducing new stocks and reporting suspected outbreaks of any diseases to the Competent Authority.

- In order to ensure early detection of any possible outbreak of an aquatic animal disease, it is obligatory for the operator to notify any suspect case of disease to the Competent Authority immediately.

- Abnormal and increased mortality of any fish should be immediately reported to the Competent Authority.

- Dead fish as well as live fish showing clinical signs of disease, should be removed and disposed of under the supervision of the Competent Authority.

- The aquaculture production business operator should take into account the resources needed to control a large number of outbreaks occurring within a short period of time.

1.2.3.3 Feeds

- All feed and feed ingredients to be used for feeding farmed fish should meet standards as provided by the Competent Authority.

- Strict measures should be in place in order to prevent hazards from being transmitted from feeds to aquatic animals via direct or indirect means.

- Direct transmission occurs when the cultured species consumes feeds containing a pathogenic agent while indirect transmission refers to pathogens in feeds entering the aquatic environment or infecting non target species, and thereby establishing a mechanism for indirect infection of the species of commercial interest.

- Pathogens that are less host-specific present a greater risk of indirect transmission as they can establish reservoirs of infection in multiple species.

1.2.3.4 Prohibited pharmacological substance.

The use and traceability of any veterinary drug or other pharmacologically active substance or feed additives to be used in the farming process for prophylactic, therapeutic, diagnostic or zoo technical purpose has to be notified to and approved by the Competent Authority.

1.2.3.5 General hygiene provisions for sea cage farming and associated operations.

1. As far as possible, each aquaculture business operator has to ensure that its farming activity is protected against contamination, having regard to any processing that the farmed fish will subsequently undergo.

2. Aquaculture business operators are to comply with requirements laid down by the Competent Authority relating to the control of hazards in sea farming and associated operations, including:

    a. measures to control contamination arising from the air, water, feed, veterinary medicinal products, handling and disposal of waste; and

    b. measures relating to animal health and welfare that have implications for human health, including programmes for the monitoring and control of zoonoses and zoonotic agents.

3. Aquaculture business operators rearing, harvesting or producing farmed fish are

to take adequate measures, as appropriate:

a. to keep any facilities used in connection with sea farming and associated operations, including facilities used to store and handle feed, clean and, where necessary after cleaning, to disinfect them in an appropriate manner.

b. to keep clean and, where necessary after cleaning, to disinfect, in an appropriate manner, equipment, containers, crates, vehicles and vessels;

c. to use potable water, or clean water, whenever necessary to prevent contamination;

d. to ensure that staff involved in sea farming, processing and any other related activities are in good health and undergo training on health risks;

e. as far as possible to prevent animals and pests from causing contamination;

f. to store and handle waste and hazardous substances so as to prevent contamination; and

g. to take account of the results of any relevant analyses carried out on samples taken from fish or other samples that have importance to human health.

4. Aquaculture business operators are to take appropriate remedial action when informed of problems identified during official controls performed by the Competent Authority.

1.2.3.6 Recommendations for good hygiene practice

5. Guides for good hygiene practice should include appropriate information on hazards that may arise in sea farming and associated operations and actions to control hazards, including requirements laid down by the Competent Authority.

6. Examples of such hazards and measures may include:

a. the control of contamination such as mycotoxins, heavy metals and radioactive material;

b. the correct and appropriate use of veterinary medicinal products and feed additives and their traceability;

c. the preparation, storage, use and traceability of feed;

d. the proper disposal of dead fish, waste and litter;

e. protective measures to prevent the introduction of contagious diseases transmissible to humans through food, and any obligation to notify the Competent Authority;

f. procedures, practices and methods to ensure that food is produced, handled, packed, stored (chilled cabinet) and transported under appropriate hygienic

conditions, including effective cleaning and pest-control;

g. measures relating to the cleanliness of the harvest process; and

h. measures relating to record-keeping.

1.2.3.7 Record-keeping

1. Aquaculture business operators are to keep and retain records relating to measures put in place to control hazards in an appropriate manner and for an appropriate period, commensurate with the nature and size of the aquaculture business.

2. Aquaculture business operators are to make relevant information contained in these records readily available to the Competent Authority on request.

3. Aquaculture business operators should keep records relating to:

   a. All movements of animals by the aquaculture production business operators in such a way that the tracing of the place of origin and destination can be guaranteed;

   b. Mortality during transport, as practicable for the type of transport and the species transported;

   c. Any water exchanges during transport, in particular the sources of new water and site of release of water;

   d. The nature and origin of feed fed to the fish;

   e. Veterinary medicinal products or other treatments administered to the fish, dates of administration and withdrawal periods;

   f. All occurrences of diseases that may affect the safety of products of animal origin;

   g. All results of any analyses carried out on samples taken from the fish farm or other samples taken for diagnostic purposes that have importance for human health; and

   h. Any relevant reports on checks carried out on fish or fishery products

1.3 NEED FOR EIA

Any development proposal listed in the First Schedule under Part IV, Section 15(2) of the Environment Protection Act (EPA) 2002 requires an Environmental Impact Assessment (EIA) licence. In fact, with the amendments brought to Section 8 of the Fisheries and Marine Resources Act 2007, fish farming at the 8 declared farming zones in the sea has been declared scheduled undertakings requiring an Environmental Impact Assessment as per Item according to the EPA 2002 are at **Annex 1.**

A proponent applying for an EIA licence shall submit in electronic form and in 15 printed copies of his EIA report and any such additional copies as may reasonably be required by the Director. Guidelines for submission of EIA reports in soft copy version are at **Annex 2.**

NB: All associated activities as regards to the project should be included under one EIA.

1.4 REQUIRED EXPERTISE –

Depending on the scale of the activity / project, a team of cross-functional professionals with sufficient experience may conduct the EIA for fish farming activity in the sea.

The areas of expertise may include:-

- Fisheries / marine Science / environmental Science;
- Hydrographic survey/hydrodynamics / geology / hydrogeology;
- Civil /coastal / chemical/mechanical engineering;
- Oceanography;
- Socio/environmental/natural resource – economics;
- Surveying/architecture / planning / project management; and
- process designs

1.5 PERTINENT NATIONAL LEGISLATIONS

The following environmental regulations as well as policies and standards need to be complied amongst others.

- Fisheries and Marine Resources Act, 2007 (Act no. 27 of 2007)
- Finance (Miscellanous Provision)Act 2008
- Environment Protection Act 2002 (GN no. 73 of 27 July 2002)
- Public Health Act (GN no. RL4/323 – 24 April 1982)
- Planning and Development Act, 2004
- (Dumping Waste and Waste Carriers Licence) Regulations 2002
- Refuse Collection Regulations made by relevant Local Authority
- Environment Protection (Standards for Air) Regulations 1998 (GN no. 92 of 29 August 1998)

- Environment Protection (Standards for Hazardous wastes) Regulations 2001 (Page 21) (GN no. 157 of 2001)
- Environment Protection (Standards of Effluent Discharge Permit) Regulations 2003 (GN no. 43 of 2003)
- Environment Protection (Standards for Effluent Discharge into the Ocean) Regulations (GN no. 45 of 2003)
- Guidelines for Coastal Water Quality
- Maritime Zones Act 2005
- Dangerous Chemical Act 2004
- Genetically Modified Organisms Act 2004 (partly proclaimed)
- Occupational Health and Safety Act (2005)
- Animal Diseases Act 1925
- Town and Country Planning Act 1954 and
- Food Act 1998

1.6 INTERNATIONAL TREATIES

International agreements/conventions relevant to fish farming in the sea are:

- United Nations Convention on the Law of the Sea (UNCLOS), 1982
- Ramsar convention on Wetlands (http://www.ramsar.org/)
- The construction of fish farms shall not adversely affect any wetland habitat in Mauritius. Selected sites on land should be at least 30 m from wetlands as per Planning Policy Guidance.
- International Convention for the Safety of Life at Sea(SOLAS), 1974
- Convention for the Protection, Management and Development of the Marine and Coastal Environment in the Eastern African Region and Related Protocols (Nairobi Convention)
- Code of Conduct for Responsible Fisheries (FAO) 1995
- Convention on Biological Diversity: Ratified on 1992
- United Nations Framework for the Convention on Climate Change (UNFCCC)

2 FACTORS TO CONSIDER WHEN PREPARING THE EIA REPORT -

The outcome of an EIA is a formal document, which presents all the relevant information about the EIA process. Four bodies of information arise from an EIA process: methodology, data, results and conclusions derived from them. The use of graphical information such as maps, tables and graphs, is an effective way of improving communication. The EIA shall also be accompanied by supported appendices, the baseline study report and the environmental assessment that will provide technical details on specific issues, assumptions and modeling projections.

However, the document must also provide a summary of details adequate to allow the average reader to make an informed decision on the project as part of the non-technical summary.

It is the proponent's responsibility to identify and address, as fully as possible, the matters relevant to the specific proposal and to comply with the statutory requirements for the preparation of an EIA report. The following factors are important when preparing an EIA report:

- ◈ Early Considerations of the Strategic Context
- ◈ Early Assessment of Options
- ◈ Identifying Issues (foreseen and unforeseen)
- ◈ Prioritising Issues
- ◈ Mitigation
- ◈ Operation and maintenance
- ◈ Monitoring and evaluation

2.1 EARLY CONSIDERATIONS OF THE STRATEGIC CONTEXT -

Prior to embarking on fish farming at sea, a proponent and/ or his consultant (s) shall ensure that the proposed development is compatible with the farming zones listed in the Fourth Schedule of the Finance (Miscellaneous Provision) Act 2008 and as per the Process Flow for authorisation for fish farming at sea.

- ◈ If the undertaking is not in the appropriate zone and in the absence of proof of land ownership for related facilities to be sited on land/authorisation to use the site for the proposed development , the application will not be considered;
- ◈ No permit for development shall be granted in respect of an undertaking, unless there is an approved EIA Licence;
- ◈ No development shall be allowed on sensitive coastal areas including mangroves and wetlands; and conservation areas and their buffer zones, e.g. marine

protected areas, islet nature reserves and islet natural park;

- Natural drains shall not be blocked;
- Any discharge of effluent shall be in compliance with the regulations in force;
- Measures proposed for the protection of water resources shall be to the satisfaction of Ministry of Public Utilities; and
- Measures proposed for the protection of marine resources shall be to the satisfaction of the Fisheries Division

2.2 EARLY ASSESSMENT OF OPTIONS

The objectives for the undertaking should be developed to fulfil any identified need and should encompass the principles of *Sustainable Development (SD). SD* principles should be considered when identifying options for all aspects of the proposal. All feasible alternatives that could satisfy the objectives of the proposal should be considered. When weighing up options, the biophysical, economic and social costs and benefits throughout the whole life cycle of the proposed development should be considered. The "do nothing" option should also be included in these considerations.

2.3 IDENTIFYING ISSUES (foreseen and unforeseen)

The general framework for an EIA is usually a precursor to identifying potential environmental issues; the proponent must be able to outline:

- the important characteristics of the project which will determine the scope of the potential impacts; and
- the proposed site (sea and land) and a preliminary assessment of sensitivity of the site.

If the proposed characteristic on the site should change, then the potential comforts may also change. If at any time change occurs, the scoping process for the EIA should be reviewed.

2.4 PRIORITISING ISSUES

The EIA process should focus attention on the key issues of concern. Not all issues identified will have the same degree of relevance for all proposals. The relative importance placed on different issues will vary from case to case, and is a function of the scale of the proposal and the sensitivity of the receiving environment. Issues should therefore be prioritized according to their importance in the decision- making process.

When prioritising issues, consideration should be given to the potential severity, temporal and spatial extent of any beneficial and adverse effects; their direct impacts as well as any indirect, secondary, tertiary or cumulative impacts; and whether the effects are continuous or intermittent, temporary and reversible or permanent and

irreversible.

The outcome of the identification and prioritisation process should result in:

1. a list of all issues with a preliminary estimate of the relative significance of their impacts

2. identification of the key issues

3. an explanation as to why other issues are not considered 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 on the proposal.

3 CONTENTS OF AN EIA

The EIA on proposed fish farming in a fish farming zone in the sea shall ensure that all the environmental parameters have been addressed and their consequences recognised and taken into account in the project design. The EIA report should not comprise statements of a general nature but instead shall provide substantive and indicative information on the proposed activity, the measures proposed to mitigate all adverse impacts as well as the opportunities for environmental enhancement so as to enable a proper assessment.

The EIA shall be duly signed and dated by either the proponent or his appointed legal representative and countersigned by the consultant. Under section 85(1) of EPA 2002, any person who submits a false report or submits a report misleading in any material particular or provides false or misleading information shall commit an offence.

The format below provides a guide on the content of an EIA report for a proposed fish farm in the sea.

3.1 TITLE PAGE

This should contain details of

- The full title under which the EIA has been prepared
- Location of project
- The team responsible for the EIA or name(s) of the consultant(s)/consultancy firm
- The proponent names and signatures
- The date of application

3.2 TABLE OF CONTENTS

The table of contents must indicate the different chapters with their respective page numbers

3.3 EXECUTIVE OR NON-TECHNICAL SUMMARY

The summary should be concise and give a short overview of the proposal to facilitate understanding of the proposal by the general public. The language used should be simple and non-technical.

It should primarily focus upon key environmental impacts and the proposed mitigating measures and should include a clear map or aerial photograph of the location.

3.4 INTRODUCTION

It should provide background information on the project, promoters, any experience in similar projects, project cost-benefit analysis, time scale for the development and employment opportunities as well as the technical, economical and environmental features essential to the project.

3.5 SITE AND PROJECT DESCRIPTION

This section should describe the site and project and indicate the justification and rationale underlying the project.

3.5.1 Site Description

A description should be given in general terms to indicate the nature and broad character of the local environment.

- Comprehensive site and location plans of the Fish Farming Zone, in which the fish farming activities at sea and on land will take place, drawn to scale (1:2500) with known landmarks as reference points together with aerial photographs;

- Plan showing the boundaries of the proposed area within the zone where the aquaculture activity will take place, with GPS coordinates WGS84/UTM (Latitude & Longitude in decimal degrees) for each corner mark. A lay-out plan of any land based facilities should be provided;

- A scaled site plan showing details of the structures and works associated with the proposed aquaculture operations within the Fish Farming Zone;

- Description of the physical characteristics of the zone e.g. water depth, substratum (sandy, rocky, muddy etc), prominent features, sea grass meadows; and

- Dimensions (length; width and depth) of the proposed area to be used within the

Fish Farming Zone (in metres).

3.5.2 Project Description

This should describe the project and indicate the justification and rationale underlying the project, including:

- The project proponent
- Objective and justification of the project
- Benefits and disbenefits of the project
- Details on the fish farm
- Components of the project including inputs, processes, products, types of chemicals and pharmaceuticals that will be used, feed, etc
- Design, size and scale of the project
- Detailed specification of technology to be used; its maintenance and viability (The extent, magnitude, duration, severity, significance, etc of impacts will depend on the technology used and on the scale of the activity)
- Aquaculture Operations Management Plan
- Volume of fish in cages, amount of potential waste and feed wastage
- Plans and policies with which the project conforms
- Detailed site / layout plan drawn to scale (1:2500) indicating site boundaries (as per title deeds) and showing all structures proposed to be put up on site
- Description of the structures to be placed on the area supported with drawings including details of anchorage/mooring and buoyancy systems
- Capital investment, operating costs and waste disposal costs
- A specification of requirements with respect to extreme events (cyclones, floods , sea level rise , tsunamis , earthquake , etc)
- Training requirements of the project
- Employment opportunities during implementation and operation
- Contingency plan in case of disease outbreak (The contingency plan should clearly indicate the procedures and persons to be contacted in case of such an event)
- Both common and scientific names of all species that will be farmed
- Details of where broodstock or culture stock will be obtained

- Details of the monitoring programme which shall be established by the proponent.
- Guiding principles governing fish farming
- Hatchery and quarantine

3.6 FULL DESCRIPTION OF THE EXISTING ENVIRONMENT

The description should provide details of the environment in the vicinity of the development site and any aspects of the wider environment likely to be affected by the project. In this regard, topological, physical, visual, meteorological, social, cultural, heritage, economic and aesthetic aspects should be considered. The relevant descriptions should be elaborated to serve as a baseline for assessing environmental effects.

3.6.1 Establishment of Baseline Data of the Farming Zone

- Data source, data collection methodology e.g. survey, matrix or checklist and results of site investigation
- Any constraints in collection of data or omissions in data collected and proposed remedial measures
- Sea bed, water quality - physico-chemical and ecological characteristics
- Information on the uncertainties and assumptions involved in interpreting or using results for predictive methods and analytical techniques and a description of gaps in baseline and other data used in the preparation of the EIA report.
- Physical, chemical and biological characteristics of the coastal water and also details on the flushing in the lagoon and outer reef should be given.
- A bathymetric map of the zone within the farming zone
- The description of the chemical oceanography parameters including sea water analyses, lagoon and ocean water salinity, temperature, horizontal and vertical visibility measurements and description of any sign of anthropogenic contamination or pollution, in the area of the project.
- The quantification of the physical oceanography parameters includes the wave and tidal patterns, the water circulation and the current velocity.
- The description of the type of substrate of the zone.

3.7 CLIMATIC CONDITIONS AND ASSOCIATED IMPACTS

Description of the expected environmental conditions at the time of the probable project implementation, e.g. temperature, rainfall, wind direction, wind speed and associated constraints e.g. summer season, rainy season, cyclonic period, tidal

regime and respective water current studies etc.

3.8 PREDICTED ENVIRONMENTAL IMPACTS AND POTENTIAL MITIGATING MEASURES

This part should include impacts during **construction, operation phase and decommissioning phase** on the following issues: affected stakeholders/community; air quality; water quality; solid and liquid waste management; terrestrial ecology, visual and landscape (obstruction of views by structures), surfing zone, and seafloor ecology including marine flora and fauna, critical coastal habitats; disturbance to archaeological resources; erosion; interference with public access and recreation; point and non-point sources of pollution. For each impact the section should state steps to be taken to avoid or reduce it and the likely effectiveness and adequacy of mitigation.

3.8.1 Construction Phase

- Impacts of construction and demolition activities (if any) on the physical environment such as site preparation, construction relating to the land component of the fish farming activity
- Frequency, duration and location of intrusive operations
- Transport of materials
- Public nuisances in terms of noise, dirt, odours, fumes, visibility , emissions, traffic implications
- Impacts of anchorage/mooring infrastructure in the sea for the farm and buoyage systems

3.8.2 POTENTIAL MITIGATION MEASURES

- Proper timing of construction activities
- Mitigation measures commonly required for construction activities should be incorporated (e.g., construction schedules that minimize impacts on public access and recreation, visual screening, noise buffers, siting away from high resource areas, limited construction zones and corridors, etc.), safe disposal of spoil.
- Precautionary measures against natural calamities, spillage and any accident.

3.8.3 Operation Phase

3.8.3.1 Impacts on the environment

An assessment and evaluation of potential impacts of fish farming on the environment and *vice versa* is essential with associated viable alternatives to

mitigate or eliminate the impacts. Issues, impacts and mitigation measures to be addressed in the EIA report are given below (list is non exhaustive).

Issues/Impacts

- On soil, water and air quality characteristics (biological, chemical, physical and geological characteristics). It shall address issues, impacts and mitigation measures against habitat change and degradation.

- Determining the significance of the ecological impacts. Factors include the timing of the impact, duration and frequency of the impact, timescale within which the impact is being investigated, spatial scale of an evaluation, the nature conservation value of a species or habitat

- Emissions inventory to indicate the sources, baseline and incremental concentrations

- Feed inputs and ability of the water body to assimilate and disperse fish waste and feed not consumed (nutrient load, dilution factor, residence time)

- Current speed, direction and wave frequency in the Fish Farming Zone

- Impacts to commercial fishing and navigation during construction/installation of the fish farm and during operation

- Accidental spills during loading, unloading, shipments and during operation

- Adherence to Codes of practice for fish culture

- Phytoplankton blooms

- Pollution - Discharge or release of effluent from any land- based related activities or sea-based plants

- Fish diseases and diseases outbreak.

- Utilisation of resources

- Abandonment/improper removal of fish culture structures

- Culture method/system, species and stocking density

- Escape, transboundary movements and exotic species introduction

- Traffic implications, including a brief traffic impact analysis at sea and on land.

- Interference with public access and recreation from fish farm or other structures

- Impacts on drainage system

- Unaesthetic views of seascapes
- Release of any chemicals and therapeutics

3.8.3.1.1 POTENTIAL MITIGATION MEASURES (non-exhaustive)

- Careful sitting of project away from sensitive or protected areas
- Planning and design of the development to ensure that it blends with its surroundings
- Preservation of scenic views and valued features
- Contingency plan against spillage, and disease outbreak
- Disease Risk Management Plan
- Quarantine measures
- Timing of operations to minimize impacts
- Quality control procedures and personnel training
- Notification of commercial fishing interests prior to constructions/installations
- Wastewater treatment system for land-based activities
- Proper waste treatment and disposal (solid/ liquid)
- Timing of activities to avoid major economic losses
- Responsible and sustainable fish farming techniques
- Compliance with prevailing legislations
- Type of feed
- Measures against erosion
- Measures against sea level rise/ natural calamities/force majeure such as cyclone
- Direct losses of habitats, flora and fauna, natural features (Feeding grounds, shelter, breeding sites and areas used during seasonal migration may be lost) , including habitat fragmentation
- Negative effects on the health of biota including plants and fish
- Threat to rare and endangered species
- Disruption in species diversity and the food web

- Hydrological disturbances – changes in the quality and quantity of surface and groundwater flows

- Use of pollution control equipment and establishment of appropriate working practices such as the fencing of working areas to reduce disturbance to adjacent habitats

- Proposed restoration programmes e.g. landscaping and rehabilitation proposals and their role in mitigating impacts such as compensatory rehabilitation with native species; provision of new appropriate habitats; opportunities for colonisation habitat restoration,

3.8.3.1.2 Landscape and visual impact assessment

◈ Loss of areas of distinctive landscape character, valued landscapes (e.g. local beauty spots), specific landscape elements (coastline, woodlands), viewers of the landscape (residents, tourists, visitors), conservation interest (archeological sites, historic landscapes, important habitats)

POTENTIAL MITIGATION MEASURES

◈ Careful siting , planning and design of the development to ensure that it blends with its surroundings

◈ Preservation of scenic views and valued features

◈ Replacing vegetation with an equivalent resource e.g. planting new trees

◈ Landscaping plan of site to be submitted

3.8.3.2 Ecological impacts

Ecological impact assessments are concerned with impacts not only on the structural features of the ecosystems (e.g. habitats, species) but also on their functional aspects (e.g. nutrient cycling).

The EIA Report should include:

◈ Prediction of the ecological impacts of the proposed development

◈ Direct losses of habitats, flora and fauna, natural features (Feeding grounds, shelter, breeding sites and areas used during seasonal migration may be lost) , including habitat fragmentation

◈ Negative effects on the health of biota including plants and fish

◈ Threat to rare and endangered species

- Reduction in species diversity or disruption of food webs
- Determining the significance of the ecological impacts. Factors include the timing of the impact, duration and frequency of the impact, timescale within which the impact is being investigated, spatial scale of an evaluation, the nature conservation value of a species or habitat
- Disturbance of aquatic organisms and aquatic habitats
- Hydrological disturbances – changes in the quality and quantity of surface and groundwater flows
- Changes in the physico-chemical environment.

POTENTIAL MITIGATION MEASURES

- Proper siting of project away from sensitive or protected areas
- Proper timing of construction activities if possible, when valued species are absent
- Use of pollution control equipment and establishment of appropriate working practices such as the fencing of working areas to reduce disturbance to adjacent habitats
- Proposed restoration programmes e.g. landscaping and rehabilitation proposals and their role in mitigating impacts such as compensatory rehabilitation with native species; provision of new appropriate habitats; opportunities for colonisation habitat restoration,

3.8.3.3Impacts on humans

3.8.3.3.1 Social impacts

- Impacts on local populations, namely demographic aspects, displacement of people, labour demands, etc
- Impacts on social infrastructure namely educational, recreational and health care facilities; transport; waste collection, treatment and disposal facilities; housing; water and power supply; public safety
- Impacts on land use namely conversion of land use from primary agricultural land, etc

3.8.3.3.2 Socio cultural and socio economic issues

There may also be social and economic consequences, which could be either positive or negative, arising from development. The economic and social impact of fish farming in a Fish Farming Zone should be examined in order to establish the total impact of such developments on the environment. This needs to be done not

only in terms of costs, but also in terms of potential benefits of a development.

Possible effects to be considered in the EIA may include:

- market demand for fish
    i. analysis of supply on the local market
    ii. future demand for local market
    iii. demand on the international market
- Economic impacts in terms of their potential effects on employment opportunities, income levels, foreign exchange, etc
- Increase in unemployment and shrinkage in the economy
- Potential economic impacts as a result of this development in terms of cost-benefit analysis

Socio-cultural impacts including adjacent centres of population; current activities carried out by different stakeholders; and recreational use on site.

- Impacts on cultural property, also termed as cultural heritage or cultural resources such as sites, structures and remains of historic, religious, cultural, archaeological or aesthetic value. Man- made features (e.g. burial grounds, monuments, listed buildings) as well as unique, natural sites (e.g. waterfalls, lakes, mountains) must be considered.
- Reduction of the quality and quantity of recreational opportunities or amenities
- Detrimental changes in the current use of lands and resources for traditional purposes; loss of religious sites

3.8.3.3.3 Impacts on human health and safety

- Negative effects on human health , well-being or quality of life
- Studies of Health effects and risks resulting from potential exposures to health hazards
- The nature, magnitude and likelihood of exposure should be assessed
- Health and Safety Plan shall be provided.

POTENTIAL MITIGATING MEASURES

- Safety measures for personnel, protective equipment as per Health and Safety Regulation

- Medical check up of workers
- Capacity building and training of personnel (*There should be competent and trained personnel to operate the fish farm)*

3.8.4 Risk assessment

- Frequency and severity of adverse events such as chemical spillage, technological failure, natural disasters, etc
- Probability of occurrence, reversibility, catastrophic potential, impacts on humans and the environment

3.8.5 Residual impacts

The EIA should indicate all unavoidable impacts. These should be justified in terms of benefits of the project and enhancements.

3.8.6 Cumulative and synergistic effects

- The ability of the natural and social environments to assimilate cumulative stresses placed on them
- The likelihood of negative synergistic effects including proposed mitigating measures.

3.9 Environmental Monitoring Plan (EMP)

The Environmental Monitoring Plan (EMP) shall include provisions made for on-site monitoring during site preparation, construction, operation, future maintenance requirements; and provision for audit during the operation of the project. The proposed general format for EMP is at **Annex 3.**

The EMP should include the following pertinent information:

1. During the project inception stage: a description of the baseline information and a benchmarking exercise based on the oceanographic characteristics in the form of a Baseline Report describing the bathymetry as well as the biological, chemical, physical and geological oceanographic characteristic of the lagoon and the outer ocean before the project is implemented. The Baseline Report shall include the setting up of at least three monitoring stations; one within the site; one monitoring station outside the fish farming zone (can be within the lagoon or the fore reef area depending on the physical oceanography at the site) and one control site far from the site to indicate and confirm if there is any local or general degradation of the marine environment. The monitoring sites should be clearly marked in the water using pegs and Line Intercept Transects for benthic surveys, fish count, seawater quality analyses and underwater photographs should be replicable at the various stages of the project.

2. During the project implementation phase: the monitoring sites shall be surveyed and checked regularly (at least once fortnightly) using the same methodology as described in the previous paragraph to detect any sign of environmental degradation during the works on land (if any)and at the sea

3. During the project commissioning and operation, the monitoring should be effected on the same sites using the same methodology as described above every month to detect any sign of environmental degradation of the marine biodiversity, take any remedial action as required before it is too late and submit reports quarterly to the Ministries in charge of Fisheries and Environment.

3.9.1 Identification of any additional studies necessary to implement the mitigating measures or monitoring and proposals recommended in the EIA report

The proponent shall indicate if he/she intends to undertake other studies in due course to monitor effectiveness of proposed mitigating measures.

3.10 Implementation Schedule

The proponent should provide an implementation schedule for the proposed project which shall include:

- EIA Reference
- Environmental impacts identified
- Recommended mitigation measures
- Objectives of the recommended measures and main concerns to address
- Responsible officer (party to implement the measures)
- Location of the impacts and measures
- Appropriate Implementation time and place of the measures
- Requirements or standards for the measure to achieve
- Responsible officer/party to provide feedback to the relevant authorities

3.11 Enhancement Opportunities

A brief outline should be given of any enhancement work such as landscaping and embellishment which is planned. This should be distinguished from mitigation measures, which are integral to the project and form part of the proposed development. For example upgrading of an access road for the public; participating in environmental upgrading campaigns; providing community services and

compensation to affected stakeholders.

3.12 Consultation

3.12.1 Public consultation

This section should indicate who has been contacted about the project. It should include:

- Statutory bodies, environmental and amenity groups and local residents, local fishermen, hotel operators, leisure boat operators etc. likely to be affected by the proposed development.
- Means for contacting the public for providing publicity about the project (leaflets, public display, questionnaires, letters, etc.).
- A brief summary of responses of public detailing the areas of concern highlighted and their contribution to the EIA.

3.12.2 Consultation with ministries/ authorities and organisations

Proponents and consultants embarking on a fish farming activities in the sea are advised to consult the following Ministries/ Authorities prior to finalising their EIA report:

- Prime Minister's Office
- Ministry of Housing & Lands
- Ministry of Public Utilities (WMA, WRU, CWA)
- Ministry of Public Infrastructure and Land Transport (RDA)
- Ministry of Local Government and Solid Waste Management
- Ministry of Agro Industry Food Production and Security(Fisheries Division, NPCS, Forestry, CA)
- Ministry of Environment and National Development Unit
- Ministry of Health & Quality of Life
- Ministry of Industry & Medium Enterprises, F.S & C.A
- Municipalities/ District Council
- Ministry of Public Infrastructure, Land Transport and Shipping

- Ministry of Labour, Industrial Relations and Employment

3.13 Alternatives

This section should give an outline of:

- The alternatives to the project
- The “Do Nothing” option - what will be the outcome of not undertaking the project?
- the alternative considered to be the “ most environmentally friendly” even if this is not the project
- Can the project be undertaken elsewhere?
- Any alternative manner or process in which the undertaking may be carried out so as to cause less harm to the environment.
- An evaluation of the impacts of each alternative, with clear information on the criteria used to assign significance and for rejecting the alternatives
- The stage in the planning process when they were rejected

3.14 Conclusions and Summary of Environmental Outcomes

Include any irreversible residual impacts, which cannot be mitigated.

3.15 Appendices

These should include information, which would cluster the main body of the text, such as plans and maps; species lists; press releases; written responses to the project.

As appropriate, include any additional technical information and description of approaches or methods used to provide conclusions in the EIA report; a full list of reference materials; names and qualifications/expertise of the EIA consultants and experience in preparing pertinent EIA Reports for the previous years.

3.16 PROPONENT CHECKLIST FOR FISH FARMING AT SEA

1. EIA duly signed by proponent or legal representative_____
2. EIA duly signed by consultant who prepared the report_____
3. Number and quality of printed EIA copies submitted (18)_____
4. Name and Address of Proponent_____
5. Name, address and qualifications of consultants_____

6. Conformity of soft copy version to proposed guidelines_____
7. Title page_____
8. Table of contents_____
9. Executive or non-technical summary_____
10. Introduction_____

- Background information on project, promoters, any experience in similar projects_____
- Project cost-benefit analysis_____
- Time scale for development_____
- Employment opportunities_____
- Technical, economical and environmental features of project_____

11. Site Description_____

- Letter of Intent (Letter of Authorisation) from the Permanent Secretary in charge of Fisheries_
- Letter of Reservation for the fish farming zone from the Prime Minister's Office_____
- Zoning, land extent_____
- Site plan (prepared and signed by land surveyor)_____
- Context plan_____
- Certified site / location plan to scale _____
- Known landmarks_____
- Surrounding environment_____
- Number of similar undertakings in the area_____
- Compatibility of land uses within the area_____

12. Project Description_____

- Principle , concept and purpose of farm_____
- Benefits and disbenefits of the project_____
- Design, size and scale of project_____

- Capacity of farm_____
- Quality of fish to be farmed (certification)_____
- Source and volume of broodstock_____
- Types of infrastructure to be used_____
- Detailed site/layout plan_____
- Detailed specification of technology used_____
- Plans policies and regulations with which the project conforms_____
- Detailed plans of buildings /cages / structures----------
- Capital investment_____
- Provision for utilities_____
- Surface drains_____
- Disposal of wastewater_____
- Disposal of solid waste_____
- Contingency plan_____

13. Description of existing environment_____
    - Baseline data_____
    - Detailed bathymetric study of lagoon within the identified fish farming zone
    - Physical, chemical and biological characteristics of the coastal water_____
14. Climatic conditions and Associated impacts_____
15. Predicted Environmental Impacts and Potential Mitigating measures_____

	Construction Phase		Operation Phase		Decommissioning Phase	
Environmental Issues	**Impacts**	**Mitigating Measures**	**Impacts**	**Mitigating Measures**	**Impacts**	**Mitigating Measures**
1. Energy use 2. Air quality 3. Coastal and marine issues 4. Land issues 5. Landscape and visual impact 6. Growth – inducing impacts 7. Ecological Impacts 8. Social impacts 9. Socio- cultural and economic impacts 10. Human health and safety 11. Noise impact 12. Risk assessment 13. Residual impacts 14. Cumulative and synergistic effects						

16. Environmental Monitoring Plan (EMP)_____
    - During site preparation and implementation phase_____
    - During operation phase_____
    - During decommissioning phase_____
17. Identification of additional studies_____
18. Implementation schedule_____
19. Enhancement opportunities_____
20. Public consultation _____
21. Consultation with relevant stakeholders_____
    - Permit / clearances obtained_____
22. Alternatives_____
23. Conclusion_____
24. Appendices_____
25. References_____

4 ANNEX 1

REQUIREMENTS OF AN EIA REPORT ACCORDING TO EPA 2002

The Environment Protection Act provides a general guide on the contents of an EIA document which shall contain a true statement and description of:

(a) the name and address of the proponent;

(b) the ownership of the undertaking and of the land on which it is being conducted;

(c) the name, address and qualifications of the consultant who prepared the EIA;

(d) the precise location and surroundings of the undertaking, the zoning of the site and the number of similar undertakings in the area;

(e) the principle, concept and purpose of the undertaking;

(f) the direct or indirect effects that the undertaking is likely to have on the environment;

(g) an assessment of the social, economic and cultural effects which the undertaking is likely to have on the people and society;

(h) any actions or measures which the proponent proposes to take to avoid, prevent, change, mitigate or remedy, as far as possible, the likely effects of the undertaking on the environment;

(i) an assessment of the inevitable adverse environmental effects that the undertaking is likely to have on the environment, people and society, where it is implemented in the manner proposed by the proponent;

(j) an accurate assessment of the irreversible and irretrievable commitment of resources which will be involved in the undertaking, where it is implemented in the manner proposed by the proponent;

(k) any alternative manner or process in which the undertaking may be carried out as to cause less harm to the environment;

(l) an environmental monitoring plan;

(m) information pertaining to the decommissioning of the project at the end of its life cycle and associated impacts, proposed measures to return the site as far as possible to its former state, or rehabilitation measures;

(n) in the case of a new infrastructure proposal, an environmental management plan to be implemented during the construction phase; and

(o) such other information as may be necessary for a proper assessment and

review of the potential impact of the undertaking on the environment, people and society.

Furthermore Section 19 states that, the EIA shall contain particulars of the schedule of works undertaken by the proponent and his consultants in the preparation of the EIA, including particulars of any consultation held with the public in the area where the undertaking is to be located.

Section 18 also provides for the EIA to be accompanied by:

(a) satisfactory proof of ownership of the undertaking through the Letter of Intent relating to the fish farming activities from the PS in charge of Fisheries and the concession from the PMO;

On applying for an EIA licence, a proponent shall submit to the Director of Environment an EIA report:

(a) in electronic form, and in 15 printed copies, and such additional copies as may reasonably be required by the Director;

(b) Signed by the proponent or his duly appointed legal representative and countersigned by the consultant who prepared the report.

Furthermore, the Director may request such additional information from the proponent as he thinks necessary.

Any proponent who gives false or misleading information, or fails to disclose any material fact or information in a EIA, shall commit an offence, and shall on a first conviction, be liable to a fine not exceeding 50,000 rupees and to imprisonment for a term not exceeding 2 years.

Any proponent who contravenes section 15(2) shall on a first conviction, be liable to a fine which shall be not less than 50,000 rupees and not more than 100,000 rupees and to imprisonment for a term not exceeding 4 years.

The Director of Environment may serve, or cause to be served, on any person who commences or carries on any development or activity without the relevant licence or permit issued under the EPA 2002 a **stop order** prohibiting the development or the activity.

5 ANNEX 2

GUIDELINES FOR SUBMISSION OF EIA REPORTS IN SOFT COPY VERSIONS

Under **Section 18** of the New Environment Protection Act 2002 and to allow more transparency, applicants submitting EIA reports should submit same in both hard copy and soft copy versions. The objective of adhering to the specifications, as set down below is to ensure that users can download the EIA reports through the Ministry's Website in a more user-friendly format. In this connection the Ministry strongly appeals to you for your collaboration and co-operation in this matter.

(A) SPECIFICATIONS OF SOFT COPY VERSION

The soft copy version of the report, which should ***be identical to the hard copy version***, should be submitted in electronic file preferably on a CD or in WinZip format in floppy disks.

(a) The document should be broken into its different chapters with each chapter in a separate file. The executive summary also should be treated as a chapter and submitted in a separate file. If a chapter exceeds 50MB, then it should be further broken down into files of less than 50 MB.

(b) The table of contents also should be submitted in one separate file. All the chapters/headings/appendices listed under the table of contents should have proper naming. This is important to allow the user to know which file he/she is accessing.

(c) The table of contents should provide links to the different chapters including the executive summary and appendices.

(d) All filenames must:

- be less than 8 characters
- be in small letters
- start with a letter

(B) The soft copy version should be page numbered, in the same order as the hard copy and should be submitted in any one of the following 2 different formats:

- Html format.
- PDF format

All html files must be in the htm extensions file format. All image files must be in the gif/jpg extension file format.

(C) The EIA section will open the electronic file in the presence of the applicants in order to ensure that the hard and soft copy versions are absolutely the same. In case the soft copy version does not contain documents, which are present in the hard copy version, the applicants would be called upon to fill in the form as per Appendix 1. Decision to accept or reject the soft copy version would be taken by the EIA Division and the applicants would be informed at a later stage**.**

The Ministry encourages applicants to submit their soft copy version reports at the time of submission of the EIA reports (hard copy versions) in order to allow timely processing.

6 Appendix I

Please indicate which documents are missing from the softcopy version of the EIA report

TITLE OF REPORT: ……...

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FULL NAME: ……...

DESIGNATION: ……..

PHONE: ……. **FAX**: …… **EMAIL**: …….

SIGNATURE: ……...

DATE: ……...

FOR OFFICE USE

Verified by: ……...

Signature: …….

Date: ……..

7 ANNEX 3

Proposed format for an Environmental Monitoring Plan (EMP)

Proposed format for EMP:

1. Site Preparation and implementation phase

- Site characteristics (include plans/photographs/drawings/ showing the project area any environmental sensitive receivers and ambient air/water/sea water qualities)
- Works involved and proposed mitigating measures to prevent negative impacts on water course /road users/immediate neighbours.
- Clauses to be included in contract documents to ensure implementation of proposed mitigating measures.
- Person/s responsible for informing the authorities on the date of commencing works and monitoring the proposed mitigating measures.
- Reporting procedures to the authorities.

2. Operation Phase

- Parameters to be monitored (e.g. effectiveness of the disease monitoring plan, effectiveness of measures taken in respect of liquid and solid waste management, measures adopted in respect of use of feed, antibiotics and drugs
- Monitoring methodology
- Equipment to be used and calibration details
- Monitoring locations and control stations
- Monitoring frequency and duration
- The institutional system by which monitoring data will be collected, collapsed (standards), analysed, interpreted and action taken if necessary to prevent or reduce unwanted impacts
- Contingency plan (in case of emergencies such as uncontrolled discharge of pollutants, disease outbreak, natural calamities)
- Maintenance component including infrastructure maintenance, daily and periodical maintenance of the site, setting up of appropriate maintenance

teams for treatment plant, standby generator, etc.

- Management structure for maintenance and monitoring.
- Reporting procedures to the authorities.

3. <u>Decommissioning phase</u>

- Works involved and proposed mitigating measures to prevent negative impacts on water course/road users/immediate neighbours.

- Clauses to be included in contract documents to ensure implementation of proposed mitigating measures.
- Person/s responsible for informing the authorities on the date of commencing works and monitoring the proposed mitigating measures.
- Reporting procedures to the authorities.

An EMP should not be taken as a nice piece of paper included in the EIA report to influence positively the decision-maker. Instead an EMP should be implemented by the proponent, documented in regular reports. It is proposed that the report resulting from the implementation of an EMP should contain the following:

- An executive summary.
- Basic information on the project including a synopsis of the project organization, management structure (for maintenance and monitoring), and works undertaken during the monitoring works.
- A brief summary on the requirements of the EMP including all parameters monitored; methodology used; environment quality performance/standards limits; environmental mitigating measures as recommended in the EIA report and consent condition imposed in the EIA licence; and environmental requirements in contract documents.
- Status on the implementation of the mitigating measures and pollution control measures.
- Drawings/plans showing the project area, any environmental sensitive receivers and the location of the monitoring and control stations.
- Monitoring results including date, time frequency and duration.
- Presentation of monitored parameters (preferably graphical plots of trends)
- Constraints and any factors which might have affected the monitoring results
- A summary of non-compliance of the environmental quality performance

limits.

- A review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;

- A description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance;

- A summary record of all complaints received (written or verbal) for each media, including locations and nature of complaints, liaison and consultation undertaken, actions and follow-up procedures taken and summary of complaints;

- A summary record of notification of summons, successful prosecutions for breaches of environmental protection/pollution control legislation, and actions taken to rectify such breaches;

- A forecast of the works programme, impact predictions and monitoring schedule for the next three months; and

- Comments, recommendations and conclusions for the monitoring period.

8 REFERENCES

1. Prime Minister's Office: Maritime Zone Act (2005)
2. Ministry of Agro-Industry, Food Production and Security (Animals diseases Act (1925)
3. Finance Act (Miscellaneous Provisions) Act 2008
4. Ministry of Environment (September 2002): Environment Protection Act
5. Ministry of Environment (2002): Meeting the challenges of sustainable development
6. Ministry of Housing & Lands (2004): Planning Policy Guidance
7. The World Bank (August 1998): Environmental guidelines
8. Asian Development Bank (1993): Environmental Assessment Guidelines
9. Division of Water, Environment and Forest Technology, CSIR, Stellenbosh (Sep. 1996): Strategic Environmental Assessment)
10. Ministry of Agro-Industry, Food Production and Security (Fisheries and Marine Resources Act 2007)
11. Developpement de L'Aquaculture à L'ile Maurice, Etude du Potentiel Aquacole (Aquaculture Master Plan 2007).
12. Code of Conduct for Responsible Fisheries, FAO, 1995