# ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES FOR RADIOACTIVE MATERIALS AND RADIOACTIVE WASTES

Source: Compact Waste Facility in the State of Texas in United States

**DEPARTMENT OF ENVIRONMENT**
MINISTRY OF ENERGY, SCIENCE, TECHNOLOGY, ENVIRONMENT & CLIMATE CHANGE
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# PREFACE

This is the first edition of the **Environmental Impact Assessment Guidelines For Radioactive Materials and Radioactive Wastes** following the amendments to the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015 of the Environmental Quality Act (EQA) 1974 on 28 August 2015.

In Malaysia, an **Environmental Impact Assessment (EIA)** is a statutory requirement for activities, which have been prescribed under Section 34A of the EQA 1974. These prescribed activities have been categorised under the new Order into the **First** and **Second Schedules**.

The Guidelines aim to protect the quality of the environment in the development of prescribed activities involving radioactive materials and radioactive wastes by:

- Defining environmental requirements for the prescribed activity.
- Providing a range of tools and methods to avoid and/or to reduce and minimise the sources of environmental pollution to an acceptable level.
- Guiding the selection and application of these tools and methods to maintain a healthy environment during different phases of project implementation, including abandonment / decommissioning phase.
- Guiding towards environmental excellence by self-regulating and implementing 5S concept in environmental management.

The Guidelines shall provide guidance to the Project Proponents, Qualified Person (i.e. DOE-registered EIA Consultants), and other EIA-related practitioners in the preparation and submission of EIA reports for **prescribed activities involving radioactive materials and radioactive wastes** as stated in the Order.

The Guidelines shall only be used within the framework of the EQA 1974 including its future updates, and its subsidiary regulations.

**(DATO' DR. HAJI AHMAD KAMARULNAJUIB BIN CHE IBRAHIM)**

Director General of Environmental Quality

Malaysia

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# ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES FOR RADIOACTIVE MATERIALS AND RADIOACTIVE WASTES

## TABLE OF CONTENTS

**PAGE**

**PAGE**

**PAGE**

**PAGE**

**PAGE**

# LIST OF TABLES

## LIST OF FIGURES



## LIST OF APPENDICES

# ABBREVIATIONS

| | |
|---|---|
| 4R | Reduce, Reuse, Recover and Recycle |
| Act 127 | Environmental Quality Act 1974 |
| Act 304 | Atomic Energy Licensing Act 1984 |
| AELB | Atomic Energy Licensing Board |
| AI | Appointed Individuals |
| AN | Ammoniacal Nitrogen |
| APCS | Air Pollution Control System |
| As | Arsenic |
| B | Boron |
| BAT | Best Available Technologies |
| BMP | Best Management Practices |
| BOD | Biochemical Oxygen Demand |
| BOD | Biochemical Oxygen Demand |
| BPEO | Best Practical Environmental Option |
| BSRP | Atomic Energy Licensing (Basic Safety Radiation Protection) Regulations 2010 |
| Cd | Cadmium |
| CEMS | Continuous Emission Monitoring System |
| CEO | Chief Executive Officer |
| $Cl_2$ | Free Chlorine |
| CM | Compliance Monitoring |
| CN | Cyanide |
| CO | Carbon Monoxide |
| COA | Conditions of Approval |

| | |
|---|---|
| COD | Chemical Oxygen Demand |
| $Cr^{3+}$ | Chromium Trivalent |
| $Cr^{6+}$ | Chromium Hexavalent |
| Cu | Copper |
| DID | Department of Irrigation and Drainage |
| DO | Dissolved Oxygen |
| DOE | Department of Environment |
| DOF | Department of Fisheries |
| DOSH | Department of Occupational Safety and Health |
| e.g. | Example |
| EESIM | Environmental Essentials for Siting of Industries in Malaysia 2017 |
| EGIM | Environmental Impact Assessment Guideline in Malaysia 2016 |
| EIA | Environmental Impact Assessment |
| EIA Order | Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015 |
| EIATRC | EIA Technical Review Committee |
| EM | Environmental Manager |
| EMP | Environmental Management Plan |
| EMT | Environmental Management Teams |
| EO | Environmental Officer |
| EPMC | Environmental Performance Monitoring Committee |
| ERCMC | Environmental Regulatory Compliance Monitoring Committee |
| ERP | emergency response plan |
| ESA | Environmental Sensitive Areas |
| ESCP | Erosion and Sediment Control Plan |

| | |
|---|---|
| ESI | Environmental Screening Information |
| ESM | Environmental Scoping Matrix |
| ETA | Event Tree Analysis |
| etc. | Et cetera |
| F-18 | Fluorine 18 |
| Fe | Iron |
| FGD | Focal Group Discussions |
| FTA | Fault Tree Analysis |
| GA | Government Agencies |
| GIS | Geographic Information System |
| HC | Hydrocarbons |
| HCl | Hydrogen Chloride |
| HEPA | High Efficiency Particulate Filter |
| HF | Hydrogen Fluoride |
| Hg | Mercury |
| HIA | Health Impact Assessment |
| ICRP | International Commission on Radiological Protection |
| IEM | Institution of Engineers Malaysia |
| IETS | Industrial Effluent Treatment System |
| IM | Impact Monitoring |
| JKPTG | Department of Director General of Land and Mines |
| JKR | Public Works Department |
| LD-P2M2 | Land Disturbing Pollution Prevention And Mitigation Measures |
| LEM/TEK/56 | Guidelines for Decommissioning of Facilities Contaminated with Radioactive Materials |

| | |
|---|---|
| MESTECC | Ministry of Energy, Science, Technology, Environment and Climate Change |
| MIDA | Malaysian Investment Development Authority |
| MITI | Ministry of International Trade and Industries |
| MMO | Malaysian Medical Organization |
| Mn | Manganese |
| MOH | Ministry of Health |
| MOM | Minutes of Meetings |
| MOSTI | Ministry of Science, Technology and Innovation |
| MPFN | National Physical Planning Council of Malaysia |
| mSv/yr | millisievert per year |
| MSMA | Urban Stormwater Management Manual for Malaysia 2012 |
| MTRA | Marine Traffic Risk Assessment |
| NGO | Non-Governmental Agencies |
| Ni | Nickel |
| $NO_2$ | Nitrogen Dioxide |
| $NO_2$ | Nitrite |
| $NO_3$ | Nitrate |
| NORM | Naturally Occurring Radioactive Material |
| NPCZP | National Physical Coastal Zone Plan |
| NPP-3 | National Physical Plan-3 |
| Nuclear Malaysia | Malaysian Nuclear Agency |
| $O_3$ | Ozone |
| P2M2 | Pollution Preventions and Mitigation Measures |
| Pb | Lead |
| PBT | Local Authority |

| | |
|---|---|
| PEMS | Predictive Emission Monitoring System |
| PERHILITAN | Department of Wildlife and National Parks Peninsular Malaysia |
| PLANMalaysia (JPBD) | Department of Town and Country Planning of Peninsular Malaysia |
| PM | Performance Monitoring |
| $PM_{10}$ | Particulate Matter 10 Micron |
| $PM_{2.5}$ | Particulate Matter 2.5 Micron |
| $PO_4$ | Phosphate |
| PPE | personal protective equipment |
| PTD | District and Land Office |
| PTG | Land and Mines Office |
| QRA | Quantitative Risk Assessment |
| RIA | Radiological Impact Assessment |
| RPO | Radiation Protection Officer |
| RQSAT | Report Quality Self-Assessment Tool |
| $S^{2-}$ | Sulphide |
| SI | Soil investigations |
| SIA | Social Impact Assessment |
| Sn | Tin |
| $SO_2$ | Sulphur Dioxide |
| SPAN | National Water Services Commission |
| SPC | State Planning Committee |
| SSA | Site Suitability Assessment |
| SSL | Site Screening Levels |
| STS | Sewage Treatment Systems |
| Th-232 | Thorium 232 |

| | |
|---|---|
| TIA | Traffic Impact Assessment |
| TOR | Terms of Reference |
| TORAC | TOR Adequacy Check |
| TSS | Total Suspended Solids |
| VOC | Volatile Organic Compounds |
| Zn | Zinc |
| ZOI | Zone of Impact |
| ZOS | Zone of Study |

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# CHAPTER 1

# INTRODUCTION

## 1.1 INTRODUCTION

This document is entitled the "**Environmental Impact Assessment (EIA) Guidelines for Radioactive Materials and Radioactive Wastes**" (herein referred to as the "Guidelines").

The Guidelines are newly issued to align with the latest amendments in the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015 (herein referred to as the EIA Order 2015), of the Environmental Quality Act 1974 (Act 127).

EIA Order 2015 superseded the previous Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 1987, with a revised list of Prescribed Activities, which are now divided into the **First Schedule** (comprised of 21 Prescribed Activities) and **Second Schedule** (comprised of 17 Prescribed Activities).

The Department of Environment (herein abbreviated to as DOE) through the EIA Order 2015 has enhanced the EIA process to make it more reflective of the scope, functions and visions of the Department in line with its Environmental Management Strategic Plan, focusing on **self-regulation** by implementing the environmental mainstreaming tools as well as the application of **5S concept** in compliance with latest environmental requirement and improvement of environmental management.

The Guidelines are applicable to any activities that fulfil the definition of Activity 17 of the Second Schedule of EIA Order 2015 (herein referred to as Activity 17).

It is to be read together with Environmental Impact Assessment Guideline in Malaysia (EGIM 2016), Environmental Essentials for Siting of Industries in Malaysia (EESIM 2017) and other relevant sectoral EIA guidelines for specific industries (herein referred to as Sectoral Guidelines).

In addition, the Guidelines are to be read together with Section 12(1) of the Atomic Energy Licensing Act 1984 (Act 304) and associated regulations, orders and guidelines made under it that regulate matters on radiological activities in Malaysia.

Compliance with the requirements set out in those various specific Sectoral Guidelines, EGIM 2016, EESIM 2017, EIA Order 2015 and Act 304, is the obligations of the Project Proponent as stated under Section 34A (2C) of the Act 127 and/or any amendments thereafter.

## 1.2 GUIDELINES OBJECTIVES

The objectives of the Guidelines are to:

(a) Provide a clear and concise guidance document on EIA preparation to the stakeholders, Project Proponents, Qualified Persons (i.e. DOE registered Environmental Consultants), Government Agencies (GAs), Enforcement Officers and other EIA related practitioners.

(b) Facilitate harmonization, integration and adoption of specific radiological procedures, as outlined in the Act 304, the associated regulations, orders, and guidelines made under Act 304 into the EIA process.

(c) Provide a detailed step-by-step guidance with explanations of the EIA procedures and submissions, comprising:

  (i) Environmental Scoping Information (ESI).

  (ii) Terms of Reference (TOR).

  (iii) EIA Reporting.

(d) Define the scope of the EIA with a focus on the significant radiological issues relevant to the Atomic Energy Licensing Board (AELB) in respect of the DOE's three functional areas (water, air and wastes), whilst also taking into consideration radiological safety and protection requirements by AELB and/or other agencies (e.g. Department of Occupational Safety and Health (DOSH)), to facilitate overall decision-making and project approval of the EIA.

(e) Provide an integrated framework for decision making for the DOE to assess the EIA report in consideration of AELB as the authority responsible for radiological activities in the country.

## 1.3 SCOPE OF THE GUIDELINES

The scope of the Guidelines covers the prescribed activities defined by Activity 17 of the EIA Order 2015 as follows:

17 Radioactive Materials and Radioactive Waste:

Any activity specified in this Schedule and the First Schedule using radioactive materials and generating radioactive wastes

In turn, the prescribed activities under Activity 17 shall only be applicable to the following activities:

(a) Activities that require Class A and/or Class G licences under Act 304.

**Table 1.3.1: Class of licenses under AELB**

| Class of License | Description | Activity |
|---|---|---|
| **Class A** | Radioactive Materials | Manufacture, Trade-in, Produce, Process, Purchase, Own, Possess, Transfer, Handle, Sell, Store, Import, Export |
| | | Milling of materials containing or associated with radioactive materials |
| | | Waste Treatment Facility for radioactive materials |

| Class of License | Description | Activity |
|---|---|---|
| **Class B** | Nuclear Materials | Same as Class A |
| **Class C** | Irradiating Apparatus | Purchase, Sell, Trade in, Transfer, Import, Export, Possess, Own, Use, Store and Handle. |
| **Class D** | Transportation | Transport |
| **Class E** | Import Export | Import, Export |
| **Class F** | Nuclear Installation | Same as Class A |
| **Class G** | Disposal/Storage Radioactive Materials before Disposal | Disposal of radioactive materials or their wastes, Storage of radioactive materials or their wastes<br>Decommissioning of milling facility or waste treatment facility |
| **Class H** | Others | Maintenance, Leak Test |

(b) Activities that require a Radiological Impact Assessment (RIA) to be conducted

(c) Any other activities or otherwise determined by AELB as requiring RIA.

This EIA Guidelines are NOT applicable to the following;

(a) Activity 11 Power Generation and Transmission Activity (b) Construction of nuclear-fuel power station with or without transmission line under the Second Schedule of the EIA Order 2015

(b) Activities that involve nuclear reactor, nuclear materials and nuclear wastes.

This Guidelines are applicable for projects involving the use of radioactive materials and generating radioactive waste, in assisting the Project Proponent when planning and developing new or expanding existing projects during the four major phases of project development, i.e. planning, pre-construction, construction and operation.

Specifically, for project development involving Activity 17, EIA considers the inherent nature of the radiological activities and their potential impacts as additional consideration.

## 1.4 STRUCTURE OF THE GUIDELINES

The Guideline is structured according to the step-by-step procedures highlighted in **Section 1.4**, divided into eight Chapters with their respective supporting sections below:

| Chapter | Details |
|---|---|
| **Chapter 1**: Introduction | Provides an introduction to the Guidelines covering the objectives, scope and structure.<br>Provides an overview on environmental project planning and approaches to integrate the EIA process.<br>Provides a concise review of legislations, policies and guidelines, and how they relate to the EIA process.<br>Provides definitions for associated key terms. |
| **Chapter 2**: Terms of Reference (TOR) | Provides the procedures to conduct environmental screening and scoping the significant issues to prepare the TOR from the ESI.<br>Presents the structure and content for TOR reporting, including an overview of the review and endorsement process.<br>Provides stakeholders engagement requirements. |

| Chapter | Details |
|---|---|
| **Chapter 3**: Environmental Impact Assessment: Baseline Conditions | Provides an outline of the relevant baseline information required for incorporation into the EIA report. |
| **Chapter 4**: Environmental Impact Assessment: Evaluation of Impacts | Provides the methodology and tools to identify, predict, evaluate and assess the significant environmental impacts. |
| **Chapter 5:** Environmental Impact Assessment: Mitigation Measures | Identifies appropriate Pollution Preventions and Mitigation Measures (P2M2) to minimise any negative impacts arising from the development of the project; and the types of measures to manage any residual impacts. |
| **Chapter 6**: Environmental Impact Assessment: Environmental Management Plan | Provides an EMP framework for post EIA.<br>Details out self-regulation requirement by implementing the Environmental Mainstreaming Tools.<br>Provides the environmental monitoring and audit programmes for post-EIA. |
| **Chapter 7:** Environmental Impact Assessment: Abandonment Plan | Provides an Abandonment Plan framework.<br>Provides the environmental monitoring and audit programmes for post-abandonment activity. |
| **Chapter 8**: EIA Reporting and Review | Presents the structure and content for EIA reporting, including an overview of the review and approval process. |

## 1.5 ENVIRONMENTAL PROJECT PLANNING

An Environmental Impact Assessment (EIA) is an integral part of an overall project development. Incorporation of the EIA during planning stage for the project provides significant benefits and value add to the project (see **Box 1**).

**Box 1**

**Benefits of Incorporating EIA into Project Planning**

(i) Ensures compliance to environmental and development policies, facilitating project approval and avoid instances where changes need to be made later.

(ii) Assist in Site Suitability Assessment (SSA) by identifying environmental constraints and limitations to ensure the best site is chosen, in tandem with other technical and financial considerations by the Project Proponent.

(iii) Complements other planning considerations to provide feedback towards technical and management deliberations by the Project Proponent.

(iv) Reduce the adverse impacts from a project and make it more environmentally and socially acceptable among the stakeholders. It can even become a positive selling point for the Project Proponent, e.g. adoption of green technology.

(v) Allows for the adoption of Best Available Technologies (BATs) and Best Management Practices (BMPs) in the project which would improve the overall quality of the project.

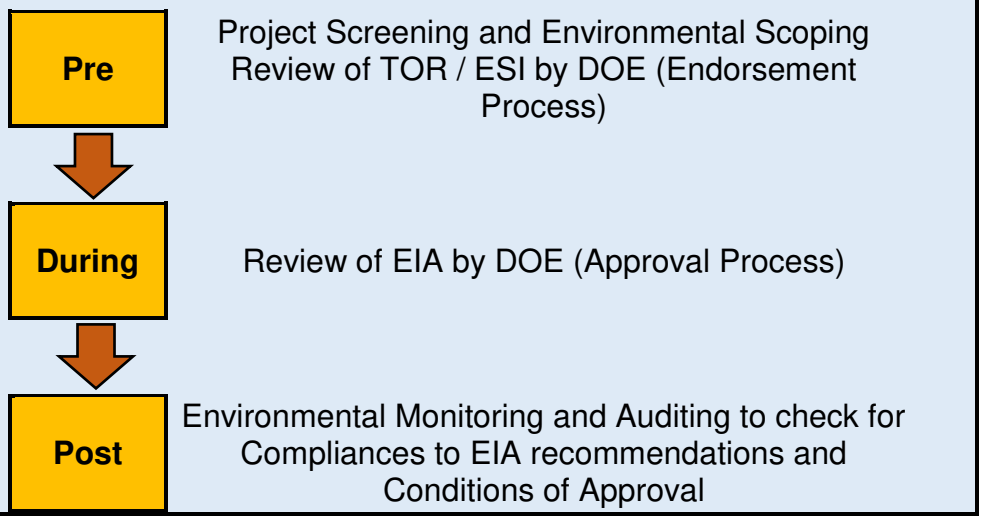
An EIA identifies the key areas of environmental significance and provides a means to decide, by the Project Proponent and the Qualified Person, on the types of mitigation measures to avert or minimise any adverse impacts at an early stage.

At the same time, the EIA can also enhance the project needs and the environmental conservation and protections with the correct use of the EIA tools.

The whole EIA review and approval processes are guided by the EGIM 2016. **Box 2** illustrates the stages in the EIA processes.

**Box 2**

**Stages in EIA Processes**




## 1.6 OVERVIEW OF ENVIRONMENTAL ASSESSMENT PROCESS

An EIA report should contain important information for:

(i) The Project Proponent to implement the mitigation measures in an environmentally and socially responsible manner.

(ii) The DOE and other authorities to make an informed decision on the project, including preparation of the conditions of approval (COA).

(iii) The public to understand the project and its potential impacts on the environment.

Good practices in EIA preparation are shown in **Box 3**.

**Box 3**

**Good Practices for EIA**

(i) Purposive: The EIA should meet its aims of informing decision making and ensuring an appropriate level of environmental protection and human health.

(ii) Focused: EIA should concentrate on significant environmental effects, taking into account the issues that matter.

(iii) Adaptive: EIA should be adjusted to the realities, issues and circumstances of the proposals under review.

(iv) Participative: EIA study should provide appropriate opportunities to inform and involve the interested and affected publics, and their inputs and concerns should be addressed explicitly.

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

(vi) Rigorous: EIA should apply the 'best practicable' methodologies to address the impacts and issues being investigated.

(vii) Practical: EIA should identify measures for impact mitigation that work and can be implemented.

(viii) Credible: EIA study should be carried out with professionalism, rigor, fairness, objectivity, impartiality and balance.

(ix) Efficient: EIA process should impose the minimum cost burden on proponents consistent with meeting process requirements and objectives.

Source: EIA Training Resource Manual Second Edition (UNEP, 2002).

The following section provides an overview of the step-by-step guide to the environmental assessment of a radioactive materials and radioactive wastes project:

**Step 1: Provide Project Brief and Initiate Critical Studies**

A Project Proponent who intends to develop a project involving the use of radioactive materials and generating radioactive wastes, shall state and outline pertinent information regarding the project. This is to enable the Qualified Person to understand the intent, objectives and scope of the proposed project.

The information shall first be used objectively to screen whether the project is a prescribed activity under the First or Second Schedule of the EIA Order 2015.

Secondly, the information shall be used to determine if the prescribed activity is subjected to the definition under Activity 17. If it is, to further determine whether the project is within the scope of the activities defined in Section 1.4 of the Guidelines.

**Table 1.6.1: Examples on Requirement of Project Brief**

| Information | Details |
|---|---|
| Project Information | • Project title.<br>• Details of Project Proponent [Company, address, contact person(s) and contact details].<br>• Project concept and description.<br>• Project layout plan and components.<br>• Details on activities in flow charts, mass balances, etc.<br>• Sources of materials.<br>• Material storage areas.<br>• Transport route and temporary access.<br>• Project implementation schedule.<br>• List of infrastructure, utilities and amenities. |

| Information | Details |
|---|---|
| Project Location | • Description of project location including boundary coordinates.<br>• Maps (topographic, aerial, satellite, etc.) the locations of the site in relation to surrounding land use, sensitive receptors and landmarks.<br>• Supporting photographs and documentation.<br>• Future land use map (e.g. structure and local plans).<br>• Zoning and land use policies related to the project.<br>• Identification of sensitive receptors (affected communities, areas of ecological importance, heritage and archaeological significance, etc.).<br>• Buffer and setback requirements, if any. |
| Associated Studies<br>(where applicable) | • Radiological Impact Assessment (RIA)<br>• Social Impact Assessment (SIA)<br>• Traffic Impact Assessment (TIA)<br>• Health Impact Assessment<br>• Hazardous Waste Management Plan<br>• Radioactive Waste Management Plan<br>• Occupational Safety Management Plan |

**Step 2: Identify the Legal Requirements**

The Project Proponent undertaking the project shall comply with all legal requirements before developing the project and before carrying out the EIA (refer to the sections):

(i) **Section 1.7:** Environmental legislative requirement.

(ii) **Section 1.8:** Terms and definitions relevant to the Guidelines.

(iii) **Section 2.2:** Environmental and Radiological screening procedure.

**Step 3: Check if Project Aligns to Existing Policies and Guidelines**

The Project Proponent shall clear all policy and administrative matters relating to the project prior to submitting the EIA report to DOE. **Section 1.9** of this Guidelines lists the potential policies and guidelines to be met by the Project Proponent.

**Step 4: Stakeholder Engagement**

It is prudent to carry out stakeholder engagements early, before the start of the project and the EIA. Constant engagement with the DOE and AELB is advisable, including the relevant GAs when preparing the TOR and EIA. **Section 2.12** provides details of stakeholder engagements approaches.

**Step 5: Preparation of the TOR and ESI**

The Project Proponent shall prepare a project TOR and complete the ESI. At this point of the study, preliminary environmental data will suffice. Projects involving the use of radioactive materials and generating radioactive wastes, shall require the Project Proponent to prepare RIA as required by AELB. However, if quantitative environmental data and RIA are available, they should be included in the TOR.

Information needed in the TOR shall consist of, but not limited nor restricted to, the ones listed in **Chapter 2**. The information needed in the TOR shall address both environmental information as well as radiological information.

**Step 6: Submission of the TOR**

All data and information obtained during scoping shall be reviewed for preparation of the TOR report based on DOE requirements stated in the EGIM 2016, and in this Guidelines. The TOR shall be submitted to DOE for review and endorsement as detailed in **Chapter 2** of this Guidelines.

**Step 7: Baseline Data Collection for EIA**

After endorsement of the TOR by DOE, baseline data collection (primary and/or secondary) shall be carried out to obtain information of the project environment and its surrounding areas. **Chapter 3** provides the types of baseline data required for the EIA.

**Step 8: Carry Out the EIA Studies**

The major studies and components of the EIA shall cover the followings:

(i) **Chapter 4:** Impact assessment on the significant environmental issues.

(ii) **Chapter 5:** Identification of suitable P2M2 to avert and/or to minimise the significant environmental issues arising from implementation of the project and identification of residual impacts.

(iii) **Chapter 6:** Provision of the Environmental Management Plan (EMP) framework.

(iv) **Chapter 7:** Provision of the Abandonment Plan framework.

(v) Conclusion to the EIA.

**Step 9: Drafting EIA Report**

The format of the EIA report is detailed in **Chapter 8** of this Guidelines.

The results of assessments and studies required by other GAs have to be incorporated into the EIA report. However, the whole of other GAs' individual reports need not be fully incorporated in the EIA Report; but they shall be reviewed and approved by the respective GAs.

**Step 10: Carry Out Public Engagement**

The main objective of these public engagements is to brief the stakeholders regarding the project, the potential environmental issues and the proposed mitigation measures, to address their concerns and to seek any further required feedbacks.

A Second Schedule EIA requires public engagements with the relevant stakeholders who are likely to be affected by the project directly or indirectly (e.g. communities or institutions, businesses and the general public), upon completion of the Draft EIA report.

All findings from any public engagements shall be incorporated into the final EIA report (refer to **Chapter 2.12** for further details).

**Step 11: Submission of the EIA report**

The completed EIA report shall be submitted to DOE for review as per procedure defined in the EGIM 2016. Details of the EIA submission and review process are detailed in **Chapter 8** of this Guidelines.

## 1.7 ENVIRONMENTAL LEGISLATIVE REQUIREMENTS

The Environmental Quality Act 1974 (Act 127) is the main legislation governing environmental management in Malaysia.

Amendments to this main legislation and new subsidiary legislations or regulations may be enacted from time to time, pertinent and relevant to changing circumstances. The Project Proponent and Qualified Person are required to refer to and adopt any latest amendments for their project.

The DOE under the Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC) is the main agency tasked to implement the Act 127. It has overall functions and responsibilities on environmental management and enforcement as prescribed under the said legislation and its subsidiary legislations and regulations.

Project development that fulfils the definition of Activity 17 in addition, shall comply with the administration of the laws, rules and regulations under Act 304. The Project Proponents shall take cognizant that the operations of any radiological activities, facilities or industries in Malaysia are controlled under the Act 304 enforced by the AELB.

The Project Proponent is responsible to comply with all prevailing and/or any new laws that are being enforced or to be enforced in Malaysia.

### 1.7.1 Environmental Quality Act 1976 (Act 127)

EIA is a mandatory requirement under the provision of Section 34A (2) of the Act 127 for activities prescribed in the EIA Order 2015.

Section 34A(2) stipulates “Any person intending to carry out any prescribed activities shall appoint a qualified person to conduct an environmental impact assessment and to submit a report thereof to the Director General in the manner as the Director General may prescribed, before any approval for the carrying out of such activities is granted by the relevant approving authority, submit a report to the Director General. The report shall be in accordance with the guidelines prescribed by the Director General and shall contain an assessment of the impact such activity will have or is likely to have or is likely to have on the environment and the proposed measures that shall be undertaken to prevent, reduce or control the adverse impact on the environment.”

Section 34A(2A) stipulates “The Director General shall maintain a list of qualified persons who may carry out an environmental impact assessment and submit a report thereof.”

Section 34A(2B): The qualified person who submits the report shall:-

(a) be responsible for the environmental impact assessment and the recommendations of the environmental impact assessment;

(b) ensure that the report and the recommendation do not contain any false or misleading information;

(c) take a professional indemnity insurance for any liability arising from the environmental impact assessment and the recommendations of the environmental impact assessment;

Section 34A(2C): The report shall be in accordance with the guidelines as the Director General may prescribed and shall contain:-

(a) An assessment of the impact such activity will have or is likely to have on the environment; and

(b) The proposed measures that shall be undertaken to prevent, reduce or control the adverse impact on the environment.

### 1.7.2 Environmental Quality (Clean Air) Regulations, 2014

The regulations in the Environmental Quality (Clean Air) Regulations 2014 are applicable for premises that uses radioactive materials and generates radioactive wastes.

### 1.7.3 Environmental Quality (Industrial Effluents) Regulations, 2009

These regulations are applicable to any premises that generates industrial effluents.

The following regulations are to be considered during the EIA:

**Design and construction of industrial effluent treatment system**

5(1) An owner or occupier of a premises shall conduct any design and construction of the industrial effluent treatment system to collect and treat the industrial effluent or mixed effluent generated within the premises in strict compliance with the specifications as specified in the Guidance Document of the Design and Operation of Industrial Effluent Treatment System issued by the Department of Environment.

**Compliance with Specifications of Industrial Effluent Treatment System**

6 (1) No person shall operate any industrial effluent treatment system unless it complies with the specifications as specified in sub-regulation 5(1).

Specifically, the treated industrial effluents quality from the premise shall comply with the Fifth, Seventh, Eighth and Ninth Schedules of the Regulations.

### 1.7.4 Environmental Quality (Sewage) Regulations, 2009

This regulations applied to any premises which discharge sewage onto or into any soil, or into any inland waters or Malaysian waters, other than any housing or commercial development or both having a population equivalent of less than one hundred and fifty.

### 1.7.5 Environmental Quality (Scheduled Wastes) Regulations, 2005

The Environmental Quality (Scheduled Wastes) Regulations 2005 regulates the handling, movement, disposal and treatment of scheduled wastes in Malaysia. During the EIA preparation stage, this regulation shall be considered, in particular:

**Responsibility of Waste Generator**

8(1) Every waste generator shall ensure that scheduled wastes generated by him are properly stored, treated on-site, recovered on-site for material or product from such scheduled wastes or delivered to and received at prescribed premises for treatment, disposal or recovery of material or product from scheduled wastes.

8(2) Every waste generator shall ensure that scheduled wastes that are subjected to movement or transfer be packaged, labelled ad transported in accordance with the guidelines prescribed by the Director General.

**Storage of Scheduled Wastes**

9(1) Scheduled wastes shall be stored in containers which are compatible with the scheduled wastes to be stored, durable and which are able to prevent spillage or leakage of the scheduled wastes into the environment.

9(2) Incompatible scheduled wastes shall be stored in separate containers, and such containers shall be placed in separate secondary containment areas.

9(3) Containers containing scheduled wastes shall always be closed during storage except when it is necessary to add or remove the scheduled wastes.

9(4) Areas for the storage of the containers shall be designed, constructed and maintained adequately in accordance with the guidelines prescribed by the Director General to prevent spillage or leakage of schedule wastes into the environment.

9(5) Any person may store scheduled wastes generated by him for 180 days or less after its generation provided that:-

(a) The quantity of scheduled wastes accumulated on site shall not exceed 20 metric tonnes; and

(b) The Director General may at any time, direct the waste generator to send any scheduled wastes for treatment, disposal or recovery of material or product from the scheduled wastes up to such quantity as he deems necessary.

## 1.8 TERMS AND DEFINITIONS

The common terms and definitions adopted for this Guidelines are provided in the Glossary while the key terms and definitions are described in this Section. In case of doubt and uncertainty of the terms, clarification with DOE and AELB shall be carried out.

All legal definitions and interpretations shall be based on the Interpretation Acts 1948 and 1967 (Act 388). Terms and interpretations relevant to EIA Order 2015 shall also be based on any interpretation and relevant documents published or to be published by DOE. Additionally, radiological terms, interpretation and definitions shall be based on any interpretation and relevant documents published or to be published by AELB. Similarly, other terms and interpretations of other GAs shall be based on the respective GAs for their respective terms and conditions.

**Under DOE**

(a) Land Disturbing Activities

Based on the EGIM 2016, "land disturbing activities" refer to any project development activity that is subjected to Section 34A of the Act 127 involving clearing of trees or vegetation, excavating, raising or sloping of ground, trenching, grading and blasting.

**Under AELB**

(a) Radioactive Material

“Radioactive Material” means any nuclear fuel, radioactive product or radioactive waste.

(b) Radioactive Waste

“Radioactive Waste” means any waste which consists wholly or partly of the following;

(i) a substance or article which if it were not waste would be radioactive material; or

(ii) a substance or article which has been contaminated in the course of the production, storage or use of any radioactive material, nuclear material or prescribed substance or by contact with or proximity to any other waste within the meaning of paragraph (a) of this definition

(c) Dealing

"Dealing” in relation to any radioactive material, nuclear material, prescribed substance or irradiating apparatus, means any activity involving the manufacturing, trading, producing, processing, purchasing, owning, using, transporting, transferring, handling, selling, storing, importing or exporting of such radioactive material, nuclear material, prescribed substance or irradiating apparatus.

## 1.9 POLICY AND GUIDELINES COMPLIANCE

Any proposed development involving the use of radioactive materials and generating radioactive wastes shall comply to the requirements under Act 304 and all its subsidiary regulations, orders and guidelines.

In addition, the proposed development shall comply with and adhere to the requirements enabled in the national and state legislations and enactments, policies, local regulations, procedures and guidelines published by the national and state governments, agencies and local authorities, where applicable.

### 1.9.1 Other Policy and Legislation Requirements

The project shall comply with all legal requirements (statutory and non-statutory) and procedures of Malaysia. The project shall be in line with and not contradict the current national and state development policies and plans, especially for high impact projects.

The Project Proponent and his team shall engage AELB and DOE as well as with all the relevant national requirements and state agencies during the project planning stage. Common requirements by other GAs may be shown in **Table 1.9.1** and **Table 1.9.2**.

**Table 1.9.1: Associated or Other Requirements Prior to EIA Submission**

| Agencies | Requirements / Compliance | Outputs |
|---|---|---|
| Atomic Energy Licensing Board (AELB) | Atomic Energy Licensing Act 1984 (Act 304) and subsidiary regulations, order and guidelines | To ensure that the project complies with the AELB requirements specifically for radioactive activities, use of radioactive materials and substances or generating radioactive wastes |
| | Radiological Impact Assessment (RIA) | To determine that the project does not exert additional radiological dose to the environment than the background radiation and that the project put in place appropriate plans and procedures to ensure the safety of project team against hazards of radioactive activities, use of radioactive materials and substances or generating radioactive wastes |

| Agencies | Requirements / Compliance | Outputs |
|---|---|---|
| Malaysian Investment Development Authority (MIDA) | Malaysian Investment Development Authority (Incorporation) Act 1965 (Act 397) | Approvals and/or supporting documents |
| National Physical Planning Council of Malaysia (MPFN)<br>Regional/Land Development Authority<br>State Planning Committee (SPC)<br>Local Authority (PBT) | Town and Country Planning Act 1976 (Act 172) and subsidiary regulations, order and guidelines | Approvals and/or supporting documents :<br>• National and state development policies National Physical Plan<br>• State Structural Plan<br>• Local Plan<br>• Adherence to land use compatibility |

Note: The list is not exhaustive and not all the above may be relevant to the project. It is the responsibility of the Project Proponent and Qualified Person to determine the relevant information required for environmental assessment and project compliance.

Due diligence shall be undertaken in regards to policy compliance and study with the relevant agencies and government departments. In the case of radioactive materials, to comply with the policy, guidance and study requirements of the AELB.

The Project Proponent and Qualified Person shall determine the specific compliance requirements, based on the scope and nature of the project.

Proof of compliance in the form of, but not limited to, GAs approvals, support letters and minutes of meetings (MOM), among others, shall be included as part of the TOR and EIA. ALEB and other GA requirements shall be cleared before proceeding with the EIA Report submission.

**Table 1.9.2: Associated or Other Requirements During or Post EIA**

| Agencies | Legal Requirements | Outputs |
|---|---|---|
| PLANMalaysia (JPBD) | Town and Country Planning Act 1976 (Act 172) and subsidiary regulations, order and guidelines<br>*Manual Penilaian Impak Sosial Bagi Projek Pembangunan Edisi Ke-2 2018* | To ensure that the project is in line with the structure/local plans and compatible with the surrounding land use.<br>Approval for Social Impact Assessment (SIA), where applicable<br>Approval of any project and activities within the ESA or limits by *Jawatankuasa Teknikal Pembangunan Kawasan Sensitif Alam Sekitar* |
| Department of Director General of Land and Mines (JKPTG)<br>Land and Mines Office (PTG)<br>District and Land Office (PTD) | National Land Code 1965 (Act 56)<br>Territorial Seas Act 2012 (Act 750) | To ensure Project Proponent owns the land and land status is correct with its intended development type.<br>To ensure no constraints on the land that may prohibit it from being developed (minerals, sand resources etc.). |
| Public Works Department (JKR) | Road Transport Act 1987 (Act 333) | Approval for Traffic Impact Assessment (TIA) and Road Safety Audit |
| Forestry Department of Peninsular Malaysia | Forestry Act 1984 (Act 313) | Development requirements in permanent reserved forests |
| Department of Wildlife and National Parks Peninsular Malaysia (PERHILITAN) | Wildlife Conservation Act 2010 (Act 716) | Development requirements in/near wildlife sanctuaries and other protected areas.<br>Requirement for relocation plan, conservation, etc.<br>Wildlife management plan |

| Agencies | Legal Requirements | Outputs |
|---|---|---|
| Department of Fisheries (DOF) | Fisheries Act 1985 (Act 317) | Approvals and/or supporting documents:<br>• Development in fishery zones.<br>• Impacts on jetties, fish landing areas, artificial reefs, etc.<br>• Impacts on fishermen livelihood.<br>• Conservation of turtles, terrapins, etc. |
| Department of Irrigation and Drainage (DID)<br>State Water Authority | Street, Drainage and Building Act 1974 (Act 133)<br>State enactments on water resources, river basins and coastal areas<br>Urban Stormwater Management Manual for Malaysia (MSMA) 2012 | Approvals and/or supporting documents:<br>• Hydraulic study<br>• Coastal protection works.<br>• Permission for river diversion.<br>• Requirement for river reserves and coastal setbacks.<br>• Drainage plans - storm water management<br>• Erosion and Sediment Control Plan (ESCP).<br>• Shoreline monitoring. |
| Marine Department of Peninsular Malaysia | Merchant Shipping (Amendment and Extension) Act 2007 (Act 1316) | Approval / permits / supporting documents for:<br>• Marine Traffic Risk Assessment (MTRA)<br>• marine navigation<br>• vessel registration<br>• issuance of notice to mariners<br>• navigational aid<br>• marine pollution control, etc. |

| Agencies | Legal Requirements | Outputs |
|---|---|---|
| Atomic Energy Licensing Board (AELB) | Atomic Energy Licensing Act 1984 (Act 304) | Approvals and/or supporting documents:<br>• Radiological Impact Assessment (RIA), where applicable<br>• Operation license |
| Local Authority (PBT) | Town and Country Planning Act 1976 (Act 172) and subsidiary regulations, order and guidelines | Approvals and/or supporting documents :<br>• Development order<br>• Earthwork plans<br>• Building plans |

Note:The list is not exhaustive and not all the above may be relevant to the project. It is the responsibility of the Project Proponent and Qualified Person to determine the relevant information required for environmental assessment and compliance.

### 1.9.2 National and State Policies and Plans

The relevant policies and plans for new development of projects involving radioactive activities, use of radioactive materials and generating radioactive wastes are listed in **Table 1.9.3**. They serve as references for the Project Proponent and the Qualified Person when undertaking the project. Any change or amendment to existing policies and plans (i.e. updating, revision, new edition, etc.) shall be taken into account in the EIA by the Qualified Person.

### 1.9.3 Guidelines and Guidance Documents

The EIA report shall also refer to the relevant guidelines and guidance documents issued by DOE and other GAs pertaining to environment-related system and management, and any other documents and notices issued from time to time, related to the EIA process and procedures.

The list of relevant Guidelines and Guidance Documents are appended as **Appendix A**.

**Table 1.9.3: List of Policies and Plans Potentially Relevant to Development Of Activity 17 Projects**

| Policies and Plans | Details and Scope |
|---|---|
| National Physical Plan-3 (NPP-3) (JPBD, 2016) | National spatial planning guidelines: covers national and state parks. |
| National Physical Coastal Zone Plan (NPCZP) (JPBD, 2012) | National spatial planning guidelines for coastal zones and associated activities. |
| State Structure and Local Plans (Various Local Authorities and publishing dates) | State and local level planning guidelines for national and state parks, including development controls. |
| National Policy on the Environment [Ministry of Science, Technology and Innovation (MOSTI), 2002] | Specifies eight principles to harmonise economic development goals with environmental imperatives. It seeks to integrate environmental considerations into development activities and in all related decision-making processes; foster long-term economic growth and human development; and protect and enhance the environment. |

Note: The list is not exhaustive and not all the above may be relevant to the project. It is the responsibility of the Project Proponent and Qualified Person to determine the relevant information required for environmental assessment and compliance.

# CHAPTER 2

# TERMS OF REFERENCE

## 2.1 INTRODUCTION

The Terms of Reference (TOR) is the first major milestone in the overall EIA process.

This Chapter, comprising 10 Sections, provides the steps in detail to prepare the TOR for submission and endorsement by the DOE. These steps are as follows:

**Section 2.2:** Environmental Screening.

**Section 2.3:** Environmental Scoping.

**Section 2.4:** Site Suitability Assessment (SSA).

**Section 2.5:** Study Boundary.

**Section 2.6:** Baseline Data Review.

**Section 2.7:** Determination of Key Project Activities.

**Section 2.8:** Identification of Significant Impacts and Priority Setting.

**Section 2.9**: Establishment of Study Requirements for EIA.

**Section 2.10:** Outlining of Mitigation Measures.

**Section 2.11:** Preparation and Submission of TOR/ Environmental Screening Information (ESI).

## 2.2 ENVIRONMENTAL AND RADIOLOGICAL SCREENING

Environmental Screening and Radiological Screening are carried out to determine whether or not a proposed project is a prescribed activity under Activity 17 of the EIA Order 2015.

The Project Proponent shall work closely with the Qualified Persons of DOE and AELB, and shall carry out a screening exercise to determine if the proposed activity is a prescribed activity under the EIA Order 2015.

Thereafter, the Project Proponent shall screen whether the project fulfil the description of Activity 17 of the EIA Order 2015.

If the project fulfils the description of Activity 17, the Project Proponent shall be required to undertake radiological screening following the rules and regulations of Act 304. If the proposed project does not fulfil the description of Activity 17, only environmental screening shall suffice.

Findings from this screening shall form the basis to develop the TOR for the DOE endorsement.

Potential outcome criteria of project screening are shown in **Box 4**.

**Box 4:**

**Potential Outcomes from Project Screening**

(i) No EIA is required: If the project does not fall within any prescribed activities under the First or Second Schedule, and/or has insignificant impacts on the environment.

(ii) EIA is required: If the project will have potentially significant environmental impacts and/or falls within the prescribed activity under the First or Second Schedule. Even if a project falls under the First Schedule, and at the same time, fulfils the definition of Second Schedule Activity 17, the project is then required to submit the EIA as a Second Schedule EIA.

(iii) Further studies and clarification from DOE: If the potential impacts from the project are uncertain, indeterminate, ambiguous or may not fall neatly within any prescribed activities, i.e. involving new technologies, DOE shall be consulted upon on the need for an EIA.

## 2.3 ENVIRONMENTAL SCOPING

The main objective of environmental scoping for an activity which is subjected to Second Schedule Activity 17, is to identify the environmental and radiological attributes and issues to determine the focus, depth, spatial and temporal boundaries of the EIA that are deemed significant and requiring assessment.

Scoping shall be carried out in the early stage of the project cycle. It enables the EIA to focus only on the significant issues, impacts and sensitive receptors. In the case of activities involving radioactive materials and generating radioactive wastes, it enables the EIA to integrate radiological issues and impacts to sensitive receptors due to the activities.

Scoping shall encompass all environmental aspects (physical-chemical, biological and socio-economic) as well as radiological aspects impacting the environmental aspects through the established radiation protection plans and procedures to enable an overall preliminary evaluation of the significant impacts. At the start of the scoping exercise, no attempt shall be made to exclude, pre-empt and pre-judge any issues of concern.

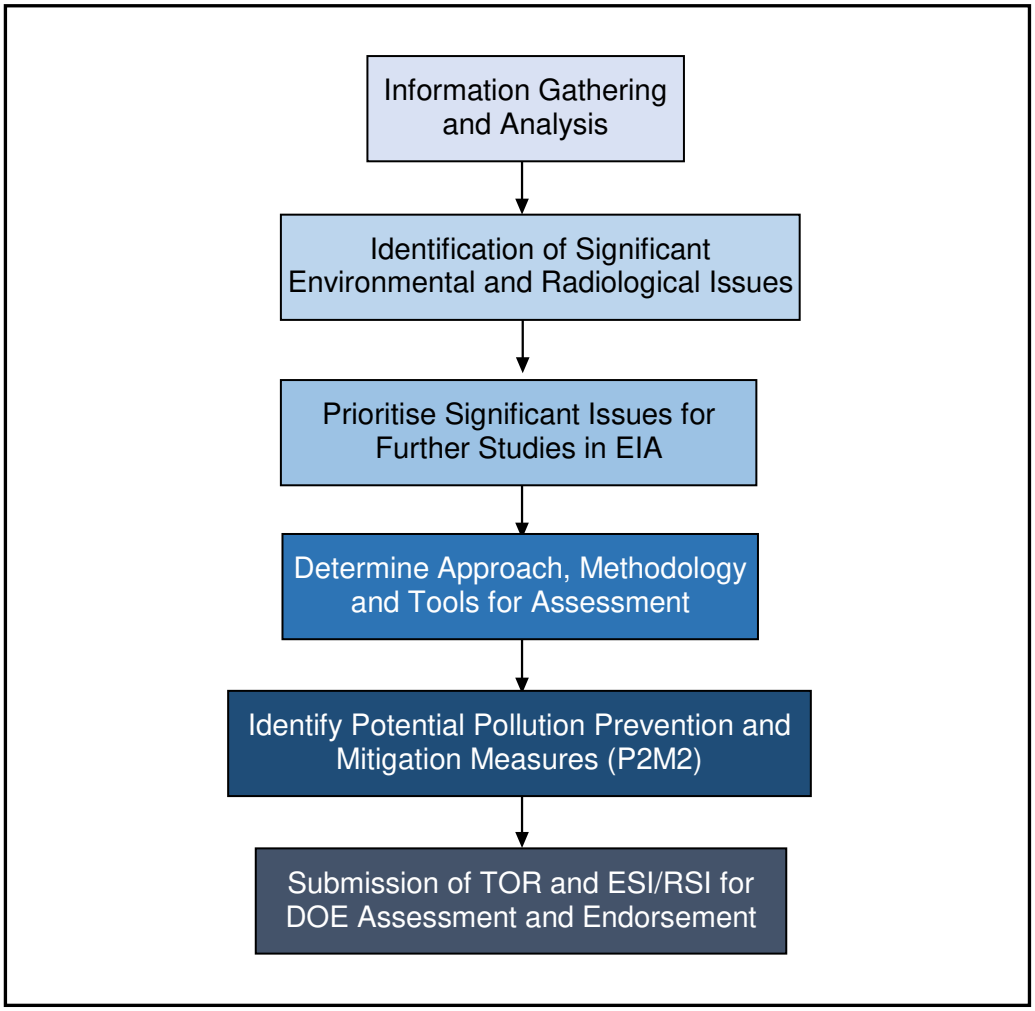
The Environmental Scoping shall be based on EGIM 2016 and the Radiological Scoping shall conform to Act 304, and other associated guidelines.

The scoping exercise (also refer to **Figure 2.3.1**) comprises the following steps, which are elaborated on in the accompanying sections:

(i) Site Suitability Assessment (SSA): The SSA shall consider all alternatives or options to refine and improve upon the original concept design environmentally and radiologically (refer to **Section 2.4**).

(ii) Determination of Study Boundary: The Qualified Person shall determine the extent of the Zone of Study (ZOS) and Zone of Impact (ZOI) based on site conditions and environmental sensitivity as well as the radiological screening findings (refer to **Section 2.5**).

**Figure 2.3.1: Flow Path for Environmental and Radiological Scoping**




(iii) Baseline Data Review: The Qualified Person shall carry out qualitative assessment based on desktop study and literature review. These may be supplemented by initial site investigations and stakeholder engagements (refer to **Section 2.6**). Quantitative assessment can be provided where necessary and available. Radiological baseline data is to be incorporated as part of the baseline data review.

(iv) Determination of Key Project Activities: The Qualified Person and / or Competent Person(s) shall outline the key project activities at various phases of project implementation (pre-construction, construction and operations) (refer to **Section 2.7**).

(v) Identification of Significant Impacts and Priority Setting: This step will involve preliminary identification of significant issues for further detailed assessment in the EIA. Non-significant issues shall also be addressed accordingly in the EIA study but through general/qualitative impact prediction and evaluation (refer to **Section 2.8**). Specific radiological issues are addressed through the RIA procedures.

(vi) Establishment of Study Requirements for EIA: Identify and detail out the methodologies and assessment tools to be carried out in the EIA for identified significant impacts (refer to **Section 2.9**). Radiological methodologies and assessment tools are in accordance with RIA procedures.

(vii) Outlining of Mitigation Measures: Based on the identified significant impacts, the Qualified Person shall determine and select suitable mitigation measures to abate the environmental and radiological impacts (refer to **Section 2.10**).

(viii) Preparation and Submission of ESI and TOR: Findings from the scoping exercise shall be compiled, collated and analysed to prepare the TOR for submission to DOE (refer to **Section 2.11**).

## 2.4 SITE SUITABILITY ASSESSMENT

The SSA is detailed in the EGIM 2016. Generally, this is carried out at the feasibility stage where alternatives and options to the proposed concept and layout will be amended and finalised, which will form the basis in the scoping exercise (refer to **Table 2.4.1** for examples). The SSA in activities involving radioactive activities and generating radioactive wastes can be conducted through the undertaking of RIA.

The scoping exercise will value add to this SSA through recommendations of pragmatic mitigation measures, such as P2M2 and BMPs, where potential environmental degradation and radiological risks are anticipated including when developing activities that use radioactive materials and generating radioactive wastes.

**Table 2.4.1: Considerations in Project Alternatives and Options**

| Options | Considerations |
|---|---|
| Project Siting | • Adherence to national and state policies and guidelines.<br>• Adherence to national radiological policies, regulations and guidelines<br>• Site constraints to the project and *vice versa*.<br>• Location and proximity to sensitive receptors.<br>• Buffer/setback availability and requirements.<br>• Disaster risk factor (including radiological disaster risk factor)<br>• Any alternative sites proposed for the project. |
| Terrain, Topography, (where applicable) | • Conservational value.<br>• Availability of land for setbacks and buffers.<br>• Possibility of avoidance of unsuitable terrain.<br>• Type of terrain and limitations.<br>• Visual/aesthetic impacts. |
| Accessibility | • Access by land and sea.<br>• Proximity to construction/source materials.<br>• Strategic locational advantages. |
| Technology Options | • Availability of technology to minimise environmental and radiological impacts.<br>• BAT options.<br>• Benchmarking with alternative technology.<br>• Green technology adoption. |
| Project Component and Design | • Adaptive design to suit terrain/sensitive areas.<br>• Layout consideration.<br>• Choice of construction methods. |

| Options | Considerations |
|---|---|
| Social Constraints | • Location within or close to existing communities.<br>• Need for land acquisition and relocation.<br>• Island carrying capacity.<br>• Availability of water resources. |
| Economy and Finance | • Potential employment and business.<br>• Cost and benefit considerations.<br>• Supply and demand scenarios.<br>• Potential loss of economy and income. |
| Operations | • Carrying capacity.<br>• Allowable activities and zoning.<br>• Adoption of best practices and green development concepts. |

## 2.5 STUDY BOUNDARY

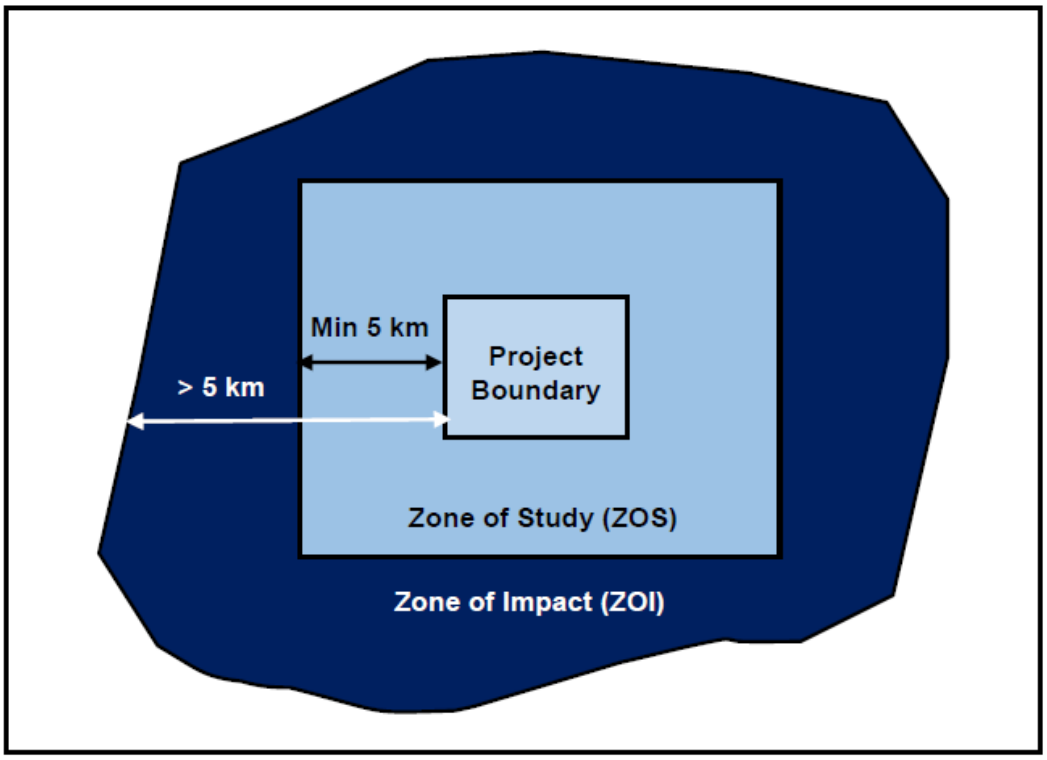
The study boundary is an important component in the EIA study. For activities that use radioactive materials and generating radioactive wastes, the requirements for study boundary or its equivalent shall be determined by AELB. The wider study boundary shall be adopted to ensure total coverage of both environmental and radiological requirement.

Typically there are two types of study boundaries as follows:

(i) The study boundary, which defines the ZOS. In terms of criteria, the ZOS is the study area generally encompassing a 5-km radial zone from the project boundary (refer to **Figure 2.5.1**). In terms of criteria, the ZOS is left to the Qualified Person to define the limits of the spatial boundary.

(ii) The impact boundary, which defines the spatial area of the potential impacts to extend beyond the ZOS, and hence, this impact area is termed the ZOI. The ZOI may vary depending on the size of the project. The extent of the ZOI shall be determined by the Qualified Person based on the nature and extent of significant impacts.

**Figure 2.5.1: Diagram Showing the Difference between ZOS and ZOI**




## 2.6 BASELINE CONDITIONS

A description of the existing environment where the proposed project is to be located (termed as "baseline conditions") shall be presented. Typically these are described as physico-chemical environment, biological environment and human environment. **Chapter 3** of this Guidelines describes the approaches to document the baseline conditions.

The level of details shall be based on factors such as area, size, types of activities and potential impacts to the surrounding sensitive environments. The criteria to decide on the priority of relevant information shall be based on the levels of significance.

If any of the information is not available at the time of scoping, but is important for the EIA study, it shall be recorded as baseline information to be addressed at the EIA stage. Irrelevant or insignificant information to the project should be omitted during environmental scoping.

## 2.7 DETERMINATION OF KEY PROJECT ACTIVITIES

Project activities are the basis for assessing the potential impacts due to the inherent nature that any project activities would inevitably give rise to environmental impacts. **Table 2.7.1** provide a summary list of activities in a typical project with issues of concern at the pre-construction, construction and operational and closure/exit phases. The list is not exhaustive and the Qualified Person shall add to the list whenever necessary.

**Table 2.7.1: List of Typical Project Activities**

| Project Stage | Project Activities | Key Environmental Impacts |
|---|---|---|
| Pre-construction | Topographical Survey<br>Land Acquisition<br>Detailed Design<br>GAs Approval | Socio economic<br>Change of land use |
| Construction | Influx of construction workers / setting up works camp | Socio economic<br>Creation of spin off businesses<br>Conflicts with local cultures<br>Water quality (sewage)<br>Waste generation (solid waste) |
| | Site Clearing / biomass removal | Effect on flora and fauna / endangered species<br>Habitat removal / Contamination of habitat<br>Erosion risk<br>Waste generation (biomass) |

| Project Stage | Project Activities | Key Environmental Impacts |
|---|---|---|
| Construction | Site preparation and earthworks | Alteration of local hydraulic regime<br>Water Quality (sediment in surface runoff)<br>Air Quality (fugitives)<br>Noise Pollution<br>Waste generation (unsuitable materials) |
| | Civil works such as building of structures / plant proper | Soil contamination<br>Water quality (sediment in surface runoff, spills)<br>Air Quality (fugitives, emissions)<br>Noise Pollution<br>Waste generation (scheduled waste, solid waste) |
| | Transportation of materials to site | Noise Pollution<br>Air Quality<br>Traffic congestion<br>Road safety |
| | Mechanical and Electrical Works | Noise Pollution<br>Air Quality<br>Waste generation (scheduled waste, solid waste) |
| | Testing and Commissioning Works | Noise Pollution<br>Air Quality (emissions)<br>Water Quality (effluent)<br>Safety |

| Project Stage | Project Activities | Key Environmental Impacts |
|---|---|---|
| Operation | Normal Operation | Air Quality (emissions)<br>Water Quality (industrial effluents, sewage)<br>Noise Pollution<br>Waste generation (scheduled waste, solid waste, radioactive waste)<br>Safety<br>Public Health |
| | Maintenance Works<br>Outage Period | Waste generation (scheduled waste, solid waste, radioactive waste)<br>Safety |
| | Abnormal Operation | Air Quality (uncontrolled emissions)<br>Water Quality (untreated industrial effluents, sewage)<br>Noise Pollution<br>Waste generation (scheduled waste, solid waste, radioactive waste)<br>Safety<br>Public Health |
| | Materials handling and storage | Land and groundwater contamination (leaks and spills)<br>Safety<br>Traffic congestion |
| Abandonment | Decommissioning<br>Rehabilitation | Waste generation (scheduled waste, solid waste, radioactive waste)<br>Land and groundwater contamination (leaks and spills)<br>Water quality (effluent, sewage) |

Note:The list is not exhaustive and not all the above may be relevant to the project. It is the responsibility of the Project Proponent and Qualified Person to determine the relevant information required for environmental assessment and compliance.

## 2.8 IDENTIFICATION OF SIGNIFICANT IMPACTS AND PRIORITY SETTING

There are many methods and tools to conduct the scoping exercise. These include checklists, matrices, or any other accepted methods, to assist in systematically organising, collating and analysing the data for the project. At the TOR stage, qualitative assessment is adequate but quantitative data can be provided to support the assessment. **Table 2.8.1** lists the advantages and disadvantages of the various common methods used. The list given is not exhaustive and any other suitable method can be used if relevant.

A useful tool is the Environmental Scoping Matrix (ESM) to amalgamate the scores from a series of criteria; ranging them from major to minor negative and positive formats of environmental impacts (see **Appendix B** for an example of the matrix used).

**Table 2.8.1: Advantages and Disadvantages of Impact Identification Methods**

| Method | Advantages | Disadvantages |
|---|---|---|
| Checklists | • Easy to understand and use.<br>• Good for site selection and priority setting.<br>• Simple ranking and weightages. | • Do not distinguish between<br>• direct and indirect impacts.<br>• Do not link action and impact.<br>• The process of incorporation of values can be controversial. |
| Matrices | • Link action to impacts.<br>• Good method for displaying EIA results. | • Difficult to distinguish direct and indirect impacts.<br>• Have potential for double-counting of impacts. |

| Method | Advantages | Disadvantages |
|---|---|---|
| Networks Overlays | • Link actions to impacts.<br>• Useful in simplified form to check for second order impacts.<br>• Handles direct and indirect impacts.<br>• Easy to understand.<br>• Focus and display spatial impacts.<br>• Good siting tool. | • Can be very complex if used beyond simplified version.<br>• Can be cumbersome.<br>• Poorly suited to address impact duration or probability. |
| GIS and Computer Expert Systems | • Good for impact identification and spatial analysis.<br>• Good for experimenting. | • Heavy reliance on knowledge and data.<br>• Often complex and expensive. |

Source: EIA Training Resource Manual Second Edition (UNEP, 2002).

Note: The list is not exhaustive and not all the above may be relevant to the project. It is the responsibility of the Project Proponent and Qualified Person to determine the best method to adopt for their study.

The Qualified Person and the Project Proponent's input is vital at this stage as their knowledge and experience would ensure appropriate weightage is given to the issues under assessment (see **Box 5**). From the scoping outputs, a priority list of environmental impacts shall be determined for in-depth studies and assessments in the EIA.

**Box 5:**

**Criteria for Determining Significance of Environmental Impacts**

(i) Magnitude: Defined as the degree and scale of an impact (may be detrimental or beneficial) towards sensitive receptors due to a proposed activity.

(ii) Permanence: Defined as to whether the effects are temporary in nature (e.g. only during certain work activities or only during the construction stage), or may result in permanent effects (e.g. landform alteration due to cut and fill).

(iii) Reversibility: A measure of whether mitigation measures can be implemented in rehabilitating the site back to its original state or better.

(iv) Cumulative Effects: A measure of whether the effects will be accumulative singly or in combination with other effects from nearby sites/activities (that may be detrimental or beneficial) over a time period.

## 2.9 ESTABLISHMENT OF STUDY REQUIREMENTS

Once the key environmental and radiological impacts have been identified and prioritised, the subsequent step is to establish the appropriate study requirements to address these significant impacts.

The scope of the EIA studies are dependent on the scale and extent of the development, its relationship to adjacent land uses and nearby sensitive receptors, the type of planning and study approvals as required by the relevant GAs, which will be generally determined in consultation and engagement with these agencies (refer to **Section 2.6**), and other relevant criteria.

In the case of activities that use of radioactive materials and disposal of radioactive wastes, the subsequent step is to link to the appropriate assessment requirements under the Act 304 to address the significant impacts identified and prioritized during the EIA study.

In this case, the scope of the EIA studies shall be dependent on the scale and extent of the development, the use of radioactive materials and disposal of radioactive wastes and their relationship to adjacent land uses and nearby sensitive receptors, the type of planning and study approvals as determined in consultation and engagement with AELB, and other relevant criteria.

The Qualified Person shall provide the methodologies, assessment / modelling tools, and expected outputs derived from the assessment of the significant impacts, as part of the TOR. **Table 2.9.1** provides a list of applicable studies. This list is only indicative and non-exhaustive as site conditions can vary from project to project. Hence, it is the responsibility of the Qualified Person to check and verify the applicability and extent of the relevant studies to be conducted for a specific project.

The EIA Technical Review Committee (EIATRC) shall later assess the adequacy of the proposed studies and may recommend additional studies to be incorporated into the TOR.

**Table 2.9.1: List of Potential Studies to be Considered in the EIA**

| Type of Studies | Government Agencies | Prescribed Activities | |
|---|---|---|---|
| | | First Schedule | Second Schedule |
| Radiological Impact Assessment (RIA) | AELB | √ | √ |
| Air Dispersion Modelling | DOE | √ | √ |
| Water Dispersion Modelling | DOE / DID | √ | √ |

| Type of Studies | Government Agencies | Prescribed Activities | |
|---|---|---|---|
| | | First Schedule | Second Schedule |
| Noise Prediction Modelling | DOE / DID | √ | √ |
| Quantitative Risk Assessment (QRA) | DOE / DOSH | √ | √ |
| Health Impact Assessment (HIA) | DOE / MOH | √ | √ |
| Soil investigations (SI) | JMG / JKR | √ | √ |
| Terrain and slope classification | JMG / JKR | √ | √ |
| Geotechnical Report | JMG / JKR | √ | √ |
| Land use Compatibility | PLANMalaysia | √ | √ |
| Social Impact Assessment (SIA) | PLANMalaysia | √ | √ |
| Traffic Impact Assessment (TIA) | JKR | √ | √ |
| Heritage Impact Assessment | Department of National Heritage | When applicable | When applicable |

Note: The list is not exhaustive and not all the above may be relevant to the project. It is the responsibility of the Project Proponent and Qualified Person to determine the relevant information required for environmental assessment and compliance.

## 2.10 OUTLINING OF MITIGATION MEASURES

The Qualified Person with the assistance of the technical consultants and specialists shall assess the BATs, BMPs and options for P2M2 to address the identified key environmental issues. At this point in the TOR/ESI, the identified measures shall be qualitative and descriptive only, to be further detailed in the EIA stage.

In addition to the mitigation measures for environmental impact above, mitigation measures for radiological impact shall be outlined in conformance to the various laws and regulations, guidelines and code of practices approved by AELB depending on the types of activities.

**Table 2.10.1: Typical Project Alternatives and P2M2 Considerations**

| Options | P2M2 Considerations |
|---|---|
| Project siting | Consider alternative siting with better suitability of the below:<br>• Locations and proximity of sensitive receptors<br>• Buffer zones / setback<br>• Compatibility with the local land uses / neighbours<br>• Risk consideration<br>• Existing infrastructure tie-in / availability<br>• Proximity to human settlement / sensitive receptors<br>• Proximity to any cultural heritage |
| Terrain / Topography | Consider alternatives of:<br>• To maximise usage of the existing terrain to minimize earthworks on site and import of soil / minimize land reclamation.<br>• Avoidance of unsuitable terrain. |
| Socio Economic | Consider options to minimize:<br>• Land acquisition.<br>• Pressure on the existing infrastructure |

| Options | P2M2 Considerations |
|---|---|
| Existing Environment | Consider alternatives of:<br>• Minimize impact to the existing carrying capacity of receiving water bodies (if there is industrial effluent discharge)<br>• Minimize impact to the existing air shed (if there is emission discharge)<br>• Minimize disturbance to any natural ecosystem nearby the project site. |
| Technology option – process and pollution control / treatment systems | Consider alternatives of:<br>• Available technology options of higher efficiency<br>• Clean technology option<br>• BAT options<br>• Options to minimize plant resources – electricity / water / natural gas consumption. Recycling of resources.<br>• Technology options to reduce pollution to the environment |
| No Project Option | Consider the benefits of no project and also the loss of potential benefits including socio economic and other development benefits brought by the project. |

## 2.11 PREPARATION AND SUBMISSION OF TOR

Findings from the scoping exercise shall be incorporated into the ESI as information to develop the TOR. The TOR shall be submitted to DOE for review and endorsement before proceeding to the EIA stage.

### 2.11.1 Content of TOR

The TOR report shall be prepared in accordance with the format detailed under the Guidance Document for Preparing TOR under Appendix 8 of the EGIM 2016.

The TOR shall contain, but not limited to, the following:

(i) Introduction: Include the title to the project and a brief introduction to the project details.

(ii) List of Consultants/Study Team: Include the list of Consultants and Study Team (DOE registration number, academic background, experience, area of study and declaration). The EIA consultant team shall be led by a Team Leader who shall be responsible for the EIA report. For activities involving the use of radioactive materials and generating radioactive wastes under Activity 17 of the EIA Order 2015, at least one of the team members shall be registered under AELB.

(iii) Project Scope: Detail out the legal requirements to carry out the project. Provide description on the project, project activities and implementation schedule.

(iv) Alternatives Consideration: Provide the assessment of the various alternatives/options considered for the project and detail out the justifications and reasons for selection of the final project layout, components and/or details.

(v) Significant Environmental and Radiological Impacts to be Studied: Include the findings from the environmental scoping and detail out the significant impacts which will result from the project activities that are required to be included in the EIA.

(vi) Study Boundary: Delineate the study boundaries and identify the Environmentally Sensitive Areas (ESA) within the zone of study / zone of impacts.

(vii) Assessment Standards: List the standards, criteria, acceptable limits, etc. that will be used to assess the environmental impacts.

(viii) Timeline of Study: Detail our all studies/investigations to be carried out, including indicative dates.

(ix) Consideration of Concurrent Projects: List potential concurrent or planned projects that may result in cumulative impacts.

(x) Description of Modelling Tools and Assessment Methodologies: List the modelling tools and methodologies to undertake the impact assessment and evaluation of significance.

(xi) Possible Mitigation Measures: Outline the mitigation measures or BMPs from similar projects that may be used to address the environmental impacts from the project.

The ESI shall be appended as part of the TOR as a supporting document. The format for the ESI is as detailed in Appendix 8 of the EGIM 2016.

### 2.11.2 TOR Adequacy Check Process

A review shall be carried out by the EIATRC comprising the DOE officers and Appointed Individuals (AI) and/or GAs including specifically AELB officers and appointed individuals. The TOR Adequacy Check (TORAC) requirements and procedures shall follow the requirements as detailed out in the EGIM 2016 or any future amendments to it.

The adequacy of the scoping exercise and the TOR shall be decided in a TORAC meeting, chaired by the DOE (refer to **Box 6** for possible outcomes).

When the TOR Report is endorsed, the Project Proponent shall proceed to the EIA stage.

**Box 6:**

**Outcomes from TORAC Review**

At the end of the process, the TORAC meeting can decide the following:

(i) Endorse the report.

(ii) Endorse the report with revisions, where a Revised TOR shall be submitted.

(iii) Reject the report with reasons (a fresh TOR can still be submitted).

## 2.12 STAKEHOLDERS ENGAGEMENT

Stakeholder engagement is an important process at the preliminary stage, prior to drafting the TOR. At the start of the proposed project, the Project Proponent and/or the Qualified Persons shall undertake series of discussions with DOE, AELB, relevant planning and approving authorities and other GAs to confirm the study requirements and the approval processes to be followed, and to obtain their feedbacks regarding the proposed project.

The feedback from stakeholder engagement shall be considered in the TOR, EIA and by the EIATRC. Hence stakeholder participation facilitates the multi parties' communication and enhance further the overall EIA processes and improves the comprehensive nature of the environmental assessment.

The mechanisms for stakeholder engagement in the EIA process can be direct, indirect and formal or informal. EGIM 2016 has succinctly highlighted this as follows:

*…"EIA is a multi-disciplinary study on the environmental components such as water quality, air quality, waste management, environmentally sensitive areas and natural resources. It involves the participation of government agencies, non-governmental agencies (NGO), academicians, experts and environmental practitioners including qualified and competent persons, industries and public at large. Hence, the EIA process should provide adequate opportunities to all stakeholders including the affected public to express their concerns and provide inputs for decision making process by relevant approving authority."*

Engaging with stakeholders can have general benefits to a project as shown in **Box 7**.

**Box 7**

**Aims of the Stakeholder Engagement**

(i) To understand the GA's key requirements, especially approvals process, and guidelines to be cleared for the project.

(ii) To convey the aims and scope of the development to the affected stakeholders, inform of potential impacts from the development and mitigation measures put in place to address them. This builds public trust and confidence towards the project.

(iii) To obtain feedbacks from the stakeholders on their concerns so that adjustments can be made for incorporation into the project designs and EIA for project implementation.

(iv) To allow early resolution of any conflicts and impasses, avoiding costly delays.

**Box 8** provides some examples of good practices when engaging with the stakeholders.

**Box 8**

**Good Practices in Stakeholder Engagement**

(i) Stakeholder Identification: Selection of stakeholders should be inclusive, encompassing and without bias. The focus should be those that are directly affected by the project within the ZOI but may include any other relevant stakeholders.

(ii) Transparency: The stakeholder engagement process shall be carried out in a transparent and inclusive manner, with ample opportunities for the relevant stakeholders to obtain information, provide comments and submit feedbacks.

(iii) Information Disclosure: Information provided should be adequate and relevant to allow for stakeholders to understand the project and make informed decisions. Sufficient time should be allowed for information assessment and feedback.

(iv) Communication Tools: Communication can be in many forms – reports, formal meetings, focal group discussions (FGD), townhall meeting, dialogues, information sheets, surveys, websites, etc. The method should best be suited to the target audience, with information communicated in simple to understand language and none too technical.

(v) Notification: All stakeholders should be informed and notified appropriately of any meetings or discussions to be held and given ample time to make arrangements. All efforts shall be made to ensure representative attendance by the stakeholders.

(vi) Selection of Venue: Meeting locations should be in a venue close by, convenient and accessible to the stakeholders. This would ideally be near the project site. For public display of EIA reports, these shall be at locations open and accessible to the public, e.g. public library, police station, local authority office, etc.

(vii) Documentation: All engagements shall be properly documented and reported in the EIA. Actions taken to address the issues brought up shall be clearly spelled out and mitigation measures incorporated as part of the project design. It is a good practice to follow up with the stakeholders on actions taken.

(viii) Accountability and Continuity: All comments and feedbacks from stakeholders shall be assessed and reviewed objectively. Actions shall be taken by the Project Proponent to address legitimate concerns. Stakeholder management should be throughout the project lifespan. Provision of platforms for stakeholders' engagement post-EIA is a best practice that should be adopted.

### 2.12.1 Identification of Stakeholders

Various stakeholders have different roles in the process. A useful distinction is between 'statutory' and 'non-statutory' stakeholders as follows.

(i) Statutory stakeholders, primarily government agencies, are those organizations and bodies that, by law, are required to be involved in any planning, development or operational activity.

Examples: DOE, AELB, DOSH, MIDA, Ministry of International Trade and Industries (MITI), Ministry of Health (MOH), local government, universities, research institutes, etc.

(ii) Non-statutory stakeholders are additional stakeholders which may be affected, directly or indirectly, by the activity and therefore have an interest in the EIA.

Examples of these non-statutory stakeholders are local residence associations, NGO in the likes of Institution of Engineers Malaysia (IEM), Malaysian Medical Organization (MMO), Bar Council, political parties, interest and pressure groups.

The main purpose of bringing in the stakeholders in the EIA process is to allow wider institutional capacity to identify and to consider all the environmental and radiological issues that are of differing and varying significance to the various stakeholders.

**Table 2.12.1** presents an indicative, but non-exhaustive, list of potentially relevant stakeholders and their role and responsibilities.

**Table 2.12.1: Key Stakeholders and their Roles and Responsibilities**

| Stakeholder | Role and Responsibilities |
|---|---|
| **DOE** | Administrator of the EIA process under the Act 127.<br>Decision on the EIA report, environmental regulatory body to ensure project complies with the environmental requirement.<br>Issue environmental license or permits to the Project Proponent. |
| **AELB** | Administrator of matters on atomic energy in Malaysia under Act 304<br>Responsible for the issuance of the licenses and COA for matters and activities on atomic energy in Malaysia<br>Approvals, controls and licensing of all matters and activities on atomic energy in Malaysia. |
| **Project Proponent and his Other Consultants** | Initiate project proposal.<br>Initiate and comply with the EIA process and its terms and conditions.<br>Publicly release all relevant information on the project proposal and EIA.<br>Manage and be fully responsible for their development activities and associated social and environmental impacts. |
| **Government Agencies, NGO, Trade Associations** | Contribute technical knowledge and expertise to EIA process.<br>Disseminate information about project proposals and EIA process.<br>Assist Project Proponents and other stakeholders to understand concepts and participate in EIA processes. |

| Stakeholder | Role and Responsibilities |
|---|---|
| **Affected Communities – residentials, business groups, neighbouring industries** | Be aware of and read/consider about project proposals in areas of influence.<br>Engaged, as much as practicable, with project proponents and environmental agencies regarding project proposals.<br>Help to identify potential risks and impacts of project proposals, as well as project alternatives and impact avoidance strategies.<br>Identify and communicate community needs, desires and expectations from project. |

Note:The list is not exhaustive and not all the above may be relevant to the project. It is the responsibility of the Project Proponent and Qualified Person to identify the relevant stakeholders.

### 2.12.2 Methods of Engagement

In these consultations, two-way communication approach shall be undertaken and in addition, to making the environmental and radiological reports public once the consultations have been concluded. Thereafter the consultations shall culminate in a process to receive comments from both statutory and non-statutory stakeholders for further consideration in the EIA study. All comments received shall be recorded and evaluated, although some may be irrelevant and therefore would not be addressed in the corresponding documents. A time limit for the process shall be established and publicized as part of the overall explanation process to the stakeholders.

In instances where transboundary impacts may be of concern, a modification in the stakeholder consultations and timelines may be required to allow the transboundary input to be considered for the overall EIA process.

Common methods of engagements and expected outputs are provided in **Table 2.12.2**.

**Table 2.12.2: Methods of Engagement and Expected Outputs**

| Stakeholder | Type of Consultation | Information Requirement |
|---|---|---|
| DOE | Meeting and/or pre-consultations | Comments on TOR/ESI and EIA process and requirements |
| AELB | Meeting and/or pre-consultations | Comments on TOR/ESI, radioactive activities licensing and approval, including RIA processes and requirements |
| Project Proponent and Consultants | Meetings and/or private consultations | Information required for the project<br>Consultation on changes in project design. Incorporation of P2M2 and another radiological dose control |
| Relevant GAs | Meetings and/or pre-consultations<br>Official correspondence | Agency requirements such as key elements of policies, regulations and guidelines to adhere to, including planning approval requirements<br>Methods to address those key elements and approval procedures |
| Affected Public and Local Population | Questionnaire surveys<br>Interviews (formal and informal)<br>FGD<br>Public briefing<br>Project briefs<br>Website | Project briefings<br>Views and concerns on the project<br>Inputs for project incorporation<br>Conflict resolution mechanism |
| NGO | Meetings and/or private consultation | Concerns and inputs on project |

Note:The list is not exhaustive and not all the above may be relevant to the project. It is the responsibility of the Project Proponent and Qualified Person to identify and select the best method of engagements.

Essentially as a project that uses radioactive materials and radioactive wastes may capture a wider interest among the members of public, the following methods are recommended to capture wider public participations for the proposed project. These methods are used for raising initial awareness and soliciting involvement and serving long-term information sharing.

**Extent of Public Participation**

The extent of public participation shall be based on the extent of the envisaged impacts, i.e. national, regional, local, area or in situ level. Other criteria to be considered include ecological / biophysical attributes, social concerns, visual exposure and cumulative impacts. The level of advertising and participation mechanism shall be determined by the extent of impacts.

**Public Notice**

This method can be used to provide initial information to the public about a proposed development to solicit public reaction, comments and suggestions by posting the announcement in widely read papers and / or electronic media by the Project Proponent.

The same approach can be used later in the process to inform people about public hearings / meetings, the selection of stakeholder committees, plans for conducting surveys, workshops, site observation visits etc. by the project's pubic / community management team.

Also, the notice may indicate how further information can be obtained, example via a telephone or e-mail, brochure, newsletters, public information centres, websites etc.

Whenever public notices are posted, the mechanisms for receiving feedbacks shall be in place. These mechanisms may include post office box, project office location, telephone hotline number and / or email address.

**Public Hearings / Community Meetings**

This method serves to explain / elaborate details on project information and study findings. Both public hearings and community meetings shall aim at sensitizing the public on ways to respond, the process involved, and the mechanisms available to them (through nominated representatives or stakeholder committees), to enable them to participate meaningfully.

Where direct impact is anticipated on specific individual or group of communities (in cases of relocation or resettlement), discussions on types and expected values of compensation shall be mediated by relevant authorities. In addition, due consideration shall be given to issues associated with socio-economic, cultural heritage and adaptability to changes among the impacted individuals / group of communities.

**Public Information**

Some projects require public educational information to assist them in making well informed and objective comments. Projects involving radioactive materials and wastes are sensitive and can be easily misunderstood by the public due to lack of understanding or non-factual information on the subject matter. Thus, a proper public information and education programme should be established by the Project Proponent and relevant stakeholders, when necessary.

### 2.12.3 Documentation and Reporting

Initial stakeholders engagement and expectations from the stakeholders shall be incorporated into the TOR, especially in regards to policy compliance and regulatory adherence.

Proof of engagement shall be in the form of written reports, official response letters from the GAs, meeting notes, photos of events / engagements, etc.

The public participation process shall be properly documented and reported in the EIA. The report should contain the following:

(i) Details of the programme (dates, venue, itinerary).

(ii) Attendance list of participants.

(iii) Copies of survey forms.

(iv) Brief summary of findings from the event, e.g. reports, minutes of meeting, list of questions and responses, photograph of event.

(v) Video or voice recordings (optional and only as reference).

All stakeholders engagement information shall form part of the appendix in the EIA, and the issues brought up and responses from the Project Proponent, shall be clearly stated and discussed in the EIA report.

# CHAPTER 3

# ENVIRONMENTAL IMPACT ASSESSMENT: BASELINE CONDITIONS

## 3.1 INTRODUCTION

An EIA report shall contain a description of the existing environment before project development (termed as “baseline conditions”) that may or may not be affected directly or indirectly by the proposed project.

During the EIA study, the baseline conditions should be used to determine the type mitigation measures being put in place in order to ensure the quality of environment remains within acceptable criteria and risks.

During project implementation stage, the baseline data should be used for reference or comparison against the project’s monitoring data to verify the performance of the mitigation measures.

**Box 9**

**Objectives for Description on Baseline Conditions**

(i) Identify existing environmental conditions which may influence project design decisions (e.g. site layout, structural or operational characteristics).

(ii) Identify sensitive issues or areas requiring mitigation or compensation.

(iii) Provide input data to analytical models for prediction of impacts.

(iv) Provide baseline reference for comparison during project implementation stage.

## 3.2 ENVIRONMENTAL BASELINE

The baseline conditions may be described based on primarily surveys from the ZOS or from validated secondary sources. Radiological baseline data shall be gathered for projects that are confirmed as prescribed activities under Activity 17 of the EIA Order 2015 (also refer to Section 1.3 of this EIA Guidelines).

### 3.2.1 Secondary Data Collection

Secondary data includes information and statistical data from various sources but mainly from official published reports, census, publications and research papers. They are collected to form the basic information brief for the project.

All sources of information and statistics have to be clearly referenced and acknowledged alongside the date of publications in the EIA. References for all maps, photos and diagrams will also need to be included in the EIA.

### 3.2.2 Primary Data Collection

The development of a prescribed activity under Activity 17 of the EIA Order 2015, shall require adequate primary baseline data collection for the ambient environment.

Primary data is collected to fill in gaps in information or to obtain first hand data for detailed assessment. Common methodologies employed for primary (environmental) data collection include at-site and off-site site surveys and sampling programmes, while common methodologies for primary radiological data include site radiation survey and radiation measurement.

The survey area shall be bounded by the ZOS. However, if the predicted impact is much further away, then the ZOI shall be part of the survey and assessment area. This has to be clearly defined in the EIA. In radiological activities, this information shall be determined by AELB. Data collection shall cover three major environmental components as follows.

Generally, primary baseline data collected during the EIA study should be acceptable as relevant references for two (2) years from the date of field monitoring, unless the Qualified Person is able to prove that there is no significant changes to the surrounding physical, biological and human environments within the zone of impact of the project site within or after 2 years.

The following sections describe typical parameters, methods, sampling locations and criteria for comparison for a prescribed activity under Activity 17 of the EIA Order 2015. Additional requirement for baseline establishment may be referred to the relevant Sectoral EIA Guidelines of the proposed project.

Samples collected shall be analysed by accredited laboratories. Samples from activities involving radioactive materials or radioactive wastes shall be analysed by accredited radiological laboratory or equivalent.

All test certificates and data shall be included in the appendix of the EIA Report as supporting evidence.

**Physico-chemical Environment**

In line with the DOE's environmental mainstreaming, the EIA study shall focus on the core aspects of pollution in the physico-chemical environment, which are water, air and wastes. Baseline information on these three core aspects are needed to determine the state of the terrestrial and marine environment before, during, and after project implementation when benchmarked against the DOE standards.

A baseline sampling plan, which includes locations, methods of sampling and parameters to be sampled, shall be decided based on the project site and clearly documented in the EIA. **Table 3.2.1** below provides type of baselines studies.

**Biological Environment**

The biological environment is very wide ranging in scope and is the most important component in projects involving radiological activities. Consultation with AELB shall be made prior to data collection, surveys and assessments.

The scope and requirement for the terrestrial and marine biological environment shall be determined together with the respective GAs. The assessment reports are to be approved by these GAs before incorporation of the findings in the EIA report.

If the biological impact of the Project is not significant, secondary data would suffice.

**Human Environment**

Socio economic of the human environment in the ZOS shall be documented in the EIA. This secondary data normally includes the population census as well as community profiles from the local authorities, district offices and community leaders. Socio economic data could also be obtained from FGD and direct person-to-person interviews.

If the proposed project is subjected to a SIA under Act 172, requirements as prescribed in the *Manual Penilaian Impak Sosial Bagi Projek Pembangunan Edisi Ke-2 2018* shall be referred. PLANMalaysia shall review, endorse and enforce the requirements of the SIA. Main findings from the SIA shall be incorporated into the EIA report.

Other aspects that may affect communities within the vicinity of the project site shall be considered if they are deemed as significant issues. The requirements may include, but not be limited to, public health, heritage and culture, archaeology and traffic. The findings of these studies shall be incorporated into the EIA report, where applicable.

**Radiological Environment**

Relevant data collection will be required for the section on radiological environment in the EIA through the completion of the RIA study.

**Table 3.2.1: Typical Baseline and Radiological Studies**

| Recommended Parameter | | Guidelines/ Standards | Recommended Requirements |
|---|---|---|---|
| **River Water Quality** | | | |
| Dissolved Oxygen (DO)<br>Temperature<br>Conductivity<br>pH<br>Biochemical Oxygen Demand (BOD)<br>Chemical Oxygen Demand (COD)<br>Total Suspended Solids (TSS)<br>Ammoniacal Nitrogen (AN)<br>Mercury (Hg)<br>Cadmium (Cd)<br>Chromium Trivalent ($Cr^{3+}$) | Chromium Hexavalent ($Cr^{6+}$)<br>Arsenic (As)<br>Cyanide (CN)<br>Lead (Pb)<br>Copper (Cu)<br>Manganese (Mn)<br>Nickel (Ni)<br>Tin (Sn)<br>Zinc (Zn)<br>Boron (B)<br>Iron (Fe)<br>Phenol<br>Free Chlorine ($Cl_2$)<br>Sulphide ($S^{2-}$)<br>Total coliform<br>Faecal coliform<br>Radioactivity<br>Radionuclides | National Water Quality Standards of Malaysia | One-time composite sampling.<br>Upstream and downstream of major rivers and streams within the ZOI.<br>Minimum two sampling locations (depending on river type)<br>Multi-depth sampling for deep rivers (>1 m deep).<br>Heavy metals testing required if activity involve industrial and/or mining projects.<br>Pesticides testing required for agricultural and/or forestry projects.<br>Water quality parameters shall be selected based on the site conditions.<br>Radioactive parameters shall be selected based on site conditions and as determined by AELB |

| Recommended Parameter | | Guidelines/ Standards | Recommended Requirements |
|---|---|---|---|
| **Estuarine and Marine Water Quality** | | | |
| DO<br>Temperature<br>Conductivity<br>pH<br>Turbidity<br>Salinity<br>TSS<br>As<br>Cd<br>$Cr^{6+}$<br>Cu<br>Pb<br>Hg<br>Zn | CN<br>Ammonia (Unionised)<br>Nitrite ($NO_2$)<br>Nitrate ($NO_3$)<br>Phosphate ($PO_4$)<br>Phenol<br>O&G<br>Faecal coliform<br>*E. coli**<br>Enterococci*<br>Radioactivity<br>Radionuclides | Malaysia Marine Water Quality Criteria and Standards | Only if site is adjacent to coastal areas.<br>Sampling must be at least 100 m from coastline.<br>Sampling done for high tide and low and spring and neap tides, once each.<br>Multi-depth sampling (top, middle and bottom).<br>Minimum five sampling locations. |
| **Air Quality** | | | |
| $PM_{2.5}$<br>$PM_{10}$<br>Carbon Monoxide (CO)<br>Sulphur Dioxide ($SO_2$)<br>Nitrogen Dioxide ($NO_2$)<br>Ozone ($O_3$) *<br>Radioactivity<br>Radionuclides<br><br>Note:<br>*Ozone needs to be measured for selected projects only. Justification needs to be provided for its omission. | | Malaysian Ambient Air Quality Standards | Parameters to be sampled are dependent on-site conditions.<br>One-time sampling at minimum two stations (upwind and downwind).<br>Project boundary and nearest receptors. |

Note: The list above is for indicative and non-exhaustive. The Project Proponent and Qualified Person shall include and provide any additional baseline sampling including parameters, as required by DOE, other GAs and/or deemed necessary for the project.

**Table 3.2.2: Other Studies**

| Recommended Parameter | Reference | Sampling Requirements | Approving Authority |
|---|---|---|---|
| Geology and Soil | | | |
| Site topography based on land surveys.<br>Soil profile analysis including K-value for erosion analysis.<br>Radioactivity<br>Radionuclides | JMG and JKR requirements and guidelines | Soil Investigation (SI).<br>Hand auger (determine K-value). | JMG<br>JKR |
| Hydrology | | | |
| Stream flow.<br>Riverbed cross section. | DID requirements | Site survey to verify river system and drainage.<br>Stream gauging to ascertain flow and river bed cross-section.<br>Identification of downstream sensitive receptors. | DID |
| Land use | | | |
| Current land use<br>Future and committed land use<br>Sensitive receptors<br>Zoning and compatibility | Structure and local plans<br>Marine Park Management Plans | Site surveys.<br>Mapping to update information.<br>Within the ZOI. | PLANMalaysia<br>Department of Marine Park Malaysia |

| Recommended Parameter | Reference | Sampling Requirements | Approving Authority |
|---|---|---|---|
| Social Impact Assessment (SIA) | | | |
| Population profile<br>Identification of stakeholders<br>Perception survey | *Manual Penilaian Impak Sosial Bagi Projek Pembangunan Edisi Ke-2 2018* | Carried out as part of the SIA.<br>Surveys on target groups potentially affected by the project.<br>Surveys shall represent the stakeholders in the ZOI.<br>Stakeholder engagement conducted. | PLANMalaysia |
| Public Health | | | |
| Population profile<br>Public health status | Guidance Document on Health Impact Assessment (HIA) in EIA | Carried out as part of the HIA.<br>Surveys on target groups potentially affected by the project.<br>Surveys shall represent the stakeholders in the ZOI.<br>Stakeholder engagement be conducted. | MOH<br>Health Department |
| Traffic | | | |
| Traffic count for peak traffic periods<br>Traffic risks during transportation of radiological materials | JKR and AELB requirements and guidelines | Carried out as part of TIA.<br>Traffic surveys at major junctions leading to project site. | JKR<br>AELB |

| Recommended Parameter | Reference | Sampling Requirements | Approving Authority |
|---|---|---|---|
| Wastes Management | | | |
| Estimation of biomass from site clearing.<br>Potential waste (municipal, construction & demolition, scheduled wastes) generation.<br>Potential waste (radioactive wastes, NORM) | DOE, PBT and AELB requirements and guidelines | Site surveys to ascertain existing site conditions. | DOE<br>PBT<br>AELB |
| Heritage, Culture and Archaeology | | | |
| Identify and determine significance of value of such sites within or near to project site. | National Heritage Register | Site surveys and interviews with authorities and locals. | National Heritage Department.<br>Department of Museum. |

Note:The list above is indicative, non-exhaustive and may not be relevant to the project. It is the responsibility of the Project Proponent and Qualified Person to include and provide any additional information required by the GAs from the outcome of stakeholder engagements.

# CHAPTER 4

# ENVIRONMENTAL IMPACT ASSESSMENT: EVALUATION OF IMPACTS

## 4.1 INTRODUCTION

This section presents the impact assessment approaches and prediction methodologies / tools for potentially key environmental impacts that may arise from the development of a project. EIA for activities that use radioactive materials and generate radioactive wastes shall include assessment of radiological impacts onto the environment through RIA.

There are many methods to assess the environmental impacts. Generally, all methods of impact assessment seek to compare the existing environment against a predicted future environment caused by activities during different phases of project implementation.

While there is no one method that fits all requirements, the predictive and assessment method chosen should have at least the following attributes:

(i) Established and proven methods and models.

(ii) Adequate, accurate and up-to-date data for assessment.

(iii) Results can be replicated and is reproducible by independent evaluators.

(iv) Cost-effective and for any software, it can be purchased (propriety software and tools can also be used). Widely accepted freeware is acceptable.

The Qualified Person shall select the best method to conduct the assessments and / or generate practical scenarios from reliable datasets to ascertain the magnitude, extent and significance of impacts from the project.

## 4.2 PREDICTION AND EVALUATION OF IMPACTS

Only significant issues shall be assessed in detail in the EIA. Issues that are not significant shall only be addressed qualitatively.

The level of details in the impact identification shall commensurate with the following factors:

(i) Type of radiological activities, materials and waste, and the source terms.

(ii) Scale of the project (land area, total disturbed areas, etc.).

(iii) Intensity of development (total land clearing, phasing of land clearing).

(iv) Potential pollution sources from the project.

(v) Magnitude and complexity of impacts.

(vi) Area of impacts (localised versus transboundary).

(vii) Probability of cumulative impacts (effects of project on adjacent land areas and *vice versa*).

(viii) Sensitivity of nearby receptors (e.g. Environmentally Sensitive Areas).

The following sections describe typical but are not limited to, significant components and impacts related to a prescribed activity under Activity 17 of the EIA Order 2015. Additional requirement may be referred to the relevant Sectoral EIA Guidelines of the proposed project.

(i) The prediction and evaluation of radiological impacts due to the site development of the proposed project site development shall be based on the similar matrices to that of the EGIM 2016. This is primarily due to the main component in the development of any radiological activities being the same impacts on the biophysical dimensions of air, water and land.

(ii) In addition to the impact matrices outlined in the EGIM 2016, the impacts outline should be further extended to include components where radiological activities may amplify the environmental impacts components.

## 4.3 AIR QUALITY

### 4.3.1 Sources of Pollutions

**Construction Stage**

Contribution of air pollutants during the construction are primarily related to dust and combustion gases from vehicles and machineries and fugitive dust from exposed soil surfaces at the project site.

**Operation Stage**

Atmospheric emissions from a processes can be broadly categorized into point sources and fugitive emissions. Point source emissions can be routed to a pollution control device for treatment. For diffuse and fugitive emissions, the objective of controls are through prevention and / or minimization (e.g. improved process equipment with least fugitive emissions, and by capturing in ducted system). **Table 4.3.1** gives typical air pollutants from processes.

**Table 4.3.1: Air Pollutants and Their Potential Sources**

| Air Pollutants | Sources |
|---|---|
| Volatile Organic Compounds (VOC) | Process vents<br>Storage and transfer of liquids and gases<br>Fugitive sources and intermittent vents<br>Processes / distillation units |
| Particulate matters | Conditioning of solid raw materials<br>Drying of solid products<br>Catalyst regeneration<br>Waste handling |
| Combustion gases:<br>NOx, CO, SOx, HC, metals, dust | Furnaces<br>Steam boilers<br>Incinerators |
| Acid gases (HCl, HF) | Halogenation reactions |
| Dioxins / Furans | Production processes that use chlorine<br>Incinerators |

### 4.3.2 Impact Assessment

It is suggested that the followings are considered for air quality impact assessment:

(i) The significant pollutants emitted from the proposed project. Continuous, large volume with high concentration emissions point sources should be given priority.

(ii) Ambient air prediction and assessment scenarios. Examples of scenarios: normal operation conditions (with air pollution control system to specified guaranteed performance limits), worst case scenario (no treatment of flue gas during worst atmospheric conditions) and emergency bypass scenario (emergency shutdown due to power outage or plant upset or air pollution control system failure).

(iii) Meteorological data should be sourced from the nearest Meteorological Station.

(iv) Sensitivity of the receiving environment or sensitive receptors, should there be any locally specified tolerance levels, such as exposure dosage levels to plant or human.

(v) Reference to assessment criteria such as the New Malaysia Ambient Air Quality Standard, baseline conditions or any relevant standards / guideline limits.

In order to assess whether an emission meets the ambient air quality objective, it is necessary to determine the ground-level concentrations that may arise at various distances from the source.

Air dispersion modelling is often used to determine the ambient ground-level concentrations of an emitted pollutant, given information about the emissions and the nature of the atmosphere. Model predictions are useful in a wide variety of air quality decisions, including determining appropriateness of facility location, monitoring-network design and stack design. Models also provide information on the areas most influenced by emissions from a source, the contribution of weather to observed trends and the air quality expected under various scenarios.

The initial air quality assessment is conducted qualitatively and once it is identified as significant emission sources, the assessment should progress to quantitative assessment by either screening modelling or refined / advanced modelling to predict the pollutants' ground-level concentrations. Refined air dispersion model provides detailed analysis of the parameters and caters for multiple emission sources, thus gives a more accurate estimate of the pollutants' concentrations at receptors. However, a refined model demands for more specific input data which can include topography, better receptor grid resolution, downwash or other plume adjustment and pollutant decay or deposition algorithm. Refer to **Section 4.10** of this Guidelines for examples of prediction tools.

The main objective of a modelling study is to determine the significance of the effects of pollutants being discharged from a particular source and its ZOI. Some of the key information to be included in reporting modelling results are:

(i) Information about the input data and how variations may affect the results.

(ii) Discussion on the accuracy of the modelling results.

(iii) Identification of the receptors that are most highly impacted and those are the most sensitive.

(iv) Tabulate the model output in predicted pollutants concentrations at respective sensitive receptors and evaluate the significances.

(v) Maps of the pollutants' dispersion contours overlay on a land use map surrounding the project site.

## 4.4 WATER QUALITY

### 4.4.1 Sources of Pollutions

**Construction Stage**

Site clearing and earthworks activities, involve removal of vegetation and soil movement. These could result in the increase of surface runoff, soil erosion and sedimentation in waterbodies.

During peak construction period, the presence of large number of workers at site will translate to a significant amount of sewage generation.

During the testing and commissioning, large amount of water may be used for hydrostatic pressure test on storage tanks, vessels and transfer pipelines. These waters sometimes contains corrosion inhibitors, antifreeze compounds, biocide or other chemical additives. At this stage, effluent may be generated and its characteristics may be fluctuating in accordance to the processes being tested.

Nearby water resources are also at risk of accidental spillage or leak of fuel and hazardous materials including chemicals, during handling and storage.

**Operation Stage**

A processing plant may generate process effluent and / or wash waters periodically. These waters usually contain high pollutant matters. Depending on the type of raw materials or additives or catalyst being used in the process, other unique water parameters may be observed.

Meanwhile, other common effluent streams includes:

**First flush pits:** These waters are largely stormwater but may contain spilled chemicals or oily water from process areas, utility areas or storage areas .

**Boiler blowdown:** These waters will be non-oily but high in dissolved solids. It may also be contaminated with heavy metals and anti-scaling agents.

### 4.4.2 Impact Assessment

Selection of methodology for water quality impact assessment may vary, depending on the quality of effluent discharges and the location of discharge point.

It is suggested that the followings are considered for water quality impact assessment:

(i) The significant pollutants emitted from the proposed project. Continuous, large volume and high concentration of water sources and parameters should be given priority.

(ii) Water quality prediction and assessment scenarios. Examples: normal operation conditions (with Industrial Effluent Treatment System (IETS) to the specified guaranteed performance limits), worst case scenario (no effluent treatment).

(iii) Hydrology data should be sourced from the nearest DID Monitoring Station.

(iv) Sensitivity of the receiving environment or sensitive receptors, should there be any locally specified tolerance levels, such as drinking water intake, recreational requirement, agricultural or aquaculture requirement, ecological requirement, other downstream industrial needs, navigation etc.

(v) Reference to assessment criteria such as the national river and marine water guidelines, baseline conditions or any other relevant standards / guideline limits.

Impact assessment shall rely on the concept of assimilative capacity of the receiving waterbody and water quality objectives. Quantification of the assimilative capacity of the receiving environment shall take into account physical processes, as well as all chemical, biochemical and biological processes.

The prediction exercise or modelling should provide information as the basis for determining whether the aquatic resources and beneficial users are at risk, or that the assimilative capacity may be exceeded as a result of the project implementation.

When the prediction shows the water quality of the received waterbodies may have been significantly compromised due to the discharges from the project, then suitable mitigation measures shall be considered to alleviate the concern so as to either remove or mitigate the impacts to the receiving waterbodies.

### 4.4.3 Outputs

The main objective of an impact assessment is to determine the significance of the effects of pollutants being discharged from a particular source and its ZOI, and key information to be reported include:

(i) Information about the input data and how variations may affect the results.

(ii) Discussion on the accuracy of the predictions.

(iii) Identification of the receptors that are most highly impacted and those are the most sensitive.

(iv) Presentation of predicted pollutants concentrations in tabulation or maps of the pollutants' dispersion contours.

## 4.5 RISK ASSESSMENT

### 4.5.1 Sources of Hazards

Some proposed installations may handles and uses large amounts of hazardous substances. The Occupational Safety and Health (Control of Industrial Major Accident Hazards) Regulations 1996 defines "major hazard installation" as an industrial activity which produces, processes, handles, uses, disposes of or stores, whether permanently or temporarily, one or more hazardous substances or a category or categories of hazardous substances in a quantity or quantities which is or are equal to or exceed the threshold quantity stipulated in its regulations.

The operational hazards of which the risk assessment will focus on, are:

- Fires
- Explosions
- Thermal decomposition
- Chemical leakage

### 4.5.2 Impact Assessment

The objectives of a risk assessment are to identify and quantify the probability and consequences of the possible emergency events that may escalate from the project site to the surrounding areas offsite and potentially cause undesirable outcome such as human injury, fatality or destruction of property, to calculate the risk level, and to suggest measures to reduce the level of risk if higher than the risk acceptance criteria.

Risk assessment for EIA reporting is guided by EIA Guidelines for Risk Assessment by DOE Malaysia (2004).

**Qualitative Assessment**

This risk assessment is a screening exercise and the outcome is the risk ranking of the identified hazards. If the qualitative risk assessment indicates that the risk is insignificant or acceptable with specific risk control measures, then there is no need to carry out further quantitative risk assessment. Some of the method for qualitative risk assessment include:

- Risk matrix.
- Risk calculator.

**Quantitative Assessment**

Quantitative risk assessment involves:

(i) Frequency / Probability Analysis

This is a method to determine the probability of occurrence of a hazardous event by the Event Tree Analysis (ETA) or Fault Tree Analysis (FTA). They should reveal the outcomes of the root cause of failure and help identify further hazardous events. The root causes can be component failures, human errors or other pertinent events that can lead to hazardous event.

(ii) Consequence Analysis

This is a method to determine the chance of the vulnerable resource, usually human beings, to attain the harmful effects of the identified hazard. The worst case of the harmful effect is fatality. Consequence analysis can be divided into 3 steps namely:

- Source analysis
- Exposure analysis
- Dose analysis

(iii) Risk Estimation

The three principal factors that determine the risk posed by an industrial activity are:

- The chance of attaining serious harm due to the occurrence of the major hazards such as fire, explosion and / or toxic release;
- The probability of occurrence of the hazard;
- The population within the affected region where the effects of the occurrence of the major hazards can be felt.

Combination of the first two factors in the risk estimation will result in individual risk values and combining all the three factors will result in societal risk values. Where relevant, the triggering of secondary events or domino effects shall be assessed too.

### 4.5.3 Outputs

The main objective of this risk assessment is to determine the individual and societal risks values and to determine the acceptability of these risks.

(i) Individual risk

Individual risk represents the frequency or probability of an individual dying due to the occurrence of the hazardous event. The individual is assumed to be unprotected and to be present during the total exposure time.

(ii) Societal Risk

Societal risk represents the frequency or probability of having an accident with N or more people being killed simultaneously. The people involved are assumed to have some means of protection. The societal risk is presented as an F-N curve, where N is the number of deaths and F is the cumulative frequency of accidents with N or more deaths.

(iii) Risk Tolerability

Outcome from the risk assessment is usually compared to the risk tolerability criteria so that a decision can be made whether the risk is broadly acceptable or tolerable or if it is unacceptable. The risk tolerability criteria recommended in the EIA Guidelines for Risk Assessment by DOE Malaysia (2004) are:

- The 1 x $10^{-6}$ fatalities / person per year individual risk contour should not encompass involuntary recipients of industrial risks such as residential areas, schools, hospitals and places of continuous occupancy, etc.
- The 1 x $10^{-5}$ fatalities / person per year individual risk contour should not extend beyond industrial boundaries.

## 4.6 PUBLIC HEALTH

### 4.6.1 Sources of Health Hazards

A health hazard may be biological, chemical, physical or radiological in nature.

**Construction Stage**

Among the common health hazards during construction stage are:

- Respiratory effects from exposure to gaseous and particulate pollutants such as particulate matters below 10 microns ($PM_{10}$), $SO_2$, $NO_2$ from fuel combustion machinery on sites.

- Vector-borne diseases (dengue fever, malaria which are caused by the unhygienic construction sites or living workers quarters). Water-borne and food-borne disease like cholera, typhoid and hepatitis A due to improper sewage and solid waste disposal in the workers' camp area.
- Physical injuries due to work accidents, road traffic accidents, noise-induced hearing impairment from exposure to vehicle or machinery noises.
- Accidents and explosion hazards from handling highly flammable materials on site (pipelines, storage tanks etc.).

**Operation Stage**

Among the possible health hazards during the operation are:

- Respiratory effects due to air borne pollutants as outlined in **Section 4.3** of this Guidelines.
- Health effects from ingestion exposure to various water borne pollutants in the discharged effluents and waterbodies as outlined in **Section 4.4** of this Guidelines.
- Cancer effects from exposure to carcinogens such as radionuclides, heavy metals, VOC etc.
- Physical injuries due to work accidents, road traffic accidents, noise-induced hearing impairment from exposure to vehicle or machinery noises.
- Accidents and explosion hazards from handling highly flammable materials on site (pipelines, storage tanks etc.).

### 4.6.2 Impact Assessment

The health risk assessment for EIA reporting is guided by the Guidance Document on Health Impact Assessment (HIA) in Environmental Impact Assessment published by DOE Malaysia (2012).

Health risk is an outcome of health hazard and exposure to that hazard. Approaches to health risk assessment are namely qualitatively or quantitatively.

**Qualitative Assessment**

Qualitative health risk assessment involves listing and describing the probable change in health outcomes or endpoints that would be realised due to the proposed project.

For example, inappropriate waste handling during the construction stage may lead to potential breeding of pests like rodents and disease vectors like mosquitoes and flies. However, the quantum of increase in the populations of rodents or mosquitoes or the subsequent increase in the prevalence of diseases associated with them, are not quantified.

Qualitative assessment also applies based on the comparison of the community air pollutant exposure levels with established ambient air guideline levels. If the air pollutant exposure levels are below the guideline levels, then the potential health impact is considered as minimum or insignificant.

**Quantitative Assessment**

Quantitative health risk assessment generates a risk value on the potential adverse health effects of human exposures to environmental hazards.

The assessment should contain the following:

- Hazard identification
- Dose-response assessment
- Exposure assessment
- Risk characterization

The application of quantitative assessment is mainly limited to the assessment of chemical hazards as biological and physical hazards do not lend themselves well to quantitative assessment. In such cases, qualitative assessment should apply.

### 4.6.3 Outputs

The main objective of this health impact assessment is to determine the acceptability of these health risks.

Acceptable health risk is a societal acceptance (those who are being subjected to the risk) level of risk, which is considered tolerable or as something people can live with comfortably. The risk tolerability criteria recommended in the Guidance Document on HIA in Environmental Impact Assessment by DOE Malaysia (2012) are:

- Hazard Index is a summation of the hazard quotients for all chemicals to which an individual is exposed. For non-carcinogenic risk, a Hazard Index value of 1.0 or less than 1.0, indicates that no adverse human health effects (noncancer) are expected to occur.
- For carcinogenic risk: values of $10^{-6}$ to $10^{-4}$ are given as a range of "generally acceptable risk".

## 4.7 WASTE GENERATION

### 4.7.1 Sources of Wastes

**Construction Stage**

Typical type of wastes during construction stage include:

- Excavation spoils / unsuitable soils
- Biomass materials
- Construction wastes – timber, cut piles, concrete, scrape metal etc.
- General solid wastes
- Scheduled wastes. Examples: SW102 (waste of lead batteries), SW305 (spent lubricating oil), SW306 (spent hydraulic oil), SW408 (contaminated soil, debris or matter resulting from cleaning up of chemical, mineral oil scheduled wastes spills), SW409 (disposed containers, bags or equipment contaminated with chemicals, mineral oil or scheduled wastes), SW410 (rags, plastic, paper or filters contaminated with scheduled wastes), SW421 (mixture of scheduled wastes), SW422 (mixture of scheduled and non-scheduled wastes).

**Operation Stage**

The proposed project may generates a variety wastes stream in its operation stage. These wastes basically can be classified into 2 main groups namely:

- Non-hazardous / domestic wastes such as scrap metals, plastic and paper wastes etc.
- Hazardous / scheduled waste which consists of some radiological wastes, toxic organic or heavy metal content.

**Abandonment Stage**

At any stage of project abandonment, sorting and management of wastes are anticipated and these wastes can include:

- Equipment and machineries.
- Non-hazardous / domestic wastes such as scrap metals, plastic and paper wastes etc.
- Hazardous / scheduled waste, consists of some radiological wastes, toxic organic or heavy metal content.

### 4.7.2 Impact Assessment

The key consideration in the waste assessment includes:

(i) Evaluation and list the type and nature of wastes.

(ii) Estimation of the volume of wastes to be generated.

(iii) Assessment on the proposed handling, storage, transportation and disposal / recovery / reutilisation / recycling method and the potential environmental impacts.

Some of the potential environmental impacts associated with waste generation and handling on site are:

(i) Soil / ground water contamination due to improper storage area or improper disposal method of wastes.

(ii) Water quality deterioration due to untreated leachate from the waste storage area into the nearby waterbodies.

(iii) Odour problem.

(iv) Health risk to the workers and the nearby residents.

### 4.7.3 Outputs

The main objective of the impact assessment on waste generation is to determine the significance of the effects on existing support resources (example: licensed facilities for scheduled wastes) or the potential impact for on-site storage (example: on-site secured landfill).

## 4.8 SOCIO ECONOMIC

### 4.8.1 Socio Economic Concerns

Socio economic concerns are usually gathered and verified through stakeholder engagements. Analysis of the data and information gathered during stakeholder engagement should determine the key social and institutional concerns; identify the key stakeholder groups and determine how relationships between the groups will affect or be affected by the project; and document expectations and proposals from the groups.

Some of the potential key socio economic concerns are:

(i) Lifestyle impacts: on the way how the project will affect the people's lifestyle.

(ii) Cultural impacts: the effect on customs, values, religious belief and other elements which make a social or ethnic group distinct.

(iii) Community impacts: on infrastructure, services, voluntary organizations, activity networks and unity.

(iv) Amenity / quality of life impacts: on sense of place, aesthetics and heritage, perception of belonging, security, liveability and aspiration for the future.

(v) Health impacts: on mental, physical and social well-being.

It is also important to consider how these socio economic concerns may vary in accordance with different stages of a project life cycle as follows.

**Pre-construction Stage**

During this stage where the project is conceived, project notification and announcement to the community are initiated. Some of the anticipated concerns are changed expectation or fear about the community and its future, increase or decrease in the nearby property or land value, fear of land acquisitions and concerns about the environmental, social and health impacts.

**Construction Stage**

The construction stage normally will raise concerns associated with environmental impacts such as noise, dust generation, traffic congestions and other associated hazards that may affect the quality of life of the nearby community. Some projects may require influx of large group of foreign workers which may put a strain on the existing infrastructure and the difference in culture and lifestyle may raise concerns on community unity and cultural values.

**Operation Stage**

The socio economic concerns during operational stage, may be associated to safety and health hazards. During this stage, the project can have social benefits by offering economic and employment opportunities to the locals.

**Abandonment Stage**

During decommissioning and abandonment stage of a project, associated concerns may be related to the livelihood (loss of jobs and businesses) and health of the local community.

### 4.8.2 Impact Assessment

The socio economic impact assessment may use a semi-qualitative assessment approach to describe and evaluate impacts.

Factors taken into account to establish impact significance will include probability, spatial extent, duration and magnitude of the impacts in addition to the sensitivity of receptors (whether impacts are likely to be disproportionately experienced by vulnerable groups). Indirect socio economic impacts (i.e. induced effects) will also be assessed using the same approach.

It is suggested that the followings are considered for socio economic impact assessment:

(i) Assessment is based on the analysis of information gathered from issues scoping, baseline profiling and past experiences to predict possible socio economic concerns and the magnitude of these concerns.

(ii) Determine project activities and receptors interaction.

(iii) Assess the views and perception of the affected stakeholders. The findings mainly from surveys and FGD may be contentious and often skewed. Therefore, the assessments should have overall on-the-ground judgements, even after the surveys are interpreted by the Qualified Person.

(iv) Identifying trade-offs between the adverse and beneficial impacts of a proposed development is part of this analysis.

(v) Mitigation includes strategies, plans and programmes to reduce, avoid or manage predicted adverse impacts.

### 4.8.3 Output

Land and property acquisition and / or relocation of communities shall be prioritised and settled first by proponent prior to EIA submission. Compatibility with surrounding land use shall be verified next.

Output of the impact assessment may be presented in risk matrix tabulation or in discussion format in the EIA reporting.

## 4.9 PREDICTION METHODS AND TOOLS

There is a wide range of predictive tools and models for prediction, evaluation and assessment of both environmental and radiological impacts (**Table 4.9.1**).

The Project Proponent and Qualified Person shall select the best predictive method to conduct the assessments and/or generate practical scenarios from reliable datasets to ascertain the magnitude, extent and significance of impacts from the project.

Projects that are subjected to the need for an RIA, shall need to obtain the necessary approvals from the AELB in the use of the best radiological predictive method to conduct its impact assessments and/or generate practical scenarios from reliable radiological datasets to ascertain the magnitude, extent and significance of radiation impacts from the project.

**Table 4.9.1: Examples of Impact Assessment Prediction Methods and Tools**

| Impact Assessment | Prediction Methods and Tools | Output |
|---|---|---|
| Air Quality | Dispersion model based on gaussian plume - use for screening or refined modelling.<br>Examples: ISCST3, AERSCREEN, AERMOD, CALPUFF | Contour of air pollutants dispersion for various scenarios.<br>Zone of impact on land use map. |
| Water Quality | Dispersion model for screening or refined modelling on water pollutants dispersion.<br>Examples: QUAL2K, Delft3D-Flow, MIKE 21, WASP7 | Graph or dispersion contour of water pollutants over spatial for various scenarios.<br>Zone of impact on land use map. |
| Hydraulic and Hydrodynamics | Guidelines for Preparation of Coastal Engineering Hydraulic Study and Impact Evaluation by DID<br>Use of hydraulic and hydrodynamics 2D/3D modelling software<br>Examples: Delft3D-Flow, MIKE 21 | Changes in the wave, water level and current flow and direction for various scenarios.<br>Sediment transport and coastal morphology changes. |
| Erosion and Sedimentation | Revised Universal Soil Loss Equation (RUSLE)<br>Modified Universal Soil Loss Equation (MUSLE)<br>Computer models / numerical calculations | Soil loss rates and sediment yield.<br>Erosion risk and potential soil loss maps. |

| Impact Assessment | Prediction Methods and Tools | Output |
|---|---|---|
| Hydrology | Hydrological analysis in accordance with Urban Stormwater Management Manual for Malaysia 2nd Edition (MSMA-2) by DID<br><br>Examples: HEC-HMS, HEC-RAS, FLO-2D, TUFLOW, EXTRAN and Storm Water Management Model (SWMM) | Estimate peak flood, runoff, watershed analysis, flood plain hydraulics, etc.<br><br>Flood risk map. |
| Noise | Numerical calculations / computer models<br><br>Computer models for multiple and different type of sources, barrier, terrain and meteorological considerations<br><br>Examples: CadnaA, SoundPLAN | Predicted exposure and project boundary noise levels.<br><br>Compliance to guideline levels.<br><br>Zone of impact on land use map. |
| Vibration | Numerical calculations | Predicted exposure levels.<br><br>Compliance to guideline levels.<br><br>Zone of impact on land use map. |
| Risk Assessment | EIA Guidelines for Risk Assessment by DOE (2004) – qualitative or quantitative<br><br>Computer models for consequence modelling for multiple and different type of hazard sources<br><br>Examples: CIRRUS, SCOPE, KAMELEON etc. | Predicted exposure risk levels.<br><br>Compliance to risk acceptance criteria. |

| Impact Assessment | Prediction Methods and Tools | Output |
|---|---|---|
| Public Health | Guidance Document on HIA in Environmental Impact Assessment by DOE (2012) – qualitative or quantitative | Predicted exposure risk levels.<br>Compliance to risk acceptance criteria. |
| Waste Generation | Surveys, stakeholder engagements<br>Assessment on proposed wastes management strategies etc. | Determine significance of the effects on existing support resources.<br>Potential impact for on-site storage. |
| Socio Economic | Surveys, stakeholder engagements<br>Comparative evaluation<br>Risk calculations | Risk matrix with socio economic concerns and the magnitude of impact. |
| Radiological | Radiation dose exposure to radiation workers, public and environment e.g using RESRAD, etc. | Before and after scenario, accidental, and long term |

Note: The list is not exhaustive and not all the above may be relevant to the project. It is the responsibility of the Project Proponent and Qualified Person to determine the relevant information required for environmental assessment and compliance. Proposed assessment models shall be well established and acceptable to DOE.

Among the common methods and tools are:

(i) Expert opinion.

(ii) Consultations and questionnaires.

(iii) Checklists.

(iv) Spatial analysis.

(v) Network and system analysis.

(vi) Matrices.

(vii) Carrying capacity analysis.

(viii) Mathematical and computer modelling.

(ix) Case studies.

Simple methodology is preferred, though this depends on the complexity of the potential impacts. The chosen method shall be appropriate to address the potential impact, taking into consideration the local conditions of the site.

EIA shall be scientifically and technically sound and whenever necessary, quantitative impact prediction on the more significant impacts should be carried out.

Impact prediction using modelling tools has the capability to capture the impacts under various scenarios, either for short, mid to long term period, normal operation or the worst-case scenario. The outputs shall be presented in a concise manner and all uncertainties should be discussed.

If computer modelling is carried out, the following information is required:

(i) Name and description of method / model.

(ii) Model set-up.

(iii) Data collection and analysis.

(iv) Calibration and validation.

(v) Detail of scenarios for modelling.

(vi) Presentation of results (raw data, table form, graphs, contours).

(vii) Limitations in data collection or method chosen.

Technical reports, references, data analysis and raw data, where applicable, shall be included as appendix in the EIA Report to support the impact assessment methodology.

The main reporting on impact assessment in the EIA Report shall include the predicted results and outputs of respective studies, which have to be in sufficient technical details to support the assessment. It shall also be written in a manner that is easily understood by decision makers and the public.

## 4.10 EVALUATION CRITERIA

The method to determine the level of significant impact is to benchmark the results against the stipulated and current evaluation criteria which are namely the standards or guidelines limits imposed by DOE and / or various GAs particularly, AELB for development of activities involving the use of radioactive materials and generating radioactive wastes (refer to **Table 4.10.1**).

In situations where there are no local standards or guidelines, regional or international references can be adopted, based on expert opinion of the Qualified Person. However, the chosen criteria shall be suitable and relevant to local conditions.

**Table 4.10.1: Common Standards and Guidelines Limits**

| Impacts | Evaluation Criteria |
|---|---|
| Air Quality | Emission standard limits: Environmental Quality (Clean Air) Regulations 2014<br><br>Ambient air:<br>New Malaysian Ambient Air Quality Standards |
| Noise | The Planning Guidelines for Environmental Noise Limits and Control (DOE 2007) |
| Vibration | The Planning Guidelines for Vibration Limits and Control (DOE 2007) |
| Discharged water from Silt Trap / Sediment Basin | TSS: 50mg/L or 100mg/L, depending on locality<br>Turbidity: 250 NTU |

| Impacts | Evaluation Criteria |
|---|---|
| Water Quality | Effluent standard limits:<br>Environmental Quality (Industrial Effluent) Regulations 2009<br>Environmental Quality (Sewage) Regulations 2009<br><br>Inland Waters:<br>National Water Quality Standards for Malaysia<br>National Standard for Drinking Water Quality (MOH 2004)<br><br>Marine Waters:<br>Malaysia Marine Water Quality Criteria and Standard<br><br>Groundwater:<br>Site Screening Levels (SSLs) in the Contaminated Land Management and Control Guidelines No. 1: Malaysian Recommended Site Screening Levels for Contaminated Land (DOE 2015) |
| Risk Assessment | Risk criteria from EIA Guidelines for Risk Assessment (DOE 2004):<br>• Voluntary individual risk: 1 x $10^{-6}$ fatalities/person per year<br>• Involuntary individual risk: 1 x $10^{-5}$ fatalities/person per year |
| Public Health | Risk criteria from Guidance Document on HIA in Environmental Impact Assessment (DOE 2012):<br>• Hazard Index for non-carcinogenic risk: ≤ 1.0<br>• Lifetime carcinogenic risk: $10^{-6}$ to $10^{-4}$ |
| Wastes | **Scheduled wastes**<br>Environmental Quality (Scheduled Wastes) Regulations 2005.<br>**Radioactive wastes**<br>Atomic Energy Licensing Act 1984 |

| Impacts | Evaluation Criteria |
|---|---|
| | **Other wastes**<br>Solid Waste and Public Cleaning Management Act 2007.<br>Local authority requirements. |
| Social Impacts/ Heritage, Culture and Archaeology | Public perception on acceptability.<br>National Heritage Register (National Heritage Department).<br>Preservation of cultural, heritage, historical, and archaeological items and sites of significance.<br>SIA requirements in the context of the Town and Country Planning Act (Amendment) 2017 (Act A1522) for three categories:<br>SIA 1: Development projects under subsection 20B (1) and (2) of Act A1522 for coastal reclamation projects and major national infrastructure.<br>SIA 2: Development projects under subsection 22(2A) Act 172 for new township development for population over 10,000 people or covering area over 100 ha or both, major national infrastructure and development in slope and hill areas.<br>SIA 3: Any other development projects with significant social impacts as ordered by the National Physical Planning Council (MPFN) from time to time. |
| Visual Aesthetics | Public perception on acceptability. |

Note: The list is not exhaustive and not all the above may be relevant to the project. It is the responsibility of the Project Proponent and Qualified Person to determine the relevant criteria required for environmental assessment and compliance.

The evaluation criteria for specific radiological components to be used as a guide by the Project Proponent shall be based on the prediction methods and tools approved by the AELB, from which the outcomes shall be derived. Some of the evaluation criteria are listed below.

(i) General criteria: Absorbed dose by the member of the public shall not exceed the yearly allowable limit of 1 mSv/yr.

(ii) Related General Criteria:
- Site characteristics that could affect the safety of the radioactive installation shall be investigated and assessed.
- Characteristics of the natural environment in the region that might be affected by potential radiological impacts in operational areas and in accidental conditions shall be investigated.

All these characteristics shall be observed and monitored throughout the lifetime of the radiological installation.

The conclusion of an impact assessment shall present the magnitude of potential impact as highlighted in **Box 10**.

**Box 10**

**Outcomes from Impact Assessment**

No Impact: This scenario occurs when there are very low to no sensitive receptors in the vicinity of the project to receive the impacts. Examples are communities living very far away, and they are not within the zone of impact. Another scenario is when there are terrain constraints such as steep slopes, but the Project Proponent has redesigned the layout without affecting these areas.

Significant Impact: This scenario is based on the predictive results. In the assessment, if the results showed that the project will generate detrimental impacts, then mitigation measures will have to be provided to address the issues. Any residual impacts shall also be clearly stated in the EIA.

Non-significant Impact: Impacts will inevitably occur in project development but it may not result in significant exceedance of the acceptance criteria. An example is discharge of runoff water with suspended solids due to minor soil movement at stabilised construction area which could meet Class II water quality limits. Under this scenario, the impact is classified as non-significant, with the level of impact abiding by the stipulated criteria.

# CHAPTER 5

# ENVIRONMENTAL IMPACT ASSESSMENT: MITIGATION MEASURES

## 5.1 INTRODUCTION

The focus of this Chapter is on the pollution prevention and mitigation measures (P2M2) to sustain the integrity of the project and its surrounding areas, through:

(i) Avoidance of negative impacts by selection of best options / alternatives.

(ii) Adoption of appropriate preventive measures and best management practices (BMPs) to reduce and minimise the impacts, when an adverse impact cannot be avoided.

(iii) Ensure residual impacts are kept within acceptable levels.

(iv) Ensure radiological exposures are kept within acceptable levels

In the context of this EIA Guideline, the principles of P2M2 by EGIM 2016, shall be extended to the radiological activities of the project based on the system of dose constraint required under the Atomic Energy Licensing (Basic Safety Radiation Protection) Regulations 2010 (BSRP 2010). This is outlined in detail under Section 5.3. AELB may determine the use of other principles of P2M2 that is equivalent to that of P2M2 under EGIM 2016 based on the provision of Act 304 and other rules and regulations, order and guidelines made under it.

## 5.2 APPLICATION OF P2M2

The core principles of P2M2 are to reduce environmental degradation and pollution through management measures best suited to the site conditions to preserve the integrity of the site and to ensure public safety.

The general approach of P2M2 is by means of the following:

(i) Extent of P2M2 shall correspond to the degree of significance of the predicted impact. Once an impact is identified as significant, P2M2 shall be recommended in the EIA Report. For minor issues, simple management actions will suffice, e.g. water browsing for dust control at site and hoardings for noise.

(ii) Priority shall be given to control at source, than to rectify the impacts later on.

(iii) Mitigation has to be site and project-specific. P2M2 need not be complex and costly, but shall instead be practical, easy to implement and effective.

(iv) P2M2 shall include adequate explanations based on the design and function; and supported by diagrams, illustrations, photos and maps. The technical reports and specifications of the P2M2 shall be included as an appendix in the EIA Report.

(v) The use of new technology is encouraged if it can be proven to be effective in mitigating the impacts.

(vi) P2M2 require regular inspection, maintenance and rehabilitation. These shall be incorporated as part of the environmental management requirements of the project, including the allocation of sufficient budget for such a purpose.

(vii) Effectiveness of P2M2 shall be recorded and documented as part of the monitoring and audit programmes (refer to Chapter 6).

(viii) The Qualified Person shall propose BMPs, if deemed necessary.

(ix) P2M2 and BMPs shall be incorporated early into the overall project design and as part of the Environmental Management Plan.

The Project Proponent shall engage a Qualified Consultant to prepare the detailed designs of any Pollution Control Systems for the EIA study. The Qualified Consultant shall be a professional engineer who holds a current registration certificate issued by the Board of Engineers and be a certified Competent Person under Section 49A of the Act 127.

In the case of Prescribed Activity 17 projects, Project Proponent shall engaged AELB authorized and qualified person(s) during project implementation stage.

The submission of the EIA Report and the pledge given by the Project Proponent shall reflect a commitment towards ensuring the P2M2 are implemented during all stages of work activities. These efforts shall include but not limited to measures, actions or due diligence in accomplishing the overarching goal of protecting the environment in project implementation.

## 5.3 RADIOLOGICAL

Objective: To prevent or minimise radiological exposure risks from the project's activities.

Generally, P2M2 to manage radiological risks are similar to the P2M2 principles for other environmental aspects. However, P2M2 to manage radiological risks shall conform to the rules and regulations, and technical guidance issued and regulated by AELB.

P2M2 approaches and technologies to manage radiological risks may vary from plant to plant, sites and locality, economic and environmental considerations, technology availability, etc. The chosen P2M2 shall address the safety standards prevailing enforced by AELB and generally follows the following principles.

### 5.3.1 Containment

In principle, the radionuclides shall be contained in a well-defined space. The idea of containment is to minimize the spread of contamination with positive controls on the release, if it has the potential to be so.

Some radioactive materials are kept and sealed in capsules made of stainless steel, thus, the name sealed sources.

If the material is to be worked openly, it shall be placed in air tight enclosures or at least a properly ventilated space. The choice of which depends on the radioactivity levels, toxicity as well as the volume of the materials.

Working with small volume open source radionuclides in air requires the application of containment facility like fume cupboards and gloveboxes. Enclosures should be of air tight design maintained at certain negative pressure, such that any leakage occurs only from less contaminated zones into a more contaminated zone. Suitable air change per hour should be applied to dilute the air borne contamination levels within the enclosures. Highly toxic and volatile radionuclides require the working in enclosures such as above with the use of remote manipulators and tongs. Fume cupboards can be used for working with small quantity of radioactive materials with very low radioactivity level. Working with high level activity requires the application of shielding, which can be in the form of lead, steel or even concrete, to protect workers from external radiation. All enclosures are connected to radioactive ventilation systems that finally treat the air borne contamination downstream before discharge through stacks, for further dilution and dispersion, identical to non-radiological pollutant control systems.

Working with high volume open source radionuclides require almost similar concepts of protections but due to the large volumes, the air tight enclosures etc may be limited, especially during initial waste handling. Thus, control of airborne contamination shall rely on proper ventilation, avoid dusty situation, etc. The processing of the waste material in various reactors, vessels, piping etc. shall be done in air tight negative pressure environment, such any potential leaks shall be from ambient towards more contaminated environment. Ultimately, all processed gaseous contaminants shall be scrubbed and High Efficiency Particulate Filter (HEPA) filtered prior to discharging into the environment. For the resulting aqueous waste from the processing plant, it shall be treated producing clear supernatant free from radionuclides and contaminated sludge to be filtered and treated as solid waste, which further shall be solidified, stabilized before disposal.

### 5.3.2 Delay and Decay

One of the unique characteristics of radioactivity is the decay of radioactivity level over time, i.e. half the value after reaching its half-life. This characteristics can be exploited to reduce the level of radioactivity before putting it into disposal form.

Some material has very short half-life e.g. Fluorine 18 (F-18) used in hospital diagnosis is only a few hours, versus Thorium 232 (Th-232) with million years half-life. Thus, disposing F-18 is always possible and practical but Th-232 disposal by decay approach is almost impossible.

Intermediate long-lived isotopes may undergo decay process by storage at designated centres, e.g. at Nuclear Malaysia, where the storage time allowed is to span for 10 half-lives or so before finally ready for deep bore hole disposal. The design and conditioning of the sealed sources, including multiple encapsulation as well as geo-hydrological characteristics of the host disposal site will need to be dealt with. The environmental impact aspects then shall be evaluated both radiologically and non-radiologically.

### 5.3.3 Reduce and Reuse

Efforts shall be observed in the process of planning and designing to minimise the generation of waste. When waste is generated, means shall be sought to reuse this materials for other purposes.

Some solid waste can be diluted and reused. The Atomic Energy Licensing (Radioactive Waste Management) Regulations 2011 allows for exemption of certain types of radionuclides (listed in Schedule 2 of the same regulations) as well as NORM related waste, to be reused.

Compaction of waste is one of the means to reduce the waste volume. Alternatively, incineration is another method of reducing the volume of waste, if it is combustible.

### 5.3.4 Dilute and Disperse

Design of stacks that is required to dilute and disperse the radioactive contaminants after the filtration and adsorption or scrubbing process, shall consider all aspects including meteorology, discharge velocities, thermal plumes, surrounding buildings, etc. similarly as applied to non-radiological pollutants.

The emission shall be monitored based on external measurement of radiation level (gross gamma, alpha and beta) that could be correlated to the levels of radioactivity discharge. Stack monitoring may also be carried out by taking emitted gas samples and measured through radioactivity counter. Ultimately, the level of radioactive materials found on the ground shall not exceed the maximum radionuclide concentrations published by international bodies like International Commission on Radiological Protection (ICRP).

### 5.3.5 Arrest and Capture

The emissions, be it gaseous or liquid that contains particulate radionuclides, can be filtered to scavenge solid particulate radionuclides. Filtration technology involved the use of or HEPA which normally has a 99.99% removal efficiency.

Gaseous radionuclides like radio-iodine, can be adsorbed on activated carbon designed for radioactive application also having 99.9% removal efficiency.

### 5.3.6 Stabilization

If the radioactive material is to be disposed of in the secured radioactive landfill, the waste shall be stabilized or conditioned so that the leaching of the radionuclides through water medium passed the standards as enforced by AELB. Stabilization involves the process of binding the radionuclides into a binding material, like cement or polymer, so that, the leachability is minimum.

Some of the stabilization technologies that may be adopted are as follows:

(i) Cementing or equivalent methods will increase the volume of the final waste, but this is relatively cheaper and easier.

(ii) Thermal stabilization uses thermal method to stabilize the radionuclides by sintering or slagging or even vitrification. The former normally operates at 850 - 1200°C, whereas the later operates at above 1350°C.

(iii) Some radioactive materials and waste exist commingled with organic and hazardous materials. An example is oil sludge from oil and gas industry. Waste stabilization is achieved when the organic content is combusted / incinerated at about 1200°C (or pyrolyzed), disintegrating and reverting the materials to the solid ash phase, liquid phase if scrubbing is used, as well as gaseous phase. The solid product if its sintered, becomes stable ash ready for land disposal.

(iv) Organic hazardous waste may also contain some radioactive materials due to processing, or inherited from the feed stock material, normally related to NORM. To eliminate the organic materials, the waste may be incinerated or equal. The fate of radioactive NORM behaves just like normal heavy metals i.e. some may remain in the ash and others exist in the gaseous streams.

(v) Ashes that contained radioactive materials are subjected to controls by AELB before disposal in approved landfills. The flue gases that may contain radioactive materials at high temperatures may be subjected to flue gas cooling, scrubbing and filtration before discharging through the stack for dilution and dispersion.

(vi) The sludges collected by the bag filter, scrubber, etc. are also subjected to both DOE and AELB approval for hazardous and radioactive waste controls. Similar to hazardous waste, passing the standard leaching test is applicable for both before approval can be given.

All proposed options and technologies adopted are subjected to RIA. Findings from RIA shall be incorporated into the EIA report.

### 5.3.7 Disposal

Disposal is the last technological effort to control the release of the radionuclides into the environment and safeguarding the public from exposures from radioactive materials. Final disposal will require the approval of AELB.

## 5.4 AIR QUALITY

Objective: To minimise emission of fine dust and gaseous pollutants from construction and operation activities, and prevent impact of ambient air quality pollution.

**Examples of P2M2:**

Construction Stage

(i) Wet suppression along main logistic routes and earth stockpiles.

(ii) Clean up any spillage along logistic roads and at entrances/exits.

(iii) Periodical maintenance of vehicles and machineries to control dark smoke emissions.

**Examples of P2M2:**

Operation Stage

(i) Apply suitable Best Available Techniques (BAT) – references to Guidance Document for Fuel Burning Equipment and Air Pollution Control Systems and AELB requirement.

(ii) Apply suitable fugitive emission control – references to Guidance Document for Fugitive Emission Control and Guidance Document on Leak Detection and Repair and AELB requirement.

(iii) Conduct performance monitoring on process controls.

(iv) Conduct performance monitoring on air pollution control systems – references to Technical Guidance on Performance Monitoring of Air Pollution Control Systems (DOE-APCS-5 First Edition 2006) and AELB requirement.

(v) Conduct continuous and / or periodical emission monitoring in compliance with Environmental Quality (Clean Air) Regulation requirements – further references to DOE requirement on Predictive Emission Monitoring System (PEMS) and Continuous Emission Monitoring System (CEMS) and AELB requirement.

## 5.5 WATER QUALITY

Objective: To minimise discharge of water pollutants to the receiving waterbodies, and to prevent impact to water pollution during construction and operation activities. Where possible, to maintain water quality at baseline conditions or better within the DOE and AELB prescribed limits.

**Examples of P2M2:**

Construction Stage

(i) Provision of toilet facility and maintenance in accordance to the National Water Services Commission (SPAN) requirements.

(ii) Provision of containment facility designed to contain 110% of the largest inventory for petroleum and liquid chemicals storage area. Containment facility shall be made from impermeable materials with spill recovery facility.

(iii) Provision of oil or chemical spill kit.

**Examples of P2M2:**

Operation Stage

(i) Separate drainage systems for effluent and stormwater.

(ii) Provision of first flush pit at process areas.

(iii) Apply suitable Best Available Techniques (BAT) in generation and treatment of sewage, process effluent and wash water– references to Technical Guidance Document for on the Design and Operation of Industrial Effluent Treatment System (DOE-IETS-9 Sixth Edition 2015) and AELB requirement.

(iv) Conduct performance monitoring on process controls.

(v) Conduct performance monitoring on industrial effluent treatment systems – references to Technical Guidance Document on Performance Monitoring of Industrial Effluent Treatment Systems (DOE-IETS-1 Seventh Edition 2015) and AELB requirement.

(vi) Conduct continuous and / or periodical effluent quality monitoring in compliance with Environmental Quality (Sewage) Regulation and / or Environmental Quality (Industrial Effluent) Regulation and any AELB requirements.

## 5.6 WASTE MANAGEMENT

Objective: To minimise the amount of radioactive waste, as well as mixed radioactive waste and scheduled waste, generated from the site and to ensure proper containment, collection, storage and disposal of the different types of radioactive wastes generated during construction (if any) and operations.

**Examples of P2M2:**

Solid Wastes

The measures for proper solid waste management include:

(i) Implementation of 4R (Reduce, Reuse, Recover and Recycle).

(ii) Provision of suitable and adequate temporary storage areas / bins.

(iii) Regular housekeeping.

(iv) Disposal at approved landfill.

Radioactive Wastes

P2M2 for radioactive waste (also refer to Section 5.3 of this EIA Guidelines) shall include proper radioactive waste management monitoring and controls in adherence to the Atomic Energy Licensing (Radioactive Waste Management) Regulation 2011. Some examples include but not limited to:

(i) Radioactive waste storage area with appropriate bunding, spill and airborne dusts, particulate controls, leachate controls

(ii) Radioactive waste inventory.

(iii) Proper radioactive waste labelling.

(iv) Radioactive waste spill management plan and provision of waste spill kit.

(v) Competent person trained in radioactive waste management.

(vi) Radiation dose monitoring systems for radiation workers.

Scheduled Wastes

Radioactive waste that has been cleared from the definition in Act 304 by AELB in writing, shall be reclassified as scheduled waste and shall be managed under the Environmental Quality (Scheduled Wastes) Regulations 2005. Some P2M2 examples include but not limited to:

(i) Implementation of 4R (Reduce, Reuse, Recover and Recycle)

(ii) Provision of suitable and adequate temporary scheduled waste storage area with containment facility and security. Containment facility shall be designed to contain 110% of the largest inventory of liquid scheduled waste. Containment facility shall be made from impermeable materials with spill recovery facility.

(iii) Scheduled waste notification, labelling, inventory and consignment to track and control movement of scheduled wastes.

(iv) Provision of oil or chemical spill kit.

(v) Scheduled waste management and disposal at licensed facilities using licensed transporters.

## 5.7 SAFETY AND HEALTH MANAGEMENT

Objective: To ensure safety and health of workers and public.

**Examples of P2M2:**

(i) Safety and health measures are intended to address issues such as work place conditions, worker's health. This include preventive checks on any communicable diseases among the workers, provision of personal protective equipment (PPE), firefighting equipment, safety trainings and having an emergency response plan (ERP) in place.

(ii) Proper work procedures are designed at-site and off-site to prevent unauthorised entry from the public into the active work site to reduce the risks of accidents and injuries.

(iii) Visitors safety shall be ensured by the operators in all visitation and educational activities. Adequate medical and treatment facilities shall be provided in case of emergencies.

## 5.8 RESIDUAL IMPACTS

Impacts that persist even after all mitigation measures are judiciously undertaken, are termed residual impacts. The extent of residual impacts shall be clearly detailed in the EIA report, both for radiological and non-radiological residual impacts.

# CHAPTER 6

# ENVIRONMENTAL IMPACT ASSESSMENT: ENVIRONMENTAL MANAGEMENT PLAN

## 6.1 INTRODUCTION

The Environmental Management Plan (EMP) is a legal document prepared by the Project Proponent incorporating pollution prevention and mitigation measures (P2M2) and best management practices (BMPs) stipulated in the Conditions of Approval (COA) by the Department of Environment (DOE).

Other than mitigation measures, the EMP includes self-regulation requirements, an environmental monitoring plan and an audit programme to assess the effectiveness of the P2M2 implementation.

The EMP is a living document and has to be updated whenever there are major changes to the project design, layout or construction methods that could result in impacts not originally stated in the EMP.

In projects that fulfils the definition of Activity 17, the EMP shall need to be read together with the RIA.

Application of 5S in upkeeping with latest environmental requirement and improvement of project's environmental management. Refer **Box 11** for the principal of 5S.

## 6.2 EMP FRAMEWORK

During the EIA stage, the project may not have sufficient information of the project work plan to produce a comprehensive EMP. The EMP chapter in the EIA should only be an EMP framework for eventual morphing into a full EMP post the EIA approval stage.

The Project Proponent can submit the detailed EMP concurrently with the EIA Report if there is already sufficient information for the EMP. The EMP can later be updated to incorporate the requirements of the COAs.

The format for the EMP shall be based on the requirements stated within the EGIM (DOE, 2016), and shall contain details from the LD-P2M2 Document, and the proposed monitoring and audit programmes. Extended information covering radiological components shall be incorporated in the EMP for projects that fulfil the definition of Activity 17 based on manners so acceptable by AELB.

**Box 11**

**Application of 5S in Upkeeping Environmental Compliances**

| | |
|---|---|
| Seiri | Organise, Sort - eliminate things that are obsolete and not in used, and store them away. |
| Seiton | Set in Order, Neatness - arrange the items or information used regularly so that they can be easily accessible and quickly store. |
| Seiso | Clean, Shine - everything is checked and functioning properly. |
| Seiketsu | Standardise - develop routine or programme to organise work areas and processes. |
| Shitsuke | Discipline, Sustain - create a culture that follows the steps of 5S on a daily basis. |

Note: 5S was developed in Japan by Hiroyuki Hirano

## 6.3 SELF-REGULATION

DOE has initiated a Guided Self-Regulation requirement for all prescribed activities during the project implementation stages. The project shall incorporate into the EMP the requirement of the Environmental Mainstreaming Tools.

This shall cover the seven environmental mainstreaming tools:

(i) Environmental Policy.

(ii) Environmental Budgeting.

(iii) Environmental Monitoring Committee.

(iv) Environmental Facility.

(v) Environmental Competency.

(vi) Environmental Reporting and Communications.

(vii) Environmental Transparency.

### 6.3.1 Environmental Policy

This refers to the Project Proponent's Environmental Policy and the conveyance of such policies throughout the organisation.

For projects that fulfil the definition of Prescribed Activity 17, the Project Proponent's Environmental Policy and the conveyance of such policies throughout the organisation shall include references to radiological activities of the Project.

### 6.3.2 Environmental Budgeting

The Project Proponent has to provide an environmental budget for environmental related commitments, e.g. personnel, P2M2, monitoring, auditing, training, remedial and rehabilitation works. The Project Proponent in addition must provide a radiological budget for radiological-related commitments, e.g. personnel, P2M2, radiation monitoring, auditing, training, remedial and rehabilitation works.

If the budget is not available during the EIA stage, the Project Proponent shall provide a pledge to allocate adequate budget for the project during the post-EIA stage to ensure compliance.

The budget requirements shall also form part of the bill of quantity (BQ) for the contractors at the contractual stage.

### 6.3.3 Environmental Monitoring Committee

The Project Proponent is required to identify and setup an Environmental Regulatory Compliance Monitoring Committee (ERCMC) at the policy level headed by the Chief Executive Officer (CEO) or organisation chairman. The ERCMC shall include a member having the necessary knowledge or competencies in radiation protection and safety.

At the working level, the Environmental Performance Monitoring Committee (EPMC) is chaired by a senior officer of the organisation and consist of at least a member having the necessary knowledge or competencies in radiation protection and safety.

Main contractors are required to have their respective Environmental Management Team (EMT) comprising at least a minimum number of personnel such as an Environmental Manager (EM) and an Environmental Officer (EO) and at least a member having the necessary knowledge or competencies in radiation protection and safety.

The organisation chart along with the roles and responsibilities of all relevant parties in charge of environmental management for the project in national and state parks shall be included in the EMP framework.

### 6.3.4 Environmental Facility

The EMP shall provide the range of environmental facilities that are able to address radiological materials and radiological wastes in the project, such as industrial effluent treatment system (IETS), sewage treatment systems (STS), air pollution control system (APCS), BMPs, P2M2 structures and associated supporting utilities and facilities that need operational and maintenance support.

### 6.3.5 Environmental Competency

Training requirements are needed to ensure competency for environmental management for all relevant site personnel. The proposed training programme and requirements shall be included in the EMP framework.

Training requirements are also needed for the respective radiation workers. The proposed radiation safety and protection training programme and requirements, so approved by AELB shall be included in the EMP framework.

### 6.3.6 Environmental Reporting and Communication

The EMP framework shall contain a reporting time schedule for various submissions during the post EIA stage, which shall include:

(i) Environmental Management Plan.

(ii) Environmental Monitoring Reporting.

(iii) Environmental Audit Reporting.

The mode of communication between the ERCMC, EPMC, EMT and Radiation Protection Officer (RPO) shall be clearly defined.

Lines of communication between the Project Proponent, the EPMC and the relevant stakeholders, shall also be clearly defined. This is not only limited to project site management, but also in engagements with affected communities and the general public to manage any potential grievances and expectations.

## 6.4 MONITORING AND AUDIT PROGRAMMES

The environmental monitoring and audit programmes are important components of the EMP. Monitoring and audit shall be implemented during the post EIA stage.

### 6.4.1 Monitoring Category

Environmental monitoring can be categorised into three main categories:

**Performance Monitoring (PM)**

(i) Relates to monitoring on the performance of treatment systems such as IETS, STS and APCS.

(ii) This shall be undertaken by Competent Person with expertise in the related treatment system.

**Compliance Monitoring (CM)**

(i) Relates to the monitoring of P2M2 within the site and their performance. Samplings and measurements are usually taken either at the emission or discharge points (e.g. effluent, sewage, sediment basin).

(ii) This shall be carried out by Competent Person associated with accredited laboratory.

**Impact Monitoring (IM)**

(i) Impact monitoring may only be required in cases where there is a possibility that the impacts may still affect receptors outside of the project boundary despite implementation of P2M2. Samplings and measurements are usually taken either from the ambient air, water, noise and vibration and / or from sensitive recipients such as flora and fauna samples. Radiological monitoring shall conform to the requirements of AELB.

(ii) This shall be carried out by Competent Person associated with accredited laboratory.

### 6.4.2 Monitoring Programme

The extent of monitoring shall be determined by the scale of the project and of the predicted impacts. Monitoring covers both within the project site and outside of its boundary where the impacts are perceived to affect sensitive receptors.

Details of the monitoring programme are decided upon by the Qualified Person and to be approved by DOE, before implementation. The monitoring locations, frequencies, parameters to monitor, recommended limits, instrumentation and personnel requirements have to be identified in the EMP. **Table 3.2.1** shows a typical monitoring programme for projects with radiological activities.

DOE has the authority to mandate any changes or requires additional information and data apart from those specified in the EMP.

### 6.4.3 Environmental Audit

Environmental auditing is a post EIA evaluation process to determine the effectiveness and performance of the mitigation measures put in by the Project Proponent to comply with the COAs. The environmental audits on projects that are Prescribed Activity 17 shall need to follow both requirements of the DOE and AELB.

Audit requirements are guided by the Environmental Audit Guidance Manual (DOE, 2011) and relevant radiological auditing guidance by AELB. The audit shall be undertaken by an independent third party and DOE registered auditor and AELB authorized and registered auditor.

The typical audit process involves:

(i) Pre-audit: Preparation of a pre-audit checklist and information request to the auditee. Submission of a notification of audit to DOE, AELB and auditee.

(ii) On-site Audit: Briefing to the auditee by Lead Auditor. Audit shall include documentation review, site inspection, interviews with relevant personnel to obtain the necessary information to gauge compliance and site sampling (optional). Auditee will be briefed at the Closing Meeting with the on-site Audit Summary which will be submitted to the DOE.

(iii) Post-audit: Lead Auditor shall submit an Audit Report to DOE within 14 calendar days after the site audit. The auditee shall develop a Corrective Action Plan for any non-compliances which shall be submitted to DOE within 21 calendar days of the site audit.

# CHAPTER 7

# ENVIRONMENTAL IMPACT ASSESSMENT: ABANDONMENT PLAN

## 7.1 INTRODUCTION

An Abandonment Plan is a document prepared by the Project Proponent detailing the overall decommissioning / abandonment strategy and plan once the project decommissioning / abandonment has been identified.

**Box 12**

When project is abandoned?

(i) Change of project development stages and / or phases.

(ii) Major maintenance or turnaround events during operation stage.

(iii) Temporary cease of activities due to change in project ownership or change in project contractor.

(iv) Temporary or permanent cease of activities due to change of government policies.

(v) Temporary or permanent cease of activities during construction stage due to challenges in project funding.

(vi) Temporary or permanent cease of activities during operation stage due to challenges in company financing.

(vii) Decommissioning and closure of facilities due to the ending of its designed life or at the end of their useful life.

(viii) Decommissioning and closure of facilities due to expiry of concession.

Note:

Under Act 304 and Guidelines for Decommissioning of Facilities Contaminated with Radioactive Materials (LEM/TEK/56 dated 30 April 2008), the term “decommissioning” is used instead of “abandonment”.

The plan shall also incorporate P2M2 and BMPs that should be implemented when performing the decommissioning / abandonment activities.

## 7.2 ABANDONMENT PLAN

Specific regulations governing the decommissioning / abandonment of project activities that use radioactive materials and generating radioactive waste in Malaysia is governed by AELB and the Guidelines for Decommissioning of Facilities Contaminated with Radioactive Materials (LEM/TEK/56) shall be referred.

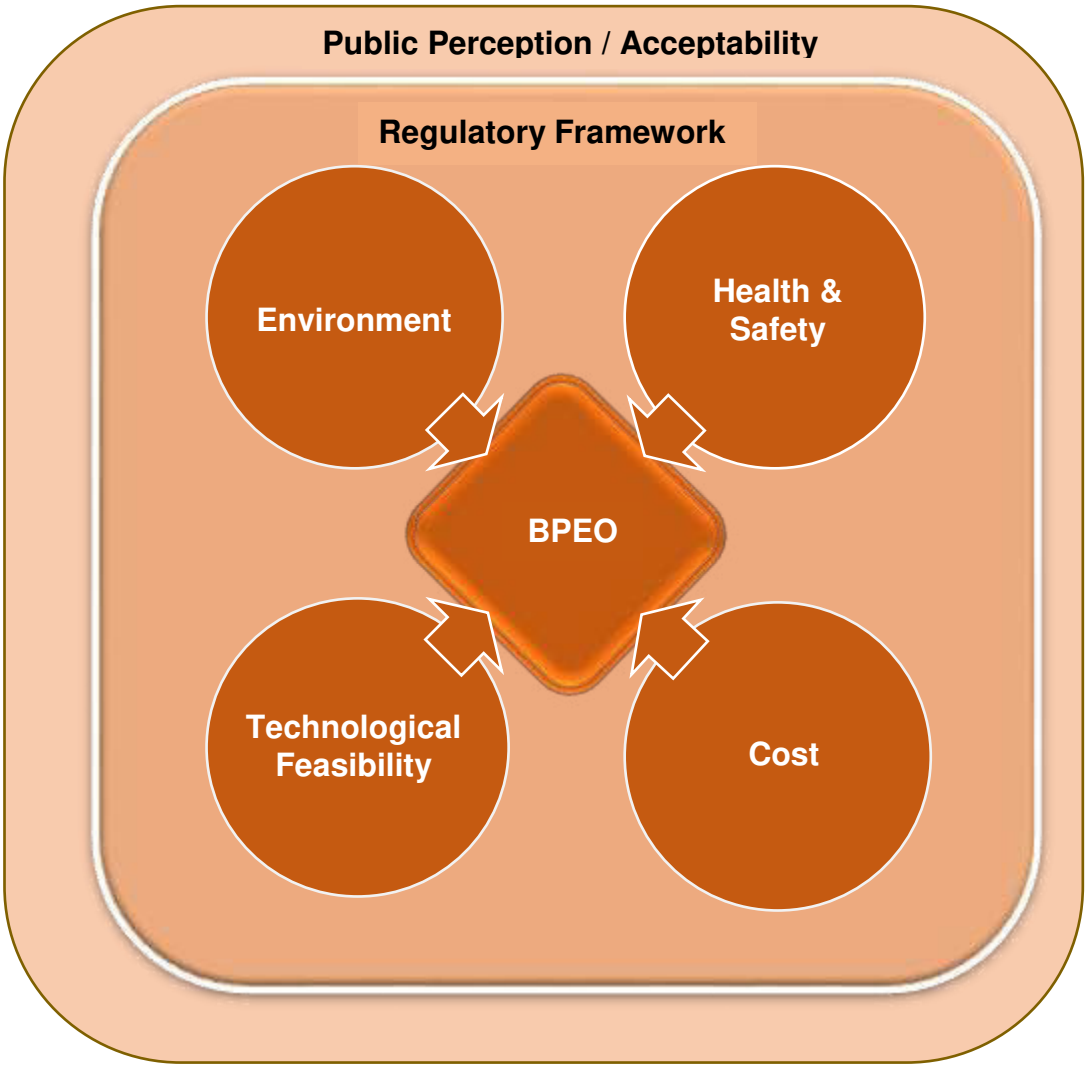
Decommissioning / abandonment of project activities not scoped in the above shall be subjected to other Sectoral EIA guidelines where applicable.

### 7.2.1 Pre-Abandonment Activities

To determine the best decommissioning / abandonment option, a **Best Practical Environmental Option (BPEO)** assessment should be performed. This assessment shall be described and the outcome presented in the Abandonment Plan. **Figure 7.2.1** illustrates BPEO Concept.

The process of decommissioning / abandonment an project facility may raise complex issues. It is widely accepted that in selecting the “best” decommissioning option, it is essential that due consideration is given to the critical and inter-related requirements of human health and safety, environmental protection, technological feasibility and economic stewardship within the broader context of public perception / stakeholder acceptability. A BPEO assessment provides a means of determining which decommissioning option is the most suitable for a facility.

**Figure 7.2.1: Best Practical Environmental Option Concept**




### 7.2.2 Abandonment Activities

Details of the abandonment activities shall be described in the Abandonment Plan.

During the abandonment phase of a project, the following activities are normally expected:

(i) Tendering process and awarding of contract for decommissioning and demolition work;

(ii) Removal and disposal of radioactive waste, scheduled waste, demolition materials and refuse;

(iii) Disassembling equipment and plant;

(iv) Removal of plant piping, cabling, storage facilities and reusable components;

(v) Demolition of building and breaking up for removal;

(vi) Site levelling and filling; and

(vii) Site stabilisation / Rehabilitation.

Details of the selected or preferred decommissioning option shall be described in the Abandonment Plan.

At a minimum, the following aspects and associated management plans shall be presented in the Abandonment Plan:

(i) Procedures for dismantling or demolishing.

(ii) Procedures for managing excess materials and wastes that would be generated as a result of the decommissioning of the facility.

(iii) Identify all hazards and risks associated with the decommissioning activities and outline mitigation measures to minimize such hazards.

(iv) Emergency response and communication procedures to address concerns related to the decommissioning activities.

### 7.2.3 Post Abandonment Activities

Appropriate site remediation and restoration activities shall be described if site contamination is detected.

A post decommissioning monitoring programme should be conducted to assess environmental changes and implications of the selected decommissioning option and to monitor any potential residual impacts. Depending on the sensitivity of the site, additional survey may be conducted to monitor the recovery of the site.

## 7.3 REPORTING

The detailed Abandonment Plan shall be submitted to DOE for review and acceptance at **least three (3) months** prior to its implementation. Submission of the equivalent Abandonment Plan (the Decommissioning Plan) to AELB shall be based on the requirements of AELB's guidelines.

The format of Abandonment Plan shall comply with the associated guidance document to be issued by DOE and AELB respectively.

Environmental Sustainability Report which shall include post abandonment's environmental monitoring, BMP inspections and wastes inventories is to be submitted to DOE office post project abandonment stage.

# CHAPTER 8

# EIA REPORTING AND REVIEW

## 8.1 INTRODUCTION

This Chapter provides the format and procedures for an EIA Report to be submitted to the DOE for approval, after the completion of all other necessary studies and requirements.

## 8.2 EIA REPORT

### 8.2.1 EIA Report Format

The EGIM 2016 provides the specifications and format for EIA reporting under Section 4.6 and Appendix 9 of the guideline.

The EIA Report shall typically include the following contents:

(i) Declaration from the Project Proponent and Qualified Person in the format detailed in Appendix 9 of the EGIM 2016. The declaration must be printed in the respective company's letterhead and attached to the EIA.

(ii) Executive Summary of the EIA Report in Bahasa Malaysia and English.

(iii) Brief Introduction to the project, Project Proponent (address, key person and contact information), Environmental Firm (address, key person and contact information) and EIA Team Members (name, academic qualifications, areas of study, signature).

(iv) Review of the policy, regulatory and legal requirements for the project (refer to **Chapter 1** of this EIA Guideline for details).

(v) Terms of Reference (TOR) for the EIA Study as endorsed by the DOE (refer to **Chapter 2** of this EIA Guideline for details). Endorsement letter from DOE to be attached as an appendix to the EIA Report.

(vi) Statement of need for the project. Supporting arguments for the project to justify its needs and necessity shall be included as part of the report. Key points are shown in **Box 13**.

**Box 13**

**Key Points for Statement of Need**

Among key supporting arguments for a project can include, but are not limited to the following:

- Fulfilment of or adherence to the goals of national and state policies and plans.
- Provision of essential services to the community or stakeholders, e.g. better housing, improved amenities, etc.
- Improving the existing environmental conditions of an area.
- Social and economic benefits to society.
- Bringing new green and sustainable technology that will benefit the community and country.

(vii) Deliberation on the alternatives and project options (refer to **Section 2.4** of this EIA Guideline).

(viii) Detailed description of the project including site information, concept and breakdown of major components, material and manpower requirements, project activities and time schedule (refer **Table 8.2.1**).

(ix) Description of the baseline conditions (physical-chemical, biological and human environment) within the ZOS that may be impacted by the project (see **Chapter 3** of this EIA Guideline).

(x) Assessment of the significant impacts (positive and negative), prediction of the extent and effects on nearby sensitive receptors and proposal of P2M2 to minimise or enhance these impacts and any potential residual impacts (see **Chapters 4 and 5** of this EIA Guideline).

(xi) Details of public consultation and engagement as part of EIA requirements.

(xii) Environmental Management Plan (EMP) incorporating the LD-P2M2, monitoring and audit programme (see **Chapter 6** of this EIA Guideline).

(xiii) Appendices containing technical studies, supporting documentation, results of analysis, list of references, etc. to be included.

**Table 8.2.1: Recommended Project Description in EIA Report**

| | |
|---|---|
| **Project Details** | Project title.<br>Name and contact details of the Project Proponent.<br>Name and contact details of EIA Team.<br>Location of project (coordinates, lot no, district, etc.).<br>Relevant map of project location and accessibility. |
| **Location** | General site plan including ZOS (5-km radius)<br>Project boundary and layout (with coordinates).<br>Description of location in relation to identifiable landmarks (e.g. city centres, main roads, towns, etc.). |
| **Project Component and Design Details** | Project details (land area, buffer, lots and land status).<br>Project concept, layout and components.<br>Technology use.<br>Examples of similar project type and scale.<br>Supported with drawings, illustration and diagrams. |
| **Project Activities** | Method statement for major project activities during pre-construction, construction and operational stages.<br>Manpower requirements.<br>Resource requirements |
| **Infrastructure, Utilities and Amenities Requirement** | Details of the estimated demand for:<br>Water supply.<br>Electricity.<br>Sewerage.<br>Telecommunications.<br>Transport system.<br>Waste management. |
| **Project Implementation Schedule** | Estimated timeline for phases implementation from planning, to construction and operational phases.<br>Details of each stages of implementation. |

Note:The list is not exhaustive and not all the above may be relevant to the project. It is the responsibility of the Project Proponent and Qualified Person to determine the relevant information required for environmental assessment and compliance.

### 8.2.2 Executive Summary

The Executive Summary provides a concise brief of the findings and recommendations from the EIA. It shall be written in non-technical language, both in Bahasa Malaysia and English, presenting the following information:

(i) Title of the project.

(ii) Name and contact details of the Project Proponent.

(iii) Name and contact details of EIA Team members.

(iv) Location of the project site.

(v) Relevant maps showing project location and sensitive receptors and extent of the ZOS.

(vi) Alternatives considered.

(vii) A tabulation of significant impacts and proposed P2M2 (format as detailed in EGIM 2016).

(viii) Description of monitoring and audit programme.

(ix) Conclusion to the Study.

Soft copy of the Executive Summary (PDF format) shall be submitted to DOE along with soft copy of the full EIA Report.

### 8.2.3 Data Deliverables

The Project Proponent shall make available all relevant data collected during the EIA study (in raw or processed format) along with the EIA Report, when requested by DOE.

Examples of such data include sampling results (certificates and raw data), modelling databases, baseline data (surveys, hydrographic data and climate data), metadata files, etc. This data shall also be provided to the relevant government agencies (GAs) upon request.

### 8.2.4 Conclusion to the EIA Report

The Qualified Person shall provide a pledge that the EIA study is carried out professionally and that the recommendations for P2M2 to be implemented will be able to mitigate against the identified environmental impacts to an acceptable level to ensure minimal degradation of the environment.

The Project Proponent shall also provide a pledge that he has understood the studies and recommendations in the EIA, and shall carry out all P2M2 recommended in the EIA Report.

## 8.3 PUBLIC DISPLAY

A Second Schedule EIA will have mandatory requirements prior to the approval of the EIA Report. These include:

Public Engagement: Public engagement is mandatory for a Second Schedule EIA. This can take in many forms and the common approach is through focus group discussion or public briefing with the stakeholders within the ZOI. In the briefing, the Project Proponent and EIA Team shall present the project brief followed by a questions and answers session. All discussions will be recorded and reported in the EIA.

Public display and review of EIA Report: EIA Report will be displayed after submission of the EIA Report, for a period of a month whereby the public will have an opportunity to review and officially submit their responses and comments in writing to the DOE. Notification of the public display of EIA Report is published in two local newspapers and / or any other media as approved by DOE.

Display locations: The EIA Report will be displayed at selected locations (DOE office, public libraries and local authority offices) where the public can access and view the documents easily. The Project Proponent and Qualified Person can propose suitable locations for display to DOE.

Online display: All submitted EIA Reports will be uploaded to the DOE website for the duration of the review period.

## 8.4 EIA REPORT SUBMISSION AND REVIEW PROCESS

The EIA Report submission shall be in line with the steps and procedures outlined in the EGIM 2016.

The EIA Report Quality Self-Assessment Tool (RQSAT) in the EGIM 2016 can be used by the Project Proponent and the Qualified Person to assist in conducting self-check of the quality of the EIA Report prior to submission to DOE.

An EIA Checklist is appended in **Appendix C**, which is required to be filled in by the EIA preparer and included in the EIA Report.

When the EIA is approved, DOE will issue an approval letter with conditions of approval to the Project Proponent. Outcomes from an EIA review are presented in **Box 14**. If the EIA Report is rejected on the grounds that the EIA Report is lacking in key information and / or assessment or the revised EIA Report cannot be submitted within the EIA review timeline period, the revised or updated EIA Report can be submitted later when it is ready and the EIA review timeline will commence again.

**Box 14**

**Outcomes from EIA Review Process**

The possible outcomes of the EIATRC meetings are:

(i) Approval of the EIA Report, provided that the report meets with the requirements of Section 34A (3) of the Environmental Quality Act (EQA) 1974.

(ii) Rejection of the EIA Report, where the report does not meet the requirements of Section 34A (3) of the EQA 1974.

The decision on the EIA Report as issued by DOE marks the end of the EIA process.

# REFERENCES

American Public Health Association, American Water Works Association, Water Environment Federation (APHA) (2017). Standard Methods for the Examination of Water and Wastewater 23rd Edition

Arizona Department of Environmental Quality Air Programs Division (1999). Arizona Ambient Air Quality Guidelines (AAAQGs)

Atomic Energy Licensing (Basic Safety Radiation Protection) Regulations 2010

Atomic Energy Licensing (Radioactive Waste Management) Regulations 2011

Atomic Energy Licensing Act 1984 (Act 304)

Atomic Energy Licensing Board (1996). Guideline on Radiological Monitoring for Oil and Gas Facilities Operators Associated with Technologically Enhanced Naturally Occurring Radioactive Materials

Atomic Energy Licensing Board (2008). Guideline on Decommissioning of Facilities Contaminated with Radioactive Materials

Department of Environment (1993). Buku Panduan Kawasan Sensitif Alam Sekitar.

Department of Environment (2004). Environmental Impact Assessment Guidelines for Risk Assessment

Department of Environment (2006). Technical Guidance on Performance Monitoring of Air Pollution Control Systems.

Department of Environment (2007). Noise Labelling and Emission Limits of Outdoor Sources

Department of Environment (2007). The Planning Guidelines for Environmental Noise Limits and Control

Department of Environment (2007). The Planning Guidelines for Vibration Limits and Control

Department of Environment (2008). Guidelines for Prevention and Control of Soil Erosion and Siltation in Malaysia

Department of Environment (2011). Environmental Audit Guidance Manual

Department of Environment (2012). Guidance Document of Health Impact Assessment (HIA) in Environmental Impact Assessment (EIA)

Department of Environment (2015). Contaminated Land Management and Control Guidelines No. 1: Malaysian Recommended Site Screening Levels for Contaminated Land

Department of Environment (2015). Contaminated Land Management and Control Guidelines No. 2: Malaysian Recommended Site Screening Levels for Contaminated Land

Department of Environment (2015). Contaminated Land Management and Control Guidelines No. 3: Malaysian Recommended Site Screening Levels for Contaminated Land

Department of Environment (2015). Technical Guidance Document on the Design and Operation of Industrial Effluent Treatment Systems.

Department of Environment (2015). Technical Guidance Document on Performance Monitoring of Industrial Effluent Treatment Systems.

Department of Environment (2016). Environmental Impact Assessment Guidance in Malaysia.

Department of Environment (2016). Guidance Document on Implementation of Self-Regulation Initiative in Industrial Manufacturing Premises – Environmental Mainstreaming Tools

Department of Environment (2017) Guidelines on Land Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2)

Department of Environment (2017). Environmental Essentials for Siting of Industries in Malaysia

Department of Irrigation and Drainage (1997). Guidelines on Erosion Control for Development Projects in the Coastal Zone (JPS 1/97).

Department of Irrigation and Drainage (2010). Guidelines for Erosion and Sediment Control in Malaysia.

Department of Irrigation and Drainage (August 2012) Urban Stormwater Management Manual for Malaysia 2nd Edition (MSMA-2)

Department of Town and Country Planning of Peninsular Malaysia (2016). National Physical Plan-3 (NPP-3).

Department of Town and Country Planning of Peninsular Malaysia (2012). National Physical Coastal Zone Plan (NPCZP).

Department of Town and Country Planning of Peninsular Malaysia (2018). Manual Penilaian Impak Sosial Bagi Projek Pembangunan Edisi Ke-2

Department of Town and Country Planning of Peninsular Malaysia (2012). National Physical Coastal Zone Plan (NPCZP)

Environmental Quality Act 1974 (Act 127)

European Commission (Feb, 2003). Integrated Pollution Prevention and Control (IPPC) Ref Document on Best Available Techniques in the Large Volume Organic Chemical Industry

Factories and Machinery Act 1974 (Act 139)

Fisheries Act 1985 (Act 317)

Forestry Act 1984 (Act 313)

Malaysian Investment Development Authority (Incorporation) Act 1965 (Act 397)

Malaysian Sewerage Industry Guidelines Vol 4: Sewage Treatment Plants.

Merchant Shipping (Amendment and Extension) Act 2007 (Act 1316)

Ministry of Health Malaysia (2009). National Standard for Drinking Water Quality

Ministry of Natural Resources and Environment (2016). National Policy on Biological Diversity 2016 – 2025.

Ministry of Science, Technology and Innovation (2002). National Policy on the Environment.

MS 1228:1991 Code of Practice For Design and Installation of Sewerage Systems

National Heritage Act 2005 (Act 645)

National Land Code 1965 (Act 56)

Occupational Safety and Health (Control of Industrial Major Accident Hazards) Regulations 1996

Occupational Safety and Health Act 1994 (Act 514)

Road Transport Act 1987 (Act 333)

Solid Waste and Public Cleansing Management Act 2007 (Act 672)

Street, Drainage and Building Act 1974 (Act 133)

Town and Country Planning Act 1976 (Act 172)

United Nations Environment Programme (UNEP) (2002). EIA Training Resource Manual 2nd Edition

Wildlife Conservation Act 2010 (Act 716)

www.epa.gov

www.msonline.gov.my

www.standards.govt.nz

www.standards.org.au

# GLOSSARY

| | |
|---|---|
| Air Pollution Control Systems (APCS) | Facility designed and constructed for the purpose of preventing or reducing the potential emission that causes air pollution, and includes the extraction system, control equipment and chimney. |
| Appointed Individuals (AI) | Persons appointed to be part of the Technical Review Committee with expertise and specialist knowledge on specific fields/subjects to contribute to the technical review of a report. |
| Approving Authority/ Agencies | Any government ministry, agencies or department with the authority to approve a project and/or activity under their jurisdiction by law. |
| Auditing | An evaluation process carried out by an independent auditor to determine effectiveness and performance of P2M2 and to ensure compliance of a project with the environmental approvals. |
| Baseline Data | Site specific data pertaining to the existing environment (physical, chemical, biological and human). It establishes the existing and ambient conditions within the zone of study, before changes occur as a result of a project activities. |
| Best Available Technology (BAT) | The most current and advanced technologies and methods available for pollution prevention and management. |
| Best Management Practices (BMP) | The best and practical structural or non-structural methods for the purpose of preventing or reducing pollution from a project activities. |
| Bill of Quantities (BQ) | Itemised list with estimated quantities of works and management requirements for a project issued to a contractor to quote. |
| Buffer Zone | An area designated around the boundary of a plant and/or adjacent to environmentally sensitive areas where no or limited development is allowed for the purpose to provide safety buffer and/or mitigate against any potential environmental risks. |

| | |
|---|---|
| Carrying Capacity | Maximum population size of the species that the environment can sustain indefinitely, given the food, habitat, water, and other necessities available in the environment.<br><br>The ability of a built resource or natural resource to absorb changes and related physical development without degradation. |
| Cleared Waste | Materials containing levels of radionuclides at activity concentrations less than those specified in the Second Schedule of the Atomic Energy Licensing (Radioactive Waste Management) Regulations 2011. |
| Competent Person | A person with the necessary skills and knowledge to carry out the specific technical task, usually gained through certification, work experience or training. This competent person related to environmental protection may be regulated by the DOE. |
| Controlled Area | An area where the annual dose received by a worker is likely to exceed three-tenths of the annual dose limit |
| Emergency Response Plan (ERP) | A manual incorporating all measures, actions, roles and responsibilities for the project team to take action during emergencies and crisis, covers various scenarios that may occur during construction and operations. |
| Environment | The area (specific zone to be affected by the project), and all natural resources (physical, biological and human resources), people, economic development and quality-of-life values. |
| Environmental Impact Assessment (EIA) | A study to identify, predict, evaluate and communicate information about the impacts (both beneficial and adverse) on the environment of a proposed development activity and to detail out the mitigating measures prior to project approval and implementation. |
| Environmental Management Plan (EMP) | A legally binding document which spells out in concise details the environmental requirements and P2M2 as detailed in the EIA and LD-P2M2 as well at other information, e.g. environmental budget, monitoring and audit programmes and roles and responsibilities of the EMT. |

| | |
|---|---|
| Environmental Management Team (EMT) | Specialist team comprising of relevant personnel of a project with specific roles and responsibilities in the management of environmental matters at-site. |
| Environmental Sensitive Areas (ESA) | Refers to areas that are of critical importance in terms of the goods, services and life-support systems they provide such as water purification, pest control and erosion regulation. In addition, they also refer to areas that habour the wealth of the nation's biodiversity. |
| Guided Self-Regulation (GSR) | An initiative by DOE to cultivate environmental ownership and excellence in environmental commitment from the sectors regulated by DOE especially in regards to performance monitoring of pollution control measures, scheduled reporting, record keeping, competent persons and involvement of environmental professionals with specific roles. |
| Industrial Effluent | Any waste in the form of liquid or wastewater generated from the manufacturing process including the treatment of water for water supply or any activity occurring at any industrial premises. |
| Industrial Effluent Treatment System (IETS) | Facility with collection system, designed and constructed for the purpose of reducing the potential of the industrial effluent or mixed effluent to cause pollution. |
| Land-Disturbing Activities | Activities such as clearing of trees or vegetation, excavating, raising or sloping of ground, trenching, grading and blasting. |
| Mixed Effluent | Any waste in the form of liquid or wastewater containing both industrial effluent and sewage. |
| Performance Monitoring | Routine monitoring of certain characteristics to provide an indication that an pollution control system is functional and capable of treating the pollutants generated. |
| Pollutants | Any natural or artificial substances, whether in a solid, semi-solid or liquid form, or in the form of gas or vapour, or in a mixture of at least two of these substances, or any objectionable odour or noise or heat emitted, discharged or deposited or is likely to be emitted, discharged or deposited from any source which can directly or indirectly cause pollution and includes any environmentally hazardous substances. |

| | |
|---|---|
| Pollution | Any direct or indirect alteration of the physical, thermal, chemical or biological properties of any part of the environment by discharging, emitting or depositing environmentally hazardous substances, pollutants or wastes so as to affect any beneficial use adversely, to cause a condition which is hazardous or potentially hazardous to public health, safety or welfare, or to animals, birds, wildlife, fish or aquatic life, or to plants or to cause a contravention of any condition, limitation or restriction to which a licence under this Act 127 is subject. |
| Pollution Prevention and Mitigation Measures (P2M2) | The various methods (structural and non-structural) required to ensure that pollution does not occur or at least minimised as result of a project. |
| Qualified Person | A person appointed by the Director General of Environment or is certified by DOE under Section 34A (2B) to carry out an EIA study. |
| Radiation Protection Officer (RPO) | A technically competent person appointed by the licensee and approved by AELB in writing, to supervise the implementation of the appropriate radiation protection regulations, measures and procedures |
| Radioactive Contamination | The presence of any radioactive material, nuclear material or prescribed substance on a surface in quantities in excess of 0.4 Becquerel per square centimetres (Bq $cm^{-2}$) for beta and gamma and low toxicity alpha emitters, or 0.04 Bq $cm^{-2}$ for all other alpha emitters. |
| Radioactive Decommissioning | To remove safely from service and to reduce residual contamination to a level that permits termination of any applicable licenses and release of the facility from further regulatory control and for unrestricted use |
| Radioactive Decontamination | Activities employed to remove or reduce the levels of radioactive contamination in or on structures, equipment, materials, items, buildings, personnel and areas of a contaminated facility and its site |
| Waste | Any matter prescribed to be scheduled waste, or any matter whether in a solid, semi-solid or liquid form, or in the form of gas or vapour which is emitted, discharged or deposited in the environment in such volume, composition or manner as to cause pollution. |

| | |
|---|---|
| Zone of Impact | The area which will receive the impacts from the project. |
| Zone of Study | Boundary identified for the EIA Study which would be the main spatial area to carry out baseline data gathering, determine extent of modelling and assessment and other supporting studies. |

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# APPENDICES

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# APPENDIX A

# LIST OF GUIDELINES AND GUIDANCE DOCUMENTS

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**List of Guidelines and Guidance Documents by Department of Environment**

| No | Guidelines / Guidance Documents | Source |
|---|---|---|
| 1. | Contaminated Land Management and Control Guidelines No. 1: Malaysian Recommended Site Screening Levels for Contaminated Land, 2015 | www.doe.gov.my |
| 2. | Contaminated Land Management and Control Guidelines No. 2: Malaysian Recommended Site Screening Levels for Contaminated Land, 2015 | www.doe.gov.my |
| 3. | Contaminated Land Management and Control Guidelines No. 3: Malaysian Recommended Site Screening Levels for Contaminated Land, 2015 | www.doe.gov.my |
| 4. | Environmental Essentials for Siting of Industries in Malaysia, 2017 | DOE Offices |
| 5. | Environmental Impact Assessment Guidance in Malaysia, 2016 | DOE Offices |
| 6. | Environmental Impact Assessment Guidelines for Risk Assessment, 2004 | DOE Offices |
| 7. | Guidance Document of Health Impact Assessment (HIA) in Environmental Impact Assessment (EIA), 2012 | DOE Offices |
| 8. | Guidance Document on Implementation of Self-Regulation Initiative in Industrial Manufacturing Premises – Environmental Mainstreaming Tools, 2016 | DOE Offices |
| 9. | Guidelines on Land Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2), 2017 | DOE Offices |
| 10. | Technical Guidance Document for on the Design and Operation of Industrial Effluent Treatment System (DOE-IETS-9 Sixth Edition 2015) | Environment Institute of Malaysia (EiMAS) |
| 11. | Technical Guidance Document on Performance Monitoring of Industrial Effluent Treatment Systems (DOE-IETS-1 Seventh Edition 2015) | Environment Institute of Malaysia (EiMAS) |
| 12. | Technical Guidance on Performance Monitoring of Air Pollution Control Systems (DOE-APCS-5 First Edition 2006) | www.doe.gov.my |
| 13. | The Planning Guidelines for Environmental Noise Limits and Control, 2007 | www.doe.gov.my |
| 14. | The Planning Guidelines for Vibration Limits and Control. 2007 | www.doe.gov.my |

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# APPENDIX B

# SAMPLE OF ENVIRONMENTAL SCOPING MATRIX

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# Sample Environmental Assessment Matrix For A EIA Project

Key:

| | | | |
|---|---|---|---|
| **NA** | Insignificant and excluded from Matrix | **I-D** | Potentially significant adverse environmental impact for which a design solution has been identified |
| **I-T** | Environmental impact that is potentially but on a temporary basis and will assume equilibrium after certain period of time | **I-R** | Residual and significant adverse environmental impact |
| **I-M** | Environmental impact that is potentially significant but there is insufficient data to make reliable prediction. Close monitoring and control is recommended | **I+** | Significant environmental enhancement |

| | | | PROJECT ACTIVITIES | PRE CONSTRUCTION | | | CONSTRUCTION | | | | | | | OPERATION | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | SURVEY | PROJECT DESIGN | ENGAGEMENT WORKS | MOBILISATION TO SITE | SITE CLEARING | EARTHWORK | CIVIL AND STRUCTURAL WORKS | MECHANICAL AND ELECTRICAL WORKS | TESTING AND COMMISSIONING WORKS | ABANDONMENT | NORMAL OPERATION | MAINTENANCE WORKS / OUTAGE PERIOD | ABNORMAL OPERATION | MATERIAL HANDLING AND STORAGE | ABANDONMENT |
| ENVIRONMENTAL COMPONENTS | PHYSIOCHEMICAL | LAND | Landforms | | | | | | | | | | | | | | | |
| | | | Soil Profile | | | | | | | | | | | | | | | |
| | | | Soil Composition | | | | | | | | | | | | | | | |
| | | | Slope Stability | | | | | | | | | | | | | | | |
| | | | Subsidence and Compaction | | | | | | | | | | | | | | | |
| | | | Seismicity | | | | | | | | | | | | | | | |
| | | | Flood Plains/Swamps | | | | | | | | | | | | | | | |
| | | | Land Use | | | | | | | | | | | | | | | |
| | | | Engineering and Mineral Resources | | | | | | | | | | | | | | | |
| | | | Buffer Zones | | | | | | | | | | | | | | | |
| | | SURFACE WATER | Flow Variation | | | | | | | | | | | | | | | |
| | | | Water Quality | | | | | | | | | | | | | | | |
| | | | Drainage Pattern | | | | | | | | | | | | | | | |
| | | | Water Balance | | | | | | | | | | | | | | | |
| | | | Flooding | | | | | | | | | | | | | | | |
| | | | Existing Use | | | | | | | | | | | | | | | |

Key:

| | | | |
|---|---|---|---|
| **NA** | Insignificant and excluded from Matrix | **I-D** | Potentially significant adverse environmental impact for which a design solution has been identified |
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| | | | PROJECT ACTIVITIES | PRE CONSTRUCTION | | | CONSTRUCTION | | | | | | | OPERATION | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | SURVEY | PROJECT DESIGN | ENGAGEMENT WORKS | MOBILISATION TO SITE | SITE CLEARING | EARTHWORK | CIVIL AND STRUCTURAL WORKS | MECHANICAL AND ELECTRICAL WORKS | TESTING AND COMMISSIONING WORKS | ABANDONMENT | NORMAL OPERATION | MAINTENANCE WORKS / OUTAGE PERIOD | ABNORMAL OPERATION | MATERIAL HANDLING AND STORAGE | ABANDONMENT |
| ENVIRONMENTAL COMPONENTS | PHYSIOCHEMICAL | GROUND WATER | Water Table | | | | | | | | | | | | | | | |
| | | | Flow Regime | | | | | | | | | | | | | | | |
| | | | Water Quality | | | | | | | | | | | | | | | |
| | | | Recharge | | | | | | | | | | | | | | | |
| | | | Aquifer Characteristics | | | | | | | | | | | | | | | |
| | | | Existing Use | | | | | | | | | | | | | | | |
| | | ATMOSPHERE | Air Quality | | | | | | | | | | | | | | | |
| | | | Air Flow | | | | | | | | | | | | | | | |
| | | | Climatic Changes | | | | | | | | | | | | | | | |
| | | | Visibility | | | | | | | | | | | | | | | |
| | | NOISE | Intensity | | | | | | | | | | | | | | | |
| | | | Duration | | | | | | | | | | | | | | | |
| | | | Frequency | | | | | | | | | | | | | | | |
| | BIOLOGICAL | SPECIES AND POPULATIONS | Terrestrial Flora | | | | | | | | | | | | | | | |
| | | | Terrestrial Fauna | | | | | | | | | | | | | | | |
| | | | Aquatic/Marine Flora | | | | | | | | | | | | | | | |
| | | | Aquatic/Marine Fauna | | | | | | | | | | | | | | | |

Key:

| | | | |
|---|---|---|---|
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| | | | PROJECT ACTIVITIES | PRE CONSTRUCTION | | | CONSTRUCTION | | | | | | | OPERATION | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | SURVEY | PROJECT DESIGN | ENGAGEMENT WORKS | MOBILISATION TO SITE | SITE CLEARING | EARTHWORK | CIVIL AND STRUCTURAL WORKS | MECHANICAL AND ELECTRICAL WORKS | TESTING AND COMMISSIONING WORKS | ABANDONMENT | NORMAL OPERATION | MAINTENANCE WORKS / OUTAGE PERIOD | ABNORMAL OPERATION | MATERIAL HANDLING AND STORAGE | ABANDONMENT |
| ENVIRONMENTAL COMPONENTS | BIOLOGICAL | HABITATS AND COMMUNITIES | Terrestrial Habitats | | | | | | | | | | | | | | | |
| | | | Terrestrial Communities | | | | | | | | | | | | | | | |
| | | | Aquatic Habitats | | | | | | | | | | | | | | | |
| | | | Aquatic Communities | | | | | | | | | | | | | | | |
| | | | Estuarine Habitats | | | | | | | | | | | | | | | |
| | | | Estuarine Communities | | | | | | | | | | | | | | | |
| | | | Marine Habitats | | | | | | | | | | | | | | | |
| | | | Marine Communities | | | | | | | | | | | | | | | |
| | HUMAN | HEALTH AND SAFETY | Physical Safety | | | | | | | | | | | | | | | |
| | | | Psychological Well-Being | | | | | | | | | | | | | | | |
| | | | Parasitic Disease | | | | | | | | | | | | | | | |
| | | | Communicable Disease | | | | | | | | | | | | | | | |
| | | | Physiological Disease | | | | | | | | | | | | | | | |
| | | SOCIAL AND ECONOMIC | Employment | | | | | | | | | | | | | | | |
| | | | Property / Relocation | | | | | | | | | | | | | | | |
| | | | Education | | | | | | | | | | | | | | | |
| | | | Utilities / Amenities | | | | | | | | | | | | | | | |

Key:

| | | | |
|---|---|---|---|
| **NA** | Insignificant and excluded from Matrix | **I-D** | Potentially significant adverse environmental impact for which a design solution has been identified |
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| | | | PROJECT ACTIVITIES | PRE CONSTRUCTION | | | CONSTRUCTION | | | | | | | OPERATION | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | SURVEY | PROJECT DESIGN | ENGAGEMENT WORKS | MOBILISATION TO SITE | SITE CLEARING | EARTHWORK | CIVIL AND STRUCTURAL WORKS | MECHANICAL AND ELECTRICAL WORKS | TESTING AND COMMISSIONING WORKS | ABANDONMENT | NORMAL OPERATION | MAINTENANCE WORKS / OUTAGE PERIOD | ABNORMAL OPERATION | MATERIAL HANDLING AND STORAGE | ABANDONMENT |
| ENVIRONMENTAL COMPONENTS | HUMAN | AESTHETIC AND CULTURAL | Landforms | | | | | | | | | | | | | | | |
| | | | Biota | | | | | | | | | | | | | | | |
| | | | Wilderness | | | | | | | | | | | | | | | |
| | | | Water Quality | | | | | | | | | | | | | | | |
| | | | Atmospheric Quality | | | | | | | | | | | | | | | |
| | | | Climate | | | | | | | | | | | | | | | |
| | | | Tranquillity | | | | | | | | | | | | | | | |
| | | | Sense of Community | | | | | | | | | | | | | | | |
| | | | Community Structure | | | | | | | | | | | | | | | |
| | | | Man-Made Objects | | | | | | | | | | | | | | | |
| | | | Historic Places or Structure | | | | | | | | | | | | | | | |
| | | | Religious Places or Structure | | | | | | | | | | | | | | | |
| | | | Landscape | | | | | | | | | | | | | | | |

# APPENDIX C
# EIA CHECKLISTS

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# CHECKLISTS

## CHECKLIST FOR TERMS OF REFERENCE (TOR) / ENVIRONMENTAL SCOPING INFORMATION (ESI)

| Item | | Adequacy Check | | Remarks |
|---|---|---|---|---|
| | | Yes | No | |
| **1.0** | **Is the project a NEW development?** | | | |
| **2.0** | **Is the project an AMENDMENT to an existing development? If so,** | | | |
| | (a) Was there an EIA for the existing development? | | | |
| | (b) Does the addition involve new area development? If so how much and where? | | | |
| **3.0** | **Has policies compliance been met by the Project Proponent?** | | | |
| | (a) Federal / state approvals | | | |
| | (b) Land status/ acquisition | | | |
| | (c) Land use compatibility | | | |
| | (d) Environmentally Sensitive Areas | | | |
| | (e) Others (Forest, Fisheries, etc.) | | | |
| **4.0** | **Who were involved in the scoping tasks?** | | | |
| | (a) Project Proponent | | | |
| | (b) Town planner/Architect | | | |
| | (c) Engineering consultants | | | |
| | (d) Environmental consultant | | | |
| | (e) Affected public/stakeholders | | | |
| | (f) Government agencies | | | |
| | (g) Others | | | |
| **5.0** | **Does the project involve the following activities?** | | | |
| | (a) Establish accessibility | | | |
| | (b) Base camp and site facilities | | | |
| | (c) Mobilisation of workers, equipment and materials | | | |
| | (d) Site clearing and biomass removal | | | |

| Item | | Adequacy Check | | Remarks |
|---|---|---|---|---|
| | | Yes | No | |
| | (e) Earthworks | | | |
| | (f) Drainage works | | | |
| | (g) Civil and structural works | | | |
| | (h) Electrical and mechanical works | | | |
| | (i) Testing and commissioning works | | | |
| | (j) Materials/products handling and storage | | | |
| | (k) Process controls | | | |
| | (l) Air pollution control system | | | |
| | (m) Industrial / Sewage effluent treatment system | | | |
| | (n) Noise / vibration controls | | | |
| | (o) Safety controls | | | |
| | (p) Waste generations | | | |
| | (q) Others | | | |
| **6.0** | **Land use on site and surrounding areas** | | | |
| | (a) Are the following features intersected by the Project? | | | |
| | (i) Rivers and/or lakes | | | |
| | (ii) Coastal areas | | | |
| | (iii) Wetlands/Mangroves | | | |
| | (iv) Coral reefs/Seagrass beds | | | |
| | (v) Forest reserves | | | |
| | (vi) Built-up areas | | | |
| | (vii) Tourism/recreational areas | | | |
| | (b) Are the environmental issues with each feature identified? | | | |
| **7.0** | **Timeline** | | | |
| | (a) Project implementation schedule (by phase, in chronological order of occurrence) | | | |

| Item | | Adequacy Check | | Remarks |
|---|---|---|---|---|
| | | Yes | No | |
| **8.0** | **Project information provided** | | | |
| | (a) Project concept and layout | | | |
| | (b) Project activities | | | |
| | (c) Material sources and storage | | | |
| | (d) Infrastructure, utilities and amenities requirement | | | |
| **9.0** | **Site Suitability Assessment** | | | |
| | (a) Siting constraints / suitability addressed? | | | |
| | (b) Have the affected public be informed/consulted? | | | |
| | (c) Alternative project layout provided? | | | |
| | (d) Best available technology (BAT) considered? | | | |
| | (e) Carrying capacity considered? | | | |
| | (f) No Project Option? | | | |
| **11.0** | **Significant impacts scoped and prioritized?** | | | |
| | (a) Identified Impacts | | | |
| | (i) Water quality | | | |
| | (ii) Air quality | | | |
| | (iii) Noise and vibration | | | |
| | (iv) Safety impact | | | |
| | (v) Health impact | | | |
| | (vi) Waste generation | | | |
| | (vii) Others | | | |
| | (b) For each significant impact, were the methods and scope sufficient for impact assessment? | | | |
| | (c) Were mitigation measures proposed to address the significant impact? | | | |

**CHECKLIST FOR ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT**

| Item | | Adequacy Check | | Remarks |
|---|---|---|---|---|
| | | Yes | No | |
| **1.0** | **Executive Summary (Brief and concise)** | | | |
| | (a) In Bahasa Malaysia | | | |
| | (b) In English | | | |
| **2.0** | **Introduction** | | | |
| 2.1 | (a) Title of the project | | | |
| | (b) Project Proponent details | | | |
| | (c) EIA Consultant details | | | |
| | (d) Project location (boundary coordinates) | | | |
| | (e) Relevant maps showing project location and ESAs | | | |
| 2.2 | Legal requirements | | | |
| **3.0** | **Terms of Reference** | | | |
| **4.0** | **Statement of Need** | | | |
| | (a) Principle reasons for proposed project (include relevant supporting documents) | | | |
| | (b) Aim of Project | | | |
| **5.0** | **Project Options** | | | |
| | (a) Alternatives considered? | | | |
| | (b) Project optimization done? | | | |
| **6.0** | **Project Description** | | | |
| 6.1 | Project Concept: | | | |
| | (a) Layout plan | | | |
| | (b) Size and land requirement | | | |
| | (c) Project component | | | |
| | (d) Method statement | | | |
| | (e) Labour requirement | | | |
| | (f) Raw material requirement | | | |
| | (g) Infrastructure/Utilities/Amenities | | | |
| 6.2 | Project activities: Construction | | | |
| 6.3 | Project activities: Operational | | | |

| Item | | Adequacy Check | | Remarks |
|---|---|---|---|---|
| | | Yes | No | |
| 6.4 | Project Implementation Schedule (Chart) | | | |
| **7.0** | **Description of Existing Environment** | | | |
| 7.1 | Baseline | | | |
| | (a) Physico-chemical | | | |
| | (i) Land use, land use zoning and compatibility | | | |
| | (ii) Topography / Bathymetry | | | |
| | (iii) Geology and soil | | | |
| | (iv) Hydrology | | | |
| | (v) Climate | | | |
| | (vi) Water quality | | | |
| | (vii) Ambient air quality | | | |
| | (viii) Ambient noise | | | |
| | (b) Biological (where applicable) | | | |
| | (i) Terrestrial ecology | | | |
| | (ii) Aquatic/Marine ecology | | | |
| | (iii) Fishery resources | | | |
| | (c) Socio-economy | | | |
| | (i) Demography | | | |
| | (ii) Public Health | | | |
| | (iii) Historical, cultural and archaeological aspects | | | |
| | (iv) Stakeholders Engagements | | | |
| 7.2 | Others agencies requirement: | | | |
| | (a) Social Impact Assessment | | | |
| | (b) Health Impact Assessment | | | |
| | (c) Traffic Impact Assessment | | | |
| | (d) Marine Traffic Risk Assessment | | | |
| | (e) Others | | | |

| Item | | Adequacy Check | | Remarks |
|---|---|---|---|---|
| | | Yes | No | |
| **8.0** | **Evaluation of Impacts** | | | |
| 8.1 | Detailed examination of impacts during: | | | |
| | (a) Pre-construction Phase | | | |
| | (b) Construction Phase | | | |
| | (i) Establish accessibility | | | |
| | (ii) Base camp and site facilities | | | |
| | (iii) Mobilisation of workers, equipment and materials | | | |
| | (iv) Site clearing and biomass removal | | | |
| | (v) Earthworks | | | |
| | (vi) Drainage works | | | |
| | (vii) Civil and structural works | | | |
| | (viii) Electrical and mechanical works | | | |
| | (ix) Testing and commissioning works | | | |
| | (x) Waste generation | | | |
| | (xi) Site stabilization and landscaping | | | |
| | (xii) Others | | | |
| | (c) Operational Phase | | | |
| | (i) Materials/products handling and storage | | | |
| | (ii) Process controls | | | |
| | (iii) Air pollution control system | | | |
| | (iv) Industrial / Sewage effluent treatment system | | | |
| | (v) Noise / vibration controls | | | |
| | (vi) Safety controls | | | |
| | (vii) Waste generations | | | |
| | (viii) Others | | | |

| Item | | Adequacy Check | | Remarks |
|---|---|---|---|---|
| | | Yes | No | |
| | (d) Abandonment / Decommissioning Phase | | | |
| | (i) Removal of facilities / structures | | | |
| | (ii) Removal of materials | | | |
| | (iii) Removal of wastes | | | |
| | (iv) Rehabilitation works | | | |
| **9.0** | **Pollution Prevention and Mitigation Measure (P2M2)** | | | |
| 9.1 | Environmental Aspects | | | |
| | a) Water pollution | | | |
| | b) Air pollution | | | |
| | c) Noise and vibration | | | |
| | d) Waste management | | | |
| | e) Others | | | |
| **10.0** | **Environmental Management Plan (EMP)** | | | |
| 10.1 | Guided Self-Regulation requirement | | | |
| 10.2 | LD-P2M2 | | | |
| 10.3 | P2M2 | | | |
| 10.4 | Proposed Monitoring Programme: | | | |
| | (a) Location of monitoring points | | | |
| | (b) Frequency of monitoring | | | |
| | (c) Parameters to be measured | | | |
| | (d) Procedures for reporting | | | |
| 10.5 | Environmental Audit Programme | | | |
| **11.0** | **Study Findings** | | | |
| **12.0** | **Reference** | | | |
| **13.0** | **Appendices** | | | |

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