



ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES FOR PETROLEUM INDUSTRIES



**DEPARTMENT OF ENVIRONMENT
MINISTRY OF ENERGY, SCIENCE, TECHNOLOGY, ENVIRONMENT &
CLIMATE CHANGE
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Department of Environment, Malaysia

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PREFACE

This is the first edition of the **Environmental Impact Assessment Guidelines For Petroleum Industries** 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 Petroleum Industries 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 activities related to the development of **Petroleum Industries** 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 KAMARULNAJIB BIN CHE IBRAHIM)

Director General of Environmental Quality

Malaysia

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ABBREVIATIONS

AELB	Atomic Energy Licensing Board
AI	Appointed Individuals
APCS	Air Pollution Control System
AS/NZS	Australian / New Zealand Standard
BAT	Best Available Technologies
BMP	Best Management Practices
BOD	Biochemical Oxygen Demand
BPEO	Best Practical Environmental Option
CEMS	Continuous Emission Monitoring System
CEO	Chief Executive Officer
CO	Carbon Monoxide
COA	Conditions of Approval
COD	Chemical Oxygen Demand
DID	Department of Irrigation and Drainage
DOE	Department of Environment
DOF	Department of Fisheries
e.g.	Example
EGIM	Environmental Impact Assessment Guideline in Malaysia
EIA	Environmental Impact Assessment
EIATRC	EIA Technical Review Committee
EM	Environmental Manager
EMT	Environmental Management Teams
EO	Environmental Officer
EPMC	Environmental Performance Monitoring Committee
ERCMC	Environmental Regulatory Compliance Monitoring Committee
ESCP	Erosion and Sediment Control Plan

ESI	Environmental Scoping Information
ETA	Event Tree Analysis
etc.	Et cetera
FGD	Focal Group Discussions
FTA	Fault Tree Analysis
GA	Government Agencies
H ₂ S	Hydrogen Sulphide
HCl	Hydrogen Chloride
HF	Hydrogen Fluoride
HIA	Health Impact Assessment
IETS	Industrial Effluent Treatment System
IFC	International Finance Corporation
JKPTG	Department of Director General of Land and Mines
JKR	Public Works Department
JPSM	Forestry Department Peninsular Malaysia
KSAS	<i>Kawasan Sensitif Alam Sekitar</i>
L ₁₀	Ten percentile level
L ₅₀	Fifty percentile level
L ₉₀	Ninety percentile level
L _{Aeq}	Equivalent A-Weighted Continuous Sound Level
LD-P2M2	Land Disturbing Pollution Prevention And Mitigation Measures
L _{max}	Maximum A-Weighted Continuous Sound Level
L _{min}	Minimum A-Weighted Continuous Sound Level
MESTECC	Ministry of Energy, Science, Technology, Environment and Climate Change
METMalaysia	Malaysian Meteorological Department
MIDA	Malaysian Investment Development Authority

MOH	Ministry of Health
MOM	minutes of meetings
MOSTI	Ministry of Science, Technology and Innovation
MPFN	National Physical Planning Council of Malaysia
MSMA	Urban Stormwater Management Manual for Malaysia
MTRA	Marine Traffic Risk Assessment
NH ₃	Ammonia
NO ₂	Nitrogen Dioxides
NPCZP	National Physical Coastal Zone Plan
NPP-3	National Physical Plan-3
O ₃	Ozone
P2M2	Pollution Preventions and Mitigation Measures
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 ₁₀	Particulate Matter 10 Micron
PM _{2.5}	Particulate Matter 2.5 Micron
PTD	District and Land Office
PTG	Land and Mines Office
QRA	Quantitative Risk Assessment
RIA	Radiological Impact Assessment
RQSAT	Report Quality Self-Assessment Tool
SI	Soil investigations
SIA	Social Impact Assessment
SO ₂	Sulphur Dioxide

SPAN	National Water Services Commission
SPC	State Planning Committee
SSA	Site Suitability Assessment
SSL	Site Screening Levels
STS	Sewage Treatment System
TIA	Traffic Impact Assessment
TOR	Terms of Reference
TORAC	TOR Adequacy Check
VOC	Volatile Organic Compounds
ZOI	Zone of Impact
ZOS	Zone of Study

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The ‘**Environmental Impact Assessment (EIA) Guidelines for the Petroleum Industries**’ (hereinafter referred to as the ‘Guidelines’) is updated to reflect the latest amendments in the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015, of the Environmental Quality Act 1974 (Act 127).

The amended Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015 was gazette on 28 August 2015. It 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** (21 Prescribed Activities) and **Second Schedule** (17 Prescribed Activities).

Inter alia to the above, the Department of Environment (DOE) has rationalised 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 complementary to and shall be referred together with the Environmental Impact Assessment Guideline in Malaysia (EGIM) (DOE, 2016).

Compliance with the requirements set out in this Guidelines and EGIM (DOE, 2016) is the obligations of the Project Proponent as stated under Section 34A (2C) of the EQA 1974, and/or any amendments thereafter.

1.2 GUIDELINE 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 (EO) and other EIA-related practitioners.
- (b). Facilitate integration of the EIA into the overall project planning and development cycle, to ensure compliance with and adherence to the legal requirements within the framework of environmental sustainability.
- (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 environmental issues relevant to the DOE's three functional areas (water, air and wastes), whilst also taking into consideration other environmental requirements by other authorities or agencies, to facilitate overall decision-making and project approval.
- (e). Provide a succinct framework for the DOE to assess the EIA reports.

1.3 SCOPE OF THE GUIDELINE

The scope of the Guidelines covers petroleum activities (Activity 9), which falls under the criteria provided in the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015

In accordance with Activity 9 of the EIA order 2015, specific guidelines on petroleum will be presented based on the classification of activities as follows:

Schedule 1

9. PETROLEUM:

(a). Development of-

- (i) oil field;
- (ii) gas field; or
- (iii) oil and gas field.

(b). Construction of 30 kilometres or more in length of-

- (i) off-shore pipelines;
- (ii) on-shore pipelines; or
- (iii) off-shore pipelines and on-shore pipelines.

(c). Construction of-

- (i) oil separation, processing, handling and storage facilities;
- (ii) gas separation, processing, handling and storage facilities; or
- (iii) oil and gas separation, processing, handling and storage facilities.

(d). Construction of product depot for the storage of petrol, gas or diesel which has the combined storage capacity of 60,000 barrels or more (excluding service station) within 3 kilometres from any commercial, industrial or residential area.

Schedule 2

9. PETROLEUM:

- (a). Construction of oil refineries.
- (b). Construction of gas refineries.
- (c). Construction of oil and gas refineries.

1.4 STRUCTURE OF THE GUIDELINE

The Guidelines for Petroleum Activities are divided into Chapters with their respective supporting sections below:

Chapter	Details
<p align="center">Chapter 1 Introduction</p>	<p>Provides an introduction to the Guidelines covering the objectives, scope and structure.</p> <p>Provides an overview on project planning and approaches to integrate the EIA process.</p> <p>Outlines the necessary requirements for the project to undergo initial screening and assessment.</p> <p>Provides a concise review of legislations, policies and relevant to petroleum activity development and how they relate to the EIA process.</p> <p>Provides the terms and definitions associated with coastal petroleum development and their interpretations.</p> <p>Propose the stakeholder engagement process.</p>
<p align="center">Chapter 2 Terms of Reference (TOR)</p>	<p>Provides the procedures to conduct screening and scoping the significant issues to prepare the TOR from the ESI.</p> <p>Presents the structure and content for TOR reporting, including an overview of the review and approval process.</p>
<p align="center">Chapter 3 Environmental Impact Assessment: Baseline Data</p>	<p>Provides an outline of the relevant baseline information required for incorporation into the EIA report.</p>
<p align="center">Chapter 4 Environmental Impact Assessment: Evaluation of Impacts</p>	<p>Provides the methodology and tools to identify, predict, evaluate and assess the significant environmental impacts.</p>
<p align="center">Chapter 5 Environmental Impact Assessment: Mitigation Measures</p>	<p>Identifies appropriate P2M2s to minimise any negative impacts arising from the development of the project; and the types of measures to manage any residual impacts.</p>

Chapter	Details
<p>Chapter 6 Environmental Impact Assessment: Environmental Management Plan</p>	<p>Provides an EMP framework for post EIA.</p> <p>Details out self-regulation requirement by implementing the Environmental Mainstreaming Tools.</p> <p>Provides the environmental monitoring and audit programmes for post-EIA.</p>
<p>Chapter 7 Abandonment Plan</p>	<p>Provides an Abandonment Plan framework.</p> <p>Provides the environmental monitoring and audit programmes for post-abandonment activity.</p>
<p>Chapter 8 EIA Reporting and Review</p>	<p>Presents the structure and content for EIA reporting, including an overview of the review and approval process.</p>

1.5 ENVIRONMENTAL PROJECT PLANNING

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

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.

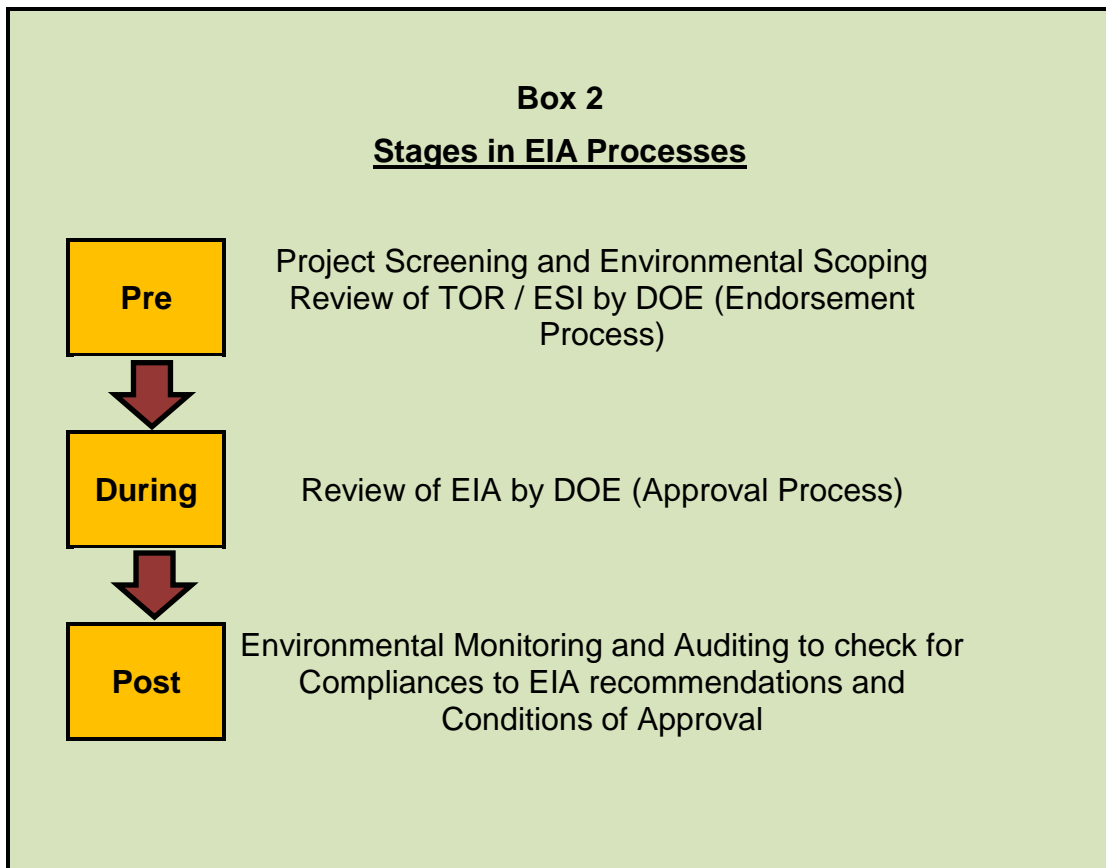
Specifically for petroleum industries development, an EIA is a very useful toolbox, since it has a wide range of tools to evaluate and mitigate any negative impacts arising from development on the physico-chemical, ecological and human components of the coastal and marine park environment.

At the same time, the EIA can also enhance the project and the environment with the correct use of the EIA tools

Box 1:**Benefits of Incorporating EIA into Project Planning**

- (a). Ensures compliance to environmental and development policies, facilitating project approval and avoid instances where changes need to be made later.
- (b). 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.
- (c). Complements other planning considerations to provide feedback towards technical and management deliberations by the Project Proponent.
- (d). 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.
- (e). 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.

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

This Section provides an overview of the step-by-step guide to the environmental assessment of a petroleum project:

Step 1: Provide the Project Brief

When a Project Proponent wants to develop a project with regards to petroleum industries, some basic information regarding the project will be required to enable the Qualified Person to understand the intent, objectives and scope of the proposed project.

The information will first be used objectively to screen whether the project is a prescribed activity or not at all. If it is a prescribed activity, whether it falls under the First or Second Schedule, based on the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015.

Step 2: Identify the Legal Requirements

The Project Proponent undertaking the project has to 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 requirements.
- (ii) Section 1.8: Policy and guideline compliance.
- (iii) Section 2.2: Environmental screening.

Step 3: Check if the 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.

Step 4: Carry Out Preliminary 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 is advisable (with the designated officer in charge), including the relevant GAs (Government Agencies) when preparing the TOR and EIA.

Engagements include meetings and focal group discussions (FGDs) to obtain site information for scoping and the EIA.

Step 5: Preparation of the TOR and ESI

Upon determining that the project requires either a First or Second Schedule EIA, an ESI and the TOR shall be prepared. At this point of the study, qualitative data will suffice.

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 (DOE, 2016), and in this Guidelines. The TOR shall be submitted to DOE for review and endorsement.

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 report shall cover the following:

- (i) **Chapter 4:** Impact assessment on the significant environmental issues.
- (ii) **Chapter 5:** Identification of suitable P2M2s 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: Draft the EIA

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

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

Step 10: Carry Out Public Engagement

A Second Schedule EIA requires mandatory public engagements with the relevant stakeholders who are affected by the project directly or indirectly (e.g. communities or institutions, businesses and the general public). For First Schedule EIAs, this engagement is encouraged.

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. Some small-scale projects may not need this session, since there is already a stakeholders' engagement prior to carrying out the TOR.

All findings from any public engagements shall be incorporated into the final EIA report.

Step 11: Submit the EIA Report and Carry out Public Display

Depending on whether the project is carried out under the First or Second Schedules, the EIA report shall be submitted to DOE State or DOE headquarters (HQ) for review, respectively.

The Qualified Person shall take note of the difference in requirements for a First Schedule and Second Schedule EIA, and to follow the required DOE procedures. The Second Schedule EIA requires a public display of the EIA Report for the public to provide formal comments and feedbacks within a specified review period of one month, to the DOE.

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.

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

1.7.1 Environmental Quality Act 1974 (Act 127)

Section 34A of the Act 127 specifies the legal requirements which provide powers to the Minister to prescribe, by order, any activity which may have significant environmental impacts for which a report on an assessment of the impact(s) of such an activity be submitted to the Director-General of the Environmental Quality for approval. The submission for approval of an EIA report by the Director-General is a requirement prior to the granting of approval by the relevant project approving authority.

1.7.2 Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015

The Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015 (EIA Order 2015) requires an EIA report to be submitted to the Director-General for approval.

There are five categories of petroleum activities mentioned in **EIA Order 2015** that are Prescribed Activities under Schedule 1 and Schedule 2, both under Activity 9 of EIA Order 2015.

1.7.3 Exclusive Economic Zone Act 1984

It regulates development activities within the Exclusive Economic Zone (EEZ). Under the EEZ Act, installation of any structure requires an application and approval of Permit-to-Install and Permit-to-Operate from the Ministry of Domestic Trade, Cooperative and Consumerism.

Petroleum projects within the EEZ, will have the project's EIA being reviewed by virtue of an administrative arrangement within the Federal Government and the Department of Environment, Malaysia.

1.7.4 Merchant Shipping Ordinance, 1952

This Ordinance applies to Peninsula Malaysia, MSO No.2 applies to Sarawak whereas its counterpart of No.11 applies to Sabah.

1.7.5 Petroleum Mining Act, 1966 (Revised 1972)

This Act regulates petroleum exploration and mining in territorial waters and the associated continental shelf.

1.7.6 Petroleum Development Act, 1974

It is an Act to provide for exploration and exploitation of petroleum whether onshore or offshore by a corporation in which will be vested the entire ownership in and the exclusive rights, power, liberties and privileges in respect of the said petroleum and to control the carrying on of downstream activities and development relating to petroleum and its products.

1.7.7 Fisheries Act, 1985

This Act deals with the fishing industry and marine parks in Malaysia.

1.7.8 Petroleum (Safety Measures) Act 1991, Act 302

This Act consolidate laws relating to safety in the transportation, storage and utilization of petroleum and to provide for matters relating thereto.

1.7.9 Occupational Safety and Health Act, 1994

This Act makes further provision for securing the safety, health and welfare of people at work, for protecting others against risks to safety or health in connection with the activities or people at work.

1.7.10 Malaysian Maritime Enforcement Agency Act, 2004

This Act functions to establish the Malaysian Maritime Enforcement Agency to perform enforcement functions for ensuring the safety and security of the Malaysia Maritime Zone with the main aim to protect the maritime and other national interests in that zone.

1.7.11 National Security Council, Directive No. 20

It coordinates disaster management in accordance with Directive No. 20; the “Policy and Mechanism on National Disaster Relief and Management”.

1.7.12 Petronas Internal Requirements

- i. PETRONAS Exploration and Production Minimum Environmental Specification (MES), Revision 2, September 2017
- ii. PETRONAS Procedure and Guidelines for Upstream Activities (PPGUA 3.0), 2013

1.7.13 International Conventions

The following are noteworthy and relevant Conventions that Malaysia is a signatory:

- i. International Conventions for the Prevention of Pollution from Ships (1973) as modified by the Protocol of 1978 (MARPOL 73/78)

This Convention seeks to prevent ships from polluting the marine environment from operational or accidental causes; covers pollution by oil, chemicals, harmful substances in packaged form, sewage and garbage.

- ii. International Convention for the Safety of Life at Sea (SOLAS), Chapters I – XII. 1974 with amendments up to 2011

This Convention promotes the safety of merchant ships, modernizes regulations and keep pace with technical developments in the shipping industry.

Table 1.7.1: Overview of Legislations, Standards and Guidelines Relevant to offshore oil and gas industry

Subject	Legislation / Guidelines	Remarks
Planning, Permits and Approvals	<ul style="list-style-type: none"> i. Exclusive Economic Zone Act, 1984 ii. National Resources and Environment (Amendment) Ordinance, 2005 iii. PETRONAS Minimum Environmental Specification (MES), 2017 iv. PETRONAS Procedure and Guidelines for Upstream Activities (PPGUA 3.0), 2013 	-
Air Emission	<ul style="list-style-type: none"> i. International Conventions for the Prevention of Pollution from Ships (1973) as modified by the Protocol of 1978 (MARPOL 73/78) ii. PETRONAS Minimum Environmental Specification (MES), 2017 iii. PETRONAS Procedure and Guidelines for Upstream Activities (PPGUA 3.0), 2013 iv. Environmental Quality (Clean Air) Regulations 2014 	Prevention of Air Pollution from Ships PPGUA – Volume 7
Discharges to Sea / Water Quality	<ul style="list-style-type: none"> i. International Conventions for the Prevention of Pollution from Ships (1973) as modified by the Protocol of 1978 (MARPOL 73/78) ii. Exclusive Economic Zone Act, 1984 iii. Environmental Quality (Sewage) Regulations 2009 iv. Environmental Quality (Industrial Effluent) Regulations 2009 v. PETRONAS Minimum Environmental Specification (MES), 2017 vi. PETRONAS Procedure and Guidelines for Upstream Activities (PPGUA 3.0), 2013 	EQA is only applicable to areas within Malaysian territorial waters
Waste Disposal & Management	<ul style="list-style-type: none"> i. International Conventions for the Prevention of Pollution from Ships (1973) as modified by the Protocol of 1978 (MARPOL 73/78) 	-

Subject	Legislation / Guidelines	Remarks
	<ul style="list-style-type: none"> ii. Exclusive Economic Zone Act, 1984 iii. Environmental Quality (Scheduled Wastes) Regulations 2005 iv. PETRONAS Minimum Environmental Specification (MES), 2017 v. PETRONAS Procedure and Guidelines for Upstream Activities (PPGUA 3.0), 2013 	
Oil Spill & Emergency Response	<ul style="list-style-type: none"> i. Merchant Shipping Ordinance, 1952 ii. Environmental Quality Act, 1974 iii. Exclusive Economic Zone Act, 1984 iv. National Oil Spill Contingency Plan v. PETRONAS Minimum Environmental Specification (MES), 2017 vi. PETRONAS Procedure and Guidelines for Upstream Activities (PPGUA 3.0), 2013 vii. National Security Council, Directive No. 20 (MKN 20) 	-
Fisheries Protection	<ul style="list-style-type: none"> i. Protected Areas and Protected Places Act, 1959 ii. Petroleum Mining Act, 1966 iii. Fisheries Act, 1985 iv. State Fisheries Ordinance, 2003 (nearshore areas) 	-
Maritime Safety	<ul style="list-style-type: none"> i. Petroleum (Safety Measures) Act 1991, Act 302 ii. Malaysian Maritime Enforcement Agency Act, 2004 iii. International Convention for the Safety of Life at Sea (SOLAS), Chapters I – XII. 1974 with amendments up to 2011 	-
HSE Management	<ul style="list-style-type: none"> i. Occupational Safety and Health Act, 1994 ii. PETRONAS Minimum Environmental Specification (MES), 2017 	PPGUA – Volume 3

Subject	Legislation / Guidelines	Remarks
	iii. PETRONAS Procedure and Guidelines for Upstream Activities (PPGUA 3.0), 2013	

1.8 POLICY AND GUIDELINE COMPLIANCE

Any 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.

The requirements can be either statutory or non-statutory and from one or more national or state agencies and authorities. Adherence to the policies and legislations will ensure that the development is in line with the requirements of the authorities to avoid complications in the project approval process.

1.8.1 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.

Due diligence shall be undertaken in regards to policy compliance and study with the relevant agencies and government departments.

The Project Proponent and his team shall be required to engage with all the relevant national requirements and state agencies during the project planning stage.

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

Common requirements by other GAs may be shown in **Table 1.8.1** and **Table 1.8.2**. 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.

All policy and administrative matters and GA requirements at the national and state levels shall be cleared before proceeding with the EIA Report submission.

Table 1.8.1: Associated or Other Requirements Prior to EIA Submission

Agencies	Legal Requirements	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) Regional/Land Development Authority State Planning Committee (SPC) Local Authority (PBT)	Town and Country Planning Act 1976 (Act 172) and subsidiary regulations, order and guidelines	Approvals and/or supporting documents : <ul style="list-style-type: none"> • National and state development policies National Physical Plan • State Structural Plan • Local Plan • 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.

Table 1.8.2: 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 <i>Manual Penilaian Impak Sosial Bagi Projek Pembangunan Edisi Ke-2 2017</i>	To ensure that the project is in line with the structure/local plans and compatible with the surrounding land use. Approval for Social Impact Assessment (SIA), where applicable Approval of any project and activities within the ESA or limits by <i>Jawatankuasa Teknikal Pembangunan Kawasan Sensitif Alam Sekitar (KSAS)</i>
Department of Director General of Land and Mines (JKPTG) Land and Mines Office (PTG) District and Land Office (PTD)	National Land Code 1965 (Act 56) Territorial Seas Act 2012 (Act 750)	To ensure Project Proponent owns the land and land status is correct with its intended development type. 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. Requirement for relocation plan, conservation, etc. Wildlife management plan

Agencies	Legal Requirements	Outputs
Department of Fisheries (DOF)	Fisheries Act 1985 (Act 317)	Approvals and/or supporting documents: <ul style="list-style-type: none"> • Development in fishery zones. • Impacts on jetties, fish landing areas, artificial reefs, etc. • Impacts on fishermen livelihood. • Conservation of turtles, terrapins, etc.
Department of Irrigation and Drainage (DID) State Water Authority	Street, Drainage and Building Act 1974 (Act 133) State enactments on water resources, river basins and coastal areas	Approvals and/or supporting documents: <ul style="list-style-type: none"> • Hydraulic study • Coastal protection works. • Permission for river diversion. • Requirement for river reserves and coastal setbacks. • Storm water management (MSMA). • Erosion and Sediment Control Plan (ESCP). • Shoreline monitoring.
Marine Department of Peninsular Malaysia	Merchant Shipping (Amendment and Extension) Act 2007 (Act 1316)	Approval / permits / supporting documents for: <ul style="list-style-type: none"> • Marine Traffic Risk Assessment (MTRA) • marine navigation • vessel registration • issuance of notice to mariners • navigational aid • marine pollution control, etc.
Atomic Energy Licensing Board (AELB)	Atomic Energy Licensing Act 1984 (Act 304)	Approvals and/or supporting documents: <ul style="list-style-type: none"> • Radiological Impact Assessment (RIA), where applicable • Operation license

Agencies	Legal Requirements	Outputs
Local Authority (PBT)	Town and Country Planning Act 1976 (Act 172) and subsidiary regulations, order and guidelines	Approvals and/or supporting documents : <ul style="list-style-type: none"> • Development order • Earthwork plans • 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.

1.8.2 National and State Policies and Plans

The relevant policies and plans for new development are listed in **Table 1.8.3**. 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.

1.8.3 Guidelines and Guidance Documents

The EIA report shall also refer to the relevant guidelines and guidance documents issued by DOE and other Government Agencies (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 1.8.3: List of Policies and Plans Relevant to Petroleum Industry Development

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.
Integrated Shoreline Management Plans (ISMP) and Integrated Coastal Zone Management (ICZM) Plans (Various states and publishing dates)	Detailed study on requirements for coastal development and controls.
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 Environmental Impact Assessment (EIA) process.

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

Section 2.2: Environmental Screening

Section 2.3: Environmental Scoping

Section 2.4: Site Suitability Assessment

Section 2.5: Study Boundary

Section 2.6: Baseline Conditions

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

Section 2.10: Outlining of Mitigation Measures

Section 2.11: Preparation and Submission of TOR

2.2 ENVIRONMENTAL SCREENING

Environmental screening is carried out to ascertain whether a proposed activity is a Prescribed Activity under the Environmental Quality (Prescribed Activity) (Environmental Impact Assessment) Order 2015.

Proposed activities with regards to the petroleum industries are listed under both Schedule 1 and Schedule 2 of the EIA Order 2015. This is shown in the following **Table 2.2.1**.

Table 2.2.1: Screening Criteria For Determination Of A Prescribed Activity

Activity	Sub-activity
<p>Schedule 1 9. PETROLEUM</p>	<p>(a).Development of-</p> <ul style="list-style-type: none"> (i) oil field; (ii) gas field; or (iii) oil and gas field. <p>(b).Construction of 30 kilometres or more in length of-</p> <ul style="list-style-type: none"> (i) off-shore pipelines; (ii) on-shore pipelines; or (iii) off-shore pipelines and on-shore pipelines. <p>(c).Construction of-</p> <ul style="list-style-type: none"> (i) oil separation, processing, handling and storage facilities; (ii) gas separation, processing, handling and storage facilities; or (iii) oil and gas separation, processing, handling and storage facilities. <p>(d).Construction of product depot for the storage of petrol, gas or diesel which has the combined storage capacity of 60,000 barrels or more (excluding service station) within 3 kilometres from any commercial, industrial or residential area.</p>
<p><u>Schedule 2</u> 9. PETROLEUM:</p>	<p>(a).Construction of oil refineries. (b).Construction of gas refineries. (c).Construction of oil and gas refineries</p>

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.
- (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.

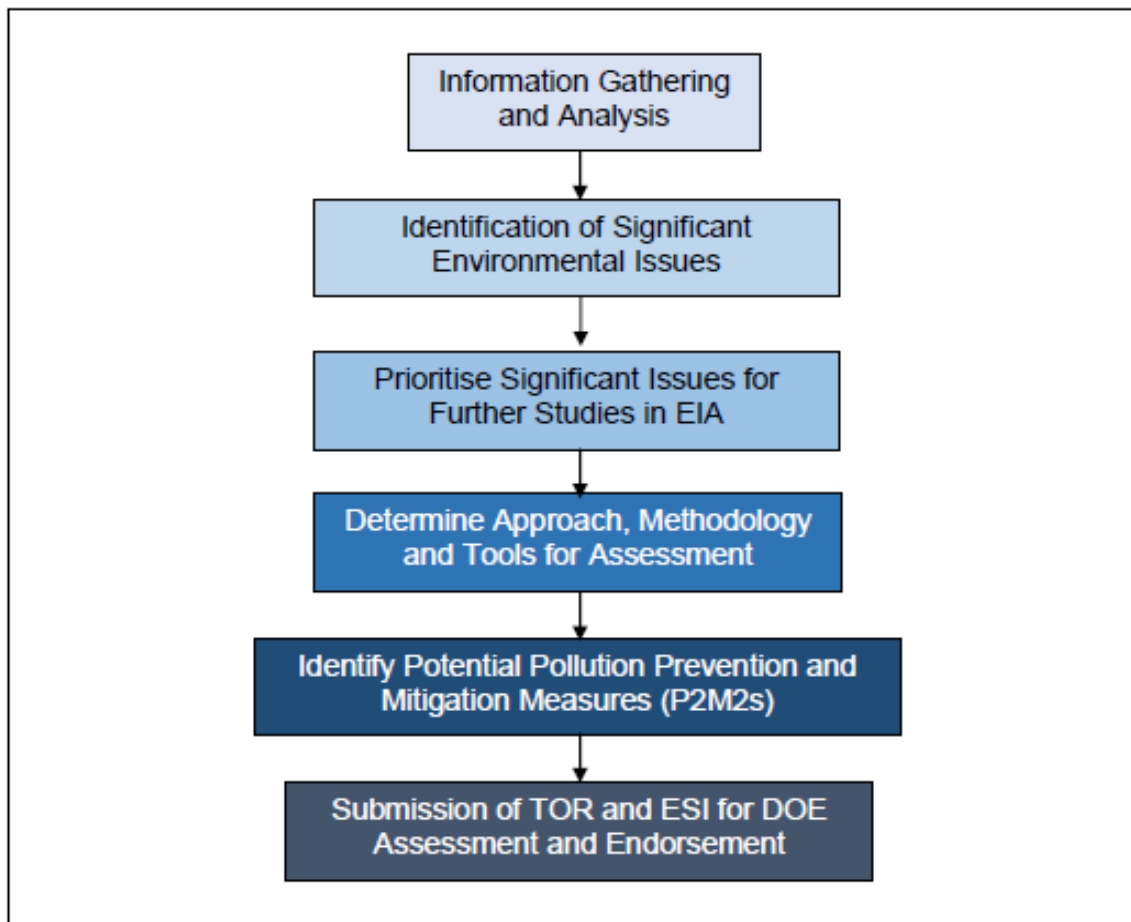
2.3 ENVIRONMENTAL SCOPING

The main objective of environmental scoping is to identify the environmental 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.

Scoping shall encompass all environmental aspects (physico-chemical, biological and human) 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 scoping exercise (also refer to **Figure 2.3.1**) comprises the following steps, which are elaborated on in the accompanying sections:

Figure 2.3.1: Flow Path for Environmental Scoping



- (i) Site Suitability Assessment (SSA): The SSA shall consider all alternatives or options to refine and improve upon the original concept design (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 (refer to **Section 2.5**).
- (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.

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

A site suitability assessment (SSA) shall be undertaken to assess the site's suitability. Options will be refined and finalised upon completion of SSA. The SSA is detailed in the EGIM (DOE, 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 scoping exercise will value add to this SSA through recommendations of pragmatic mitigation measures such as P2M2s and best management practices (BMPs), where potential environmental degradation is anticipated when developing in coastal areas and marine parks.

Table 2.4.1: Considerations in Project Alternatives and Options

Options	Considerations
Project Siting	<ul style="list-style-type: none"> • Adherence to national and state policies and guidelines. • Site constraints to the project and <i>vice versa</i>. • Location and proximity to sensitive receptors. • Buffer/setback availability and requirements. • Disaster risk factor (coastline). • Any alternative sites proposed for the project.
Terrain and Topography/ Bathymetry	<ul style="list-style-type: none"> • Conservational value. • Availability of land for setbacks and buffers. • Possibility of avoidance of unsuitable terrain. • Bathymetry of the site. • Type of coastal terrain and limitations. • Visual/aesthetic impacts.
Accessibility	<ul style="list-style-type: none"> • Access by land and sea. • Proximity to construction/source materials. • Strategic locational advantages.
Technology Options	<ul style="list-style-type: none"> • Availability of technology to minimise impacts. • Best available technology (BAT) options. • Benchmarking with alternative technology. • Green technology adoption. • Coastal and ecological protection requirements. • Marine resource protection requirements
Project Component and Design	<ul style="list-style-type: none"> • Adaptive design to suit terrain/bathymetry/sensitive areas. • Layout consideration. • Choice of construction methods.

Options	Considerations
Social Constraints	<ul style="list-style-type: none"> • Location within or close to existing communities. • Need for land acquisition and relocation. • Island and marine carrying capacity. • Availability of water resources. • Public access to coastal area. • Wetlands resources. • Tourism resources.
Economy and Finance	<ul style="list-style-type: none"> • Potential employment and business. • Cost and benefit considerations. • Supply and demand scenarios. • Potential loss of economy and income.
Operations	<ul style="list-style-type: none"> • Carrying capacity. • Allowable activities and zoning. • Adoption of best practices and green development concepts. • Tourist management. • Coastal and marine resources management.

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.

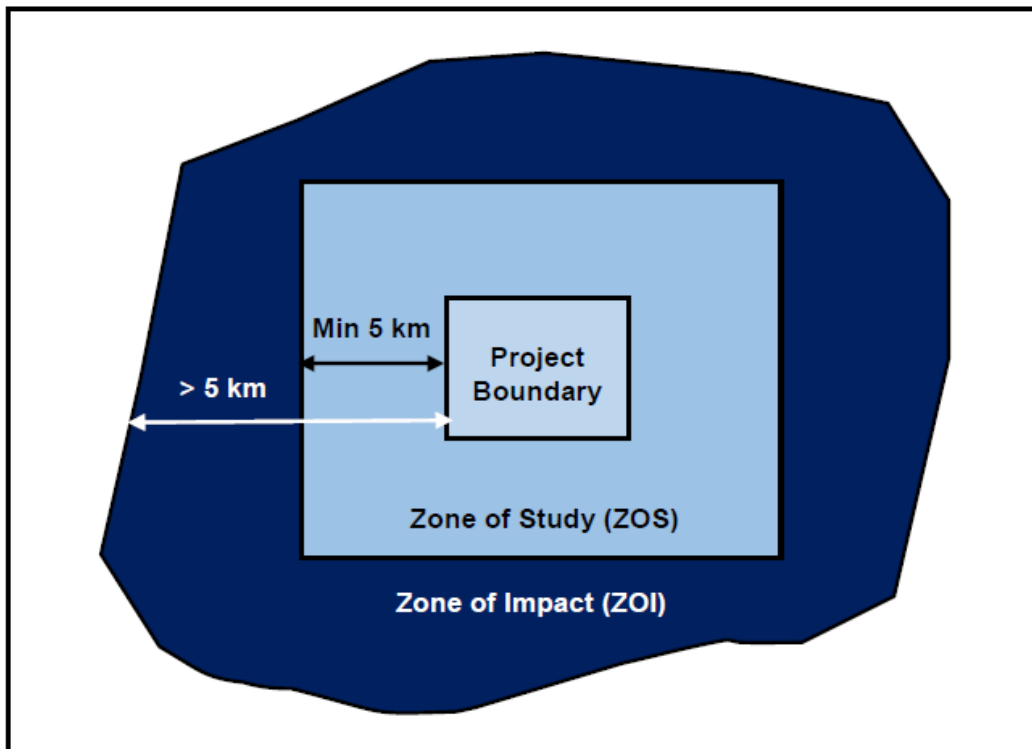
2.5 STUDY BOUNDARY

The study boundary is an important component in the EIA study. Two types of study boundaries shall be used:

- (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. If any of the items in the list are unavailable at the time of scoping, but is important to the EIA, it shall be recorded as items to be addressed at the EIA stage. Items irrelevant or insignificant to the project can and shall be omitted during environmental scoping.

2.7 DETERMINATION OF KEY PROJECT ACTIVITIES

Key Project Activities shall be defined by the Qualified Person(s) for the various project phases such as design and engineering, construction, commissioning, operations and maintenance, decommissioning and abandonment. The Qualified Person(s) shall consult with the Project Proponent who shall provide the necessary project details/ description.

Impacts due to the key activities will undergo preliminary assessment to determine its significance. Matrix table, desktop environmental risk identification and assessment shall be used to determine significance. Significant issues shall be studied in further detail during the EIA proper.

2.8 IDENTIFICATION OF SIGNIFICANT IMPACTS AND PRIORITY SETTING

An environmental scoping matrix can be used to predict the impact of a project on the environment. An environmental scoping matrix is normally presented in a 2-dimensional cross referencing:

- (i) The project activities which is deemed to have an impact to the environment; and
- (ii) The existing environmental component (encompassing physiochemical, biological and human environment) which can be affected by the project.

The matrix gives quantitative estimates of impact magnitude and significance which can then be combined with a weighing scheme to obtain a “Total Impact Score”.

A sample of the matrix is provided in **Appendix B**. These are not exhaustive and would vary project to project.

A Qualified Person shall complete the scoping exercise and matrix preferable with the Project Proponent's input such that the potential environmental impacts associated with the relevant project activities are anticipated and recorded.

From the output of the scoping matrix, a priority list of environmental impacts shall be determined for more in-depth assessment in the EIA stage.

The potential significant impacts related to the operation activities of an offshore and/ or on-shore facility listed below are not exhaustive. They are, in general, include the following:-

1. During Pre-Construction stage:-
 - Land use compatibility (for on-shore)
 - Surrounding sea use (greenfield, brownfield)
2. During Construction stage:-
 - Land or Sea Traffic hazards
 - Waste generation and management
 - Schedule waste management
 - Chemical spillage
 - Soil erosion and sedimentation
 - Dust and fumes
 - Influx of foreign workers
3. During Commissioning and Operation stage:-
 - Gaseous emissions
 - Discharge of process effluent
 - Environmental contamination due to accidental spills and leakages
 - Noise generation
 - Socio-economics impact- foreign workers, pressure on existing public infrastructure
 - Health and safety (especially pertaining to personnel and societal risk)

- Management of scheduled wastes
 - Risk of fire and explosion due to leakages / spillages due to material storage and handling.
 - Transportation of raw materials and products
4. Project Abandonment stage:-
- Management Waste and scheduled waste
 - Residual contamination
 - Site decommissioning and rehabilitation

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 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 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. 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
Air Dispersion Modelling	DOE	√	√
Water Dispersion Modelling	DOE / JPS	√	√
Noise Prediction Modelling	DOE	-	√
Quantitative Risk Assessment (QRA)	DOE / DOSH	√	√
Health Impact Assessment (HIA)	DOE / MOH	When applicable	√
Soil investigations (SI)	JMG / JKR	When applicable	√
Geotechnical Report	JMG / JKR	When applicable	√

Type of Studies	Government Agencies	Prescribed Activities	
		First Schedule	Second Schedule
Land use Compatibility	PLANMalaysia	When applicable	√
Social Impact Assessment (SIA)	PLANMalaysia	When applicable	√
Traffic Impact Assessment (TIA)	JKR	When applicable	√
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.

After the priority list of environmental impacts is determined from the scoping phase, the Qualified Person and the Project Proponent shall consider the Pollution Prevention and Mitigation Measures (P2M2) or generally referred to as the best management practices shall be included when assessing project alternatives for on-shore activities

Table 2.10.1: Typical Project Alternatives and P2M2 Considerations For Offshore and Onshore Petroleum Establishment and Pipeline Project

Options	P2M2 Considerations
Project siting	Consider alternative siting with better suitability of the below: <ul style="list-style-type: none"> • Locations and proximity of sensitive receptors • Buffer zones / setback • Compatibility with the local land uses / neighbours • Risk consideration • Existing infrastructure tie-in / availability • Proximity to human settlement / sensitive receptors • Proximity to any cultural heritage
Terrain / Topography	Consider alternatives of: <ul style="list-style-type: none"> • To maximise usage of the existing terrain to minimize earthworks on site and import of soil / minimize land reclamation. • Avoidance of unsuitable terrain.
Technology option	Consider alternatives of: <ul style="list-style-type: none"> • Available technology options of higher efficiency • Clean technology option • Best Available Technology (BAT) options • Options to minimize plant resources – electricity / water / natural gas consumption. Recycling of resources. • Technology options to reduce pollution to the environment
Existing Environment	Consider alternatives of: <ul style="list-style-type: none"> • Minimize impact to the existing carrying capacity of receiving water bodies (if there is industrial effluent discharge) • Minimize impact to the existing air shed (if there is emission discharge) • Minimize disturbance to any natural ecosystem nearby the project site.

Options	P2M2 Considerations
Social Economy	Consider options to minimize: <ul style="list-style-type: none"> • Land acquisition. • Pressure on the existing infrastructure
No Project Option	Consider the benefits of no project and also the loss of potential benefits including social-economic and other development benefits brought by the project.

Included in the discussion should be the “no project” option. This is an opportunity for the assessor to highlight any social, economic or environmental benefits that may accrue from the project and which would be denied to the community if the project was abandoned.

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 (DOE, 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/Project Leader/Manager who shall be responsible for the EIA report.

- (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 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 (ESAs) 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 (DOE, 2016).

2.11.2 TOR Adequacy Check Process

A review shall be carried out by the EIATRC comprising the DOE officers and appointed individuals (AIs) and/or GAs. The TOR Adequacy Check (TORAC) requirements and procedures shall follow the requirements as detailed out in the EGIM (DOE, 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).

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).

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

2.12 STAKEHOLDER ENGAGEMENT

2.12.1 Introduction

Stakeholder engagement is the process by which an organisation approach the project affected people to solicit their perception and opinion of the project. This is vital for those who may be affected by the decisions it makes, or can influence the implementation of its decisions. DOE has specified the need to engage with stakeholders at the beginning of the EIA preparation.

Hence among the vital task prior to EIA preparation is to identify relevant parties from governmental agencies, local community and particularly potentially affected receptors. The conduct of on-shore and off-shore stakeholder participation and engagement would be similar.

Additional engagements: While it is only mandatory for the Second Schedule EIA for official public engagement, all comments are useful in the EIA study. The Project Proponent is encouraged to carry out stakeholder engagements voluntarily even for the First Schedule EIA.

Documentation: The public participation process shall be properly documented and reported in the EIA. The report shall 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).

The report 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.

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 zone of impact (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 (FGDs), 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.

2.12.2 Stakeholder Identification

The Stakeholders are:

- (i) People affected by the impact of a project;
- (ii) People who can influence the impact of a project.
- (iii) The government authority who has jurisdiction over the project or the impact caused by the Project

Stakeholders can be individuals, groups, a community, a governmental or private institution. For the petroleum industries, potential stakeholders are shown in **Table 2.12.1**.

Table 2.12.1: Stakeholders and their Role and Interest

Impacts	Role	Interest
1. Project Proponent/ EIA Consultant	Plan, develop and/or manage the project or plant	Economic viability and safety
2. Investor	Investor in industrial project	How impacts affect viability of project and liabilities to be incurred
3. Department of Environment	Decision of EIA Reports	Extent of potential impacts and solutions to mitigate impacts to acceptable levels
4. JPBD, State Planning Unit	Zoning and land use	Extents of impacts the project has on land use and adjacent development
5. Approving Authority	Project Approval	Impacts are to be within acceptable levels with no significant residual issues
6. Local Authority	Zoning and development control	Extent of impact the project has on land uses and adjacent developments
7. Local Community	Protection of local interests	Impacts of projects and how they affect the quality of life
8. Fisheries and Marine Departments	Relevant inputs in the protection of marine life, safety and navigation	Implication on the fishing ground and other marine life, and navigation safety
9. Other Government Agencies (NREB, EPD, DID, JKR)	Relevant inputs in respect areas of expertise	Implications on other projects or activities in which they have interest or wish to promote
10. NGOs	Input and feedback on issues of special interests.	Impacts on surrounding communities and ecosystem

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 to engage for the project.

Stakeholder identification is a process that need to be carried out at the beginning of the Project planning. These stakeholders may affect and influence the decision and overall planning of the Project hence to ensure all the stakeholders are correctly identified in the beginning. The stakeholders may hold the interest of the project directly and indirectly.

Project Proponent and Investor have direct interest in the project due to investment in term of cost and time allocated for the Project. They have invested in the plan, development and overall management of the Project. They may also set certain target and timeline in their planning. In addition, their interest lies in overall economic viability and safety of the Project.

Governmental agencies will be involved directly in the Project if their jurisdiction of work in which the stipulated requirement and guidelines as well as process and procedures will have to be incorporated to the Project, namely planning, designing and overall implementation. In addition, their input may take into account surrounding or other development similar or potentially affected by the Project.

Local community and affected receptors of the Project may have to be engaged due to protection of local interests as such project may affect their quality of life in term of their wellbeing, property evaluation.

2.12.3 Methods of Engagement

There are a few engagement method. Among them are:

- (i) Interviews
- (ii) One-on-one interviews (including telephone)
- (iii) Semi-structured interviews
- (iv) Focus/working groups
- (v) Questionnaire
- (vi) Town meetings
- (vii) Conferences/forums/symposia/workshops

Engagement with the public is recommended to be initiated with head of community. For local community, early engagement can be done through contacting the head of community, e.g. Ketua Kampung, Penghulu, Head of Housing Association.

Timing of the engagement is also an important process in the EIA. Stakeholder engagement shall be conducted in 2 phases in the EIA study.

Phase 1: During the scoping stage of the TOR compilation stage so that input from relevant agencies can be solicited and being taken into account in the scoping exercise and incorporated into the EIA study at an early stage.

Phase 2: During the draft of the EIA report. This is so that the stakeholders and relevant agencies are being briefed on the outcome of the EIA study and of any impact which will affect the area of their jurisdiction

2.12.4 Documentation and Reporting

All engagements need to be recorded and attached in the TOR and EIA report. The reporting should include the following:

- (i) Names and position of participant
- (ii) Time and date
- (iii) Agenda
- (iv) Result of discussion

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 (see **Appendix C** for typical examples).

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.

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 [Department of Environment (DOE) Notice 1/2012 dated 6 Jan 2012]. References for all maps, photos and diagrams will also need to be included in the EIA.

3.2.2 Primary Data Collection

Primary data is collected to fill in gaps in information or to obtain first hand data for detailed assessment. Common methodologies include site surveys and sampling programmes at site and off site.

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.

3.2.3 Environmental Components and Indicators

Table 3.2.1 lists the likely environmental components and indicators to be described for baseline conditions. Sources to obtain the required information are also indicated in **Table 3.2.1**.

The baseline conditions may be described qualitatively but shall be sufficiently adequate to assess the potential impacts on the sensitive receptors. Quantitative data wherever available, should be provided to support the impact assessment.

Table 3.2.1: Environmental Components and Indicators

Components	Descriptions	Sources of Information
Physico-chemical Environment		
Topography / Bathymetry	Topography and slopes Bathymetry, coastal areas and landforms Description of accreting or erosional areas	Topography maps by JUPEM Nautical charts from National Hydrographic Centre National Coastal Erosion Study 2015 Field surveys
Soil	Type and characteristics Porosity and permeability Runoff rate and infiltration capacity Effective depth Inherent fertility	Soil map by Department of Agriculture Soil investigation (SI) report
Geology	Local and regional geology Underlying rock type, texture Geological structures (fault lines, shear zones, etc.) Geological resources (minerals)	Geological maps by JMG Geology investigation report
Drainage	Natural drainage patterns and network Rainfall runoff relationships Hydrogeology patterns and network Groundwater characteristics Floodplains	Topography maps by JUPEM Hydrology maps by DID Hydrogeology reports from JMG Field survey

Components	Descriptions	Sources of Information
Climate	Rainfall data and patterns Ambient temperature data and patterns Relative humidity data and patterns Wind data and patterns Extreme events (floods, droughts) Climate change projections Stability conditions and mixing height	Malaysian Meteorological Department (METMalaysia)
Water Quality	Surface water quality (rivers, lakes, ponds), water depths., flow rates Groundwater quality, water table, local aquifer storage capacity, specific yield, specific retention, water level depths and fluctuations, etc. Marine water quality, water depths, flow rates Existing sources of water pollutions Existing drinking water intake points and water treatment plants	Published reports by DOE and DID State's water resources department State's potable water provider Field surveys
Ambient Air Quality	Trending of ambient air quality Existing sources of air pollutions	Published reports by DOE Field surveys
Ambient Noise	Locations of high noise generators	Published reports by DOE Field surveys
Ambient Vibration	Locations of high vibration generators	Field surveys

Components	Descriptions	Sources of Information
Biological Environment		
Ecosystem	<p>Description of existing ecology and habitats</p> <p>Identification of ESAs and conservation areas (forest reserves, wetlands, mangroves, wildlife reserves, etc.)</p> <p>Presence of endemic, rare, threatened, endangered and near extinct species</p> <p>Species composition</p> <p>Flora – type, density, exploitation etc.</p> <p>Fauna – distribution, abundance, rarity, migratory, species diversity, habitat requirements and resilience, economic significance, commercial value, etc.</p> <p>Fisheries – migratory species, species with commercial / recreational value</p>	<p>Published literatures</p> <p>Research papers, publications and inventory data from PERHILITAN, Department of Fisheries (DOF) and Forestry Department Peninsular Malaysia (JPSM).</p> <p><i>Buku Kawasan Sensitif Alam Sekitar</i> (DOE)</p> <p>Field observations</p>
Human Environment		
Land use	<p>Land use maps (within 500m radius, 1km radius, 3km radius and 5km or beyond) and photos</p> <p>Identification of ESAs</p> <p>Future land use map</p>	<p>Topography maps</p> <p>Aerial or satellite imagery</p> <p>National Physical Plan, structure and local plans by PLANMalaysia and PBT</p> <p>Field surveys</p>
Public Health	<p>Morbidity and mortality statistics</p> <p>Chronic and infectious disease indicators</p> <p>Availability of public health facilities</p>	<p>Data from Ministry of Health (MOH)</p> <p>Field surveys</p>

Components	Descriptions	Sources of Information
Socio Economic	<p>Details of demographics</p> <p>Local economic profile</p> <p>Feedback from stakeholders engagement</p>	<p>Census data from Department of Statistics</p> <p>Local plans from PBT</p> <p>Local profile reports from community leaders</p> <p>Reports on stakeholders engagements</p> <p>Field surveys</p>
Heritage, Culture and Archaeology	<p>Locations of historical and cultural sites</p> <p>Description of heritage and cultural practices</p>	<p>Published literatures</p> <p>Research papers, publications and data from Department of Museums, National Heritage Department, JAKOA, etc.</p> <p>Local plans from PBT</p> <p>Local profile reports from community leaders</p> <p>Reports on stakeholders engagements</p> <p>Field surveys</p>
Road Network and Traffic	<p>Access to project site</p> <p>Condition of access roads</p> <p>Traffic data</p>	<p>Published traffic data by the Public Works Department (JKR)</p> <p>Road maps</p> <p>Field surveys</p>
Infrastructure, Utilities and Amenities	<p>Water, steam and electricity sources and capacity</p> <p>Sewerage and waste management facility and capacity</p> <p>Telecommunication provider and capacity</p>	<p>Information from utility providers</p> <p>Local plans from PBT</p>

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.

3.3 BASELINE MONITORING

The development of a petroleum project shall require adequate primary baseline data collection for ambient air quality, water quality and ambient noise and vibration.

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 test parameters, test methods, monitoring locations and criteria for comparison for ambient air quality, water quality, ambient noise and vibration for a petroleum project.

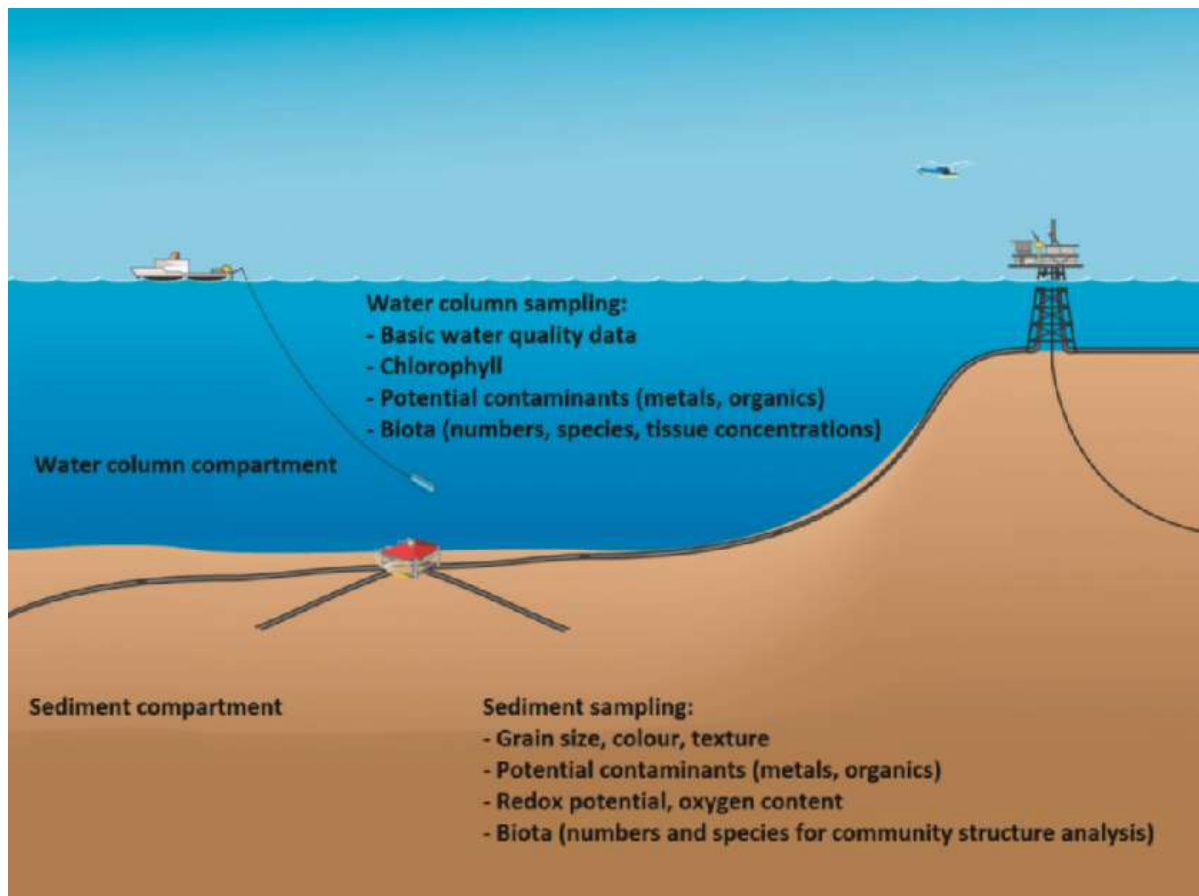
3.3.1 Offshore

Offshore oil and gas projects differ in size, complexity and environmental sensitivity and these factors should be taken into account when deciding on the baseline monitoring program. For instance, a single drilling well with no evidence of significant surrounding biological communities does not require the same level of assessment as a 20 drilling well programme near sensitive marine habitats. Hence, the environmental baseline program for the EIA should be “fit for purpose” tailored to the requirements of local regulatory regime and the environmental sensitivity of the project.

The EIA shall focus on the core aspects of pollution in DOE’s key functional areas, i.e. water, air and wastes. Baseline information on these three functional areas are needed to determine the state of the marine environment before, during and after project implementation when benchmarked against the DOE standards and well as international or petroleum industry standards if national standards are not available.

For primary data collection in offshore environment, the emphasis is often placed on the water column and sediment compartments. **Figure 3.3.1** illustrates these two compartments and the parameters that are usually considered in a baseline monitoring program.

Figure 3.3.1: Environmental Compartments Sampled in Offshore Environmental Baseline Survey



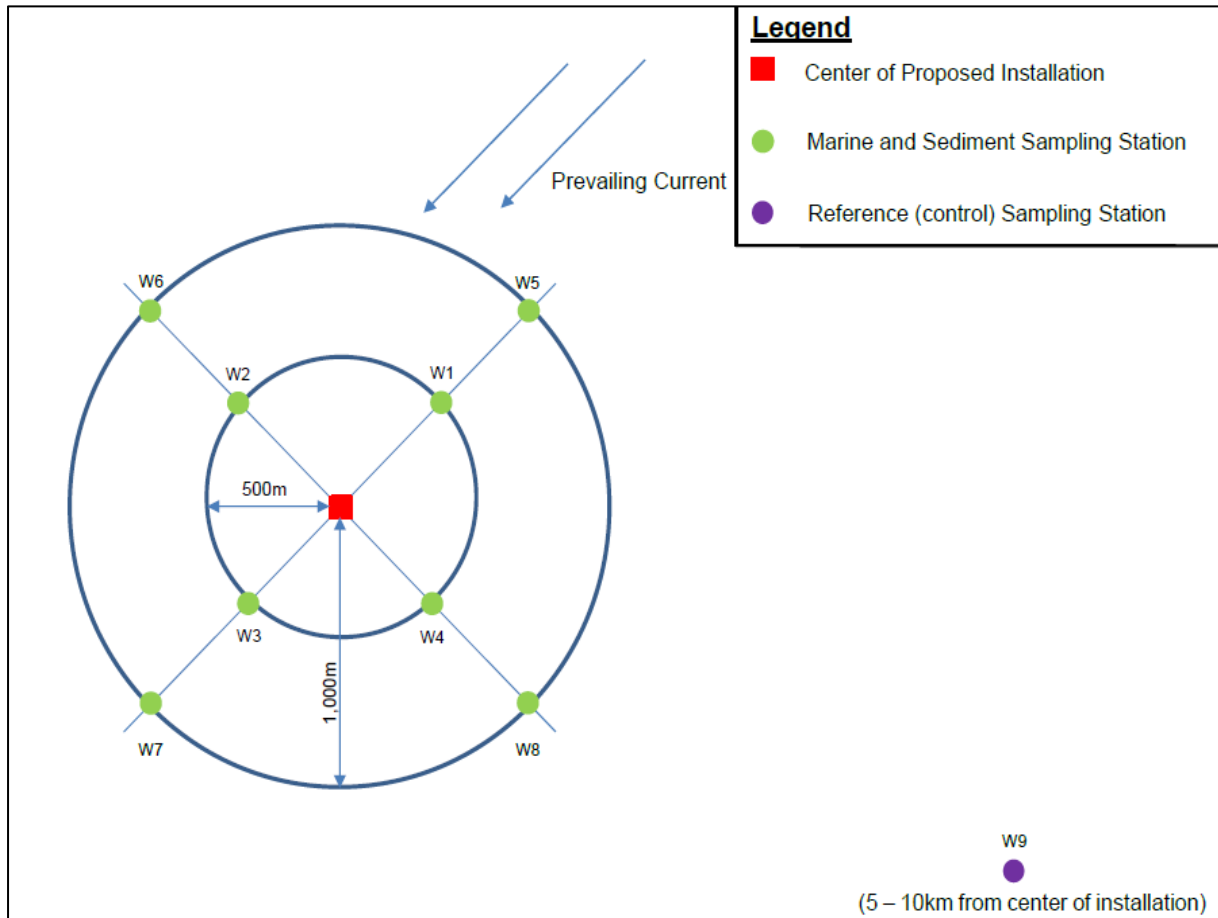
(Source: International Association of Oil and Gas Producers, 2012)

Location of Sampling Stations

Sampling stations shall be selected based on the proposed locations of the platform and pipeline route to characterise the environmental conditions of the Project area. One reference (control) station should also be identified.

For offshore projects where the planned installations are known, a radial transect design is usually adopted. A typical standard sampling plan generally considers eight (8) stations set along two (2) orthogonal axis on the plan site of installations. One (1) axis is oriented along the direction of the prevailing currents. On each axis, the stations are placed at a distance of 500 m and 1,000 m from the centre of the installation. One (1) reference station, as a minimum is placed at a distance between 5 km and 10 km from the centre of the installation, in the opposite direction to that of the prevailing currents. (Refer to **Figure 3.3.2**)

Figure 3.3.2: Typical Radial Transect Design for Offshore Sampling



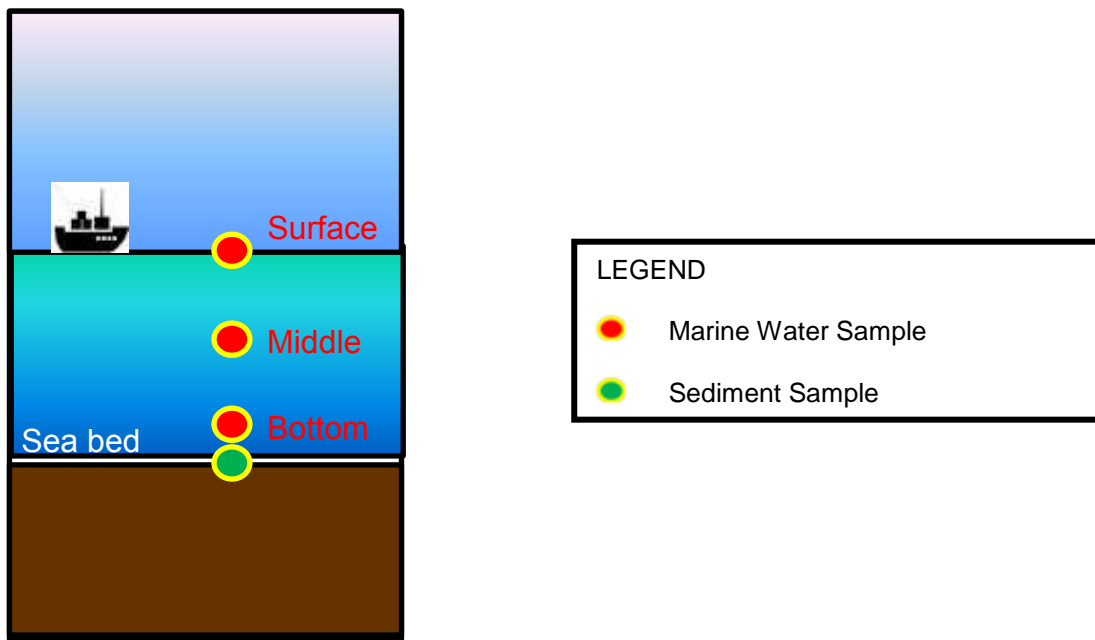
If a pipeline construction is planned, sampling stations at regular intervals shall be placed along the pipeline route. A minimum of five (5) stations should be provided for a 200 km offshore route, with extra stations in sensitive zones and in particular for the shore approach.

Marine Water Quality

Marine water samples for laboratory analysis and in-situ measurements for each sampling station should be taken at three (3) depths to assess water quality throughout the water column: surface, mid-depth (along water column) and near bottom (**Figure 3.3.3**).

A profile of the water column should be recorded in-situ at each sampling station for measurement of temperature, salinity/conductivity, pH, dissolved oxygen and turbidity. This is usually done with a multi-parameter probe.

Figure 3.3.3: Marine Water and Sediment Sampling



Marine water for laboratory analysis should be collected using a water sampler, e.g. Van Dorn water sampler. Appropriate plankton nets should be used for sampling marine planktons. For example: 100 – 200 micron for collection of zooplankton and a 10 – 20 micron net mesh is used for collection of phytoplankton.

The standard list of parameters to be analysed for marine water are as shown in **Table 3.3.1**.

Table 3.3.1: Typical List of Parameters for Marine Water

Component	Test Parameters
Water Mass Properties	Salinity, pH, Total Suspended Solid, Temperature, Dissolved Oxygen, Turbidity
Organic Content	Total Organic Carbon
Hydrocarbon	Total Hydrocarbon, Total Petroleum Hydrocarbon (TPH), Polycyclic Aromatic Hydrocarbon (PAH), Oil and Grease
Nutrients	Ammoniacal-N, Nitrate-N, Total Nitrogen and Total Phosphate

Component	Test Parameters
Heavy Metals	Barium, Cadmium, Chromium, Copper, Cobalt, Iron, Nickel, Mercury, Lead, Vanadium, Zinc
Biological	Chlorophyll a, Phytoplankton and Zooplankton

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

Sediment Quality

Baseline chemical composition of bottom sediments should be established for future monitoring and reference purposes. Sediment and benthic invertebrate sampling can be carried out simultaneously. A benthic sediment-sampling device that is suited to the sediment type, such as a Smith-McIntyre or Day grabs is usually used for water depths less than 200m. In deeper waters, a Box Corer is typically used.

The grab is lowered relatively quickly with a mechanical winch to the sea floor. The grab is then pulled slowly up and the sediment released into a bowl before taking the amount required in a labelled sample container.

Sieving shall be carried out immediately to separate the benthic invertebrates from the sediment through a series of sieves. The smallest sieve should be 0.5mm for macro benthos collection. All debris collected in the sieves should be collected and placed in 70% ethanol for later sorting under a microscope. Small spoons and tweezers are best used to collect the debris from the sieves. Fine pointed tweezers are best for collecting the small oligochaetes and crustaceans. Any macro benthos found can be placed in a separate container of 70% ethanol. The samples once collected should then be sent for identification. At least 0.1m² of bottom sediments should be collected for chemical analysis and a minimum of 0.3m² for benthos analysis.

A total of four (4) grabs is recommended to be collected from each station. Three (3) grabs for macro benthos from each station will be collected while one (1) grab is used for physical and chemical analysis. **Table 3.3.2** suggests typical test parameters for sediment.

Table 3.3.2: Typical Parameter List for Seabed Sediment

Component	Test Parameters
Physical Properties	Redox potential (measured <i>in-situ</i>), Particle Size Distribution
Organic Content	Total Organic Carbon
Hydrocarbon	Total Hydrocarbon, Total Petroleum Hydrocarbon (TPH), Polycyclic Aromatic Hydrocarbon (PAH)
Heavy Metals	Barium, Cadmium, Chromium, Copper, Cobalt, Iron, Nickel, Mercury, Lead, Vanadium, Zinc
Biological	Macro benthos

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

All samples shall be analysed by accredited laboratory. All analytical certificates and data shall be included in the EIA Report as supporting evidence (DOE Notice 1/2012 dated 6 January 2012).

Seabed Characteristics: Underwater Imagery

If the project area has been previously identified to have potentially interesting seafloor anomalies, underwater imagery through a Drop-Down Camera shall be used to record the seafloor environment and biological communities (with focus on corals) of the area.

3.3.2 Onshore

On the other hand, the list of important physical environmental components and indicators of baseline data for on-shore activities are suggested in the following sections.

Ambient Air Quality

Some petroleum project has the potential to emit air pollutants from various sources and activities, such as its processes and storage facilities.

Test Parameters and Methods

The sampling and testing methods to determine the concentrations of ambient air pollutants shall be based on standard methods acceptable to DOE. Typical examples of ambient air test parameters and sources of test methods are tabulated as **Table 3.3.3**.

Table 3.3.3: Examples of Ambient Air Test Parameters and Methods

Test Parameters	Sources of Test Methods
Particulate Matter 2.5 Micron (PM _{2.5}) (for project with combustion processes)	Australian / New Zealand Standard (AS/NZS) Method US EPA Method
Particulate Matter 10 Micron (PM ₁₀)	
Nitrogen Dioxides (NO ₂)	
Sulphur Dioxide (SO ₂)	
Ozone (O ₃)	
Carbon Monoxide (CO)	
Hydrogen Chloride (HCl)	
Ammonia (NH ₃)	
Chlorine	
Mercury	
Hydrogen Sulphide (H ₂ S)	
Volatile Organic Compounds (VOC)	

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.

Monitoring Locations

A minimum of three (3) locations with the following justifications are recommended. Additional monitoring locations should be considered if there are more of sensitive receptors nearby.

- (i) At project site
- (ii) Upwind of the project site based on reference to long term wind rose data
- (iii) Downwind of the project site

Other considerations for additional ambient air monitoring locations and frequencies, are season and climatic changes (dry and wet seasons), and pollution sources from other current activities surrounding the area.

Criteria for Comparison

The measured concentrations of air pollutants shall then be compared and evaluated against the New Malaysia Ambient Air Quality Standard (**Appendix D**).

For ambient air parameters that are not listed in the New Malaysia Ambient Air Quality Standard, references should be made to other applicable standards or guideline limits prescribed internationally (e.g. International Finance Corporation (IFC) and Arizona Ambient Air Quality Guidelines).

Water Quality

During the construction stage, activities such as earthworks and civil construction works may contribute to increase of sediment in the runoff water due to soil erosion, generation of sewage and accidental spills during petroleum or chemical handling. Meanwhile during the operation stage, process effluent, wash water, generation of sewage and accidental spills are potential sources of water pollutants.

Uncontrolled water pollutants may contaminate the surface water, groundwater and / or ultimately the marine water.

Test Parameters and Methods

The sampling and testing methods to determine the concentrations of water pollutants shall be based on standard methods acceptable to DOE. Typical examples of surface water test parameters and sources of test methods are tabulated as **Table 3.3.4**.

Table 3.3.4: Examples of Water Test Parameters and Methods

Test Parameters	Sources of Test Methods
Surface Water	
Temperature, pH, Conductivity, Dissolved Oxygen, Total Suspended Solids, BOD ₅ , COD, Oil and Grease, Total Organic Carbon, Ammoniacal Nitrogen, Nitrate, Phosphorus, Mercury, Cadmium, Lead, Chromium, Copper, Nickel, Zinc, Arsenic, Silver, Cyanide Total Coliform, Faecal Coliform	Standard Methods for the Examination of Water and Wastewater by APHA US EPA Method
Groundwater	
Water level, Temperature, pH, Conductivity, Dissolved Oxygen, Oxidation Reduction Potential, LNAPL Detection, Oil and Grease, Total Organic Carbon, Total Petroleum Hydrocarbon, Aromatic Volatile Organic Compounds (BTEX), Chlorinated Hydrocarbon, Polycyclic Aromatic Hydrocarbon, Ammoniacal Nitrogen, Nitrate, Phosphorus, Mercury, Cadmium, Lead, Chromium, Copper, Nickel, Zinc, Arsenic, Silver, Cyanide	Standard Methods for the Examination of Water and Wastewater by APHA US EPA Method

Marine Water	
Temperature, pH, Conductivity, Dissolved Oxygen, Total Suspended Solids, Oil and Grease, Total Organic Carbon, Polycyclic Aromatic Hydrocarbon, Ammonia (unionised), Nitrate, Nitrite, Nitrogen, Phosphate, Phenol, Mercury, Cadmium, Lead, Chromium VI, Zinc, Arsenic (III), Cyanide, Tributyltin, Faecal Coliform	Standard Methods for the Examination of Water and Wastewater by APHA US EPA Method

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.

Monitoring Locations

Sampling locations should cover the potential waterbodies that will be receiving discharges from the project site. Selection of sampling locations should include sensitive receptors such as water intake point, agricultural and aquaculture farming, and residential area where villagers may use water from the affected waterway for their daily uses, including groundwater.

A minimum of three (3) locations with the following justifications are recommended and additional monitoring locations should be added for water sensitive receptors downstream, where applicable.

- (i) Upstream of the project site or point of interest (e.g. location of tank farm for groundwater sampling): minimum 1 sample point
- (ii) At the receiving point of project's discharge or location of interest (e.g. tank farm location): 1 sample point
- (iii) Downstream of the project site or point of interest: minimum 1 sample point
- (iv) At any other water sensitive receptor locations

Where waterbodies are influenced by tides, sampling during flood tide and ebb tide should be carried out. In this case, water monitoring at water sensitive receptors upstream of the project site should be considered as well.

Other considerations for water monitoring locations and frequencies, are season and climatic changes (dry and wet seasons), monsoon changes, spring and neap tides, other natural changes such as sedimentation and ecological succession, and pollution sources from other current activities surrounding the area.

Criteria for Comparison

Water quality analysis results should be compared and evaluated against the national standards and guideline levels where available.

References for surface water quality and marine water quality are the Malaysia National Water Quality Standard and Malaysia Marine Water Quality Criteria and Standard as presented in **Appendices F** and **G** respectively. Groundwater quality should be evaluated against the Site Screening Levels (SSLs) as presented in the Contaminated Land Management and Control Guidelines No. 1: Malaysian Recommended Site Screening Levels for Contaminated Land, Nov 2015 by DOE Malaysia.

Ambient Noise and Vibration

Noise is defined as unpleasant and unwanted sound that may annoy human and high noise level may damage human's hearing or cause mental stress.

Vibration normally arises from rotating machineries such as fans and turbines, impact activities such as piling as well as from vehicular movement. High vibration level may annoy human or cause mental stress, and damage structures.

Test Parameters and Methods

The measurement methods to determine the ambient noise and vibration levels shall be based on methods acceptable to DOE. Noise and vibration parameters and requirement of test meters are as tabulated as **Table 3.3.5**.

Table 3.3.5: Examples of Noise and Vibration Parameters and Methods

Test Parameters	Sources of Test Methods
Ambient Noise: Leq, Lmin, Lmax, L90, L10 in dBA	ISO 1996
Vibration: Peak particle velocity be measured simultaneously in the three orthogonal x, y, z axes, computed vectorial sum	ISO 2631 BS 6472 DIN 4150

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.

Monitoring Locations

Common noise monitoring locations are:

- (i) Plant or project boundaries
- (ii) Noise sensitive receptors such as resident areas, hospitals, institutions / schools etc.

Vibration monitoring should be conducted at the nearest building to the vibration source and the best position should be on the floor slab or foundation. However, baseline vibration monitoring locations are commonly at:

- (i) Plant or project boundaries
- (ii) Vibration sensitive receptors such as resident areas, heritage building / sites, hospitals, institutions / schools etc.

Criteria for Comparison

Water quality analysis results should be compared and evaluated against the national standards and guideline levels where available.

Measured baseline noise and vibration levels should be compared and evaluated against guideline limits specified by DOE in the followings:

- The Planning Guidelines For Environmental Noise Limits and Control (Book 1 of 3), Schedule 1 to Schedule 9 of Annex A: Schedule of Permissible Sound Levels.
- The Planning Guidelines for Vibration Limits and Control in the Environment (Book 3 of 3), Schedule 1 to Schedule 6 of Annex A: Schedule of Recommended Vibration Limits.

CHAPTER 4

ENVIRONMENTAL IMPACTS 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 petroleum project.

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 (proprietary 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 PRESCRIBED ACTIVITY AND KEY ISSUES

These are the key issues in terms of potential negative impacts, proposed mitigation and residual negative impacts should be addressed. However, this is not exhaustive as the actual site has to be assessed too. **Appendix G** provides examples of potentials impacts.

4.2.1 Oil and Gas Field Development

This Section covers onshore and offshore oil and gas fields' development. "Offshore" in the context of this Guideline shall be defined as the waters 12nm from the lowest low tide level to the 200 nm Exclusive Economic Zone limit.

For developments that fall within the Malaysian territorial waters, the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order, 2015 applies. Hence, an EIA study is mandatory.

On the other hand, prescribed activities that fall within the Exclusive Economic Zone do not fall under the EIA Order 2015. However, for those that fall within the EEZ Act (Section 9, 21 (i) and 22), an EIA study is generally required by virtue of an administrative arrangement within the Federal Government (Ministry of Natural Resources, Ministry of Domestic Trade Co-operatives and Consumerism and the Marine Department).

Among typical activities may include:

- (i) A field development with one platform and interconnecting pipeline(s).
- (ii) A field development with multiple platforms and interconnecting pipelines.
- (iii) A regional (acreage/block) development with multiple fields and interconnecting pipelines.
- (iv) A near shore development (example, platform or field development within territorial waters).
- (v) Any additional requirements due to the environmental sensitivity of the area.

Typical key issues of concern in an offshore field development include:

- (i) Air quality
- (ii) Water quality
- (iii) Waste management
- (iv) Noise level
- (v) Socio economic

With regards to onshore oil and gas field development in Malaysia, it is still mostly exploratory. Additional key issues could include risk assessment and soil erosion and sedimentation. Risk Assessment should refer to DOE's Risk Assessment Guideline whereas erosion and sedimentation should refer to DOE's LDP2M2 Guideline.

4.2.2 Construction of Onshore and Offshore Pipelines

For pipeline development that fall within Malaysian territorial waters and on land, the Environment Quality (Prescribed Activities) (EIA) Order, 2015 applies. However, for those in the EEZ, EIAs are also required by virtue of an administrative arrangement between the Ministry of Energy, Science, Technology, Environment and Climate Change, Ministry of Domestic Trade Co-operatives and Consumerism, and the Marine Department

The typical main phases of a pipeline development project include:

- (i) Route selection i.e. bathymetry and seabed study on offshore pipelines route, RoW assessment for on-shore pipeline;
- (ii) Pipeline systems, features and design;
- (iii) Pipeline installation;
- (iv) Pipeline operation;
- (v) Pipeline inspection and maintenance; and
- (vi) Pipeline abandonment

Typical key issues include:

Onshore

- (i) Air quality
- (ii) Water quality
- (iii) Waste management
- (iv) Noise level
- (v) Socio economic
- (vi) Risk assessment

Offshore

- (i) Water quality
- (ii) Waste management
- (iii) Socio economic
- (iv) Risk assessment

Risk assessment should be undertaken for pipeline development and reference should be made to DOE's Risk Assessment Guideline whereas erosion and sedimentation should be refer to DOE's LDP2M2 Guideline.

4.2.3 Construction Of Oil And Gas Separation, Handling And Storage

The construction of facilities involved with separation of oil and gas, and processing which produces products, either in gaseous or liquefied form, such as natural gas, crude oil and condensate.

Typical site facilities usually consist of but not limited to the following:

- (i) Oil and gas separation units which include crude oil stabilization facilities;
- (ii) Gas processing unit which may include gas liquefying units;
- (iii) Handling facilities for sale of products that may be located on land or water next to the processing facility; and
- (iv) Storage facilities such as tanks located at site.

Typical key issues include:

- (i) Air quality
- (ii) Water quality
- (iii) Waste management
- (iv) Noise level
- (v) Public health
- (vi) Socio economic
- (vii) Risk assessment

Risk Assessment should be undertaken for pipeline development which should refer to DOE's Risk Assessment Guideline whereas erosion and sedimentation should be refer to DOE's LDP2M2 Guideline.

4.2.4 Construction Of Product Depot For The Storage Of Petrol, Gas Or Diesel

Product depots can be defined as those facilities whose activities include receiving of products either by ship, road tanker, rail wagon or pipelines; bulk storage and unloading activities for distribution. There is no generally processing activity on site.

The construction of product depots for storage of petrol, gas or diesel (excluding service stations) is subject to EIA if located within 3 kilometres of any commercial, industrial or residential areas which have a combined storage capacity of 60,000 barrels or more.

Typical petroleum products handled at depots are:

- (i) Diesel fuels
- (ii) MoGas fuels
- (iii) Jet A-1 fuels
- (iv) LPG

This list is not exhaustive: If other products are to be stored, project proponent should discuss with DOE during the project planning stage to seek their comments.

The key issues include:

- (i) Air quality
- (ii) Water quality
- (iii) Waste management
- (iv) Socio economic
- (v) Risk assessment

4.2.5 Construction of Oil and Gas Refineries

EIA is required for the development and construction of oil refineries which involve activities such as refining, processing, storage and distribution of petroleum products. This activity falls under the Schedule 2 of the EIA Order 2015. The conduct of a Schedule 2 can be referred to in EGIM 2016.

The key issues include:

- (i) Air quality
- (ii) Water quality
- (iii) Waste management
- (iv) Noise level
- (v) Public health
- (vi) Socio economic
- (vii) Risk assessment

4.3 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) Scale of the project (land area, total disturbed areas, etc.).
- (ii) Intensity of development (total land clearing, phasing of land clearing).
- (iii) Potential pollution sources from the project.
- (iv) Magnitude and complexity of impacts.
- (v) Area of impacts (localised versus transboundary).
- (vi) Probability of cumulative impacts (effects of project on adjacent land areas and *vice versa*).
- (vii) Sensitivity of nearby receptors (e.g. Environmentally Sensitive Areas).

Below are the main environmental issues for petroleum industries, both offshore and on-shore. These may vary from project to project. Hence, the Qualified Person is tasked to determine and prioritise.

4.3.1 Air Quality

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 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 petroleum processes.

Table 4.3.1: Air Pollutants and Their Potential Sources

Air Pollutants	Sources
VOC	Process vents Storage and transfer of liquids and gases Fugitive sources and intermittent vents Processes / distillation units
Particulate matters	Conditioning of solid raw materials Drying of solid products Catalyst regeneration Waste handling
Combustion gases: NO _x , CO, SO _x , HC, metals, dust	Furnaces Steam boilers Incinerators Flares
Acid gases (HCl, HF)	Halogenation reactions
Dioxins	Production processes that use chlorine Incinerators

Impact Assessment

It is suggested that the followings are considered for air quality impact assessment of a petroleum project:

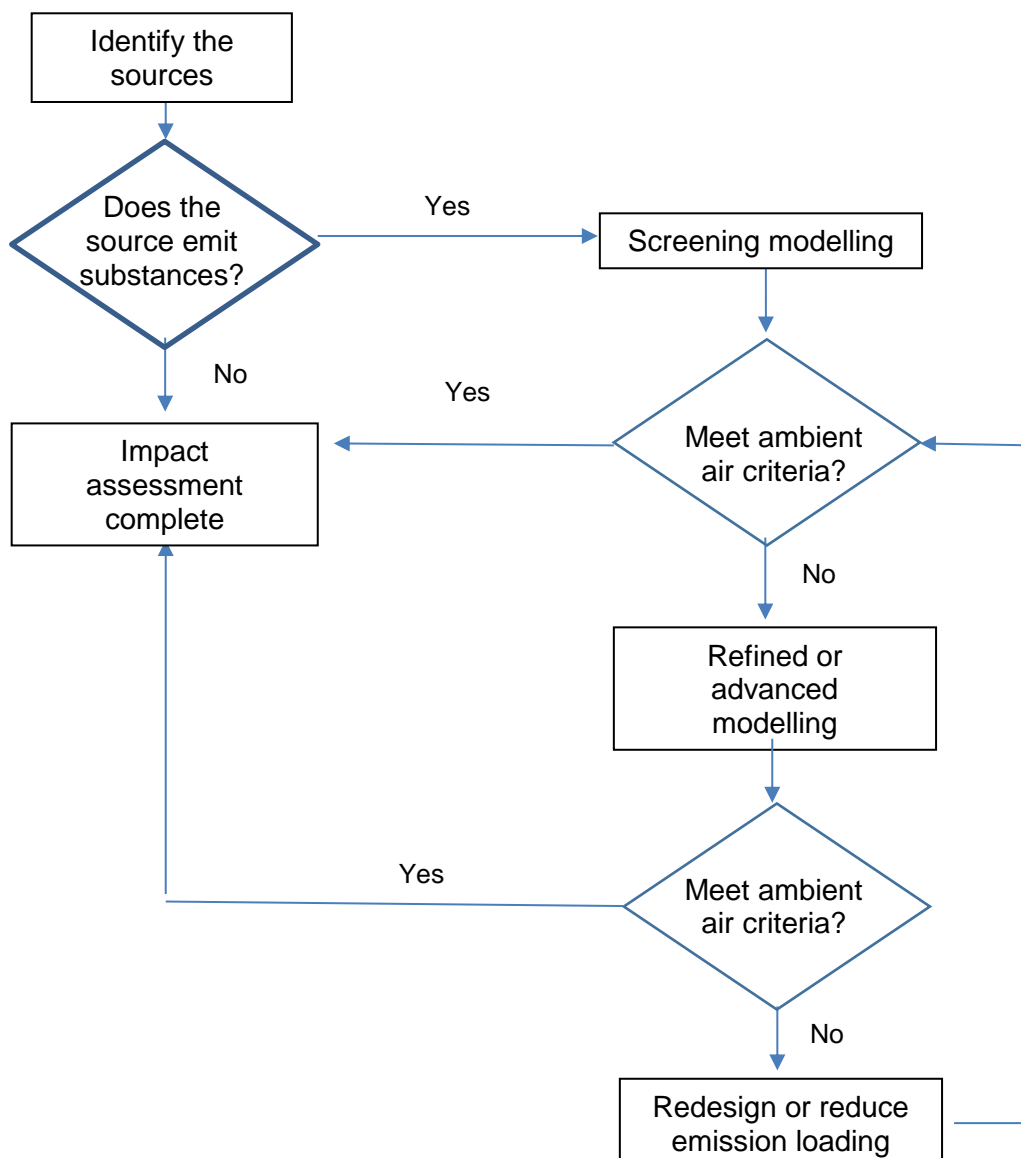
- (i) The significant pollutants emitted from the plant. Continuous, large volume with high concentration emissions point sources should be given priority.
- (ii) Ambient air prediction and assessment scenarios. Examples of scenarios: normal operation conditions (with air pollution control system to 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.

Figure 4.3.1 shows the flow in determining the level of air quality impact. 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 4.4** of this Guidelines for examples of prediction tools.

Figure 4.3.1: Flow Chart to Determine the Level of Air Quality Impact Assessment

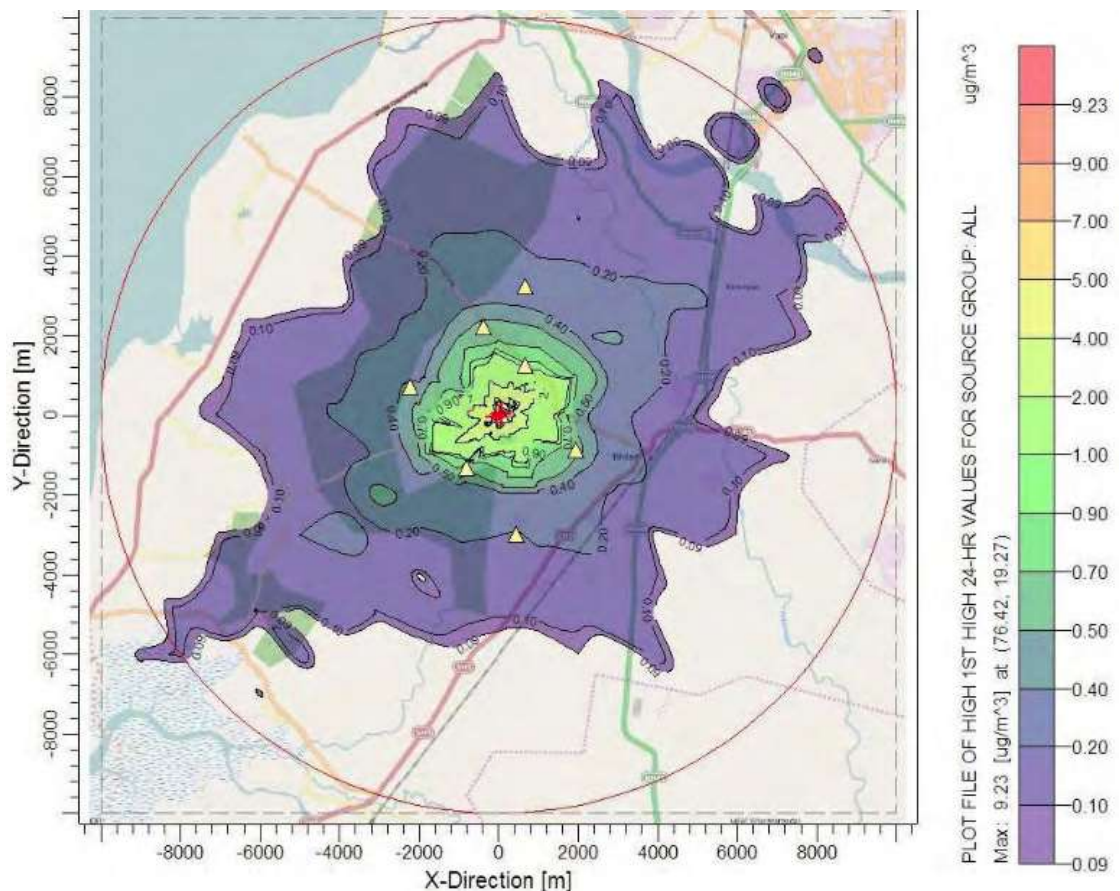


Outputs

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 Zone of Impact. 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. A sample of this contour map is illustrated in **Figure 4.3.2**.

Figure 4.3.2: Sample of Air Dispersion Contour Map



4.3.2 Water Quality

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

Some processes are known to generate process effluent and / or wash waters periodically. These waters usually contain high organic matters as indicated by COD concentrations. 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.

Cooling water: A process plant may employ once-through cooling water or circulating cooling water systems (or perhaps both may be used in large plants). If the cooling water is once through, then the cooling water discharge is low in dissolved solids but will contribute to elevation of temperature in discharge water. If the cooling water is circulated in a closed system with a cooling tower, then the blowdown from the system will be high in dissolved solids, heavy metals and to certain extent some anti-scaling agents too.

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 of a petroleum project:

- (i) The significant pollutants emitted from the process. 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 receiving 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.

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 Zone of Impact, 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.

4.3.3 Noise And Vibration

Sources of Pollutions

Construction Stage

Construction activities involve the use of machinery and equipment and generate noise typically as shown in **Table 4.3.2**.

Operational Stage

Similarly a processing plant may have machinery and equipment and activities that generate noise and vibration as presented in **Table 4.3.3**. Specific sound power levels, its noise spectrum and respective characteristics for each operating equipment may be sourced from the suppliers for better understanding on the level of concerns on noise and vibration.

Table 4.3.2: Typical Sound Power Levels from Construction Equipment and Activities

Equipment	Operating Condition	Sound Power Level @ 15 m
Bulldozer	Clearing vegetation	~ 84 dBA
Backhoe	Digging	78 - 80 dBA
Excavator	Operation	81-85 dBA
Crawler Crane	Lifting	81-85 dBA
Compressor	Operating	78-80 dBA
Concrete Batching Plant	Operation	83 dBA
Generator set	Operation	80-82 dBA
Impact Pile Driver	Operation	95-101 dBA

Table 4.3.3: Typical Sound Levels from Operating Equipment and Activities

Equipment	Sound Pressure Level
Transfer / Delivery Pump	89 - 100 dBA @ 1m
Exchanger / Exhaust Fan	90 - 100 dBA @ 5m
Air compressor	80 dBA @ 1m
Boiler	85 dBA @ 1m
Chiller	85 dBA @ 1m
Flare Combustion	~ 100 dBA @ 120m from flare
Burner Combustion	90 – 85 dBA
Conveyor Belt (line source)	82 – 103 dBA @ 1 m

Impact Assessment

Approaches to environmental noise and vibration assessment are guided by The Planning Guidelines for Environmental Noise Limits and Control and The Planning Guidelines for Vibration Limits and Control, published by the DOE Malaysia in 2007.

It is suggested that the followings are considered for noise and vibration impact assessment of a petroleum processing plant:

- (i) List of significant noise sources from the plant. Continuous and high noise or vibration levels should be given priority.
- (ii) Noise and vibration prediction and assessment scenarios. Examples of scenarios: normal operation conditions without control measures and with control measures.
- (iii) Sensitivity of the receiving environment or sensitive receptors, should there be any locally specified tolerance levels, such as exposure levels to residential, institutions, heritage buildings etc.
- (iv) Reference to assessment criteria such as the national guideline limits, baseline conditions or any relevant standards / guideline limits.

Where multiple significant sources from a petroleum processing plant have been identified, prediction of impact using modelling software normally ease the assessment tasks. These modelling tools could incorporate specific characteristics of the sources as well as attenuation features (noise barriers, buildings, terrain etc.) to generate more accurate predictions.

Outputs

The main objective of this impact assessment is to determine the compliances of anticipated noise and vibration levels at the plant boundaries and to determine the significance of the effects from the project at the identified receptors. The report should include:

- (i) Information about the input data and how variations may affect the results.
- (ii) Discussion on the accuracy of the prediction calculations and / or modelling software.
- (iii) Identification of the receptors that are most highly impacted and those are the most sensitive.
- (iv) Presentation of predicted levels in tabulation or contours maps.

4.3.4 Risk Assessment

Sources of Hazards

A petroleum project normally 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:

- (i) Fires
- (ii) Explosions
- (iii) Thermal decomposition
- (iv) Chemical leakage

Table 4.3.4 indicates the different sources and types of hazards potentially present in a petroleum project.

Table 4.3.4: Typical Sources and Type of Hazards

Source of Hazards	Hazards Type
Pipelines, pump station or compressor station	Fire or explosion, pipeline failure
Storage (no light hydrocarbons)	Tank fire, bund fire, boil-over
Storage (with light hydrocarbons)	Boiling liquid expanding vapour explosion (BLEVE)
Simple gas plants (no light hydrocarbons)	Jet fires
Simple refineries (no light hydrocarbons)	Liquid pool fires, flash fires, furnace fire
Complex Gas Plants / Refineries	Above plus vapour cloud explosions

Source:

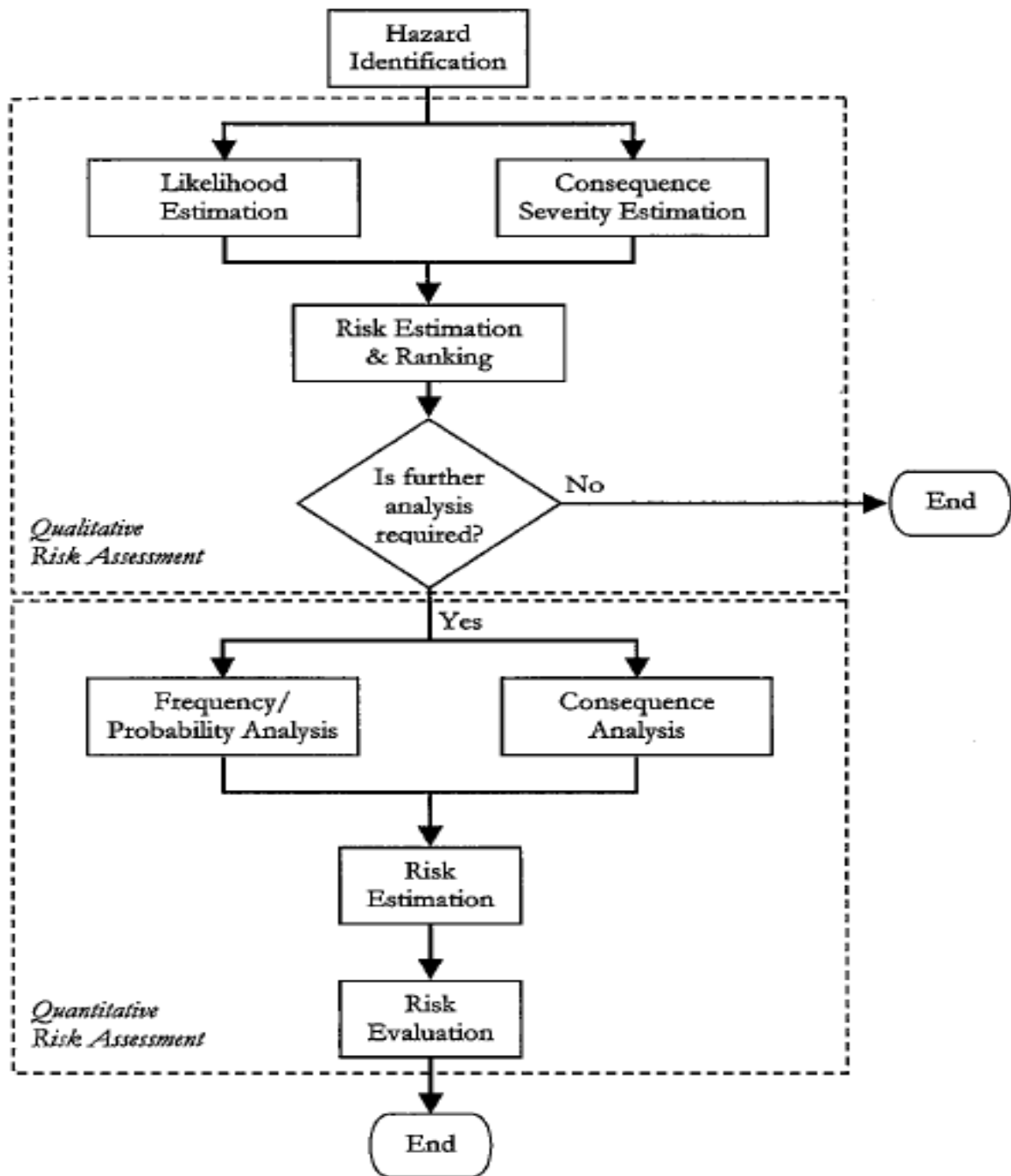
http://www.swissre.com/china/Alarming_risks_in_the_petrochemical_industry.html

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). The flow of the risk assessment of a petroleum project shall follow **Figure 4.3.3**.

Figure 4.3.3: Risk Assessment Flow



Source: Environmental Impact Assessment Guidelines for Risk Assessment (DOE, 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:

- (i) Risk matrix.
- (ii) 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

Risk Estimation

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

- (i) The chance of attaining serious harm due to the occurrence of the major hazards such as fire, explosion and / or toxic release;
- (ii) The probability of occurrence of the hazard;
- (iii) 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.

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. The individual risk is usually presented as a contour lines on a map.

(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 1×10^{-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 1×10^{-5} fatalities / person per year individual risk contour should not extend beyond industrial boundaries.

4.3.5 Public Health

Sources of Health Hazards

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

Construction Stage

Among the common health hazards during construction stage are:

- (i) Respiratory effects from exposure to gaseous and particulate pollutants such as PM₁₀, SO₂ and NO₂ from fuel combustion machinery on sites.
- (ii) 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.
- (iii) Physical injuries due to work accidents, road traffic accidents, noise-induced hearing impairment from exposure to vehicle or machinery noises.
- (iv) Accidents and explosion hazards from handling highly flammable materials on site (pipelines, storage tanks etc.).

Operation Stage

Among the common health hazards during the operation of a petroleum project are:

- (i) Respiratory effects due to air borne pollutants which originate from the operation of a petroleum processing plant as outlined in **Section 4.3.1** of this Guidelines.
- (ii) Health effects from ingestion exposure to various water borne pollutants in the discharged effluents and waterbodies as outlined in **Section 4.3.2** of this Guidelines.
- (iii) Cancer effects from exposure to carcinogens such as heavy metals, VOC etc.
- (iv) Physical injuries due to work accidents, road traffic accidents, noise-induced hearing impairment from exposure to vehicle or machinery noises.
- (v) Accidents and explosion hazards from handling highly flammable materials on site (pipelines, storage tanks etc.).

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:

- (i) Hazard identification
- (ii) Dose-response assessment
- (iii) Exposure assessment
- (iv) 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.

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:

- (i) 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.
- (ii) For carcinogenic risk: values of 10^{-6} to 10^{-4} are given as a range of “generally acceptable risk”.

4.3.6 Waste Generation

Sources of Wastes

Construction Stage

Typical type of wastes during construction stage include:

- (i) Excavation spoils / unsuitable soils
- (ii) Biomass materials
- (iii) Construction wastes – timber, cut piles, concrete, scrape metal etc.
- (iv) General solid wastes
- (v) 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

Petroleum project generates a variety wastes stream in its operation stage. These wastes basically can be classified as follows:

- (i) Drill cuttings during well drilling stage for upstream development project.
- (ii) Non-hazardous / domestic wastes such as scrap metals, plastic and paper wastes etc.
- (iii) Hazardous / scheduled waste which consists of some 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:

- (i) Structures, equipment and machineries.
- (ii) Non-hazardous / domestic wastes such as scrap metals, plastic and paper wastes etc.
- (iii) Hazardous / scheduled waste, consists of some toxic organic or heavy metal content.

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.

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).

4.3.7 Socio Economic

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 petroleum development 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 of a petroleum processing plant 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.

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 FGDs 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.

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.

4.4 PREDICTION METHODS AND TOOLS

There is a wide range of predictive tools and models for evaluation and prediction of impacts (**Table 4.4.1**). 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.

Table 4.4.1: Examples of Impact Assessment Prediction Methods and Tools

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

Impact Assessment	Prediction Methods and Tools	Output
Hydrology	<p>Hydrological analysis in accordance with Urban Stormwater Management Manual for Malaysia 2nd Edition (MSMA-2) by DID</p> <p>Examples: HEC-HMS, HEC-RAS, FLO-2D, TUFLOW, EXTRAN and Storm Water Management Model (SWMM)</p>	<p>Estimate peak flood, runoff, watershed analysis, flood plain hydraulics, etc.</p> <p>Flood risk map.</p>
Noise	<p>Numerical calculations / computer models</p> <p>Computer models for multiple and different type of sources, barrier, terrain and meteorological considerations</p> <p>Examples: CadnaA, SoundPLAN</p>	<p>Predicted exposure and project boundary noise levels.</p> <p>Compliance to guideline levels.</p> <p>Zone of impact on land use map.</p>
Vibration	<p>Numerical calculations</p>	<p>Predicted exposure levels.</p> <p>Compliance to guideline levels.</p> <p>Zone of impact on land use map.</p>
Risk Assessment	<p>EIA Guidelines for Risk Assessment by DOE (2004) – qualitative or quantitative</p> <p>Computer models for consequence modelling for multiple and different type of hazard sources</p> <p>Examples: CIRRUS, SCOPE, KAMELEON etc.</p>	<p>Predicted exposure risk levels.</p> <p>Compliance to risk acceptance criteria.</p>
Public Health	<p>Guidance Document on HIA in Environmental Impact Assessment by DOE (2012) – qualitative or quantitative</p>	<p>Predicted exposure risk levels.</p> <p>Compliance to risk acceptance criteria.</p>

Impact Assessment	Prediction Methods and Tools	Output
Waste Generation	Surveys, stakeholder engagements Assessment on proposed wastes management strategies etc.	Determine significance of the effects on existing support resources. Potential impact for on-site storage.
Socio Economic	Surveys, stakeholder engagements Comparative evaluation Risk calculations	Risk matrix with socio economic concerns and the magnitude of impact.

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.

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.

4.5 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 (refer to **Table 4.5.1**).

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 4.5.1: Common Standards and Guidelines Limits

Impacts	Evaluation Criteria
Air Quality	<p><u>Emission standard limits</u>: Environmental Quality (Clean Air) Regulations 2014</p> <p><u>Ambient air</u>: New Malaysian Ambient Air Quality Standards</p>
Water Quality	<p><u>Effluent standard limits</u>: Environmental Quality (Industrial Effluent) Regulations 2009 Environmental Quality (Sewage) Regulations 2009</p> <p><u>Inland Waters</u>: National Water Quality Standards for Malaysia National Standard for Drinking Water Quality (MOH 2004)</p> <p><u>Marine Waters</u>: Malaysia Marine Water Quality Criteria and Standard</p> <p><u>Groundwater</u>: Site Screening Levels (SSLs) in the Contaminated Land Management and Control Guidelines No. 1: Malaysian Recommended Site Screening Levels for Contaminated Land (DOE 2015)</p>
Discharged water from Silt Trap / Sediment Basin	<p><u>TSS</u>: 50mg/L or 100mg/L, depending on locality</p> <p><u>Turbidity</u>: 250 NTU</p>
Noise	The Planning Guidelines for Environmental Noise Limits and Control (DOE 2007)
Vibration	The Planning Guidelines for Vibration Limits and Control (DOE 2007)

Impacts	Evaluation Criteria
Risk Assessment	Risk criteria from EIA Guidelines for Risk Assessment (DOE 2004): <ul style="list-style-type: none"> • Voluntary individual risk: 1×10^{-6} fatalities/person per year • Involuntary individual risk: 1×10^{-5} fatalities/person per year
Public Health	Risk criteria from Guidance Document on HIA in Environmental Impact Assessment (DOE 2012): <ul style="list-style-type: none"> • Hazard Index for non-carcinogenic risk: ≤ 1.0 • Lifetime carcinogenic risk: 10^{-6} to 10^{-4}

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 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 the effects are very low or no sensitive receptors in the vicinity of the project to receive the impacts.

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.

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.

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 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 LAND DISTURBING POLLUTION PREVENTION AND MITIGATION MEASURES (LD-P2M2)

LD-P2M2 is used to reduce the adverse land based impacts, if these cannot be avoided. Standard requirements for LD-P2M2 is listed in **Table 5.3.1** which is adapted from the EGIM 2016. All submissions shall be accompanied by relevant technical drawings and maps.

Table 5.3.1: Standard Requirements for LD-P2M2

Requirement	Information to be Included
Project Activity and Implementation	Phasing plan and implementation schedule. Description of construction activities. Construction method statements.

Requirement	Information to be Included
Information and Analysis on Project Development	<p>Selected weather and rainfall data.</p> <p>Description of soil and geological characteristics (type, erodibility, hydrologic group, percentage dispersible material, excavation depth, etc.).</p> <p>Site runoff velocity and flow rates (pre- and post-development).</p> <p>Soil loss prediction (pre, during and post-development) for with and without LD-P2M2 implementation scenarios.</p> <p>Calculation for sediment traps/basins and projected runoff flows.</p> <p>Description of adjacent areas that may be affected by land disturbance.</p> <p>List of drainage, streams and river onsite as well as receiving streams and rivers.</p> <p>List of proposed P2M2.</p> <p>Access roads and project components located outside of project boundary.</p> <p>Earthworks cut and fill volume.</p> <p>Biomass, construction waste and domestic waste management.</p> <p>Spill prevention and control plan.</p> <p>Hazardous waste management.</p>
Map of Site Plan with Existing Conditions	<p>Topographic survey map.</p> <p>Geological terrain map.</p> <p>Erosion risk map.</p> <p>Land use map.</p> <p>Site development plan map.</p>

Source: Guidance Document for the Preparation of the Document on LD-P2M2, DOE, 2016.

5.3.1 Erosion Controls

Objective: To address soil erosion controls at source to reduce the impacts downstream affecting lowland communities and environmental sensitive areas (ESAs) near rivers and waterways.

Examples of P2M2:

- (i) Establish proper scheduling and phasing of P2M2 implementation in accordance to the project implementations schedule.
- (ii) Retain much of the natural vegetation by reducing the total worked area. Demarcate site and buffer areas.
- (iii) Reduce the period of slope and cleared areas exposure.
- (iv) Stabilise bare slopes and apply protective covers.
- (v) Properly protect stockpile areas.

5.3.2 Stormwater Controls

Objective: To properly manage runoff from the project site to prevent localised flooding and risk of flooding downstream, especially during the rainy seasons. The EIA shall assess the impacts of the drainage system to intercept the rapid conveyance of stormwater by using a series of retardation methods from P2M2 and MSMA-2 designed to manage the volume of flows.

Examples of P2M2:

- (i) Installation of temporary drains to minimise concentrated water flows during construction.
- (ii) Channelling discharges with a series of check dams to reduce velocity and peak flows.
- (iii) Size and capacity of temporary drains should be sufficient for at least a 10-year ARI storm event.
- (iv) All drainage and waterway banks shall be stabilised, e.g. rock cover, turf reinforcement mats, etc.
- (v) Proper stream crossing and culverts are required along waterways to prevent blockage or restriction in flows.

5.3.3 Sediment Controls

Objective: To ensure effective control of sediments in runoff to minimise risk of water pollution and reduce sedimentation in the receiving waterbodies.

Examples of P2M2:

- (i) Installation of sediment controls such as silt fences, silt traps, sediment basins, barriers etc.
- (ii) Retardation/capture structures and devices are designed to accommodate the calculated runoff volume to allow adequate time for suspended sediments to settle.
- (iii) Use of active treatment systems such as flocculants, anionic polymers, etc. in constraint areas to accelerate entrapment and settlement of fine sediments.
- (iv) Regular inspection and maintenance of the P2M2 to ensure the performance efficiency, especially after heavy storm events.
- (v) Controls on spillage of materials and mud trekking from vehicles should include tyre washing.

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 Best Available Techniques Guidance Document on Oil and Gas Industry, Best Available Techniques Guidance Document on Storage and Handling of Petroleum Products, Best Available Techniques Guidance Document on Waste Incinerator, and Guidance Document for Fuel Burning Equipment and Air Pollution Control Systems.
- (ii) Apply suitable fugitive emission control – references to Guidance Document for Fugitive Emission Control and Guidance Document on Leak Detection and Repair.
- (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).
- (v) Conduct continuous and / or periodical emission monitoring in compliance with Environmental Quality (Clean Air) Regulation requirements, DOE requirement on Predictive Emission Monitoring System (PEMS) and Continuous Emission Monitoring System (CEMS).

5.5 WATER QUALITY

Objective: To minimise discharge of water pollutants to the receiving waterbodies, and to prevent impact to water during construction and operation activities. Where possible, to maintain water quality at baseline conditions or better within the DOE 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 impermeable 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 Best Available Techniques Guidance Document on Oil and Gas Industry, Best Available Techniques Guidance Document on Storage and Handling of Petroleum Products, Best Available Techniques Guidance Document on Waste Incinerator, and Technical Guidance Document for on the Design and Operation of Industrial Effluent Treatment System (DOE-IETS-9 Sixth Edition 2015).
- (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).
- (vi) Conduct continuous and / or periodical effluent quality monitoring in compliance with Environmental Quality (Sewage) Regulation and / or Environmental Quality (Industrial Effluent) Regulation requirements.

5.6 NOISE AND VIBRATION

Objective: To minimise noise and vibration disturbance to nearby receptors as well as to protect workers in high noise environment.

Examples of P2M2:

- (i) Perimeter hoarding.
- (ii) Provision of acoustic noise barrier / enclosure.
- (iii) Provision of acoustic silencers.
- (iv) Periodical maintenance of vehicles and machineries.
- (v) Schedule piling and blasting works during day time and week days.
- (vi) Landscaping and natural buffers to assist in soften of noise effect.

5.7 WASTE MANAGEMENT

Objective: To reduce the amount of waste being generated from the project, and to ensure proper containment, collection, storage, management and disposal of these wastes during construction, operation and abandonment stages.

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.

Scheduled Wastes

P2M2 shall adhere to the Environmental Quality (Scheduled Wastes) Regulations 2005.

- (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.

5.8 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, and associated impact monitoring shall be recommended.

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.

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.

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.

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.

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.

At the working level, the Environmental Performance Monitoring Committee (EPMC) is chaired by a senior officer of the organisation.

For large-scale projects involving multiple contractual work packages by many contractors, the respective main contractors are required to have their respective Environmental Management Teams (EMTs) comprising at least a minimum number of personnel such as an Environmental Manager (EM) and an Environmental Officer (EO).

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 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.

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 and the respective EMTs should 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.

6.3.7 Environmental Transparency

This refers to the Project Proponent's initiative to be transparent on its implementation and performance of environmental management. Such sharing may be in the form of environmental sustainability report, website, billboard or fliers.

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.

6.4.8 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.
- (ii) This shall be carried out by Competent Person associated with accredited laboratory.

6.4.9 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. The monitoring programme shall be tailored for requirements of project, based on site conditions and types of development activities.

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

6.4.10 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.

Audit requirements are guided by the Environmental Audit Guidance Manual (DOE, 2011). The audit shall be undertaken by an independent third party and DOE 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 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 and abandonment strategy and plan once the project 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.

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

7.2 LEGISLATIVE REQUIREMENTS

7.2.1 Malaysian Regulation

At present, there are no specific regulations governing the decommissioning of offshore and onshore oil and gas installations and structures in Malaysia.

Oil and gas facilities decommissioning is not classified as a prescribed activity under The Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015. The preparation of an Environmental Impact Assessment (EIA) is not a mandatory requirement for decommissioning activities.

7.2.2 International Conventions

Malaysia is a signatory state to a number of international treaties, which made provisions for the management of decommissioning activities. The Abandonment Plan should take into consideration the requirement of these treaties at the time of decommissioning.

7.2.3 PETRONAS Guidelines

PETRONAS, as the custodian and manager of the national petroleum resources, has developed guidelines and requirements for both onshore and offshore oil and gas installations. PETRONAS decommissioning philosophy are as follows:

- (i) PETRONAS, as the statutory manager for petroleum resources and/or owner of petroleum facilities, is required to adhere to the standards and obligations committed to the Government of Malaysia and shall adopt measures consistent with established international rules and standards in addition to the national and local laws.
- (ii) Disused upstream installations needed to be decommissioned. The extent of the removal shall be decided on a case-by-case decommissioning assessment, taking into account all factors, particularly the legitimate interests of other stakeholders, users of the seas, the safety of navigation and the preservation of the marine environment.
- (iii) It is envisaged that each case-by-case decommissioning assessment shall entail consultations involving all interested parties.

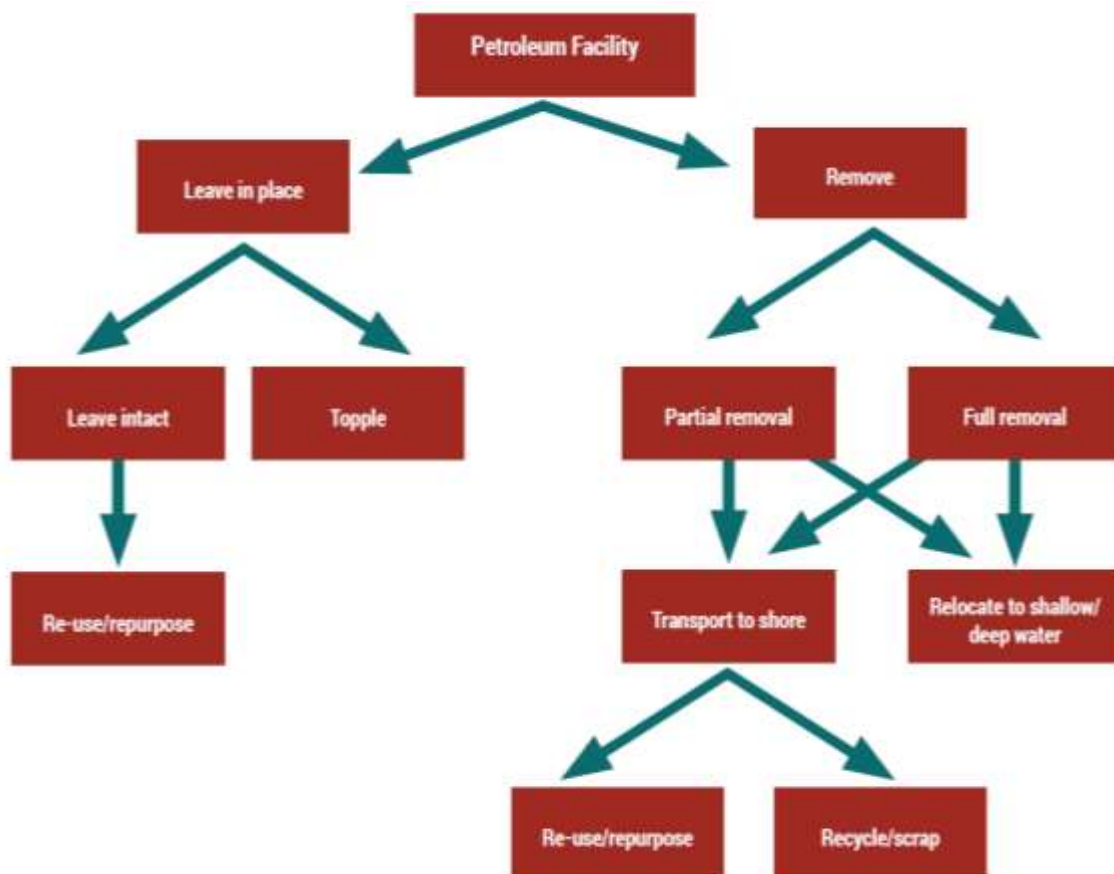
7.3 ABANDONMENT PLAN

7.3.1 Pre-Abandonment Activities

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

The process of decommissioning onshore and offshore installations can sometimes raise complex issues. Some of the possible options for decommissioning offshore facilities are highlighted in **Figure 7.3.1**.

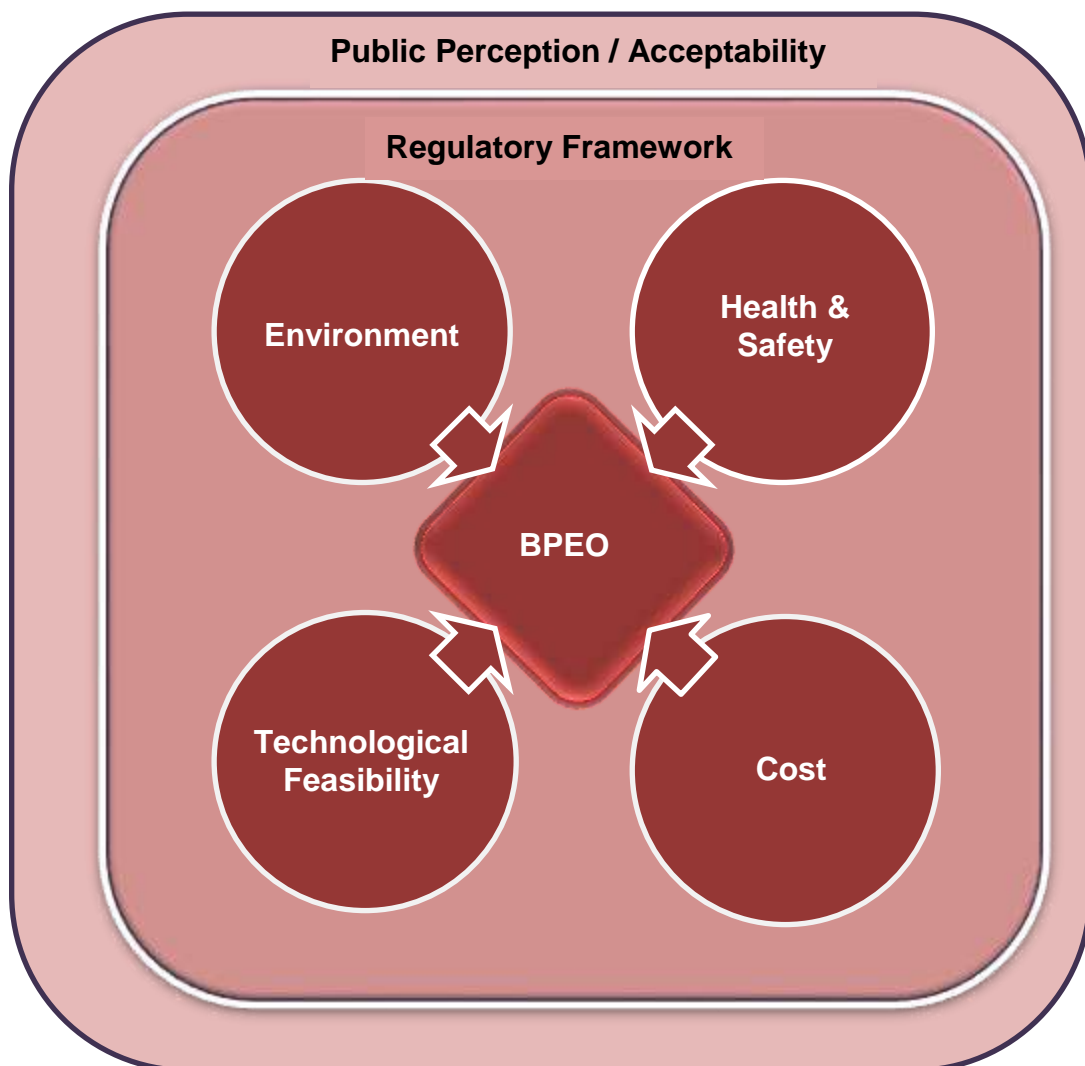
Figure 7.3.1 Decommissioning Options For Offshore Facilities



Source: Petroleum Decommissioning Guidelines, DMIRS, Government of Western Australia

BPEO assessment provides a means of determining which decommissioning option is the most suitable for a particular structure. In essence, the BPEO is the option that provides the most benefits or the least damage to the environment at an acceptable risk to personnel health and safety and at an acceptable cost. The BPEO therefore assesses the relative performance of each option with respect to technical feasibility, health and safety, environmental impact and cost (**Figure 7.3.2**)

Figure 7.3.2 Best Practical Environmental Option (BPEO) Concept



7.3.2 Abandonment Activities

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 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 (where applicable); 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.

Potential environmental impacts associated with project Abandonment stage are suggested in **Table 7.3.1**.

Table 7.3.1: Example of Impacts Associated With Abandonment of Project

Environmental Indicator	Potential Impact During Project Abandonment
Air Quality	Emission of dust due to demolition works, site levelling and filling activities. Emissions from transportation of construction materials and wastes.
Erosion and sedimentation	Dismantling and demolition works may result in soil disturbance causing increase of erosion risks.
Water Quality	Demolition and removal of fuel / chemical storage tanks and associated pipe work and dismantling of effluent treatment plant which may lead to water contamination if the residues are not properly contained. Leaching from demolition works and mishandling of wastes and chemicals.
Noise	Noise from hacking, demolition and transportation works.
Wastes	A variety of wastes to be generated during decommissioning and demolition works. These wastes may include unused machinery, metals wastes, concrete wastes and other solid wastes. Hazardous materials may include unused chemicals, oil or fuel, and scheduled wastes. Improper handling and disposal may lead to land contamination and contamination of water resources.
Socio economic	Decommissioning and abandonment of a project may bring an end to the direct and indirect employment.

7.3.3 Post Abandonment Activities

The position of any remains of installation or pipelines left *in-situ* shall be notified to mariners and appropriate state or national hydrographic services so that these structures/pipelines are marked on nautical charts.

For onshore installations, appropriate site remediation and restoration activities shall be described if residual site contamination (e.g. hydrocarbons in soil from past leaks and spills) is detected.

A post- decommissioning monitoring programme shall be conducted to assess environmental changes and implications of the selected decommissioning option and monitor potential impacts from any installation left *in-situ* and debris. Depending on the sensitivity of the site, additional survey shall be conducted to monitor the recovery of the site.

7.4 REPORTING

The detailed Abandonment Plan shall be submitted to DOE for review and acceptance at **least three (3) months** prior to its implementation.

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

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 Environmental Impact Assessment (EIA) Report to be submitted to the Department of Environment (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 (DOE, 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 (DOE, 2016). The declaration shall 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:

- (i) Increasing market demand for the products.
- (ii) Fulfilment of or adherence to the goals of national and state policies and plans.
- (iii) Social and economic benefits to society.
- (iv) Bringing new green and sustainable technology that will benefit the community and country.

- (vii) Deliberation on the alternatives and project options.
- (viii) Detailed description of the project including site information, concept and breakdown of major components, material and manpower requirements, project activities and time schedule.
- (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 P2M2s 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	<p>Project title.</p> <p>Name and contact details of the Project Proponent.</p> <p>Name and contact details of EIA Team.</p> <p>Location of project (coordinates, lot no, district, etc.).</p> <p>Relevant map of project location and accessibility.</p>
Location	<p>General site plan including ZOS (5-km radius)</p> <p>Project boundary and layout (with coordinates).</p> <p>Description of location in relation to identifiable landmarks (e.g. city centres, main roads, towns, etc.).</p>
Project Component and Design Details	<p>Project details (land area, buffer, lots and land status).</p> <p>Project concept, layout and components.</p> <p>Technology use.</p> <p>Examples of similar project type and scale.</p> <p>Supported with drawings, illustration and diagrams.</p>
Project Activities	<p>Method statement for major project activities during pre-construction, construction and operational stages.</p> <p>Manpower requirements.</p> <p>Resource requirements (e.g. soil and aggregate sources, spoil disposal area, etc.).</p>
Infrastructure, Utilities and Amenities Requirement	<p>Details of the estimated demand for:</p> <p>Water supply.</p> <p>Electricity.</p> <p>Sewerage.</p> <p>Telecommunications.</p> <p>Transport system.</p> <p>Waste management.</p>
Project Implementation Schedule	<p>Estimated timeline for phases implementation from planning, to construction and operational phases.</p> <p>Details of each stages of implementation.</p>

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 P2M2s (format as detailed in EGIM (DOE, 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

The stakeholder engagement process shall be continuous from the project planning stage. During the EIA stage, stakeholder engagement is essential for the Project Proponent to brief the stakeholders about the project and the potential impacts, and to obtain their feedback on the suggested mitigation measures.

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 (DOE, 2016).

The EIA Report Quality Self-Assessment Tool (RQSAT) in the EGIM (DOE, 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 H**, 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:

1. Approval of the EIA Report, provided that the report meets with the requirements of Section 34A (3) of the Environmental Quality Act (EQA) 1974.
2. 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 Act 1984 (Act 304)

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 (2017). Manual Penilaian Impak Sosial Bagi Projek Pembangunan Edisi Ke-2

Environmental Quality Act 1974 (Act 127)

Factories and Machinery Act 1974 (Act 139)

Fisheries Act 1985 (Act 317)

Forestry Act 1984 (Act 313)

European Integrated Pollution Prevention and Control Bureau (EIPPCB), (February 2013). Best Available Techniques (BAT) Reference Document for Mineral Oil and Gas Refineries. Joint Research Centre, Institute of Prospective Technological Studies, EIPPCB

- 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)
- PETRONAS Exploration and Production Minimum Environmental Specification (MES), Revision 2, September 2017
- PETRONAS Procedure and Guidelines for Upstream Activities (PPGUA 3.0), 2013
- Road Transport Act 1987 (Act 333)
- Solid Waste and Public Cleansing Management Act 2007 (Act 672)
- Street, Drainage and Building Act 1974 (Act 133)
- Territorial Seas Act 2012 (Act 750)
- 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

http://www.swissre.com/china/Alarming_risks_in_the_petrochemical_industry.html

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 (AIs)	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 (BMPs)	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	<p>Maximum population size of the species that the environment can sustain indefinitely, given the food, habitat, water, and other necessities available in the environment.</p> <p>The ability of a built resource or natural resource to absorb changes and related physical development without degradation.</p>
Competent Person	<p>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.</p>
Emergency Response Plan (ERP)	<p>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.</p>
Environment	<p>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.</p>
Environmental Impact Assessment (EIA)	<p>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.</p>
Environmental Management Plan (EMP)	<p>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.</p>
Environmental Management Team (EMT)	<p>Specialist team comprising of relevant personnel of a project with specific roles and responsibilities in the management of environmental matters at-site.</p>

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 harbour 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 Pollution Prevention and Mitigation Measures (LD-P2M2)	Document incorporating construction methods, processes, materials and practices intended to prevent, reduce or eliminate the generation of pollutants at the source (development area) during any land-disturbing activity through the protection of natural resources through incorporation of BMPs.
Land-Disturbing Activities	Activities such as clearing of trees or vegetation, excavating, raising or sloping of ground, trenching, grading and blasting.
Offshore	The water areas from the lowest tide level to 200 nautical mile of Exclusive Economic Zone limit.
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.

Petroleum Refining	Is the physical, thermal and chemical separation of crude oil and natural gas into useful products such as fuels, or raw materials for petrochemical and chemical industries.
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.
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	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.

APPENDICES

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APPENDIX A
LIST OF GUIDELINES AND
GUIDANCE DOCUMENTS

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List of Guidelines and Guidance Documents

No	Guidelines / Guidance Documents	Source
1.	Best Available Techniques Guidance Document on Oil and Gas Industry	www.doe.gov.my
2.	Best Available Techniques Guidance Document on Storage and Handling of Petroleum Products	www.doe.gov.my
3.	Best Available Techniques Guidance Document on Waste Incinerator	www.doe.gov.my
4.	Contaminated Land Management and Control Guidelines No. 1: Malaysian Recommended Site Screening Levels for Contaminated Land, 2015	www.doe.gov.my
5.	Contaminated Land Management and Control Guidelines No. 2: Malaysian Recommended Site Screening Levels for Contaminated Land, 2015	www.doe.gov.my
6.	Contaminated Land Management and Control Guidelines No. 3: Malaysian Recommended Site Screening Levels for Contaminated Land, 2015	www.doe.gov.my
7.	Environmental Essentials for Siting of Industries in Malaysia, 2017	DOE Offices
8.	Environmental Impact Assessment Guidance in Malaysia, 2016	DOE Offices
9.	Environmental Impact Assessment Guidelines for Risk Assessment, 2004	DOE Offices
10.	Guidance Document of Health Impact Assessment (HIA) in Environmental Impact Assessment (EIA), 2012	DOE Offices
11.	Guidance Document on Implementation of Self-Regulation Initiative in Industrial Manufacturing Premises – Environmental Mainstreaming Tools, 2016	DOE Offices
12.	Guidelines on Land Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2), 2017	DOE Offices
13.	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)
14.	Technical Guidance Document on Performance Monitoring of Industrial Effluent Treatment Systems (DOE-IETS-1 Seventh Edition 2015)	Environment Institute of Malaysia (EiMAS)
15.	Technical Guidance on Performance Monitoring of Air Pollution Control Systems (DOE-APCS-5 First Edition 2006)	www.doe.gov.my

No	Guidelines / Guidance Documents	Source
16.	The Planning Guidelines for Environmental Noise Limits and Control, 2007	www.doe.gov.my
17.	The Planning Guidelines for Vibration Limits and Control. 2007	www.doe.gov.my
18.	PETRONAS Exploration and Production Minimum Environmental Specification (MES), Revision 2, September 2017	PETRONAS
19.	PETRONAS Procedure and Guidelines for Upstream Activities (PPGUA 3.0), 2013	PETRONAS

APPENDIX B

**SAMPLE OF ENVIRONMENTAL
SCOPING MATRIX**

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APPENDIX C
EXAMPLE OF BASELINE DATA

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EXAMPLE OF BASELINE DATA

BIOPHYSICAL INVENTORY

The biophysical inventory is baseline data on the total environment. It can further be classified into:

- Inventory for physical system and
- Inventory for biodiversity

The steps for carrying out biophysical inventory are:

(a) Physical System

1. Zone the study area into landform unit (physical expression)
Locate zones on map (scale 1:10,000 or larger)
2. Zone landforms for presence of bedrock eroding to
 - Exposed;
 - Veneer (<1m of unconsolidated material over bedrock) and
 - Blanket (>1m of unconsolidated material over bedrock)Bedrock is any competent rock.
3. Zone landforms according to soil or genetic composition.
 - Appropriate classification is soil texture according to the U.S Department of Agriculture textural triangle or percent sand, silt and clay
 - Depth of sampling will be 0.5m for all non-graded surfaces and depth of cut of graded surfaces
 - One sample in the upper 30cm is required and composite samples every change in textural class
 - Sample regime set according to land form slope catena (one sample every 10m rise in elevation perpendicular to the slope across the land from unit form lowest to highest elevation)
 - Transects to be repeated every 500m on land forms larger than 10 hectares and every 100m on land forms less than 10 hectares
4. Identify the reach of the coastal area (where applicable) affected by the project. Identify the significant physical coastal processes at work within, upstream and downstream of this reach.

Physical coastal systems include:

- Currents

- Tides
- Wind and waves
- Coastal erosion and accretion
- Illuviation and alluviation

Classify the land forms for active processes of erosion, accretion, mass wasting, illuviation and alleviation.

Cite and use the DID criteria and classification for coastal erosion. The study is a useful guide to classification and prediction and should be employed as written.

5. Model soil erosion hazard and link to risk prediction of erosion using the structure plan.
6. Classify all the surface waters by stream order and physiognomic classification.
7. Conduct field survey of surface waters and sample water quality.

Minimum one sample per stream order, and above and below all points of intake and outflow, upstream and downstream of the reach.

Classify water quality according to Malaysia National Water Quality Standard or Malaysia Marine Water Quality Criteria and Standard.

This work can be expended to include coastal engineering on tidal and sediment movement via modelling if dredging/filling or structures are planned for the marine zone.

8. Conduct field survey of ambient air and sample air quality according to New Malaysia Ambient Air Quality Standard.
9. Conduct field monitoring of noise level around the project site boundary and compare with guideline noise limits.
10. Identify and odour problem around the project site.

(b) Biodiversity

1. Conduct a field survey of epi-fauna, epi-fauna and fisheries population and habitat quality for each land from unit.
 - The survey should list rare, endemic, endangered species, as well as species of economic value.
 - Species with protected status shall be identified and habitat located.

- Transects are the preferred method of sample for non-marine zones with one transect per landform.
 - Sampling techniques used for marine zones is panning (using a grab sampler, quadrats or net).
 - Landings and interviews with inhabitants may satisfy the requirements for fisheries.
 - Species, population and habitat quality are the important parameters to quantify for importance.
 - The results should be tabulated and mapped on the landform or zonal base.
2. Conduct a field survey of flora in conjunction with epi-fauna.
 - Classify community types by dominant species per strata.
 - Species with protected status shall be identified, described and habitat located and mapped.

LAND USE INVENTORY

Land use is all and occupation, active and passive, current and historical within the study area.

The steps for carrying out land use inventory are:

1. Classify, map and describe the existing land use
 - Within the study area
 - Within the “reach” of the affected area
 - Within a surround of 3 kilometres (minimum)
2. Map and describe proposed and committed land use
 - Within the study area
 - Within the “reach” of the affected area
 - Within a surround of 3 kilometres (minimum)
3. Map and describe zones of use, gazetted lands and private and public lands within the study area and a surround of minimum 3 kilometres.
4. Identify points of essential infrastructure to supply potable water, power, telecommunication and landfill.
5. Identify point of access and transportation to the study area. Carry out traffic impact study where necessary.

SOCIO-ECONOMIC ASPECTS

The socio-economic aspects of the study especially important when relocation of residents, land acquisition or disturbance of heritage area, is involved.

(a) Socio-Economic Inventory/Baseline Data

The steps for carrying out the socio-economic inventory are:

1. Prepare demographic profiles of current resident and transient habitation including numbers by sex, age, occupation, sources of employment and income, skills and mobility.

Tabulate and map the results.

A systematic survey of households within the affected area is both appropriate and efficient.

2. Design and implement public involvement programme. This should include public consultation or information, and perception study.
3. Locate and record known sites of historic and archaeological importance. Conducts field surveys and excavations of important locations.
4. When relocation of residents are involved, a sociological study should be carried out.

(b) Socio Economic Impact Assessment

The socio economic baseline data can serve to generate the list of issues-positive and negative. Generally, the key issues are displacement and relocation of residents in the long term, and disruption to lifestyle in the short term.

Some mitigations are financial compensation for relocation, opportunities for employment and improved services.

Data is required to support this simplification of the issues and resolution.

Public involvement is the most credible approach in this assessment.

Documentation can employ the same approaches as the environmental assessment.

OTHER PARAMETERS FOR OFFSHORE DEVELOPMENT

In offshore oil and gas development, baseline survey should also include:

1. Sediment samples:
 - (a) Metal and heavy metals
 - (b) Particle size distribution

(c) Hydrocarbon (petrogenic and biogenic)

(d) Benthos (polychaetes, crustacean and Mollusca)

2. Water Column Samples

Heavy metals, nutrients, organics, plankton and physical parameters such as pH, salinity, dissolved oxygen, temperature, turbidity and suspended solids.

3. Other parameters as required and pertinent to the project.

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APPENDIX D
NEW MALAYSIA AMBIENT AIR
QUALITY STANDARD

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New Malaysia Ambient Air Quality Standard

Pollutants	Averaging Time	Ambient Air Quality Standard ($\mu\text{g}/\text{m}^3$)		
		IT-1 (2015)	IT-2 (2018)	IT-3 (2020)
Particulate matter with the size less than 10 micron (PM_{10})	1 year	50	45	40
	24 hour	150	120	100
Particulate matter with the size less than 2.5 micron ($\text{PM}_{2.5}$)	1 year	35	25	15
	24 hour	75	50	35
Sulphur Dioxide (SO_2)	1 hour	350	300	250
	24 hour	105	90	80
Nitrogen Dioxide (NO_2)	1 hour	320	300	280
	24 hour	75	75	70
Ground level ozone (O_3)	1 hour	200	200	180
	8 hour	120	120	100
*Carbon Monoxide (CO)	1 hour	35	35	30
	8 hour	10	10	10

Note:

*measurement in mg/m^3

There are 3 interim targets set which include interim target 1 (IT-1) in 2015, interim target 2 (IT-2) in 2018 and the full implementation of the standard in 2020. All projects should strive to achieve the interim target 3.

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APPENDIX E
MALAYSIA NATIONAL WATER
QUALITY STANDARDS

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Malaysia National Water Quality Standards

Parameter	Unit	River Class					
		I	IIA	IIB	III	IV	V
Ammoniacal Nitrogen	mg/l	0.1	0.3	0.3	0.9	2.7	> 2.7
Biochemical Oxygen Demand	mg/l	1	3	3	6	12	>12
Chemical Oxygen Demand	mg/l	10	25	25	50	100	>100
Dissolved Oxygen	mg/l	7	5 – 7	5 – 7	3 – 5	< 3	<1
pH	-	6.5 – 8.5	6 – 9	6 – 9	5 – 9	5 – 9	-
Colour	TCU	15	150	150	-	-	-
Electrical Conductivity*	µS/cm	1,000	1,000	-	-	6,000	-
Floatables	-	N	N	N	-	-	-
Odour	-	N	N	N	-	-	-
Salinity	%	0.5	1	-	-	2	-
Taste	-	N	N	N	-	-	-
Total Dissolved Solid	mg/l	500	1000	-	-	4,000	-
Total Suspended Solid	mg/l	25	50	50	150	300	300
Temperature	°C	-	Normal + 2 °C	-	Normal + 2 °C	-	-
Turbidity	NTU	5	50	50	-	-	-
Faecal Coliform**	Count / 100ml	10	100	400	5000 (20,000) ^a	5000 (20,000) ^a	-
Total Coliform	Count /100ml	100	5,000	5,000	50,000	50,000	>50,000

Notes:

N = No visible floatable materials or debris, no objectional odour or no objectional taste

* = Related parameters, only one recommended for use

** = Geometric mean

a = Maximum not to be exceeded

Parameter	Unit	River Class				
		I	IIA/IIB	III	IV	V
Al	mg/l	Natural Levels or Absent	-	(0.06)	0.5	Levels above IV
As	mg/l		0.05	0.4 (0.05)	0.1	
Ba	mg/l		1	-	-	
Cd	mg/l		0.01	0.01* (0.001)	0.01	
Cr(IV)	mg/l		0.05	1.4 (0.05)	0.1	
Cr(III)	mg/l		-	2.5	-	
Cu	mg/l		0.02	-	0.2	
Hardness	mg/l		250	-	-	
Ca	mg/l		-	-	-	
Mg	mg/l		-	-	-	
Na	mg/l		-	-	3 SAR	
K	mg/l		-	-	-	
Fe	mg/l		1	1	1 (Leaf) 5 (others)	
Pb	mg/l		0.05	0.02* (0.01)	5	
Mn	mg/l		0.1	0.1	0.2	
Hg	mg/l		0.001	0.004 (0.0001)	0.002	
Ni	mg/l		0.05	0.9*	0.2	
Se	mg/l		0.01	0.25 (0.04)	0.002	
Ag	mg/l		0.05	0.0002	-	
Sn	mg/l		-	0.004	-	
U	mg/l		-	-	-	
Zn	mg/l		5	0.4*	2	
B	mg/l		1	(3.4)	0.8	
Cl	mg/l		200	-	80	
Cl ₂	mg/l		-	(0.02)	-	
CN	mg/l		0.02	0.06 (0.02)	-	
F	mg/l		1.5	10	1	
NO ₂	mg/l		0.4	0.4 (0.03)	-	
NO ₃	mg/l		7	-	5	
P	mg/l		0.2	0.1	-	
Silica	mg/l	50	-	-		
SO ₄	mg/l	250	-	-		
S	mg/l	0.05	(0.001)	-		
CO ₂	mg/l	-	-	-		
Gross-α	Bq/l	0.1	-	-		

Parameter	Unit	River Class				
		I	IIA/IIB	III	IV	V
Gross-β	Bq/l	Natural Levels or Absent	1	-	-	Levels above IV
Ra-226	Bq/l		<0.1	-	-	
Sr-90	Bq/l		<1	-	-	
CCE	μg/l		500	-	-	
MBAS/BAS	μg/l		500	5,000 (200)	-	
O&G (mineral)	μg/l		40; N	N	-	
O&G (Emulsified Edible)	μg/l		7,000; N	N	-	
PCB	μg/l		0.1	6 (0.05)	-	
Phenol	μg/l		10	-	-	
Aldrin / Dieldrin	μg/l		0.02	0.2 (0.01)	-	
BHC	μg/l		2	9 (0.1)	-	
Chlordane	μg/l		0.08	2 (0.02)	-	
t-DDT	μg/l		0.1	(1)	-	
Endosulfan	μg/l		10	-	-	
Heptachlor Epoxide	μg/l		0.05	0.9 (0.06)	-	
Lindane	μg/l		2	3 (0.4)	-	
2,4-D	μg/l		70	450	-	
2,4,5-T	μg/l		10	160	-	
2,4,5-TP	μg/l		4	850	-	
Paraquat	μg/l		10	1800	-	

Notes:

* = At harness 50 mg/l CaCO₃

= Maximum (unbracketed) and 24-hour average (bracketed) concentrations

N = free from visible film sheen, discoloration and deposits

Water Classes and Uses

CLASS	USES
Class I	Conservation of natural environment Water supply I – Practically no treatment necessary Fishery I- very sensitive aquatic species
Class IIA	Water Supply II – Conventional treatment required Fishery II – Sensitive aquatic species
Class IIB	Recreational use with body contact
Class III	Water Supply III – Extensive treatment required Fishery III – Common, of economic value and tolerant species, livestock drinking
Class IV	Irrigation
Class V	None of the above

APPENDIX F
MALAYSIA MARINE WATER
QUALITY CRITERIA AND
STANDARD

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Malaysia Marine Water Quality Criteria and Standard

Parameter	CLASS 1	CLASS 2	CLASS 3	CLASS E
Beneficial uses	Preservation, Marine Protected areas, Marine Parks	Marine Life, Fisheries, Coral Reefs, Recreational and Mariculture	Ports, Oil and Gas Fields	Mangroves, Estuarine and River- mouth Water
Temperature (°C)	≤ 2 °C Increase over max ambient	≤ 2 °C Increase over max ambient	≤ 2 °C Increase over max ambient	≤ 2 °C Increase over max ambient
Dissolved oxygen (mg/L)	>80% saturation	5	3	4
Total suspended solid (mg/L)	25 mg/L or ≤ 10% increase in seasonal avg, whichever is lower	50 mg/L (25 mg/L) or ≤10% increase in seasonal avg, whichever is lower	100 mg/L or ≤10% increase in seasonal avg, whichever is lower	100 mg/L or ≤30% increase in seasonal avg, whichever is lower
Oil and grease (mg/L)	0.01	0.14	5	0.14
Mercury* (µg/L)	0.04	0.16(0.04)	50	0.5
Cadmium (µg/L)	0.5	2(3)	10	2
Phenol (µg/L)	1	10	100	10
Copper (µg/L)	1.3	2.9	10	2.9
Nitrate (NO ₃) (µg/L)	10	60	1000	60
Nitrite (NO ₂) (µg/L)	10	55	1000	55
Arsenic (III)* (µg/L)	3	20(3)	50	20(3)
Ammonia (unionized) (µg/L)	35	70	320	70
Lead (µg/L)	4.4	8.5	50	8.5
Chromium VI (µg/L)	5	10	48	10

Parameter	CLASS 1	CLASS 2	CLASS 3	CLASS E
Zinc (µg/L)	15	50	100	50
Cyanide (µg/L)	2	7	20	7
Phosphate (µg/L)	5	75	670	75
Tributyltin (TBT) (µg/L)	0.001	0.01	0.05	0.01
Polycyclic Aromatic Hydrocarbon (PAHs) ng/g	100	200	1000	1000
Faecal coliform (human health protection for seafood consumption)- (MPN/100ml)	70	100(70)	200	100(70)

Note:

* levels in parentheses are for coastal and marine water areas where seafood for human consumption is applicable.

APPENDIX G
EXAMPLE OF POTENTIAL IMPACTS
AND MITIGATING MEASURES

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EXAMPLE OF POTENTIAL IMPACTS AND MITIGATING MEASURES

DURING DEVELOPMENT OF OFFSHORE PETROLEUM PROJECTS

NO.	PROJECT ACTIVITIES & SOURCES OF POLLUTION	POTENTIAL ENVIRONMENTAL IMPACTS	COMMON MITIGATING MEASURES
1.	Onshore Construction Material and equipment delivery, yard engineering, painting, electrical and instrumentation wiring	No significant impacts especially when existing fabrication yards/infrastructure is used. If new onshore fabrication yards or infrastructure has to be built, these have to assess carefully.	Fabrication contractors have to comply with terms and conditions for environmental protection which shall form part of the contract agreement between the project proponent and all its contractors. All contractors will have to comply with EQA and regulations.
2.	Offshore Installation Pipelaying, platform launching and piling	Minor and temporary impact. Benthic biota in immediate vicinity of pipelines and platforms would be disturbed temporarily because of the potential slight increase in turbidity. No deleterious effect expected as indicated by studies. However, and assessment needs to be done based on the type of chemicals added to the hydrotest water.	Proper planning to reduce installation period within shortest possible time. Normally, only non-ionic surfactants will be used. Used in concentrations recommended by manufacturers.
3.	Drilling Operation Discharge of drilling wastes such as drill cuttings, spent water based muds, low	Minor impact. Impact, if any, would be localized on benthos as indicated by studies. Temporary burial of immobile benthic organisms will occur during discharge period of drill cutting.	Drill cutting will be passed through series of shale shakers to remove muds/fluids from them. The recovered muds/fluids will be reused. In addition, only where required, low toxicity oil based mud will be used to drill certain high angle wells.

NO.	PROJECT ACTIVITIES & SOURCES OF POLLUTION	POTENTIAL ENVIRONMENTAL IMPACTS	COMMON MITIGATING MEASURES
	toxicity oil based muds adhering to cuttings	Slight increase in water turbidity during discharge. Water quality researches background levels a short distance from platforms.	Ordinarily, only water based muds will be used. Where low toxicity oil based mud is used, the oil content on cuttings will be based on internationally accepted industry practice.
4.	Production Operation Discharge of produced water	Minor and temporary impacts as indicated by studies. Water quality researches background levels a short distance from platform. No deleterious effects are expected.	Water treatment facilities will be installed to treat produced water. Oil in water discharges will comply with acceptable limit of 100 ppm.
	Atmospheric emissions	No impacts expected based on US Minerals Management Services study of air pollution from offshore operations.	Maintenance and inspection programs are in-place to minimize fugitive emissions. Low to nil ozone depletion potential systems will be used for fire protection. No venting of gas under normal operations.
5.	Other Common Drilling/ Production Activities (a) Generation of scheduled/hazardous wastes (b) Generation of other miscellaneous wastes:	Minor impact. Waste oil will be recycled into the process offshore. Other scheduled wastes will be sent onshore for proper disposal. No hazardous wastes will be discharged into the sea. Minor impact. These wastes will not be disposed into the sea but sent onshore.	Ensure a safe working environment by having the following in-place: Written procedures on waste management such as proper segregation, labelling, transportation, storage, etc. are in-place to ensure compliance to Environmental Quality (Scheduled Wastes) Regulations, where applicable.

NO.	PROJECT ACTIVITIES & SOURCES OF POLLUTION	POTENTIAL ENVIRONMENTAL IMPACTS	COMMON MITIGATING MEASURES
	<p>General garbage such as food waste, paper, plastic, rags, scrap metals</p> <p>(c) Deck drainage, wash water from laundry, showers, lavatories</p>	<p>Minor impact as the discharges will be instantaneously rendered innocuous by the dynamic wave and current mixing and dispersal actions.</p> <p>Minor impact as the discharges will be instantaneously rendered innocuous by the dynamic wave and current mixing and dispersal actions.</p>	<p>Written procedures on waste management such as proper segregation, labelling, transportation, storage, etc. are in-place.</p> <p>Deck wash water and water in open drains will be channelled to a caisson system where oil will be recovered and recycled into process and the water discharged. Sewage and wash water will be discharged below sea surface.</p>
	<p>(d) Usage of chemicals</p> <p>(e) Spills due to pipeline, rupture, well blowouts</p>	<p>Minor impact. Chemicals will only be purchased for specific use in drilling and production operations. Typically, they will be all used up.</p> <p>Minor impact. Depending on the nature of crude oil or condensate, bulk of liquid spills evaporates within 24 hours in tropical environments. Generally, an offshore spill is not expected to cause impacts to nearshore environment because of the rapid evaporation and dispersion.</p>	<p>Drip pans will be installed below equipment to contain potential minor spillages during maintenance.</p> <p>Ensure a safe working environment by having the following in-place: Written procedures on proper handling, and storage, are in-place, Safety Data Sheets (SDS) of all chemicals to be used will be available at workplace.</p>
	<p>(f) Condensate spill due to pipeline rupture, well blowout</p>	<p>Minor impact. Depending on the nature of crude oil or condensate, bulk of liquid spills evaporates within 24 hours in tropical environments. Generally, an offshore spill is not expected to cause impacts to nearshore</p>	<p>Safety and health programs and communication sessions will be conducted for personnel concerned. Administrative controls and personal protective equipment will be provided and enforced.</p>

NO.	PROJECT ACTIVITIES & SOURCES OF POLLUTION	POTENTIAL ENVIRONMENTAL IMPACTS	COMMON MITIGATING MEASURES
		<p>environment because of the rapid evaporation and dispersion.</p>	<p>Continuous corrosion inhibitor injection program will be in-place to protect pipelines to reduce corrosion risk.</p> <p>Platform will be equipped with the best available safety technology such as blowout preventers, process alarms and shutdown system.</p> <p>Key personnel are trained to be skilled operators; also trained to prevent well blowout as part of a well control program.</p> <p>In cooperation with industry, there is a comprehensive Oil Spill Response Plan with a well trained and equipped team. Simulation exercises are regularly conducted; includes regular fire drills.</p> <p>The offshore project will be fully equipped with lifesaving equipment such as life rafts, escape capsule, rope ladders, life rings, etc. All platform personnel will be trained to respond to any emergencies, with the mode of evacuation clearly defined.</p>

DURING CONSTRUCTION STAGE OF LAND-BASED PETROLEUM PROJECTS

NO.	PROJECT ACTIVITIES & SOURCES OF POLLUTION	POTENTIAL ENVIRONMENTAL IMPACTS	COMMON MITIGATING MEASURES
1.	<p>Construction of Access Tracks and Roads</p>	<p>Land clearance results in loosening of top soil which will expose it to wind erosion and generate dust.</p> <p>It is unlikely that any access tracks and roads will be built near a residential area along the Proposed Petroleum Industries.</p> <p>The heavy weight of the machinery could disturb the existing vegetation which protects the soil from erosion.</p> <p>Permanent loss of ground fauna.</p> <p>Damage to existing access roads due to heavy vehicles.</p> <p>Threat to physical safety of workers.</p> <p>Tranquillity will be affected.</p>	<p>Retain the vegetation at the perimeter to serve as wind erosion barrier. Dust abatement procedures such as water spraying regulation should be observed.</p> <p>Heavy construction work near residential areas should be limited to day-time only.</p> <p>Noisy vehicles shall be checked for proper installation of engine silencers.</p> <p>Affected residents should be informed about the construction activities and their expected duration.</p> <p>Erosion needs to be checked by building slit traps.</p> <p>Exposed surface needs to be covered with vegetation or erosion preventive measures.</p> <p>Planting vegetation and landscaping should bring back some adaptable fauna.</p> <p>Upgrade and repair access roads once project is completed.</p> <p>Safety briefing and precautions should be undertaken.</p> <p>Restrict noisy activities to day-time only.</p>

NO.	PROJECT ACTIVITIES & SOURCES OF POLLUTION	POTENTIAL ENVIRONMENTAL IMPACTS	COMMON MITIGATING MEASURES
2.	Drainage Alteration	<p>Temporary increase of suspended dust in the air is expected due to loosened to-soil</p> <p>Increase in noise from construction machinery at the nearby residential areas.</p> <p>Improper dumping of dredged spoils would cause increased suspended solids and turbidity in receiving waters.</p> <p>No impact on ground fauna, but soil erosion can increase suspended solid and turbidity in receiving waters</p> <p>Employment and commercial activities will increase.</p> <p>Workers may be exposed to threat to physical safety.</p>	<p>The perimeter vegetation should be retained, to limit the dust spread. The dust abatement procedure such as regular water spray should be observed.</p> <p>Drainage alteration works should be limited to day time only.</p> <p>Noisy activities involved should be minimised during weekends and public holidays.</p> <p>Spoil from excavation and construction activities to be properly contained or disposed of.</p> <p>Silt traps should be provided to minimise sedimentation.</p> <p>Exposed slopes to be covered.</p> <p>Proper drainage system silt traps to be maintained.</p> <p>Give priority to local labour wherever possible to avoid local hostility.</p> <p>Stringent work safety procedures should be observed and closed supervision maintained.</p>

NO.	PROJECT ACTIVITIES & SOURCES OF POLLUTION	POTENTIAL ENVIRONMENTAL IMPACTS	COMMON MITIGATING MEASURES
3.	Earthwork and Contouring	<p>Earthwork and movements of the construction machinery will generate dust.</p> <p>Increase in noise level from operation and movement of construction machinery will affect most of the residential areas along the proposed Petroleum Project.</p> <p>Earth disturbance would lead to increase in suspended solids contents and water turbidity. Aquatic life will be affected.</p> <p>Exposure of loosened soil to weather leads to erosion.</p>	<p>Dust abatement procedures such as water spray should be implemented. Trees at the boundary or the vicinity should be retained.</p> <p>Affected residents should be informed regarding the construction activities and their expected duration.</p> <p>Limit noisy construction activities to day-time only especially near residential areas and minimise heavy construction work during weekends and public holidays.</p> <p>Build noise barrier if the construction works will be carried out for a long period near residential areas if necessary.</p> <p>Earthwork to be planned and minimised.</p> <p>Apply erosion and sediment controls.</p> <p>Earthwork to be planned and phased.</p> <p>Cut and fill should be planned to ensure no excess earth is left exposed to the weather.</p> <p>Runoff to be directed to a silt trap or a temporary settling pond.</p> <p>Bare time should be minimised for example by soil mulching.</p> <p>Proper drainage system to be maintained.</p>

NO.	PROJECT ACTIVITIES & SOURCES OF POLLUTION	POTENTIAL ENVIRONMENTAL IMPACTS	COMMON MITIGATING MEASURES
		<p>Clogged drainage may result in overflows and flash floods.</p> <p>Permanent loss of existing landform and landscape.</p> <p>Damage to cultural/historical sites.</p>	<p>Ensure drainage are cleared and maintained.</p> <p>Carry out new landscaping to improve general appearance of the area.</p> <p>Seek relocation from owners/authorities or an agreeable mitigating measure.</p>
4.	Drilling and Blasting	<p>Drilling and blasting generates dust in the atmosphere.</p> <p>Erosion of loosened earth materials could cause increase solids and water turbidity.</p> <p>May endanger safety of those within the vicinity of the site.</p>	<p>Limited to day time work period.</p> <p>The perimeter trees if retained will limit the spread of dust to other areas.</p> <p>Loosened materials to be recompacted as soon as possible.</p> <p>Revegetate bare surfaces as early as possible.</p> <p>Safety procedures for drilling and blasting should be strictly observed.</p>
5.	Transportation of Materials and Equipment	<p>The atmospheric dust level along the access road is expected to increase due to lorries which used the unpacked access tracks, spillage of construction materials from lorries and mud deposited on main road.</p> <p>Increase in noise level due to the frequent flow of heavy vehicles and long trailers.</p>	<p>Dust abatement measures such water spray and tyres cleaning should be observed.</p> <p>Vegetation along the access road banks to be retained.</p> <p>Schedule the movement of heavy vehicles to during day-time only when necessary.</p> <p>Heavy vehicles should be checked for proper installation of engine silencers.</p>

NO.	PROJECT ACTIVITIES & SOURCES OF POLLUTION	POTENTIAL ENVIRONMENTAL IMPACTS	COMMON MITIGATING MEASURES
		<p>Extra workers will be needed for transporting and handling of goods.</p> <p>Flows of traffic will increase which may endanger safety of other road users.</p> <p>Noise of moving heavy vehicles will disturb tranquillity of surrounding area.</p>	<p>Road ethics and safe driving should be observed by drivers.</p> <p>Vehicles should be road worthy.</p> <p>Enough road signs to be put at points of entry and exit to work site.</p> <p>Load shall be covered to avoid spillage.</p> <p>Movement of heavy vehicles to be restricted to daytime only.</p>
6.	Materials Storage and Handling	<p>Storage of construction material such as cements, gravel and sand might be source of dust.</p> <p>Increase in noise level due to the noise of heavy vehicles such as crane and tracks at most of the residential areas along the proposed Petroleum Project,</p>	<p>It is recommended to store construction materials in covered area to avoid spread of dust.</p> <p>Loading and unloading construction materials should be conducted during day-time only and minimised during weekends and public holidays.</p>
7.	Material and equipment delivery, yard engineering, painting, electrical and instrumentation wiring	<p>No significant impacts especially when existing fabrication yards/infrastructure are used. If new onshore fabrication yards or infrastructure has to be built, these have to be assess carefully.</p>	<p>All to comply with high EQA and regulations.</p>
8.	Pipelaying, platform launching and piling	<p>Minor and temporary impacts. Benthic biota in immediate vicinity of pipelines and platform would be disturbed temporarily because of the potential slight increase in turbidity.</p>	<p>Proper planning to reduce installation period within shortest possible time.</p>

DURING TESTING AND COMMISSIONING STAGE

NO.	PROJECT ACTIVITIES & SOURCES OF POLLUTION	POTENTIAL ENVIRONMENTAL IMPACTS	COMMON MITIGATING MEASURES
1.	Normal Operation Test / Performance Test Run	<p>Commissioning of pumps and other moving parts could generate oily waste which if improperly managed could pollute river and groundwater.</p> <p>Normal test run could cause emissions that are hazardous to health.</p> <p>Water and electricity supplies may run short.</p>	<p>Waste oil to be reused if possible, otherwise it should be managed as a scheduled waste.</p> <p>Any hazardous emissions should be promptly attended to and ensure monitoring devices function well.</p> <p>Continue use of own power generators and water storage tank installed during construction.</p>
2.	Commissioning of Underground Piping	<p>Release of water after pipelines hydrotesting could increase water turbidity.</p> <p>Existing water and electricity supplies may not be sufficient to meet demand.</p> <p>Existing waste disposal system may also not be adequate.</p> <p>Leakages, pool fire and the like may threaten the physical safety of workers, residents and general public within the area.</p>	<p>Sudden release to be avoided. Water to be discharged slowly.</p> <p>Power generator and water storage installed during construction to be used. Recycle domestic water supply.</p> <p>Plan and monitor collection and disposal of waste.</p> <p>Regular monitoring and inspection are required to be detect weak joints or faulty instruments.</p> <p>Established emergency response plan.</p>

NO.	PROJECT ACTIVITIES & SOURCES OF POLLUTION	POTENTIAL ENVIRONMENTAL IMPACTS	COMMON MITIGATING MEASURES
3.	Storage of Products	Leaks and accidental discharge can endanger health and safety of workers and the public.	Ensure monitoring devices function well. Storage areas shall have spill containment and fire protection.
4.	Test Run of Waste Water Treatment Facility	Improper commissioning could lead to increased oil content of water in the downstream rivers. Inefficient treatment system will have negative impact on workers and others in the area. Effluents discharged if not properly treated will emit offensive odour.	Provision of containment and /or wastewater treatment unit equipped with effective oil interceptor. Treated effluent shall be analysed for oil and grease and suspended solid to confirm performance of treatment unit. Ensure all effluents are treated before discharge. Ensure efficient treatment of effluents.
5.	Schedule Management Waste	Leakages of schedule wastes would threaten the health and safety of workers and the environment.	Containers to be regularly checked for leakage. Containers should be stored on secured area with containment facility.
6.	Hydrotesting and dewatering of pipelines	No deleterious effect expected as indicated by studies. However, and assessment needs to be done based on the type of chemicals added to the hydrotest water.	Normally, only non-ionic surfactants will be used. Use in concentrations recommended by manufacturers.

DURING NORMAL OPERATION, MAINTENANCE AND ABNORMAL OPERATION

NO.	PROJECT ACTIVITIES & SOURCES OF POLLUTION	POTENTIAL ENVIRONMENTAL IMPACTS	COMMON MITIGATING MEASURES
1.	Operation	<p>Operation of plant can emit vapour that is hazardous to health.</p> <p>Increase in employment opportunities. Demand for housing, facilities, amenities, utilities and services will increase. Local economy will increase.</p>	<p>Rest area should be at a safe distance. Vent releasing vapour should be at safe height.</p> <p>No mitigating measures required.</p>
2.	Transportation and Products	<p>Volume of transportation and traffic can increase during normal operation.</p>	<p>Identify and de</p>
3.	Storage and Handling of Products	<p>Leakage will have deleterious effect on workers' health.</p> <p>Commercial opportunities and activities will increase.</p>	<p>Adopt proper procedures that will minimise leakage.</p> <p>Involve local people in commercial activities and opportunities.</p>
4.	Solid Waste Disposal	<p>Pollution of ground and groundwater when the wastes are buried and pollution of the air when the wastes are burnt.</p> <p>Improper disposal of biodegradable organic wastes leads to odour and pest problems</p> <p>Solid waste expected to increase with increasing activities and number of workers.</p>	<p>Generated wastes shall be kept covered in bins.</p> <p>Final disposal shall be at designated and approved landfill facility.</p> <p>Collected regularly to prevent fouling overflow in storage.</p> <p>Minimise waste generation.</p>

NO.	PROJECT ACTIVITIES & SOURCES OF POLLUTION	POTENTIAL ENVIRONMENTAL IMPACTS	COMMON MITIGATING MEASURES
5.	Schedule Waste Disposal	Improper treatment could increase oil content of water in downstream rivers.	<p>Provision of containment and / or wastewater treatment unit equipped with effective oil interceptor.</p> <p>Treated effluent shall be analysed for oil and grease and suspended solid to confirm performance of treatment unit.</p> <p>Final disposal offsite shall be managed by DOE licensed facility.</p>
6.	Abnormal Accident / Operation	<p>Abnormal operation may result in uncontrolled emissions.</p> <p>Accidents may lead to threat to physical safety.</p>	<p>Standard work procedures shall be established and adhered.</p> <p>Only trained operators are permitted to handle operation of equipment, machineries and processes.</p> <p>Established and ensure readiness for Emergency Response Plan.</p>

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APPENDIX H

CHECKLISTS

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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		

Item		Adequacy Check		Remarks
		Yes	No	
6.3	Project activities: Operational			
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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