ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES FOR LIME PLANTS

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PREFACE

This Environmental Impact Assessment Guidelines for Lime Plants is a revised version of Environmental Impact Assessment Guidelines for Industrial Projects that was published in 2007, where the Lime Planta was placed under Non-Metallic Industries category (Annex C). The Environmental Impact Assessment Guidelines for Lime Plants is newly issued in order to conform with the latest amendments specified in the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015; which is a subsidiary legislation to the Environmental Quality Act (EQA) 1974 (Act 127). Furthermore, the Department of Environment has rationalized the EIA process in order to ensure that it complies with the scope, functions and vision of the Department's Environmental Management Strategic Plan. The Plan emphasizes on the adoption of Environmental Mainstreaming and Guided Self-Regulation principles. These Guidelines are complementary to and shall be referred together with the Environmental Impact Assessment Guidelines in Malaysia (EGIM) Document 2016.

The Government of Malaysia is actively pursuing with its policy and objective of transforming the Nation's economy into a high-income country status through adoption of environmental sustainability practices. The urgency with which economic, social and political objectives must be achieved through development has greatly taxed the nation's natural resources, such as land, forests and water, whilst the discharge of wastes of various kinds has resulted in the degradation of rivers, the seas and air. In this context, it is important that environmental and social safeguards are considered and incorporated in the development of Lime Plants at the planning stage.

An EIA process should therefore focus on wastes management with emphasis on reducing, reusing, recycling and repurposing materials and their individual elements for as long as possible before they are ultimately discarded to the environment. This practice not only conserves and preserves scarce natural resources, prevents further degradation of ecosystems which human beings depend for survival, but also protects against air, water and land pollution and contamination. In this respect circular economic practices must be an essential ingredient for ensuring an environmentally sustainable Project. This aspect is emphasized in these Guidelines.

The EIA process is meant to be an added dimension in an overall holistic project planning process for the development of Lime Plants; complementing technical, financial and economic planning tools. The process considers, assesses and evaluates in greater depth the potential impacts on environmental receptors and natural resources located beyond Project boundaries. These Guidelines outline the principal activities associated with the planning, construction, operations and abandonment of Lime Plants, and describes the processes, and range of tools, that can be adopted to assess and evaluate the spatial and temporal impacts on identified receptors located in the vicinity of the Project Site(s).

Lime Plants is characterized by the large emissions of CO_2, CO, SO_2, and NO_x. Besides, the plant's operations may contribute to emissions of particulate matter including metals; hydrochloric acid. Dust dispersions can also be problematic inducing potential health impediments amongst surrounding communities. Sourcing of raw materials, and plant operations, can induce significant noise and vibration impacts and the process can lead to scarring of landscapes. As such the EIA process should recommend proper siting of facilities; and explore the possibility of employing unconventional raw materials and renewable fuels to minimize environmental encumbrances.

These Guidelines are meant to guide Project Proponents, their Qualified Persons and other EIA practitioners in the preparation and submission of EIA reports related to the development, operations and potential abandonment of Lime Plants. They shall only be employed within the framework of the EQA 1974, including its future revisions and subsidiary legislations.

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ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES FOR DEVELOPMENT OF LIME PLANTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF BOXES

ABBREVIATIONS

AIs	Appointed Individuals
APCS	Air Pollution Control Systems
BATs	Best Available Technologies
BMPs	Best Management Practices
BOD	Biochemical Oxygen Demand
C&D	Construction and demolition
CAR	Corrective Action Report
CEO	Chief Executive Officer
CFS	Central Forest Spine
CM	Compliance Monitoring
COA	Conditions of Approval
COD	Chemical Oxygen Demand
DID	Department of Irrigation and Drainage/*Jabatan Pengairan dan Saliran*
DO	Dissolved Oxygen/Development Order
DOA	Department of Agriculture/*Jabatan Pertanian*
DOE	Department of Environment/*Jabatan Alam Sekitar*
DOF	Department of Fisheries/*Jabatan Perikanan*
DOSH	Department of Occupational Safety and Health/*Jabatan Keselamatan dan Kesihatan Pekerja*
e.g.	Example
EGIM	Environmental Impact Assessment Guideline in Malaysia
EIA	Environmental Impact Assessment
EIATRC	Environmental Impact Assessment Technical Review Committee
EM	Environmental Manager/Effective Microorganism
EMP	Environmental Management Plan
EMT	Environmental Management Team
EO	Environmental Officer
EPD	Environment Protection Department
EPMC	Environmental Performance Monitoring Committee
EQA	Environmental Quality Act
EQR	Environmental Quality Report
ERCMC	Environmental Regulatory Compliance Monitoring Committee
ERP	Emergency Response Plan
ESAs	Environmentally Sensitive Areas
ESC	Erosion ad Sediment Control
ESCP	Erosion and Sediment Control Plan
ESI	Environmental Scoping Information
ESM	Environmental Scoping Matrix
etc.	*Et cetera*
FGDs	Focal Group Discussions
FRIM	Forest Research Institute of Malaysia
GAs	Government Agencies
GIS	Geographic Information System
GSR	Guided Self-Regulations

GTM	Geological Terrain Mapping
HIA	Health Impact Assessment
HQ	Headquarters
HRA	Health Risk Assessment
HWC	Human-wildlife conflicts
i.e.	*id est*
IETS	Industrial Effluent Treatment Systems
ILO	International Labour Organisation
IM	Impact Monitoring
IUCN	International Union on the Conservation of Species
JAKOA	*Jabatan Kemajuan Orang Asli Malaysia*
JKPTG	Department of Director General of Lands and Mines/*Jabatan Ketua Pengarah Tanah dan Galian*
JKR	Public Works Department/*Jabatan Kerja Raya*
JMG	Minerals and Geoscience Department Malaysia/*Jabatan Mineral dan Geosains*
JPBD	Department of Town and Country Planning/*Jabatan Perancangan Bandar dan PLANMalaysia Desa*
JPSM	Forestry Department of Peninsular Malaysia/*Jabatan Perhutanan Semenanjung Malaysia*
JPSPN	National Solid Waste Management Department/*Jabatan Pengurusan Sisa Pepejal Negara*
KPKT	Ministry of Urban Wellbeing, Housing and Local Government/*Kementerian Kesejahteraan Bandar, Perumahan dan Kerajaan Tempatan*
KSAS	*Kawasan Sensitif Alam Sekitar*
L_{10}	Ten percentile level
L_{50}	Fifty percentile level
L_{90}	Ninety percentile level
L_{AC}	Limit of Acceptable Change
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
LOS	Level of Service
LTS	Leachate Treatment Systems
MAAQS	Malaysian Ambient Air Quality Standards
METMalaysia	Malaysian Meteorological Department/*Jabatan Meteorologi Malaysia*
MOH	Ministry of Health/*Kementerian Kesihatan*
MOM	Minutes of Meeting
MOSTI	Ministry of Science, Technology and Innovation/*Kementerian Sains, Teknologi dan Inovasi*
MPFN	National Physical Planning Council/*Majlis Perancang Fizikal Negara*
MSL	Mean Sea Level
MSMA-2	*Manual Saliran Mesra Alam Edisi-2*
MUSLE	Modified Universal Soil Loss Equation
MWQI	Marine Water Quality Index

NGOs	Non-governmental Organisations
NPP-3	National Physical Plan-3
NRE	Ministry of Natural Resources and Environment/*Kementerian Sumber Asli dan Alam Sekitar*
NREB	Natural Resources and Environment Board
NTU	Nephelometric Turbidity Units
NWQS	National Water Quality Standards of Malaysia
O&G	Oil and Grease
OSC	One-Stop Centre
P.E.	Population equivalent
P2M2s	Pollution Prevention and Mitigation Measures
PBT	Local Authorities/*Pihak Berkuasa Tempatan*
PERHILITAN	Department of Wildlife and National Parks Peninsular Malaysia/*Jabatan Hidupan Liar dan Taman Negara Semenanjung Malaysia*
PM	Performance Monitoring
PM_{10}	Particulate Matter 10 micrometres or less in diameter
$PM_{2.5}$	Particulate Matter 2.5 micrometres or less in diameter
PPE	Personal Protective Equipment
PRF	Permanent reserved forest
PSD	Pipe slope drain
PTD	Land and District Office/*Pejabat Tanah dan Daerah*
PTG	Land and Minerals Office/*Pejabat Tanah dan Galian*
Q&A	Question and Answers
RAC	Report Adequacy Check
ROW	Right of Way
RQSAT	Report Quality Self-Assessment Tool
RUSLE	Revised Universal Soil Loss Equation
SAMM	*Skim Akreditasi Makmal Malaysia*
SAPs	Special Area Plans
SI	Soil Investigation
SIA	Social Impact Assessment
SMAs	Special Management Areas
SPAN	National Water Commission of Malaysia/*Suruhanjaya Perkhidmatan Air Negara*
SPC	State Planning Committee
SS	Suspended Solids
SSA	Site Suitability Assessment
STP	Sewage Treatment Plant
STS	Sewage Treatment Systems
SWMM	Storm Water Management Model
TIA	Traffic Impact Assessment
TNB	Tenaga Nasional Berhad
TOC	Table of Content
TOR	Terms of Reference
TORAC	Terms of Reference Adequacy Check
TRC	Technical Review Committee

TSS	Total Suspended Solids
UNEP	United Nations Environment Programme
UPEN	State Economic Planning Unit/*Unit Perancang Ekonomi Negeri*
WIPs	Water Intake Points
WQI	Water Quality Index
WTPs	Water Treatment Plants
ZOI	Zone of Impact
ZOS	Zone of Study

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The **'Environmental Impact Assessment (EIA) Guidelines for Development of Lime Plants** (hereinafter referred to as the 'Guidelines') is newly issued to align with the latest amendments in the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015, a subsidiary legislation to the Environmental Quality Act (EQA) 1974 (Act 127).

The amended Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015 came into force 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 segregated into two categories, i.e. the **First Schedule** (encompassing 21 Prescribed Activities) and **Second Schedule** (encompassing 17 Prescribed Activities).

Furthermore, the Department of Environment (DOE) has rationalised the EIA process to ensure that it is in conformance with the scope, functions and visions of the Department in line with its Environmental Management Strategic Plan. The Plan emphasises on adoption of environmental mainstreaming and Guided Self-Regulation (GSR) principles and the application of 5S concept in compliance with the **latest environmental requirement** and improvement of environmental management.

These Guidelines are complementary to and shall be referred together with the Environmental Impact Assessment Guideline in Malaysia (EGIM) (DOE, 2016) publication.

The Project Proponent is obligated to comply with the requirements set out in this Guidelines, as well as those prescribed in the EGIM (DOE, 2016), as specified under Section 34A (2C) of the EQA 1974 and/or any amendments made thereafter.

1.2 EIA GUIDELINES FOR LIME PLANTS

These Guidelines have been prepared to assist the Project Proponent to identify, predict, evaluate and assess the potential impacts which greenfield or expanding Lime Plants could impose on the surrounding environment, within which they are located, during the four major phases of Project development, i.e. planning, pre-construction, construction and operations. In addition, guidance for determining the range and scope of mitigation measures to control potential adverse impacts to tolerable levels are elaborated.

The EIA process will entail the execution of a range of tasks to identify, predict, evaluate and assess the potential impacts (both beneficial and adverse) which Lime Plants could have on the surrounding environment. The main objective of the EIA process is to ensure that the Project Proponent takes into consideration the consequences which such Plants could have on the continued wellbeing of ecosystems and human habitats located external to the boundaries of Project Sites.

The EIA report will 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) for Project implementation and operations.

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

The underpinning principles of the EIA process are detailed in the EGIM (DOE, 2016). Good practices in EIA preparation are shown in **Box 1**.

Box 1:

Good Practices for Conduct of EIA Studies

(i) Objective: The EIA process should meet its aims for assisting approving authorities to make informed decisions on Project viability and acceptability; and to ensure that an adequate level of protection of environmental and natural resources, and that the human health and welfare status of surrounding communities is maintained as status quo or improved.

(ii) Focused: EIA should concentrate on identifying, assessing and evaluating significant beneficial and adverse environmental impacts, focusing on pertinent issues that are of importance.

(iii) Adaptive: The EIA should be tailored to address the realities, issues and circumstances of the Project under review.

(iv) Participative: The EIA should provide ample opportunities to inform potentially affected communities especially and the general public which are interested in the Project, on the salient aspects of the Project and its environmental and social consequences. The intention being to solicit their opinions and inputs, and to address their concerns explicitly.

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

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

(vii) Practical: The EIA should identify measures for both impact mitigation and enhancement that are effective and which can be practically implemented.

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

(ix) Efficient: The EIA should impose minimum financial burden on Project Proponents, consistent with meeting process requirements and objectives.

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

1.3 GUIDELINES OBJECTIVES

The objectives of the Guidelines are to:

(a) Provide a clear and concise document on the preparation of an EIA report for the benefit of 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 study findings into the overall Project planning and development cycle, and to ensure compliance with and adherence to the legal requirements associated with the framework of environmental sustainability.

(c) Provide a detailed step-by-step guidance and explanation on 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.

1.4 SCOPE OF THE GUIDELINES

The scope of the Guidelines addresses the implementation, operation and potential abandonment of Lime Plants which fall within the criteria provided in the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015 (refer to **Section 2.3**).

The coverage of these Guidelines includes addressing environmental issues associated with the procurement of raw materials for manufacture of different types of lime-based products. This would include quarrying and preparations of limestones to produce quicklime, lime dust, and other raw materials and transportation of the raw materials to Lime Plants.

1.5 OVERVIEW OF ENVIRONMENTAL ASSESSMENT PROCESS

This Section provides an overview of the step-by-step guide to the environmental assessment of the planning, development, operations and abandonment of Lime Plants:

Step 1: Provide the Project Brief

When a Project Proponent intends to develop a Greenfield, or expand a Brownfield Lime Plant, some basic information regarding the Project will be needed to enable the Qualified Person to understand the intent, objectives and scope of the proposed Project (see **Section 2.2** for details).

The Project Brief should address the following aspects:

- The location of Project Site(s).
- Project's product and raw material specifications.
- Project Proponent and their credentials for implementing the Lime Plants.
- Government approvals garnered and those pending for Project implementation.
- Land alienation and land conversion status.
- The need for the Project.
- Manufacturing process details including sourcing of raw materials and product exports, storage for raw materials and products water sourcing proposals, effluent and sludge treatment and disposal, energy consumption rates and sources of procurement and waste solids management
- Scope of green technologies to be adopted.
- Planning, construction and operating schedules.
- Manpower requirements.
- Concept engineering reports

Step 2: Identify the Legal Requirements

The Project Proponent undertaking the Project has to comply with all legal requirements before commencing with the Project and before carrying out the EIA (refer to **Sections 2.3, 2.4 and 3.2**).

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.

Section 2.6 lists the policies and guidelines to meet environmental compliance by the Project Proponent.

Step 4: Carry Out Preliminary Stakeholder Engagement

Section 2.7 provides details of stakeholder engagements for Lime Plants. 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 (via the designated officer in charge), including the relevant GAs, when preparing the TOR and EIA.

Engagements will include public and stakeholder meetings, and Focal Group Discussions (FGDs) in order to obtain site information, and stakeholders' perceptions and concerns regarding Project implementation. Such information will be of use in conducting scoping investigations and in undertaking the EIA study.

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 (see **Chapter 3**). However, if quantitative data is available, it should be included in the TOR.

Information needed in the TOR shall consist of, but not limited nor restricted to, the ones listed in the following Sections:

(i) **Section 3.4 :** Site Suitability Assessment (SSA).

(ii) **Section 3.5 :** Determination of the study boundary.

(iii) **Section 3.6 :** Review of baseline data.

(iv) **Section 3.7 :** Determination of key Project activities.

(v) **Section 3.8 :** Identification of significant impacts and priority setting.

(vi) **Section 3.9 :** Establishment of study requirements for EIA

(vii) **Section 3.10:** Outlining of mitigation measures.

Step 6: Submission of the TOR

All data and information obtained during the scoping exercise shall be reviewed for reliability and accuracy prior to preparation of the TOR report. Report preparation shall be based on DOE requirements specified in the EGIM (DOE, 2016); as well as in accordance with the precepts outlined this Guideline. The TOR shall be submitted to DOE for review and endorsement as detailed in **Section 3.11**.

Step 7: Baseline Data Collection for EIA

After endorsement of the TOR by the DOE, baseline data collection (primary and/or secondary) shall be carried out on areas within and surrounding the Project Site(s) to garner information on environmental resources and presence of sensitive areas.

Chapter 4 describes the scope of baseline data required for the conduct of an EIA study.

Step 8: Carry Out the EIA Studies

The major studies and components of the EIA report shall cover the following:

(i) **Chapter 5:** Impact assessment of the identified significant environmental issues.

(ii) **Chapter 6:** Identification of suitable Pollution Prevention and Mitigation Measures (P2M2s) to avoid, or to reduce potential significant environmental impacts to acceptable levels, during Project implementation and operations; and to identify and ascertain the scope, intensity and prevalence of residual impacts.

(iii) **Chapter 7:** Preparation of an Environmental Management Plan (EMP) framework to monitor the actual impacts induced by the Project during its lifespan.

(iv) **Chapter 8:** Concluding remarks on the Project's potential capability to impact on surrounding environmental resources and human habitats assessed on a spatial and temporal scale.

Step 9: Draft the EIA Report

The results of assessments and studies required by other GAs have to be reviewed and approved by the respective GAs. A summarised version of such studies has to be incorporated in the EIA report. However, the whole of these GA individual reports need not be appended in the EIA report. The structure and format of the EIA report is detailed in **Chapter 9**.

Step 10: Carry Out Public Engagement

First and Second Schedule EIA requires public engagements with the relevant stakeholders who are likely to be affected by the project directly or indirectly (e.g. communities or institutions, businesses and the general public). For First Schedule EIAs, this type of engagement is mandatory to ensure that public is aware of the proposed development within their surrounding area. A First Schedule EIA may be required to follow the procedures specified in a Second Schedule EIA for the purpose of carrying out Public Engagement.

It shall be the responsibility of the Project Proponent and the EIA Consultant to organize and conduct the townhall/public hearing, with monitoring by representatives from the DOE. Project Proponent and the EIA Consultant are also responsible to identify the most suitable phase during the EIA study period to conduct the engagement.

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

All findings from any public engagements shall be incorporated into the final EIA report (refer to **Sections 2.7 and 9.3** for further details).

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

Depending on whether the Project is carried out under the First or Second Schedule, the EIA report shall, respectively, be submitted to DOE State or DOE headquarters (HQ) for review. EIA Reports for projects that straddle over two or more states; or where their waste discharges to water courses that flow through more than one state shall be submitted to DOE headquarters.

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 in either case. The Second Schedule EIA requires a public display of the EIA Report to solicit public formal comments and feedbacks, to the DOE within a specified review period of one month.

Details of the submission and review process are detailed in **Section 9.4**.

1.6 STRUCTURE OF THE GUIDELINES

The Guidelines for development, operations and abandonment of Lime Plants are structured in accordance with the step-by-step procedures described in **Section 1.5**. The substance of the Guidelines is described under eight separate

Chapters, together with their respective supporting Sections as detailed in **Table 1.1** below:

Table 1.1 List of Brief Details for Each Chapter in EIA Guidelines for Lime Plants

Chapter	Details
Chapter 1: Introduction	• Provides an introduction to the Guidelines and explains its objectives, scope and structure.
Chapter 2: Environmental Project Planning	• Provides an overview on the approach for integrating the EIA process into Project planning. • Outlines the necessary requirements for the Project to undergo initial screening and assessment • Provides a concise review of legislations, policies that are relevant to development of Lime Plants and how they relate to the EIA process. • Provides the terms and definitions associated with Lime Plants development and their interpretations. • Details out the stakeholder engagement process.
Chapter 3: Terms of Reference (TOR)	• Defines procedures for conduct of screening and scoping exercises in order to identify significant issues arising from information derived during the ESI stage for incorporation in the TOR. • Presents the structure and content for TOR reporting, including an overview of the review and approval process.
Chapter 4: Environmental Impact Assessment: Baseline Data	• Provides an outline of the relevant baseline information that needs to be incorporated in the EIA report. Information shall encompass environmental receptors which the Project could impact on and vice versa.
Chapter 5: Environmental Impact Assessment: Evaluation of Impacts	• Provides the methodology and tools to identify, predict, evaluate and assess the significant environmental impacts.

Chapter	Details
Chapter 6: Environmental Impact Assessment: Mitigation Measures	• Identifies appropriate P2M2s to minimise any negative impacts arising from the development and operations of the Project; and the range of measures that can be adopted to manage residual impacts adequately.
Chapter 7: Environmental Impact Assessment: Environmental Management Plan	• Provides an EMP framework for post-EIA monitoring and surveillance. • Details out the review process for a Project. • Describe the environmental monitoring and audit programmes for implementation post-EIA.
Chapter 8: Environmental Impact Assessment: Abandonment Plan	• Provides an Abandonment Plan framework. • Provides the environmental monitoring and audit programmes for post-abandonment activity.
Chapter 9: Environmental Impact Assessment: Reporting and Review	• Presents the structure and content for EIA reporting, including an overview of the review and approval process.

CHAPTER 2

ENVIRONMENTAL PROJECT PLANNING

2.1 INTRODUCTION

2.1.1 Environmental Impact Assessment Process

An Environmental Impact Assessment (EIA) is an integral part of Project development. Incorporation of the EIA process during early stages of Project planning conjures significant benefits and adds value to the Project (see **Box 2**).

An EIA identifies key areas of environmental impact significance and provides a means for the Project Proponent and the Qualified Person to decide, at an early stage of Project development, on the range and types of mitigation measures to be adopted in order to avert or minimise any adverse impacts being imposed on surrounding environmental receptors.

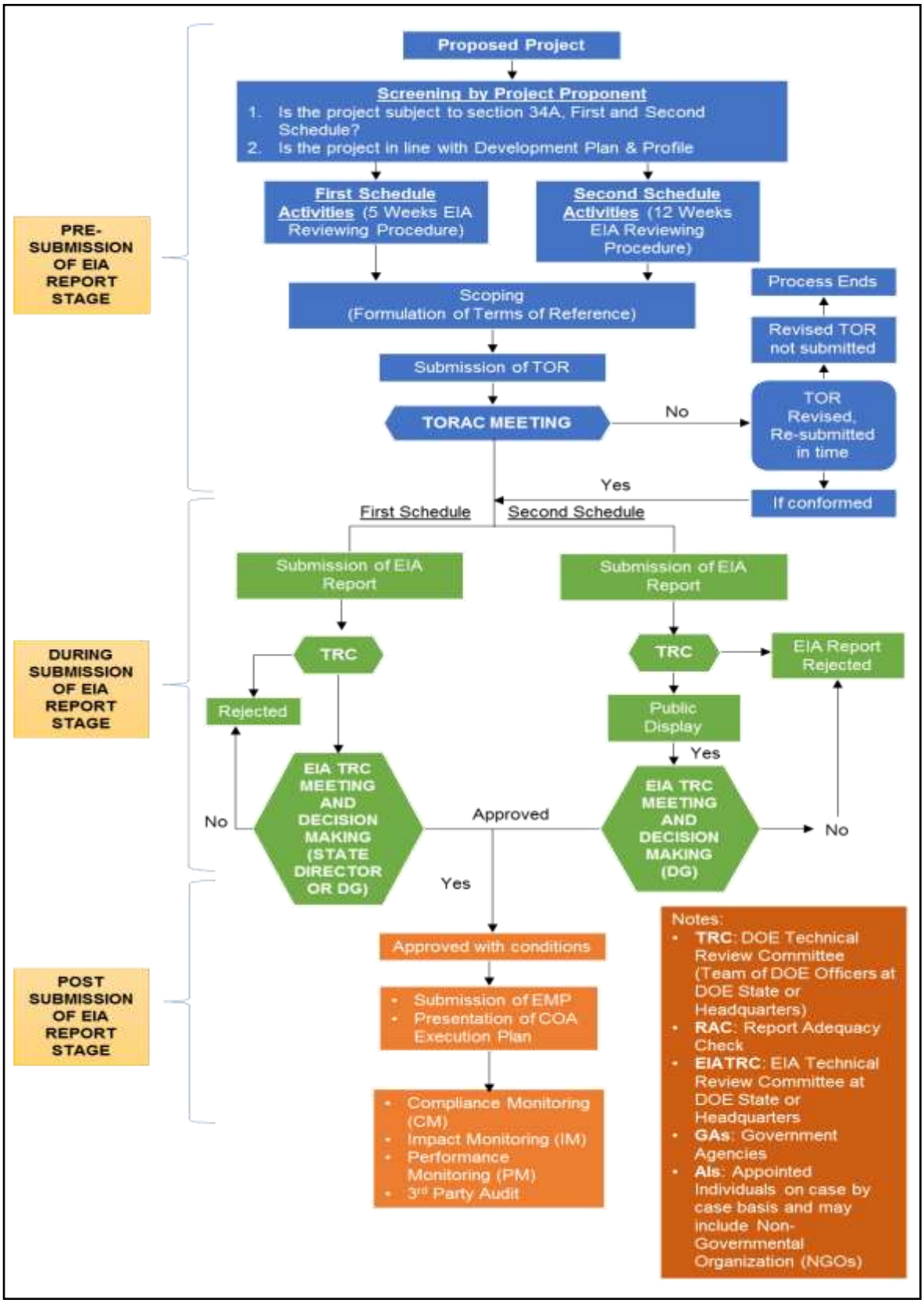
An EIA study is a very useful process for assessing the siting compatibility of Lime Plants since it has a wide range of tools to identify, evaluate and mitigate any potential negative impacts that may be imposed on the physico-chemical, biological and human components of the environment arising from Project development and operations. The EIA study also provides an opportunity to enhance potential beneficial impacts which the Lime Plants can induce on the local and regional environments, and on communities surrounding the Project Site.

At the same time the EIA process can also enhance, *inter-alia*, Project viability and sustainability, and be able to protect surrounding environmental resources with the correct application of the EIA mitigation measures.

In any development, environmental impacts arise from the emission/discharge of wastes in the form of liquids, gases, solids and other inefficient operations such as noise, vibration and light emissions. These discharges/emissions induce negative impacts on environmental/social receptors depending on the intensity and duration of the induced impact. Therefore, to mitigate such adversities it is important that efforts are made to reduce to the minimum the magnitude and extent of release of these adverse perturbations from the Project boundaries.

In order to identify and keep track on potential waste emissions from a specific Project, together with their properties and magnitude, it is important for the Project Proponent to develop a comprehensive Process Flow Diagram (PFD). The intention of the PFD is to portray the Project's manufacturing or development processes in terms of all their individual pertinent individual process units, the sequence by which they function, and their interaction and relationship with each other with regard to potential waste emissions. Refer to **Appendix A** for the example of process description and flow diagram of a Lime Plant.

An overview of the EIA process is depicted in **Figure 2.1**.



Source: Environmental Impact Assessment Guideline in Malaysia (EGIM) [Department of Environment (DOE), 2016].

Figure 2.1: EIA Procedures in Malaysia

Box 2:

Benefits of Incorporating EIA into Project Planning

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

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

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

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

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

2.1.2 Integration of Environmental Compliance in the Planning of Lime Plants

A typical Project implementation cycle involves many phases that requires inputs from various technical specialists and consultants to prepare reports for submission to the approving authorities. Throughout the ambit of this Project cycle, incorporation of environmental compliance should be advocated during three particular phases, they being:

(a) Step 1: Planning Phase

The Project Proponent is expected to have carried out initial feasibility assessment of suitable sites for development of the Project. Once a suitable site has been identified and selected, the Project Proponent may need to apply for land use conversion. Thereafter the Project Proponent will either apply for land alienation (if state or federal land) or acquire private land for development of the Project.

The Project Proponent shall ensure compliance with all National and State policies and regulations pertaining to Project development, as well as fulfil all relevant administrative matters pertaining to Project implementation and operations.

Environmental Screening: The Project Proponent, working closely with the Qualified Person, shall carry out a screening exercise to determine whether a Lime Plant Project shall have to comply with a particular Schedule under the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015, or not; and which prescribed activities under this Schedule are relevant to the Lime Plants.

Environmental Scoping: After the screening exercise, there is a need to gauge the potential significant environmental impacts which the Lime Plants Project could impose on its site as well as in the surrounding areas; and to identify Potential Pollution Prevention and Mitigation Measures (P2M2s) that can be incorporated into the Project design early to avert any future serious environmental and engineering problems/damage, such as water quality degradation of rivers, etc. The findings, collectively, termed the Environmental Scoping Information (ESI) will form the basis to develop the Terms of Reference (TOR) for the Department of Environment's (DOE) endorsement to approve/endorse.

Project Proponent must also take into consideration the implied environmental values (i.e. environmental loss and gains) resulting from Project development by conducting an Environmental Cost Benefit Analysis (CBA) during the Feasibility Study Phase, and the findings to be elaborated in the ESI. CBA is a process that is used to analyse decisions, systems or Projects, or to determine a value for intangibles. In an environmental study, CBA's are deliberated as environmental improvement or actions that somehow affect the natural environment as an indirect consequence.

Other than CBA, the Project Proponent can also conduct Economic Valuations of Environmental Impacts (EVEI). The objective of EVEI is to quantify in monetary terms, the impacts of the proposed Project on an environmental component and receptor. This study requires the monetization of potential changes (both positive and negative – if any) on environmental services arising from Project implementation. The findings of CBA can be summarized in the EIA Report. The Qualified Person may also refer to the publication entitled 'Guidelines of the Economic Valuation of the Environmental Impacts for EIA Projects by DOE (2008) as guidance to prepare an EVEI.

(b) Step 2: Feasibility and Detailed Project Design Phase

The Project's technical details and engineering designs will be submitted to the relevant approving authorities for approval, e.g. via the One Stop Centre (OSC). Often, various Government Agencies (GAs) may require additional technical studies and reports to be submitted as part of the technical submissions. In the case of DOE, this may include the preparation of an EIA report.

Environmental Impact Assessment (EIA): If a Project is categorised as a prescribed activity under the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015, it is mandatory for the Project Proponent to prepare and submit an EIA report for approval by the DOE before a Project can be implemented. The Project Proponent and Qualified Persons shall carry out the EIA study based on the endorsed TOR.

The EIA report shall incorporate major findings from the relevant sectoral studies such as wildlife relocation plans, Social Impact Assessment (SIA), Traffic Impact Assessment (TIA), etc., as required by the other GAs. The scheduling of the EIA study should take into consideration the timetable for completion of sectoral studies required by other GAs, especially conduct of SIA.

Recommendations to manage the significant environmental impacts to acceptable levels, as espoused in the EIA, shall be incorporated in the Project design. For example, major structural mitigation measures such as the construction of silt traps and/or sediment basins, etc. shall be part of the engineering works to reduce the impacts of soil erosion on water courses.

(c) Step 3: Construction and Operations Phases

Construction and operation activities must comply with the EIA Conditions of Approval (COA) issued by the DOE on approval of an EIA. The COA specifies the scope of mitigation measures to be adopted in order to ameliorate negative impacts on environmental receptors and communities which activities associated with the construction, operations and abandonment of a Lime Plant could impart. Potential negative impacts could encompass, *inter-alia*, Project activities associated with site access establishment, mobilisation of machineries and equipment, setting up base construction camps, land clearing, subsequent earthworks, effluent and solid waste discharges, gaseous pollutant emissions, structural works etc.

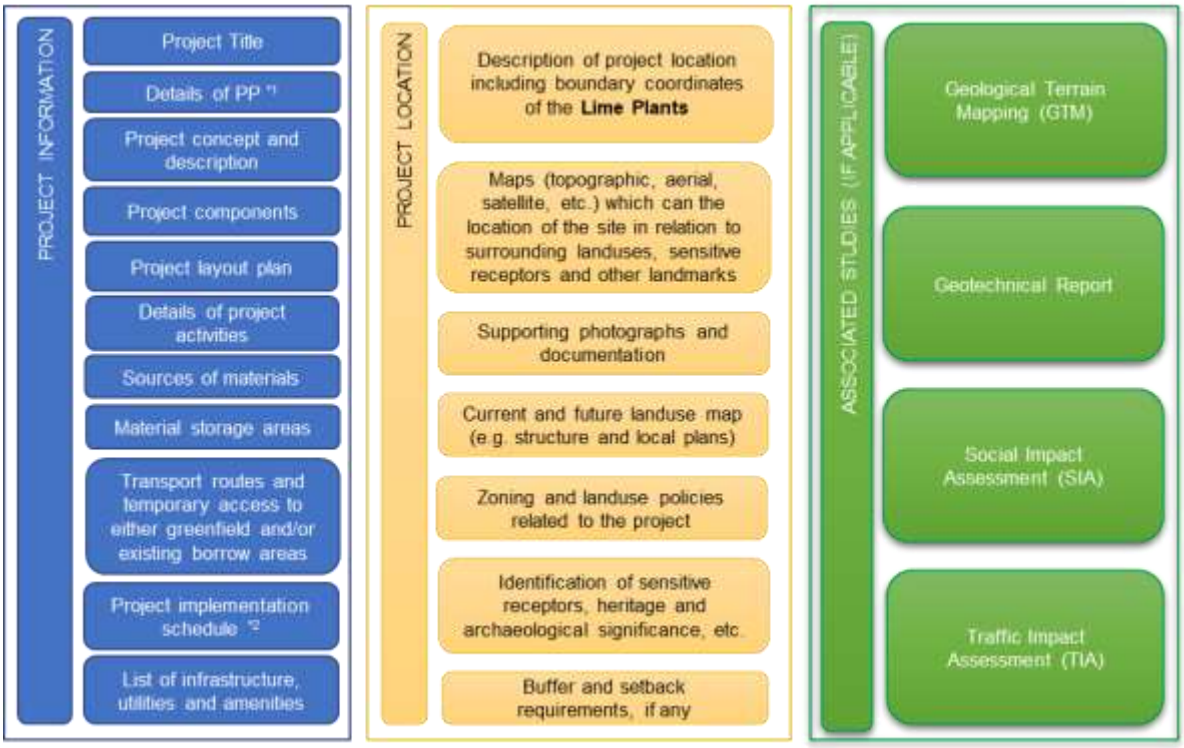
Post-EIA: The management of mitigation measures and execution of pollution controls, and their effectiveness, will be executed through an Environmental Management Plan (EMP). The EMP and the plans for environmental monitoring and auditing have to be an integrated part of all construction and operation works. These plans provide the integrative elements to ensure least degradation to the slope and hill areas during work activities.

2.2 PROJECT BRIEF

At the start of a Project, the Project Proponent shall provide a Project Brief, containing basic Project information for review by the appointed Qualified Person.

The types of information and components required to assist in identifying of the scope and requirements for an environmental assessment are listed in **Table 2.1**.

Table 2.1: Sample Project Brief by the Project Proponent



Note:

i) *1 Project Proponent (PP) [Company, address, contact person(s) and contact details].

ii) *2 Includes the time limit/period of the Project/Plant operations.

iii) 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.

The type and source of raw materials that are required for Lime Plants are important aspects to be deliberated in an EIA report. It is to be made clear whether the Project Proponent is also responsible for developing raw material procurement sites or relies on an external party to supply the materials. If the former is the case, then the development and operations of the raw material source must be subjected to an EIA process. The import of raw materials from abroad for Lime Production Plants shall be subject to relevant Authority policies. The imported raw material must be limited to a certain amount and the Project Proponent should study the possibility of utilizing wastes or by-products of other processes as raw material to reduce environmental pollution and dependency on natural resources. Besides, Project Proponent must identify the best technology or control to reduce waste generation.

The Lime Plant requires a significant amount of water for its manufacturing processes. The source of water abstraction has to be identified and whether the State has approved the amount of water to be procured. Approval will be contingent upon whether the abstraction rate induces any negative impacts on the environment and downstream water users, and whether it does not exceed the waterway's ability to sustain a viable instream ecosystem. Efforts are required to

reduce the amount of water abstraction by reclaiming wastewaters produced by the Plant and reutilising them in the manufacturing process.

The class of chemicals to be employed must be identified based on the classification of chemicals referring to CLASS Regulation 2013 *Akta Keselamatan dan Kesihatan Pekerjaan 1994*. The manner by which it will be sourced and transported to the Plant Site must be described in the EIA report. Usage of hazardous and toxic chemicals must follow the CIMAH Regulation 1996, *Akta Keselamatan dan Kesihatan Pekerjaan 1994*, and Project Proponent must justify and elaborated the impacts in detail.

Efforts are required to reduce the amount of toxic chemical and water abstraction by reclaiming wastewaters produced by the Plant and reutilising them in the manufacturing process.

A significant amount of waste by-products may be generated by the Lime manufacturing. It is therefore important to address the issue of how and where to dispose the residues. Best practice would be to reduce and reutilise the waste materials.

2.3 ENVIRONMENTAL AND RELEVANT LEGISLATIVE REQUIREMENTS

2.3.1 General Overview

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

Amendments to this principal legislation, and the enactment of new subsidiary legislations or regulations relevant to Lime Plants Project implementation and operations, may be enacted from time to time, due to changing circumstances. The Project Proponent and Qualified Person are required to keep abreast with, and refer to and adopt, any latest amendments for a Lime Plants Project.

The DOE is the main agency tasked to implement the EQA 1974 (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 have been enforced, or those that are be enforced, in Malaysia that are of relevance to the Project.

2.3.2 EIA Requirements for Development of Lime Plants

The Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015 provides the legal basis for DOE to approve an EIA for specific prescribed activities under the First and/or Second Schedules.

If a Project involves more than one prescribed activity and one of them falls under the Second Schedule, then the Project is deemed to fall under the ambit of the Second Schedule.

For development of Lime Plants, the prescribed activities are:

(i) First Schedule

Activity 6: Industry;
(c) Lime: Production of 100 tonnes or more per day of burnt lime using rotary kiln or 50 tonnes or more per day of burnt lime using vertical kiln

Activity 19: Quarry
Quarrying of rock materials

The legal adherence is based on sub-sections of the EQA 1974 (as of 5th February 2015), as follows:

(a) Section 34A (1): *The Minister, in consultation with the council, may by order prescribe any activity, which may have significant environmental impacts as prescribed activity.*

(b) Section 34A (2): *Any person intending to carry out any prescribed activity shall appoint a Qualified Person to conduct an EIA and submit a report thereof to the Director General in the manner as the Director General may prescribe.*

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

(i) An assessment of the impact such activity will have or is likely to have on the environment.

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

Note: Project Proponent shall carry out screening process for the related activities that is required to be conducted for the proposed Project development with the Environmental Quality (Prescribed Activity) (Environmental Impact Assessment) Order 2015. This is to ensure that relevant EIA requirement has been fulfilled for the Project activity e.g. quarry/mining activity for raw material requires EIA to be conducted, based on the quantum provided in the above-mentioned Order.

2.3.3 Environmental Quality Act 1974 (Act 127)

EIA is a mandatory requirement under the provision of Section 34A (2) of the Environmental Quality Act 1974 for activities prescribed in the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015.

Section 34A (2) stipulates "Any person intending to carry out any prescribed activities shall appoint a qualified person to conduct an environmental impact assessment and to submit a report thereof to the Director General in the manner as the Director General may prescribed, before any approval for the carrying out of such activities is granted by the relevant approving authority, submit a report to the Director General.

The report shall be in accordance with the guidelines prescribed by the Director General and shall contain an assessment of the impact such activity will have or is likely to have or is likely to have on the environment and the proposed measures that shall be undertaken to prevent, reduce or control the adverse impact on the environment."

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

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

(a) Be responsible for the Environmental Impact Assessment and the recommendations of the Environmental Impact Assessment.

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

(c) Take professional indemnity insurance for any liability arising from the Environmental Impact Assessment and the recommendations of the environmental impact assessment.

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

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

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

2.3.4 Environmental Quality (Clean Air) Regulations, 2014

The regulations in the Environmental Quality (Clean Air) Regulations 2014 are applicable for the Lime Plants.

A Lime Plant may require boilers, furnaces or any fuel burning equipment used for the purposes of heat, power and steam generation where the emission limits are as stipulated in the **Third Schedule, under Item A: Heat and Power Generation.**

2.3.5 Environmental Quality (Industrial Effluents) Regulations, 2009

During operation of the Lime Plant, any industrial effluents generated in the facility shall need to comply with the Environmental Quality (Industrial Effluents) Regulations 2009.

The following regulations are to be considered during the EIA:

Design and Construction of Industrial Effluent Treatment System

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

Compliance with Specifications of Industrial Effluent Treatment System

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

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

2.3.6 Environmental Quality (Sewage) Regulations, 2009

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

Where applicable, the sewage from a Lime Plant is expected to be treated to meet the **Second Schedule** of the Regulations.

2.3.7 Environmental Quality (Scheduled Wastes) Regulations, 2005

The Environmental Quality (Scheduled Wastes) Regulations 2005 regulates the handling, movement, disposal and treatment of scheduled wastes in Malaysia. The Lime Plants may generate several types of scheduled waste in its processes, such as waste oils from machineries. During the EIA preparation stage, this regulation shall be considered, in particular:

Responsibility of Waste Generator

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

prescribed premises for treatment, disposal or recovery of material or product from scheduled wastes.

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

Storage of Scheduled Wastes

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

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

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

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

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

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

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

The prescribed activities mentioned above do not apply to the States of Sabah and Sarawak, of which natural resources management are subject to separate state legislations and requirements as shown in **Table 2.2**.

Table 2.2: Environmental Legislation for Sabah and Sarawak

STATE	LEGISLATION	AUTHORITY
Sabah	Environmental Protection Enactment (Prescribed Activities) (Environmental Impact Assessment) Order 2005	Environment Protection Department (EPD)
Sarawak	Natural Resources and Environment (Prescribed Activities) Order 1994	Natural Resources and Environment Board (NREB)

2.3.8 Environmental Quality Act 1974 Act 127 Section 30A Power to Control Use of Substance and Product and to State Environmental Labelling

This Act is applied to all industrial activity that stores, processes and generates hazardous substances throughout its operations. Pollution abatement measures are described under Section 30A “Power of Use of Substance and Product and to State Environmental Labeling”.

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

This regulation applies to industrial activity in which there is hazardous substance involved. The objective of the regulation is to prevent major accidents and to limit consequential impacts on people and the environment.

2.3.10 Occupational Safety and Health Act (OSHA) 1994

An Act to make further provisions for securing safety, health and welfare of persons at work, for protecting others against risks to safety or health in connection with the activities of persons at work.

2.3.11 Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) (CLASS) Regulations 2013

This regulation applicable to chemicals supplied for use at a workplace. The main objective of the Regulation is to ensure chemicals supplied have provide sufficient information on hazards of chemicals; to mitigate the risk of accidents happening at the workplace.

2.4 TERMS AND DEFINITIONS

All legal definitions and interpretations shall be based on the Interpretation Acts 1948 and 1967 (Act 388). In addition, terms and interpretations shall also be based on any relevant interpretation documents that have been published or are to be published by DOE in the future.

The common terms and definitions adopted for these Guidelines are summarised in the following Section. In case of doubt and uncertainty of the terms, clarification with DOE shall be required.

2.4.1 Development

Under the Town and Country Planning Act 1976 (Act 172) and amendment thereof in 2006, "development" means the carrying out of any building, engineering, mining, industrial, or other similar operations in, on, over, or under land, the making of any material change in the use of any land or building or any part thereof, or the subdivision or amalgamation of lands; and "develop" shall be construed accordingly.

(a) Land Disturbing Activities

Based on the EGIM (DOE, 2016), "land disturbing activities" refer to any Project development activity that is subject to Section 34A of the EQA 1974 involving clearing of trees or vegetation, excavating, raising or sloping of ground, trenching, grading and blasting.

(b) Roads/Tunnel/Bridge

As defined under the Road Transport Act 1987 (Act 333), any public road and any other road to which the public has access, includes bridges, tunnels, lay-bys, ferry facilities, interchanges, roundabouts, traffic islands, road dividers, all traffic lanes, acceleration lanes, deceleration lanes, side-tables, median strips, overpasses, underpasses, approaches, entrance and exit ramps, toll plazas, service areas, and other structures and fixtures to fully effect its use.

For the purposes of Sections 70 and 85 of the same Act, it also includes a road under construction, but shall not include any private road, bridge, tunnel or anything connected to that road, which is maintained and kept by the private persons or private bodies.

Road classification shall be as defined by the Public Works Department (JKR) in "A Guide on Geometric Design of Roads" (JKR, 2015) for both urban and rural roads with specifications as shown in **Table 2.3**.

Table 2.3: Minimum Reserve Width for JKR Roads

Area	Road Category	Design Standard	Minimum Reserve Width (m)
Rural	Expressway	R6	60
	Highway	R5	60
	Primary Road	R5 R4	50 40
	Secondary Road	R4 R3	30 25
	Minor Road	R2 R1	20 20
Urban	Expressway	U6	65
	Arterials	U5 U4	65 40
	Collector	U4 U3	40 40
	Local Street	U3 U2 U1	40 30 25

Note : Values are for road standards in flat areas and will need to be increased accordingly for areas involving deep cuts and fills.
Source : A Guide on Geometric Design of Roads (JKR, 2015).

A "Tunnel" is an artificial underground passage, especially one built through a hill or under a building, road, or river.

A "Bridge" is a structure built to span physical obstacles such as a body of water, valley, or road, for the purpose of providing passage over the obstacle.

(c) Slopes

Slope gradients are quantified in degrees (refer **Appendix A** of EIA Guideline for Development in Slope and Hill Areas for calculation method). The slope ranges are generally categorised as shown in **Table 2.4**.

Table 2.4: Classification of Slopes

Slope Range
< 15°
≥ 15° to < 25°
≥ 25° to < 35°
≥ 35°

Source: Adapted from the Department of Town and Country Planning (JPBD), 2009.

(d) Development Restrictions

Development restrictions and controls shall abide by the policies in the National Physical Plan-3 (NPP-3) (JPBD, 2016) and other relevant national/state policies such as the State Structure Plan and Local Plan.

2.5 OVERVIEW OF THE LIME PLANTS

2.5.1 Lime Production Process

Lime and lime-based products are manufactured predominantly from limestone, where the sample of sequence of activities involved is shown in the flow diagram in **Appendix A.**

2.5.2 Issues to be Addressed in the Environmental Impact Assessment

Project location, or siting, is a very important aspect to address during the feasibility stage of Project Development. In this respect the basic requirements for a Lime Plant are that it should be located near to a quarry, to minimise hauling distance for the limestone, and there should be adequate capacity of roads/highways that provide suitable linkages to raw material sources and to wholesale and retail centres, or to ports for delivery of products.

As to addressing environmental impacts induced by a Lime Plant, the following factors should be addressed, viz:

- Ecological, geophysical, aesthetic and heritage (including loss of limestone caves) permanent changes due to mining and quarrying of limestones.
- Potential dust emission from the milling of limestone rocks to crushed limestone pieces.
- Potential gaseous emissions from thermal processing of crushed limestone to quicklime.
- Potential erosion during Plant development.

- Landscape and Land Use Changes resulting in incompatibility issues, visual intrusion and climate change effects.

- Potential water pollution impacts due to process related effluent discharges and its potential adverse impacts on downstream users, downstream economic activities, and in-stream biological resources.

- Energy consumption and its contribution to adverse climate change impacts.

- Solid waste disposals and their potential impacts on environmental degradation.

- Socio-economic impacts induced by creating direct and indirect employment, business opportunities and enhancement of the country's overall economic growth and reducing foreign exchange deficits.

Impact identification and assessment should follow the Guidelines on the procedural steps to be taken as described in this Document; and be cognizant of the Laws and Regulations that have implications on the establishment and operations of Lime Plants within Peninsular Malaysia.

In identifying mitigation measures to off-set adverse impacts to tolerable levels it is important that principles of reuse, reduce and recycling be considered where applicable and adaptable. Selected mitigation measures should adopt the Best Available Technologies Not Entailing Excessive Costs (BATNEEC) and have previously demonstrated their ability to have sustainable effects on reducing environmental pollution and degradation to acceptable levels.

The Project Proponent shall identify an environmental monitoring plan to track the actual impacts that are induced on identified environmental receptors during the construction and operating phases of the Project; and whether all recommended mitigation measures are fulfilling their predicted or expected outcomes. This monitoring exercise should also be adopted if the Project is abandoned and steps taken to reinstate the Project Site(s) to their original state.

2.5.3 Circular Economic Principles Applied to Lime Plants

A circular economy is a system that aims to maximize the use of resources, and to reduce waste generation by making the best possible use of a product. The circular economy concept stresses that industrial process should practice sustainability concept such as the efficient management of the resources. The aim is to obtain means increasing productivity with zero waste generation. The tools of this concept include reduce, reuse and recycle activities.

Reducing resource consumption and waste generation, reusing some of the waste materials in different applications, and minimizing waste production through

recycling and recovering material and energy from what was previously treated as waste can contribute towards circular economy practices.

2.5.4 Summary

In summary, for the conventional Lime Plant that obtains raw material by quarrying for limestone, the largest environmental impact is the quarrying, as this permanently destroys limestones, entailing ecological, geophysical and heritage damages. The next impacts are those due to the processes of converting limestone to quicklime and lime powders, mainly due to dusts generated.

2.6 POLICY AND GUIDELINES COMPLIANCE

Any proposed development in Environmentally Sensitive Areas (ESAs) has to 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.

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.

2.6.1 Policy Adherence

The Project has to meet all legal and environmental 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 regard to policy compliance and study requirements with the relevant agencies and government departments.

The Project Proponent and his team shall be required to engage with all the relevant national and state agencies (see also **Sections 2.6 and 2.7** for details) 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. Examples of critical requirements that shall be addressed are shown in **Table 2.5** (also refer to **Sections 2.6.2** and **2.6.3** for a list of relevant policies and guidelines).

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 must be cleared before proceeding with the EIA submission.

Table 2.5: General Policy Adherence for Lime Plants Prior to EIA Submission

Requirements/Compliance	Agencies/Department	Legal Requirements	Required Outputs
• Project approvals and/or supporting documents.	1. National Physical Planning Council of Malaysia (MPFN) 2. MIDA/MITI 3. Regional Development Authority 4. State Planning Committee (SPC) 5. *Jawatankuasa Teknikal Pembangunan Kawasan Sensitif Alam Sekitar* (KSAS) 6. Local Authority (PBT)	• Town and Country Planning Act 1976 (Act 172)	• To ensure that the Project complies with the national and state policies and requirements.
• Adherence to landuse compatibility (structure/local/ special area plan). • Development requirements in/near ESAs. • Social Impact Assessment (SIA) requirements	7. PLANMalaysia (JPBD)	• Town and Country Planning Act 1976 (Act 172)	• To ensure that the Project is in line with the structure/local plans and compatible with the surrounding landuse. • To determine need for SIA for the Project in consultation with PLANMalaysia (JPBD).
• Land status compliance. • Land acquisition. • Minerals release.	8. Department of Director General of Land and Mines (JKPTG) 9. Land and Mines Office (PTG) 10. District and Land Office (PTD)	• National Land Code 1965 (Act 56)	• To ensure that the Project Proponent owns the land and the status is correct with its intended development type. • To ensure there are no constraints on the land that may prohibit it from being developed.

Requirements/Compliance	Agencies/Department	Legal Requirements	Required Outputs
• Geological Terrain Mapping (GTM) requirements. • Geotechnical report requirements. • Slope stability and protection requirements. • Traffic Impact Assessment (TIA) requirements).	11. Minerals and Geoscience Department (JMG) 12. Public Works Department (JKR)	• National Land Code 1965 (Act 35) • Minerals Development Act 1994 (Act 525) • Geological Survey Act 1974 (Act 129) • Road Transport Act 1987 (Act 333)	• To ensure that the topography, terrain and geological features within the site is suitable for development. • To determine the need to carry out a TIA.
• Development requirements in Central Forest Spine (CFS) areas and linkages (primary and secondary) and in Permanent Reserved Forests (PRF).	13. Forestry Department of Peninsular Malaysia (JPSM)	• Forestry Act 1984 (and amendments thereof) (Act 13)	• To determine the status of the forest, ensuring it can be developed and is not within PRF, water catchment, etc.
• Development requirements in/near wildlife sanctuaries and other, protected areas. • Protection of flora and fauna. • Requirement for animal relocation plan, viaduct crossings, etc.	14. Department of Wildlife and National Parks Peninsular Malaysia (PERHILITIAN)	• Wildlife Conservation Act 2010 (Act 716)	• To determine the sensitivity of the site in terms of flora and fauna species and constraints for development.

Requirements/Compliance	Agencies/Department	Legal Requirements	Required Outputs
• Permission for river diversion. • Requirement for river reserves. • Stormwater management requirements (MSMA-2) • Erosion and Sediment Control Plan (ESCP)	15. Department of Irrigation and Drainage (DID) 16. State Water Authority	• Street, Drainage and Building Act 1974 (Act 133) • State enactments on water resources, river basins and coastal areas	• Determine the hydrological condition of the site and requirements pertaining to changes in river system and runoff management requirements.
• Development requirements within *Orang Asli* settlements and their roaming areas, agriculture plots cultural, heritage, religious and archaeological sites.	17. *Jabatan Kemajuan Orang Asli* (JAKOA)	• Aboriginal Peoples Act 1954 (Revision 1974) (Act 134)	• To ensure that the area is not occupied by *Orang Asli* community and if so, how to manage impacts.

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.

2.6.2 National and State Policies and Plans

The relevant policies and plans for development of Lime Plants are listed in **Table 2.6**. 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.

Table 2.6: List of Policies and Plans Relevant to Development of Lime Plants

POLICIES AND PLANS	DETAILS AND SCOPE
National Physical Plan-3 (NPP-3) (JPBD, 2016)	National spatial planning guidelines: covers Siting of Industrial estates.
State Structure and Local Plans (Various local authorities and publishing dates)	State and local level planning guidelines for Industrial landuse: includes development controls.
National Policy on Biological Diversity 2016 – 2025 (NRE, 2016)	Covers specifically 17 national biodiversity targets with corresponding goals and action plans to achieve within 2016 – 2025.
Central Forest Spine (CFS) I & II: Master Plan for Ecological Linkages (JPBD, 2009)	Planning requirements for development proposed in the CFS including primary and secondary linkages.
National Policy on the Environment [Ministry of Energy, Science, Technology, Environment and Climate Change (MESTCC)]	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.

Notes :

(i) The list above 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 and latest information required for environmental assessment and compliance.

(ii) Industrial Master Plan by MIDA

2.6.3 Guidelines and Guidance Documents

The EIA report must also refer to the relevant guidelines and guidance documents issued by DOE and other Government Agencies (GAs) pertaining to environment related systems and their management, and any other documents and notices issued from time to time, related to the EIA process and procedures.

Apart from the legislations, regulations, policies and plans mentioned above, **Table 2.7** provides a list of guidelines and guidance documents for EIA reporting.

Table 2.7: List of Relevant Guidelines and Guidance Documents Related to Development of Lime Plants

GUIDELINES/GUIDANCE DOCUMENTS	DETAILS AND SCOPE
***Garis Panduan Perancangan Kawasan Sensitif Alam Sekitar* (PLANMalaysia, 2017)**	Provides the requirements for development in ESAs.
Guidance Document for Addressing Soil Erosion and Sediment Control (ESC): Aspects in the EIA Report as per Appendix 3 of the EGIM (DOE, 2016)	EIA reporting format concerning soil erosion and sediment control.
Guidance Document for the Preparation and Submission of EMP as per Chapter 6 of the EGIM (DOE, 2016)	Guidance for the preparation of the EMP post-EIA including translating into action, the P2M2s recommended in the EIA and the COA.
Guidance Document for the Preparation of the Document on Land-Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2) as per Appendix 4 of the EGIM (DOE, 2016)	Guidance for the preparation of the LD-P2M2 document which is to be included as part of the EMP to be submitted to DOE for approval.
Technical Guidance on Scoping Preparation of EIA Report and Development on Hill and Slope Area (DOE, 2015)	Provides guidelines on scoping for development on hill and slope areas.
***Manual Panduan Pemeriksaan BMPs untuk Kawalan Hakisan dan Sedimen* (DOE, 2015)**	A manual on inspection procedures including checklists, of the erosion and sediment control BMPs.
Guidelines for Agricultural Development in Slope Areas [Department of Agriculture (DOA), 2013]	Guidelines for agricultural development in slope areas.

GUIDELINES/GUIDANCE DOCUMENTS	DETAILS AND SCOPE
Guidelines for Erosion and Sediment Control in Malaysia (DID, 2010)	Guidelines for prevention and control of soil erosion and siltation for specific Projects including examples of control measures and Best Management Practices (BMPs).
Guidelines for Slope Design (JKR, 2010)	Covers geotechnical design criteria for slopes.
DID Manual Volume 2 – River Management (DID, 2009)	Provides methods to assess, manage and mitigate measures for river conservation, rehabilitation and restoration.
Guidelines for Prevention and Control of Soil Erosion and Siltation in Malaysia (DOE, 2008)	Guidelines for prevention and control soil erosion and siltation for specific Projects including examples of control measures and Best Management Practices (BMPs).
Stream Crossing Guidelines: An Ecological Approach (DID, 2008)	Details on Stream Crossing requirements.

2.7 STAKEHOLDER ENGAGEMENT

2.7.1 Introduction

Stakeholder engagement is an important process at the preliminary stage, prior to drafting the TOR. At the start of the proposed Project, the Project Proponent and/or the Qualified Persons should pre-consult with DOE, the planning approval authorities and Government Agencies (GAs) to confirm their study requirements and the approval process to be followed, and to obtain their feedbacks regarding the proposed Project. All these will be considered in the TOR, EIA and by the EIA Technical Review Committee (EIATRC).

Consultations with other stakeholders, besides the GAs and approving authorities, are also needed and it is the Project Proponent and Qualified Person's responsibility to identify the key stakeholders to engage with at this early stage to assist in the preparation of the TOR and ESI.

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

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

Engaging with stakeholders can have general benefits to a Project as shown in **Box 3**.

Box 3:

Aims of the Stakeholder Engagement

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

(ii) To convey the aims and scope of the development to affected stakeholders and inform them of potential impacts induced by the development and the mitigation measures to be 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.

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

2.7.2 Identification of Stakeholders

The stakeholders can be grouped into three main groups from:

(i) GAs which have the powers and legal rights to administer, enforce and approve the Project.

(ii) General public, organisations, properties and landowners who may be directly or indirectly be affected by the Project.

(iii) Special interest groups or organisations representing their interests or influence, e.g. NGOs related to environmental conservation.

Table 2.8 presents an indicative, but non-exhaustive, list of stakeholders for engagements in connection with Lime Plant development.

Table 2.8: Key Stakeholders and their Roles and Responsibilities

STAKEHOLDER	ROLES AND RESPONSIBILITIES
Department of Environment (DOE)	•Administrator of the EIA process under the EQA 1974. •Responsible for the issuance of the COA for the EIA. •Post-EIA approvals, monitoring and enforcement.
Project Proponent	•The party to carry out the development and be responsible for obtaining all necessary approvals for the industry site. •Involved in the management of the management of the project at all stages of development. •Consultation on changes in project design incorporation of P2M2s.
Relevant GAs	•GAs which have roles and functions in the project and are responsible for the issuance of approvals for studies, technical reports and engineering plans for the project. •Engagement shall assist in determining GA requirements for the project that needs to be addressed by the Project Proponent, and also to assist in obtaining information under their respective agencies relevant for the project. •List of pertinent requirements that need to be addressed is presented in Table 2.5
Affected Public and Local Population	•The public or local population that may be directly affected by the project and whose concerns and interests need to be addressed as part of the EIA. •These may include residents, business owners, farmers, Orang Asli, private land owners, etc. •Preliminary engagement may include identifying public concerns for the project that needs to be addressed, and obtain feedback on proposed mitigation measures.
NGOs	•Provide input and feedback on issues of special interest.

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.

2.7.3 Methods of Engagement

The engagements are to be conducted in accordance with the following steps:

(i) Step 1: Identify from the relevant GAs key areas of policy, regulatory and guideline compliance.

(ii) Step 2: Obtain initial data and views from the GAs and stakeholders (communities, local leaders, etc.) to assist in preparation of the TOR.

(iii) Step 3: Document stakeholder feedbacks to identify areas of improvement that needs to be considered as per the initial Project concept designs.

(iv) Step 4: Review and assess all information and feedback obtained to determine those that are relevant for incorporation into the TOR and EIA reports.

Types of stakeholder engagement are summarised in **Table 2.9**.

Table 2.9: Public Engagement Methods and Expected Outputs

STAKEHOLDER	TYPE OF CONSULTATION	INFORMATION REQUIREMENT
DOE	• Meeting and/or pre-consultations.	• Comments on TOR/ESI and EIA process and requirements.
Project Proponent and Consultants	• Meetings and/or private consultations.	• Information required for the project. • Consultation on changes in project design incorporation of P2M2s.
Relevant GAs	• Meeting and/or pre-consultations. • Official correspondence.	• Agency requirements such as key elements of policies, regulations and guidelines to adhere to, including planning approval requirements. • Methods to address those key elements and approval procedures.
Affected Public and Local Population	• Questionnaire surveys. • Interviews (formal and informal). • Focal group discussion (FGD). • Public briefing. • Project brief. • Website.	• Project briefing. • Views and concerns on the project. • Inputs for project incorporation. • Conflict resolution mechanism.
NGOs	• Meeting and/or private consultation.	• Concerns and inputs on project.

Note: The list is not exhaustive and not all the above may be relevant to the Project.

2.7.4 Documentation and Reporting

Findings from stakeholder engagements shall be incorporated into the TOR, especially with regard to policy compliance and regulatory adherence.

Proof of engagement can be in the form of written reports, official response letters from the GAs, MOM, photos, etc.

CHAPTER 3

TERMS OF REFERENCE (TOR)

3.1 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:

(i) **Section 3.2:** Environmental Screening Procedures.

(ii) **Section 3.3:** Environmental Scoping.

(iii) **Section 3.4:** Site Suitability Assessment (SSA).

(iv) **Section 3.5:** Study Boundary.

(v) **Section 3.6:** Baseline Data Review (based predominantly on secondary data/information).

(vi) **Section 3.7:** Determination of Key Project Activities.

(vii) **Section 3.8:** Identification of Potential Significant Impacts and Priority Setting.

(viii) **Section 3.9**: Establishment of Study Requirements for EIA.

(ix) **Section 3.10:** Outlining of Preliminary Mitigation Measures.

(x) **Section 3.11:** Preparation and Submission of TOR/Environmental Screening Information (ESI).

3.2 ENVIRONMENTAL SCREENING PROCEDURES

Environmental Screening is carried out to determine whether or not a proposed Project is a prescribed activity under the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015 (refer to **Table 3.1**)

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

Table 3.1: Criteria for Screening of Lime Industry

ACTIVITY	APPLICABILITY
First Schedule Activity 6 (c) Industry: Lime	Type of Development Production of 100 tonnes or more per day of burnt lime using rotary kiln or 50 tonnes or more per day of burnt lime using vertical kiln.

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, and 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.

3.3 ENVIRONMENTAL SCOPING

The main objective of environmental scoping is to identify a range of potential significant negative as well as positive impacts and consequential issues requiring assessments so as to determine the focus, depth, spatial and temporal boundaries of an EIA Study that are deemed significant and requiring assessment. Scoping shall be carried out at the early stages of a 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 socio-economic) 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 or pre-judge any issues of concern.

The scoping exercise (also refer to **Figure 3.1**) encompasses the following steps, which are elaborated in the accompanying Sections:

(i) Site Suitability Assessment (SSA): The SSA shall consider all alternatives or options to refine and improve upon the original concept design in order to minimise consequential impacts to acceptable levels (refer to **Section 3.4**).

(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 prevailing and projected site conditions and environmental sensitivities surrounding the Project Site (refer to **Section 3.5**).

(iii) Baseline Data Review: The Qualified Person shall carry out qualitative assessment based on desktop studies and literature reviews. These may be supplemented by initial site investigations and stakeholder engagements (refer to **Section 3.6**). Quantitative assessments can be provided where necessary and when applicable.

(iv) Determination of Key Project Activities: The Project Proponent shall outline the key Project activities that are executed during various phases of Project implementation (i.e. during pre-construction, construction and operations) focussing on those that will induce pertinent environmental impacts on surrounding sensitive receptors (refer to **Section 3.7**).

(v) Identification of Significant Impacts and Priority Setting: This step will involve preliminary identification of significant impact consequences for further detailed assessment in the EIA. Non-significant consequences shall also be addressed accordingly in the EIA study but limited to general/qualitative impact prediction and evaluation (refer to **Section 3.8**).

(vi) Establishment of Study Requirements for EIA: Identify and detail out relevant methodologies and appropriate recognised assessment tools to be adopted in the EIA process for evaluating the spatial and temporal significance of potential impacts (refer to **Section 3.9**).

(vii) Outlining of Mitigation Measures: The Qualified Person shall identify sustainable and practical mitigation measures to abate significant adverse impacts (refer to **Section 3.10**).

(viii) Preparation and Submission of TOR and ESI: Findings from the scoping exercise shall be compiled, collated and analysed in order to prepare the TOR for submission to DOE (refer to **Section 3.11**).

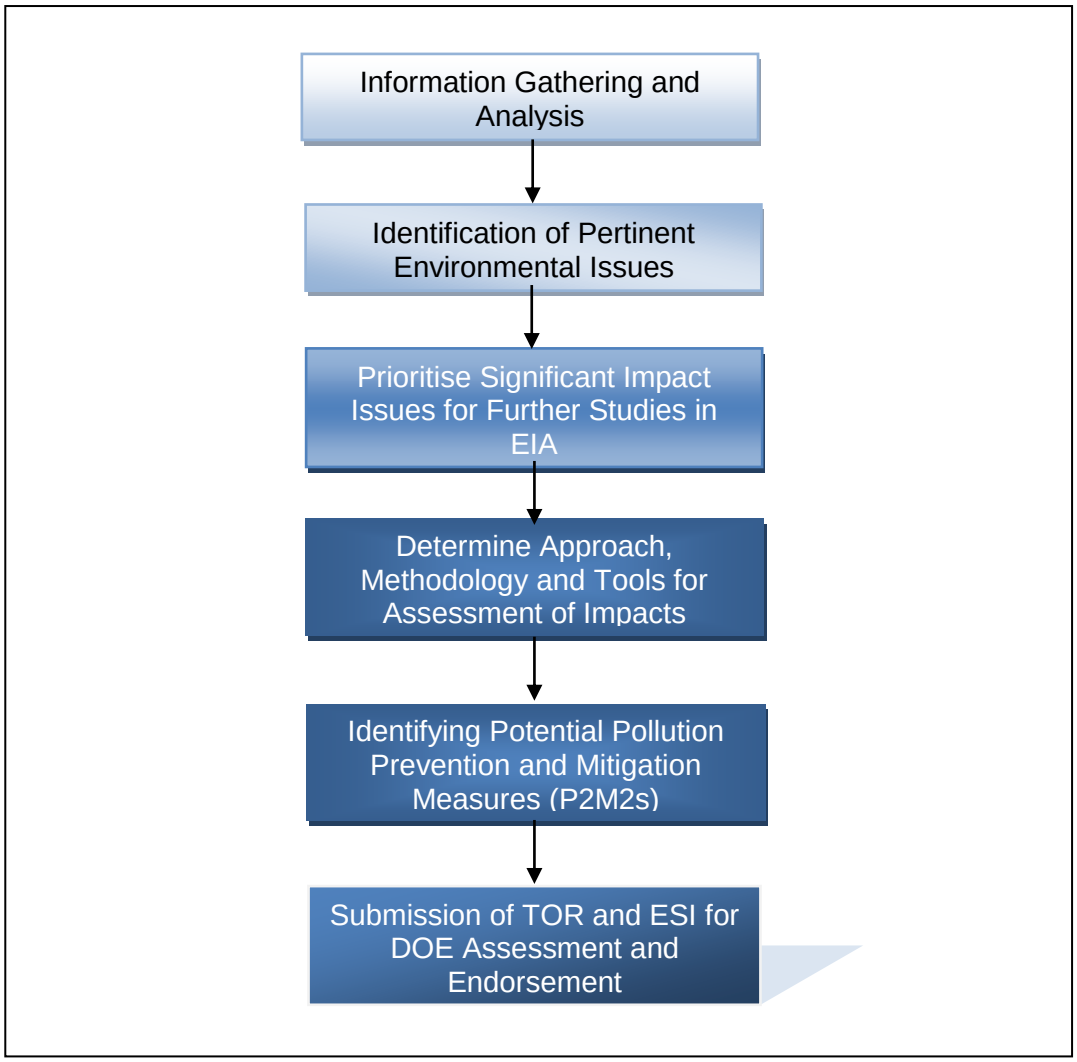


Figure 3.1: Flow Path for Environmental Scoping

3.4 SITE SUITABILITY ASSESSMENT (SSA)

The SSA processes and procedures are detailed in the EGIM (DOE, 2016). Generally, this is carried out during the Project's feasibility stage. The intention is to identify potential alternatives and options to the initial concepts and layouts which can minimize potential adverse impacts, or to enhance beneficial impacts, that are likely to be imposed on environmental and natural resources.

The 'Environmental Essentials for the Siting of Industries in Malaysia' (EESIM) and 'Guidelines for Siting and Zoning of Industry and Residential Area' shall be referred, to provide guidance to Project Proponent in selecting the suitable location or site to set up their industry.

If deemed necessary, the manufacturing concepts and the Plant layout can be amended and finalised; and which will form the basis for undertaking the scoping exercise (refer to **Table 3.2** for examples).

The scoping exercise will add value to this SSA by recommending pragmatic mitigation measures to be adopted, such as P2M2s and Best Management Practices (BMPs), to ameliorate potential environmental degradation that are anticipated when developing Lime Plants at various sites.

Table 3.2: Considerations in Project Alternatives and Options

Project Siting	• Adherence to national and state policies and guidelines. • Site constraints to the Project and vice versa. • Location and proximity to sensitive receptors. • Location and proximity to raw material sources. • Availability of adequate buffers. • Any alternative sites that needs to be proposed for the Project.
Terrain and Topography	• Conservational value. • Availability of land for buffers. • Slope classification and degree. • Site hydrology and drainage patterns. • Conditions and constraints of the site (hilly, steep slopes, geo-hazards, flood risk, soil conditions and soil erosion potentials). • Possibility of avoidance of unsuitable terrain. • Visual/aesthetic impacts.
Accessibility	• Availability of access. • Proximity to construction/source materials. • Strategic locational advantages. • Traffic conditions.
Technology Options	• Availability of technology to minimize impacts. • Best Available Technology/Techniques (BAT) options. • Benchmarking with alternative technology. • Green Technology Adoption
Project Component and Design	• Adaptive design to suit terrain. • Layout consideration. • Choice of construction method and use of green construction materials. • Maintenance issues.
Social Constraints and Attributes	• Location within or close to existing communities. • Health impediments including job creation opportunities. • Inducing job creation opportunities. • Need for land acquisition and relocation of occupants/business.
Economy and Finance	• Potential employment and business opportunities. • Cost and benefit considerations. • Supply and demand scenarios. • Potential loss of income.
Operations	• Type of landuse and operational components. • Adoption of best practices and green development concepts. • Slope management considerations.

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.

3.5 STUDY BOUNDARY

The delineation of boundaries within which impact assessments are to be conducted are important factors to be addressed in the TOR/ESI/EIA reports. In this respect two types of study boundaries are needed to be demarcated; they are:

(i) The study boundary, which defines the ZOS. The ZOS is the study area generally encompassing a 5-km radial zone from the Project boundaries (refer to **Figure 3.2**). The Qualified Person shall define the limits of the spatial boundary based on accepted criteria.

For linear Projects such as roads, railways and transmission lines, the ZOS shall cover a 1-km corridor (500m on either side of the ROW) (refer to **Figure 3.3**).

(ii) The impact boundary defines the spatial area where predicted impacts are likely to occur. This particular area may extend beyond the ZOS depending on land use profiles, and physical development and terrain characteristics etc. This zone of influence is termed the Zone of Impact (ZOI) (refer to **Figure 3.2 and Figure 3.3**).

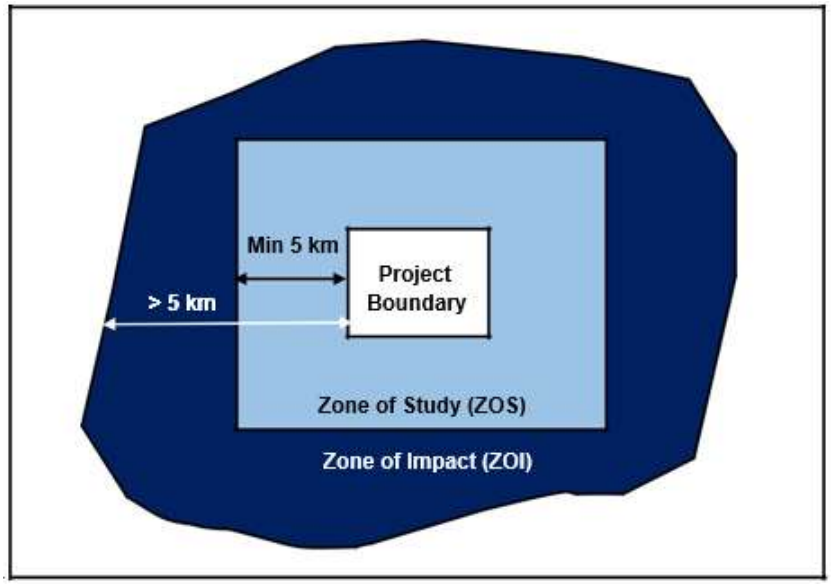


Figure 3.2: Diagram Showing the Difference between the ZOS and ZOI

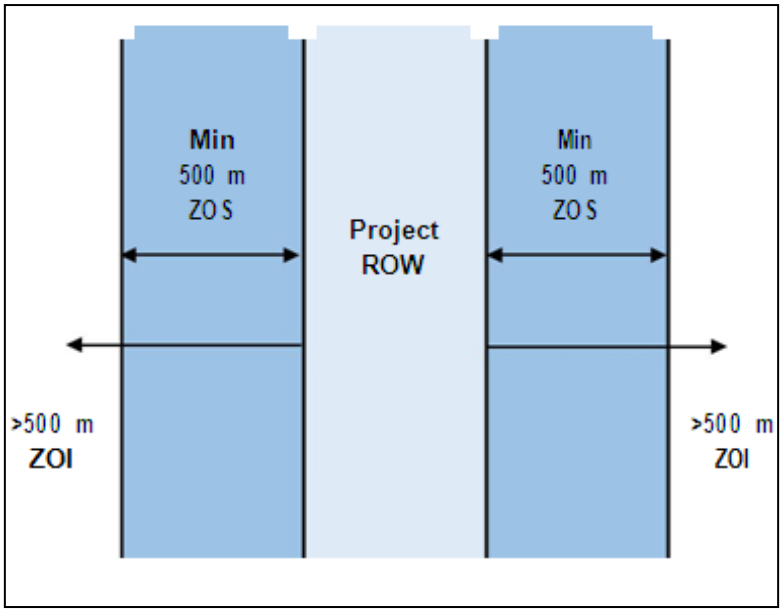


Figure 3.3: Diagram Showing the Difference between the ZOS and ZOI for Linear Projects

3.6 BASELINE DATA REVIEW

Table 3.3 lists the indicative requirements for reporting on the state of the environment and state of natural resources surrounding the Lime Plant. The baseline information shall be qualitative but shall be sufficiently adequate to assess the potential impacts on sensitive receptors. Quantitative data and findings wherever available, shall be provided to support the assessment.

The level of detail shall be based on factors such as Project terrain characteristics, surrounding land use, physical development profiles, drainage systems surface and ground water systems and types of activities and potential impacts.

If any of the items in the list are unavailable at the time of scoping, but is important to the EIA, it must 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.

The criteria to decide on the priority of relevant items shall be based on their levels of significance.

Table 3.3: Baseline Requirements for Environmental Scoping

Baseline	Requirements	Data Source
Physico-chemical		
Landuse	• Landuse maps and photos. • Description of existing and future landuse (within 5-km ZOS). • Identification of ESAs.	• Topography maps. • Aerial or satellite imagery. • Structure and local plan (PLANMalaysia). • Site investigations.
Geology/ Hydrogeology	• Description of local and regional geology. • Locations of aquifer and groundwater abstraction wells.	• Geological and hydrogeological maps by JMG. • Geological Terrain Mapping (GTM) report.
Soil and Terrain	• Topography and slopes. • Soil investigation (SI). • Construction suitability map.	• Site survey. • Soil map by Department of Agriculture (DOA). • SI report. • GTM report.
Climate	• Climate data (minimum 5 years).	• Malaysian Meteorological Department (METMalaysia).
Hydrology	• River systems and catchment areas. • Flood prone areas. • Downstream receptors.	• Topography maps. • Department of Irrigation and Drainage (DID) flood maps. • Site observations.
Water Quality	• Water Quality data (if any). • Locations of water pollution sources. • Locations of Water Intake Points (WIPs) and Water Treatment Plants (WTPs).	• State water resource departments. • Published reports by water agencies and DOE.
Air Quality	• Air Quality data (if any) • Locations of air polluting sources.	• DOE published data. • Site observations.
Noise and Vibration Level	• Locations of high noise and vibration generators.	• Site observations.

Baseline	Requirements	Data Source
Biological		
Ecosystem	• Description of existing ecology and habitats. • Identification of ESAs (forest reserve, wildlife reserves and sanctuaries, wetlands, mangroves, fisheries, etc.). • Presence of endemic, rare, threatened, endangered and near extinct flora and fauna.	• Secondary information. • Data from various relevant departments such as the Department of Wildlife and National Parks Peninsular Malaysia (PERHILITAN) and Forestry Department Peninsular Malaysia (JPSM). • *Buku Kawasan Sensitif Alam Sekitar (*DOE*).* • Site observations.
Social Aspects		
Demography	• Details of demographics. • Identification of social impact stakeholders.	• Population census from Department of Statistics. • Structure and Local plans from PLANMalaysia. • Interviews.
Public Health	• Description of public health status of communities located in the vicinity of the Lime Plant's site.	• Morbidity statistics and public health data from Ministry of Health (MOH). • Published information.
Heritage, Culture and Archaeology	• Locations of historical and cultural sites. • Location of *Orang Asli* areas and settlements.	• Data from Department of Museums, National Heritage Department, *Jabatan Kemajuan Orang Asli* (JAKOA), etc. • Published information.
Traffic	• Access to Project Site. • Transport options.	• Road maps. • Site visits. • JKR. • Department of Highways.
Infrastructure, Utilities and Amenities.	• Water, electricity, sewerage, road, telecommunication and waste.	• Information from utility providers. • Local plans from PLANMalaysia.

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.

3.7 DETERMINATION OF KEY PROJECT ACTIVITIES

Project activities are the basis for assessing potential impacts on surrounding environmental and natural resources. **Table 3.4 to Table 3.6** summarises the range of activities associated with a Lime Plant. The list is not exhaustive, and the Qualified Person shall add on or delete items, whenever and wherever necessary.

Table 3.4: List of Typical Project Activities with Issues of Concern during Pre-Construction Phase

Activities	Issues of Concern
Site access • Vegetation and biomass clearing. • Construction of temporary stream/river crossing.	• Soil erosion. • Loss of biodiversity and wildlife disturbance. • Water pollution (silt). • Air and noise pollution. • Physiological and psychological impacts on human habitats.
Site surveys • Commissioning of surveys. • Setting up of temporary camp sites. • Vegetation clearing for survey works.	
Geological terrain mapping • Site analysis (survey and computer modelling). • Development of GTM maps.	
Soil investigation and geotechnical studies. • Commissioning of surveys. • Setting up of temporary camp sites. • Vegetation clearing for survey works. • Drilling of boreholes/digging of pits to obtain samples. • Lab analysis of samples.	
Environmental assessment • Site assessment. • Collection of samples. • Analysis of samples.	• Soil erosion. • Wildlife disturbance. • Water pollution (silt). • Air and noise pollution.

Activities	Issues of Concern
Land acquisition (if any) under Social Impact Assessment (SIA) and local authorities' scope • Identification of affected lots and population. • Issuing of notice and undertaking of compensation. • Developing of relocation plans through consultation. • Acquiring of property. • Demolition of structures and buildings.	• Socio-economy (relocation) as part of the SIA requirement by PLANMalaysia. • Landuse changes wastes (demolition) psychological impacts on affected residents and business.

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.

Table 3.5: List of Typical Project Activities with Issues of Concern during Construction Phase

Activities	Issues of Concern
Access road and stream crossings • Cutting new path to Project Site or rehabilitating existing track. • Earthworks (cut and fill and slope formation). • Establishing temporary stream crossing. • Establishing drainage and culverts. • Levelling and compacting of the road surface. • Laying of aggregates and slope protection works.	• Soil erosion. • Loss of biodiversity and wildlife disturbance. • Water pollution (silt). • Air and noise pollution.
Base camp and site facilities establishment • Constructing site office, worker quarters, temporary concrete batching Plants, canteen, toilets and bathing areas, stockpile areas, storage facilities and workshops. • Establishing utilities and infrastructure: power supply, water, telecommunications, etc. • Providing temporary treatment systems, e.g. septic tanks for toilets, waste collection areas.	• Loss of biodiversity and wildlife disturbance. • Water pollution (sewage and sullage). • Drainage (runoff from site). • Air and noise pollution. • Wastes (municipal wastes). • Safety and health (vector-borne disease).

Activities	Issues of Concern
Worker recruitment, mobilisation of equipment and material • Employing workers to carry out construction work. • Transporting equipment and materials required for construction to the storage areas. • Setting up workshop areas for servicing and maintenance work.	• Socio-economy (employment, social conflicts – from SIA). • Safety and health (communicable disease, sanitary conditions, accidents and inquiry). • Air and noise pollution. • Wastes (municipal and construction wastes). • Traffic (congestion from heavy vehicle transport).
Site clearing and biomass removal • Cutting, removal and disposal of vegetation. • Establishing temporary biomass disposal site.	• Loss of biodiversity and wildlife disturbance. • Wildlife relocation. • Soil erosion. • Hydrology and drainage (increased runoff, impacts to downstream users). • Wastes (biomass disposal). • Water pollution (silt and debris). • Air (dust) and noise pollution. • Safety and health (respiratory effects from dust inhalation). • Visual/aesthetics. • Human-Wildlife Conflict (HWC).
Earthworks (cut and fill) • Excavation, filling and drilling works. • Import and export of fill material. • Platform formation for construction. • Construction of erosion and sediment control measures. • Slope and exposed areas protection work (compaction, turfing, lining, etc.).	• Soil erosion/slope failure. • Hydrology and drainage (increased runoff, impacts to downstream users). • Water pollution (silt and debris). • Air (dust) and noise pollution. • Wastes (spoil disposal). • Visual/aesthetics.

Activities	Issues of Concern
Blasting (if needed) • Application of chemical cracking or explosive blasting works for boulders and hard surfaces. • Removal of aggregates to temporary storage areas.	• Air pollution (dust). • Noise and vibration. • Safety and health (fly rock, structural damage, accident). • Wastes (aggregates, spoils).
Drainage works • Diversion of streams and existing drainage. • Establishing temporary drainage lines, sediment basins/silt traps and outlets. • Drainage protection works (lining, check dams, compaction, etc.).	• Riverbank erosion. • Water pollution (silt). • Aquatic habitat deterioration (river alteration, silt). • Flood risk. • Noise pollution.
Structural works and facilities establishment • Piling and foundation works. • Batching Plant establishment/concrete mixing. • Formwork and concrete pouring for building structures. • Brickworks, roofing and finishing. • Construction of associated facilities (power supply, water supply, telecommunications, waste disposal, etc.).	• Soil erosion/slope failure. • Water pollution (river and groundwater). • Air and noise pollution. • Hydrology and drainage (increased runoff, impacts to downstream users). • Wastes (construction wastes). • Noise and vibration.
Waste disposal • Provision of temporary waste collection and disposal sites. • Collection of accumulated wastes for disposal at designated sites. • Sewage management.	• Wastes (spoil, municipal, scheduled wastes). • Air pollution (odour). • Health impact (disease, vectors, accidents). • Water pollution (floatables, sewage, leachate). • Road transportation safety issues. • Noise and vibration.

Activities	Issues of Concern
Establishment of permanent access • Construction of permanent access road. • Closure of temporary access.	• Soil erosion. • Slope stability/failure. • Water pollution (silt). • Noise and vibration.
Final finishing and landscaping • Installation of street lighting, utilities and amenities. • Planting of trees and vegetation in completed areas.	• Visual/aesthetics.

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.

Table 3.6: List of Typical Project Activities with Issues of Concern during Operation and Closure/Exit Phases

Activities	Issues of Concern
Occupation and operation of Project • Management of impacts from human activities in the Project area. • Traffic management. • Solid waste management.	• Air and noise pollution (traffic, human activities). • Traffic (congestion). • Wastes (municipal wastes). • Socio-economy (employment, economic growth).
Slope maintenance • Periodic slope inspection by Qualified Person to ensure safety. • Grass cutting and clearing of drains. • Repairing and rehabilitation as required.	• Soil and geology. • Drainage. • Safety and health.
Lime Plant Operations • Prevention of fire hazards. • Effective management of wastes. • Minimising water consumption. • Maintenance of sewage treatment system. • Monitoring of effluent quality. • Conducting repairs as necessary. • Maintenance of infrastructure: roads, drainage, power supply,	• Water pollution (sewage, sullage, and process effluents). • Air and noise pollution. • Safety and health. • Wastes (municipal and process wastes). • Visual/Aesthetics.

Activities	Issues of Concern
telecommunication, etc. • Maintenance of landscaping areas. • Safe delivery of raw materials and delivery of manufactured products.	
Site Decommissioning • Demolition of unwanted temporary structures and buildings. • Removal of machinery, materials and workers from the site. • Filling in depressions and holes. • Removal of wastes.	• Soil erosion. • Water pollution (silt). • Air and noise pollution. • Safety and health. • Wastes (demolition wastes).
Rehabilitation works (Earth platforms and slopes; drainage, mitigation measures) • Erection of hoarding. • Establishing of protection measures for slopes and exposed areas (compaction, turfing and structural measures).	• Soil erosion. • Water pollution (silt). • Air and noise pollution. • Safety and health. • Wastes (demolition wastes).

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.

3.8 IDENTIFICATION OF SIGNIFICANT IMPACTS AND PRIORITY SETTING

3.8.1 Selection of Scoping Method

There are many methods and tools for conducting a scoping exercise. These include checklists, matrices, or any other accepted methods, to assist in systematically organising, collating and analysing Project data. At the TOR stage, qualitative assessment is adequate but quantitative data can be provided to support the assessment.

Table 3.7 lists the advantages and disadvantages of the various common methods used. The list given is not exhaustive and any other suitable method can be used, if relevant.

A useful tool is the Environmental Scoping Matrix (ESM) where a range of points from maximum to minimum are allocated for each identified criteria according to the degree of environmental impact (both negative/positive). Finally, the scores are aggregated for a few identified criteria. (Refer to **Appendix C** for an example of the matrix used for Lime Plants).

The Qualified Person and the Project Proponent's input is vital at this stage as their knowledge and experience would ensure appropriate weightage is given to each selected criteria i.e. those issues under assessment (see **Box 5**).

From the scoping outputs, a priority list of environmental impacts shall be determined for in-depth studies and assessments during the EIA process.

Table 3.7: Advantages and Disadvantages of Impact Identification Methods

METHOD	ADVANTAGES	DISADVANTAGES
Checklists	• Easy to understand and use. • Good for site selection and priority setting. • Simple ranking and weightages.	• Do not distinguish between direct and indirect impacts. • Do not link action and impact. • The process of incorporation of values can be controversial.
Matrices	• Links action to impacts. • Good method for displaying EIA results.	• Difficult to distinguish direct and indirect impacts. • Have potential for double-counting of impacts.
Networks	• Links actions to impacts. • Useful in simplified to check for second order (indirect) impacts. • Handles direct and indirect impacts.	• Can be very complex if use beyond simplified version.
Overlays	• Easy to understand. • Focus and display spatial impacts. • Good siting tool.	• Can be cumbersome. • Poorly suited to address impact duration or probability.
GIS and Computer Expert Systems	• Good for impact identification and spatial analysis. • Good for experimenting.	• Heavy reliance on knowledge and data. • Often complex and expensive.

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

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

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, aesthetics, noise and vibration, water and air pollution, etc.).

(iii) Reversibility: A measure of whether mitigation measures can be implemented to abate potential adverse environmental impacts, or to enhance positive beneficial consequences; or 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.

3.8.2 Key Issues Related to Development and Operations of a Lime Plant

(i) Air Pollution:

- Dusts from quarrying operations.
- Dusts from transportation of limestone rocks.
- Dusts from crushing of limestone rocks.
- Dusts from preparations and packing of quicklime.
- Dusts from transportation of quicklime rocks and powders.
- Dusts from packing of quicklime.

(ii) Water Pollution:

- Runoffs with sediments from limestone quarrying.
- Effluents from mixing and settling of quicklime.

(iii) Erosion:

- Erosion from limestone quarrying.
- Erosion from vehicular transport ways and slopes from quarry to mill.
- Loss of Scenery and Limestone Hills Heritage:
  - Permanent loss of natural sceneries.
  - Permanent loss of ecosystems, e.g. cave ecosystems (bats, bees, birds, plants, etc.).
  - Permanent loss of heritage areas e.g. caves.

(iv) Water Abstraction:

- Water usage for quarrying.
- Water usage for quicklime mixing.

(v) Waste Disposal:

- Disposal of unsuitable materials from quarrying.
- Disposal of residual limestone rocks after dissolving quicklime.
- Disposal of spoilt packaging materials.
- Disposal of off-shelf products.

(vi) Fire Hazards:

- Fire hazards from operation of kiln to convert limestone to quicklime.
- Fire hazards from packaging operations.

(vii) Transportation of Raw Materials and Finished Products:

- Transportation of limestone rocks.
- Transportation of quicklime rocks and powder.
- Transportation of quicklime products.

3.9 ESTABLISHMENT OF STUDY REQUIREMENTS FOR EIA

Once the key environmental impacts have been identified and prioritised (see **Section 3.8.2**), the subsequent step is to establish the appropriate study requirements to address these significant impacts.

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

The Qualified Person shall identify appropriate methodologies, and assessment/ modelling tools, to be adopted in evaluating identified significant impacts, and to outline expected outputs from the evaluation exercise (e.g. magnitude of spatial and temporal impacts), to be addressed in the TOR. **Table 3.8** shows an example of list of applicable studies in EIA. This list is only indicative and non-exhaustive as site conditions can vary from project to project. Hence, it is the responsibility of the Qualified Person to check and verify the applicability and extent of the relevant studies to be conducted for a specific Project.

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

Table 3.8: Example of List of Applicable Studies to be Considered in EIA

LIST OF APPLICABLE STUDIES	APPROVING	PRESCRIBED ACTIVITY [1ST SCHEDULE] Activity 6 (c)
Slope Analysis • Terrain and slope classification	JMG/JKR	✓
Geological Terrain Mapping (GTM)*1 • Erosion • Terrain Classification • Terrain Component • Construction Sustainability	JMG/JKR	✓
Erosion and Sediment Control • LD-P2M2 • Erosion and Sediment Control Plan (ESCP)	DOE DID	✓
Hydrology Assessment • Basin/River systems • Runoff • Flood risk	DID	✓
Baseline Sampling • Water, air, noise and/or vibration	DOE	✓
Water Quality Modelling • Total Suspended Solids (TSS) • Sewage and effluent loading	DOE	✓
Soil Investigation (SI) *2	JMG/JKR	✓
Geotechnical Report *2	JMG/JKR	✓
Landslide Risk Analysis *2	JMG/JKR	✓
Seismicity Studies *3	JMG/JKR	As required by the relevant Government Agencies (GAs)
Hydrogeological Assessment	JMG	
Air Blast and Vibration Impact Assessment (Blasting)	JMG	
Landuse Compatibility	PLANMalaysia	
Flora and Fauna Assessment • Terrestrial, aquatic and/or marine	PERHILITAN/ JPSM/ DOF	
Social Impact Assessment (SIA)	PLANMalaysia	
Traffic Impact Assessment (TIA)	JKR	
Health Impact Assessment (HIA)	MOH	
Heritage Impact Assessment (TIA)	Department of National Heritage	
Wastes Assessment • Biomass, Scheduled Wastes, Construction and Demolition, Domestic, etc.	DOE/ National Solid Waste Management (JPSPN)/ Local Authority (PBT)	

Notes:

(i) *[1] GTM shall be carried out by licensed geologist/geotechnical engineer based on JMG/JKR requirements. Report must be approved by JMG/JKR before inclusion of findings into the EIA.

(ii) *[2] Required for physical development Projects only, to be verified by a licensed geologist/geotechnical engineer based on JMG/JKR requirements. Reports must be approved by JMG/JKR before inclusion of findings into the EIA.

(iii) *[3] Only if areas have known faults or has experienced seismic activities previously. Reports must be approved by JMG/JKR before inclusion of findings into the EIA.

(iv) 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.

3.10 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 the point of the TOR/ESI, the identified measures shall be qualitative and descriptive only, to be further detailed in the EIA stage.

3.11 PREPARATION AND SUBMISSION OF TOR/ESI

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

3.11.1 TOR Table of Content (TOC)

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

(a) Introduction: Include the title to the Project, Project location, Agency approvals obtained and a brief introduction to the Project details.

(b) 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.

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

(d) Description of the Existing Environment: Present a succinct review of the current status of the pertinent/appropriate elements of the environment that have some association with Project development and operations. They would include Land use and Landscapes; Geological and Soil profiles; Climatic conditions (encompassing temperature, humidity, rainfall and wind

profiles); the quality and quantity of Water Resources: Air Quality profiles; Noise and Vibration profiles; Socio-economic profiles; Heritage profiles; Archaeological profiles etc.

(e) 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.

(f) 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.

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

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

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

(j) Consideration of Concurrent Projects: List potential concurrent or planned Projects in the vicinity of the Project Site that may result in cumulative impacts.

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

(l) 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).

3.11.2 TOR Adequacy Check (TORAC) Process

A review shall be carried out by the EIATRC comprising the DOE officers and Appointed Individuals (AIs) and/or GAs.

The 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 Headquarters (HQ)/State Director (refer to **Box 6** for the possible outcomes).

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

Box 6:

Outcomes from TORAC Review

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

(i) Endorse the report.

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

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

CHAPTER 4

ENVIRONMENTAL IMPACT ASSESSMENT: BASELINE DATA

4.1 INTRODUCTION

This Chapter identifies the scope and range of baseline information that is required to be sourced and collated in order to assist in the conduct of an Environmental Impact Assessment (EIA) study for Development of Lime Plants Project. Both primary as well as secondary data contribute towards the development of a comprehensive baseline data bank.

4.2 SECONDARY DATA COLLECTION SCOPE AND CONTENT

Secondary data encompasses information and statistical data retrieved from various sources; but mainly from official published reports, census, publications and research papers. They are collected and collated to develop basic information to support the assessment and evaluation of potential environmental impacts induced by a Project.

All relevant information and representable statistics must be clearly referenced to their source of origin and the date of their publication; and included in the EIA report [Ref: Department of Environment (DOE) Notice 1/2012 dated 6 Jan 2012]. References with respect to all maps, photos and diagrams will also need to be included in the EIA report.

4.3 PRIMARY DATA SCOPE

Primary data is sourced to reinforce and update secondary data, and to fill in gaps in information that have been collated for conducting a detailed assessment of impacts. Common methodologies for data acquisition include site surveys and on-site and off-site monitoring programmes to determine real time, or ambient, air and water qualities, noise and vibration levels, and ecological and socio-economic profiles.

The sampling and survey areas shall in most cases be confined within the Zone of Study (ZOS) boundaries. However, if the spatial extent of impacts is deemed to occur beyond such boundaries, then the baseline sampling scope, and corresponding impact assessment, shall need to extend into the Zone of Impact (ZOI) area. This must be clearly defined in the EIA study. For example, in the case of pollution of water resources, water quality impacts could reach beyond the ZOS boundaries, and potentially extend into the ZOI. Hence, the latter Zone must be

included in the impact assessment study. Data collection covers three major environmental components.

4.3.1 Physico-chemical Environment

In line with the DOE's environmental mainstreaming policy, the EIA study shall focus principally on the core impacts of water and air pollution, and waste disposal, when assessing the potential Project related impacts on the physico-chemical environment. Within the confines of the ZOI/ZOS, baseline information on these three core subjects are needed to determine the state of the environment before, during, and after Project implementation by benchmarking against relevant DOE standards and guidelines pertaining to acceptable water and air quality values, noise and vibration levels and land resource quality.

A baseline sampling plan, which delineates parameters to be sampled, methods and frequency of sampling and location of sampling sites, shall be determined based on the Project Site and its potential interaction with the surrounding environment. Details of the sampling plan and its execution schedule shall be prepared and be clearly stated in the EIA report; together with details on persons to be in charge, and time periods for execution of sampling runs.

The range of baseline parameters that need to be monitored and analysed is summarised in **Table 4.1**. The recommended parameters for water, air, noise and vibration monitoring, and the reference standards/guidelines to ascertain their related significance/implications, are provided for reference in **Appendix D to Appendix G**.

All samples must be analysed by a *Skim Akreditasi Makmal Malaysia* (SAMM) accredited laboratory or equivalent.

All test certificates and data shall be included in an Appendix to the EIA report as supporting evidence (Ref: DOE Notice 1/2012 dated 6 Jan 2012).

This has to be clearly defined in the EIA study. For example, in the case of pollution of water resources, water quality impacts could materialise beyond the ZOS boundaries, and potentially extend into the ZOI. Hence, the latter Zone must be included in the assessment study.

4.3.2 Biological Environment

The biological environment is complex in nature. Therefore, the relevant agencies such as the Forestry Department of Peninsular Malaysia (JPSM) and the Department of Wild Life and National Parks Peninsular Malaysia (PERHILITAN) must be consulted prior to carrying out data collection and surveys and in interpreting the results.

A large amount of general information already exists in the various agencies for different localities, especially with regard to any Permanent Reserved Forests (PRF), wildlife sanctuaries and protection areas. These can be referred to as secondary data. Similarly, other agencies such as the Forest Research Institute of Malaysia (FRIM) have documented inventories of flora and fauna in selected forest areas and conservation zones through published research.

When secondary biological related data is unavailable in and around the Project Site(s), primary data will be sourced to assess the impact of land clearing and earthworks on the faunal population in the surrounding environment.

Their displacement will result in their population decline due in part to loss of habitats and lack of food sources. The survey will provide an indication of the species of fauna, especially wildlife, found in the area, their population levels and their respective habitats so that a wildlife relocation plan can be initiated especially for the large charismatic animals such as elephants, tigers, sunbears, tapirs, etc.

The scope of monitoring requirements for terrestrial and aquatic biological environments will be advised by the respective Government Agencies (GAs). The reported findings on faunal inventories, and the potential impacts induced by Project activities, are to be approved by the said GAs before incorporation in the EIA report (refer to **Table 4.2**). If the biological impact by the Project is deemed insignificant, the employment of secondary data would be sufficient to support the conclusions reached.

4.3.3 Human Environment

The Project Proponent shall abide by the requirements, guidelines and procedures of PLANMalaysia in carrying out a Social Impact Assessment (SIA). PLANMalaysia shall review, endorse and enforce the requirements of the SIA. For the purpose of the EIA, only the main findings from the SIA shall be incorporated.

Relevant data collection will be required to assess the socio-economic status in the surrounding environment; the results of which will be included in the EIA report. Secondary data includes extraction of relevant information from population census report, but for an updated real time estimation of population levels in the vicinity of the Project Site(s), such information is best garnered from the local authorities, district offices (PTD) and the *ketua kampung*. Socio-economic data may also be obtained from Focal Group Discussions (FGDs) and from direct person-to-person interviews.

Other aspects of Project development and operations that may affect communities within the vicinity of the Project Site shall be considered if they are deemed to be significant issues. These may include, but not be limited to, impacts on public health, heritage and culture, archaeology and traffic circulations (refer to **Table 4.2**). The findings of these studies must be incorporated into the EIA report.

Table 4.1: Recommended Monitoring Requirements for EIA Studies

Aspect	Recommended Parameter		Guidelines/Standards	Recommended Requirements
River Water Quality	In-situ Measurements • Dissolved Oxygen (DO) • Temperature • Conductivity • pH Ex-situ Analysis • Biochemical Oxygen Demand (BOD) • Chemical Oxygen Demand (COD) • Total Suspended Solids (TSS) • Ammoniacal Nitrogen (AN) • Mercury (Hg) • Cadmium (Cd) • Chromium Trivalent (Cr^{3+})	• Chromium Hexavalent (Cr^{6+}) • Arsenic (As) • Cyanide (CN) • Lead (Pb) • Copper (Cu) • Manganese (Mn) • Nickel (Ni) • Tin (Sn) • Zinc (Zn) • Boron (B) • Iron (Fe) • Phenol • Free Chlorine (Cl_2) • Sulphide (S^{2-}) • Oil and Grease (O&G) • Total coliform • Faecal coliform	National Water Quality Standards of Malaysia (NWQS).	• One-time composite sampling. • Upstream and downstream of major rivers and streams which Project's effluents are discharged. • Minimum two sampling locations (depending on river type). • Multi-depth sampling for deep rivers (>1 m deep). • Heavy metals testing required if activity involve industrial and/or mining Projects. • Water quality parameters shall be selected on the site conditions and the range of pollutants likely to be discharged from the Project Site.
Air Quality	• $PM_{2.5}$*1 • PM_{10}*1 • Carbon Monoxide (CO)*2 • Sulphur Dioxide (SO_2)*2 • Nitrogen Dioxide (NO_2)*2 • Ozone (O_3)*2*3 Source: DOE Notice 1/2015 dated March 2015		New Malaysia Ambient Air Quality Standards.	• Parameters to be sampled are dependent on-site conditions. • One-time sampling at minimum two stations (upwind and downwind) of the Project Site(s). • Project boundary and nearest receptors.

Aspect	Recommended Parameter	Guidelines/Standards	Recommended Requirements
			Note: *1 24-hrs *2 1-hr *3 Ozone needs to be measured for selected Projects only. Justification needs to be provided for its omission.
Noise Level	• L_{Aeq} • L_{Max} • L_{Min} • L_{10} • L_{50} • L_{90}	Guidelines for Environmental Noise Limits and Control Third Edition (DOE, 2019).	• Parameters to be sampled are dependent on-site conditions and need. • One-time sampling (24-hrs for daytime and night-time). • Project boundary and nearest receptors.
Vibration	• Requirements as per Schedules 1 – 6 of the Planning Guidelines for Vibration Limits and Control.	The Planning Guidelines for Vibration Limits and Control Second Edition (DOE, 2007).	• Parameters to be sampled are dependent on-site conditions and need. • One-time sampling (1-hr for daytime and night-time). • Project boundary and nearest receptors.

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

Table 4.2: Additional Sampling and Study Requirements

Aspect	Recommended Parameter	Reference	Sampling Requirements	Approving Authority
Geology and Soil	• Site topography based on land surveys. • Seismicity. • Soil profile analysis including. K-value for erosion analysis. • Hazard mapping.	• JMG and JKR requirements.	• Soil Investigation (SI). • Hand auger (determine K-value). • Field survey of slope areas and hazards (as part of Geological Terrain Mapping).	• Minerals and Geoscience Department (JMG). • Public Works Department (JKR).
Hydrology	• Stream flow. • Riverbed cross section.	• DID requirements.	• Site survey to verify river system (including riverbed cross-sections) and drainage. • Stream gauging to ascertain flow profiles. • Identification of downstream sensitive receptors. •	• Department of Irrigation and Drainage (DID).
Hydrogeology	• Groundwater profile. • Groundwater quality.	• JMG requirements. • National Groundwater Quality Standard. • National Groundwater Quality Standard for Industry. • National Drinking Water Quality Standards.	• Groundwater table. • Hydrogeological mapping. • Groundwater quality sampling (minimum two locations depending on Project size).	• Minerals and Geoscience Department (JMG).

Aspect	Recommended Parameter	Reference	Sampling Requirements	Approving Authority
Ecological Assessment	• Habitat mapping. • Species inventory (including photographs). • Abundance and diversity assessment. **<u>Terrestrial Flora</u>** • Flora inventory. **<u>Terrestrial Fauna</u>** • Mammals. • Avian. • Herpetofauna. **<u>Aquatic Flora and Fauna</u>** • Fishery resources. • Phytoplankton and zooplankton. • Benthic organisms.	• International Union on the Conversation of Nature (IUCN) Red List. • Wildlife Conservation Act 2010 (Act 317).	• Terrestrial: Surveys within Project Site and adjacent. • Aquatic: Within Project Site and nearby ESAs (fishery resources, aquaculture sites, etc.). • ESAs (within ZOI). • Identify any endemic, rare, endangered, threatened and near extinct species within the Project Site and surrounding ZOI. • Level of sampling and data collection shall depend on the sensitivity of the site.	• JPSM. • PERHILITAN. • Department of Fisheries (DOF).
Landuse	• Current landuse. • Future and committed landuse. • Sensitive receptors. • Zoning and compatibility.	• Structure and local plans.	• Site surveys. • Mapping to update information. • Within the ZOI.	• PLANMalaysia.
Social Impact Assessment (SIA)	• Population profile. • Identification of stakeholders. • Perception survey.	• Manual for SIA of Project development.	• Carried out as part of the SIA. • Surveys on target groups potentially affected by the Project.	• PLANMalaysia.

Aspect	Recommended Parameter	Reference	Sampling Requirements	Approving Authority
			• Surveys shall represent the stakeholders in the ZOI. • Stakeholder engagement conducted.	
Public Health	• Population profile. • Public health status.	• Guidance Documentation Health Impact Assessment (HIA) in EIA.	• Carried out as part of the HIA. • Surveys on target groups potentially affected by the Project. • Surveys shall represent the stakeholders in the ZOI. • Stakeholder engagement conducted.	• Ministry of Health (MOH).
Traffic	• Traffic count during peak traffic periods.	• JKR requirements.	• Carried out as part of the Traffic Impact Assessment (TIA). • Traffic survey at major junctions leading to Project Site.	• Public Works Department (JKR).
Wastes	• Estimation of biomass from site clearing. • Potential waste (biomass, domestic, construction & demolition discards, scheduled wastes) generation.	• DOE and local authorities (PBT) requirements.	• Site surveys to ascertain existing site conditions.	• Department of Environment (DOE). • Local Authorities (PBT).
Heritage, Culture and Archaeology	• Identify and determine significance of value of such sites within or near to Project Site.	• National Heritage Register.	• Site surveys and interviews with authorities and locals.	• National Heritage Department. • Department of Museum. • *Jabatan Kemajuan*

Aspect	Recommended Parameter	Reference	Sampling Requirements	Approving Authority
				Orang Asli (JAKOA).

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

CHAPTER 5

ENVIRONMENTAL IMPACT ASSESSMENT: EVALUATION OF IMPACTS

5.1 INTRODUCTION

There are many methods to assess the environmental impacts due to a development. 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 must 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 easily accessible software, which can be purchased (propriety software and tools can also be used). Widely accepted freeware is acceptable.

It is up to the Qualified Person to 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.

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

5.2 PREDICTION AND EVALUATION OF IMPACTS

The level of detail necessary for impact identification shall be 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 other Projects located in adjacent land areas and vice versa).

(vii) Sensitivity of nearby receptors [e.g. Environmentally Sensitive Areas (ESAs)].

Table 5.1 provides a list of typical significant components and impacts related to the development and operations of Lime Plants, as a guide to the Project Proponent and Qualified Person. Photo inventories will provide important supportive evidence for the evaluation of Impacts and should be provided (see examples in **Figure 5.1(a) and Figure 5.1(b)**).

Soil erosion from worked slopes

Landslides and mudflows

Degraded waterways

Water pollution

Poor scheduled waste management

Improper management of spoils

Figure 5.1(a): Photo Inventory of Common Impacts associated with Lime Plants Development

Water ponding/flooding

Dust generation

Loss of habitats

Biomass disposal

Spoil disposal

Poor worksite management

Figure 5.1(b): Photo Inventory of Common Impacts associated with Lime Plants Development

Key impact assessments for Lime Plants required to be conducted in the EIA for the development of the Lime Plants are as follows:

- Air Quality
- Noise and Vibration
- Erosion and Sedimentation
- Water Quality
- Public Health
- Drainage Impacts

- Waste Management
- Ecology
- Socio Economic
- Hydrology
- Geotechnical Hazards
- Groundwater/Hydrogeology
- Traffic
- Safety and Health
- Risk Assessment

Other subject matter may be required to be conducted depending on the sensitivity of the receptors at the proposed Project location and requirement by other Agencies.

If the existing baseline environmental quality within and external to the proposed Project area is above the specified ambient standards, the Project Proponent needs to ensure that Project operations shall not lead to further deterioration of the existing ambient quality. For existing Plants/factories that are planning to expand their operations, or increase/upgrade their capacity, a cumulative impact assessment shall be performed to assess the degree of potential impact at the identified receptors, and the need to upgrade existing pollution control devices.

5.2.1 Air Quality

Assessment Requirements

It is important that during the construction stage of the Lime Plants, all potential sources emitting gaseous pollutants (e.g. dust and airborne particulate and other gaseous emissions) located within and external to the Project Site be identified and inventorised; before assessing their current observed influence on surrounding air shed quality status, and their impacts on surrounding sensitive receptors.

During Lime Plants operation, impacts from pollutant emissions by, *inter-alia*, fuel burning by the incinerators and other machinery, and by vehicles transporting raw materials and finished products in and out of the Lime Plants, shall be assessed independently. The objective is to ascertain the magnitude of increase in ambient pollutant concentrations in the surrounding environment induced by both Lime Plants operational activities, and by existing sources emitting similar pollutants.

Evaluation of Impacts

Air quality models are mainly Gaussian-based, and many versions are available in the market. They are employed to determine the ambient Ground Level Concentrations (GLC) of an emitted pollutant based on their amount (mass) of discharge, and with respect to long-term records of local air shed characteristics such as wind speed, direction and frequency, atmospheric stability variations over a day, and temperature and humidity levels. Model predictions are useful in a wide variety of air quality decisions, including determining the air quality expected under various scenarios.

It is best to adopt the most appropriate model to simulate the air pollutant dispersion patterns from a point source such as a stack, and to map the resulting spatial residual ground level pollutant concentrations to ascertain the degree of induced impacts on identified surrounding receptors. The change in GLCs of specific pollutants at sensitive receptors, pre- and post-development of the Lime Plants, shall be assessed and evaluated as to their significant impact and consequential implications (e.g. health, welfare and safety of surrounding communities and settlements).

Usually an initial air quality assessment is conducted on a qualitative basis to ascertain whether the Lime Plants can exert significant air quality changes on the surrounding air shed. If it is deemed possible, the air quality assessment should progress to a quantitative assessment by adopting a refined/advanced modelling system to predict with more certainty the Lime Plants' potential to increase the ambient ground-level concentration of targeted pollutants, and to what degree. Refined air dispersion models provide a detailed analysis of the selected target parameters and caters for multiple emission sources. This approach gives a more accurate estimate of the pollutants' concentrations at receptors. However, a refined model requires more specific input data which can include topographical profiles, better receptor grid resolution, downwash or other plume adjustment and pollutant decay, or deposition algorithms. Refer to **Section 5.3** of this Guidelines for examples of prediction tools.

It is suggested that the following scenarios are considered for air quality impact assessment of a Lime Plant:

(i) The significant pollutants emitted from the Lime Plants: continuous, large flow volumes with high concentration emissions from point sources should be given priority.

(ii) Ambient air prediction and assessment scenarios include, *inter-alia*, 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 plants or humans.

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

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 their significances.

The pollutants' dispersion contours should be overlaid on a land use map surrounding the Project Site. A sample of this contour map is illustrated in **Figure 5.2.**

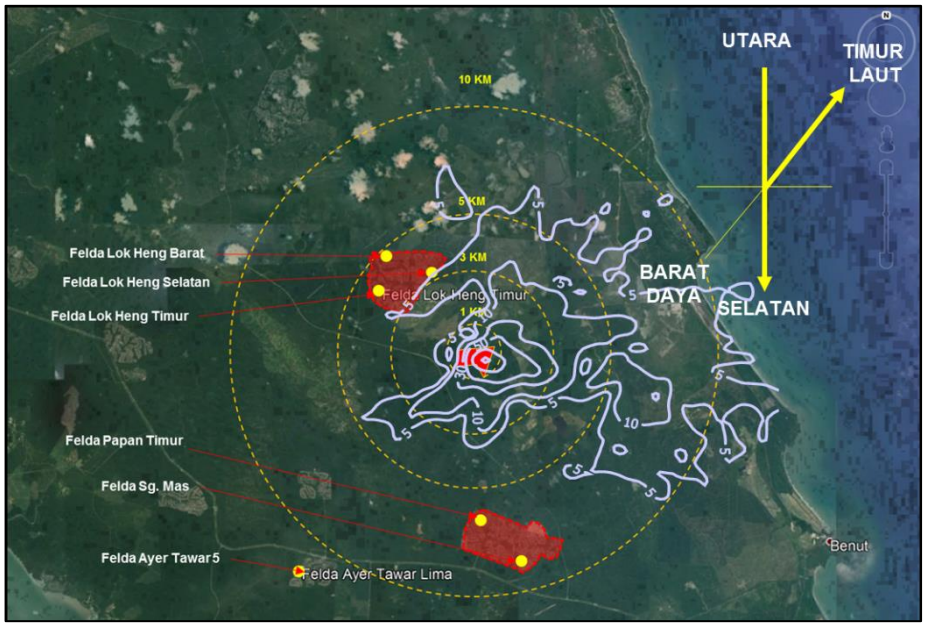


Figure 5.2: Sample of Pollutants Dispersion Contours

Output

The objective of Air Quality model simulations is to determine the degree of potential impacts imposed on nearby sensitive receptors. Cumulative impacts, that are the sum of gaseous pollutant emissions induced by Lime Plant operations, and by surrounding pollutant emitting premises, should also be elucidated.

Critical levels of gaseous pollutants imparted on sensitive receptors shall be identified to ensure that such levels can be mitigated to ensure that residual levels are within acceptable limits; and to ensure populations working in such areas are protected against potential induced health impediments.

5.2.2 Noise and Vibration

Assessment Requirements

During the construction stage of the Lime Plants, the employment of machinery and equipment shall generate noise and vibrations. Typical Sound Power Levels emitted by various Plant and equipment that are likely to be deployed to construct the Lime Plants are summarised in **Table 5.2.**

Table 5.2: Typical Sound Power Levels from Construction Equipment and Activities

Equipment	Operating Condition	Sound Power Level @ 15 m
Bulldozer (e.g. CAT D10)	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

Likewise, during the Lime Plant's operational tenure, installed Plant and equipment can emit significant noise levels at source as summarised in **Table 5.3**. Specific sound power levels, and their noise spectrum, associated with typical operating equipment can be sourced from manufacturers and suppliers for a comprehensive overview of the characteristics of potential noise emission and propagation; and measures which can be adopted to attenuate their intensity.

Table 5.3: Typical Sound Power Levels from Operating Equipment and Activities

Equipment	Sound Power Level @ 15 m
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	85 dBA @ 1m
Burner Combustion	85 - 90 dBA
Conveyor Belt (line source)	82 – 103 dBA @ 1 m

Evaluation of Impacts

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

It is suggested that the following aspects are considered for noise and vibration impact assessment for a Lime Plant:

(i) List of significant sources from the Lime Plants. Continuous high noise or vibration levels should be given priority.

(ii) Noise and vibration prediction and assessment scenarios. These would encompass normal operating conditions; with and without control measures.

(iii) Degree of sensitivity of the receiving environment and/or environmental receptors, gauged by any locally specified tolerance levels, such as exposure levels to residential, worship, 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 Lime Plant have been identified, prediction of impacts employing modelling software normally enhances the ease by which the prediction of impacts are executed. These modelling tools could incorporate specific characteristics of noise and vibration sources, as well as attenuation features (noise, barriers, buildings, terrain etc.) to generate more accurate predictions.

Predictions of noise and vibration dispersions from the Project Site can be ascertained by employing universally accepted analytical models, or through manual calculations. The objective being to determine the increase in absolute noise and vibration levels in areas within and surrounding the Project Site. The results should be portrayed in the form of noise contours and vibration spot levels for easy comprehension of the degree and severity of impact.

Outputs

The main objective of this impact assessment is to determine the potential noise and vibration levels at the Plant boundaries and whether such levels comply with DOE regulations/guidelines. Furthermore, the recommended exercise is to determine the significance of Project induced impacts 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.

The model results on predicted levels should be tabulated or portrayed as contours overlaid on suitable maps. A sample of a contour map is illustrated in **Figure 5.3.**

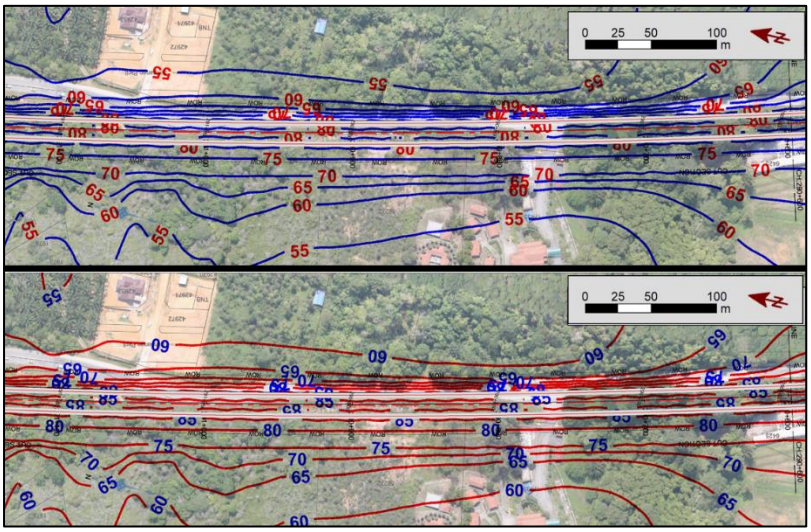


Figure 5.3: Sample of Noise Contour Map

Noise and vibration model simulations shall determine the degree of potential impacts imposed on nearby sensitive receptors. Cumulative impacts, that are the sum of noise and vibration levels induced by Lime Plant activities and by surrounding noise emitting premises, should also be quantified.

Critical levels of noise and vibration intensities imparted on sensitive receptors shall be identified so that mitigation measures can be proposed to *inter-alia*, ameliorate adverse impacts to tolerable levels, to ensure that residual levels are within acceptable limits, and to ensure those working in such areas are protected against potential induced health impediments.

5.2.3 Erosion and Sedimentation

Assessment Requirements

(i) Assessment of the scale of land clearing and removal of vegetative cover at the Project Site to determine the rate of erosion.

(ii) Assessment of the schedules for land clearing process and rehabilitation stages.

(iii) Assessment of the conditions of the hydrological and drainage systems located within and external to the Lime Plant Site; and how they may be altered if streams and rivers are diverted and/or become silted up or filled in.

(iv) Review of the type and scope of earthworks to be carried out within the Project Site.

(v) Assessment of the extent of erosion and sedimentation that will likewise affect the aquatic ecology and water pollution downstream.

(vi) Determination of suitable Best Management Practices (BMPs) and mitigation measures to reduce the effects of erosion and sedimentation.

Evaluation of Impacts

(i) Calculate the rate of soil erosion and sediment yield using standard formulae and site-specific information (surveys, soil particle analysis, terrain characteristics, hydrological data, etc.), to determine the extent of erosion and sedimentation as a result from land clearing.

(ii) Provide erosion scenarios such as with or without mitigation measures in the assessment.

(iii) Run simulation to determine the BMPs that shall be adopted to minimise the negative effects

Output

(i) Adoption of avoidance principles to maintain high risk areas [identified through slope analysis and Geological Terrain Mapping (GTM)], or in designing technical and engineering solutions to minimise erosion and geo-hazards in such areas.

(ii) Identify suitable BMPs to be incorporated in the Project through the Land-Disturbing and Pollution Prevention and Mitigation Measures (LD-P2M2) based on the modelling results.

5.2.4 Water Quality Impacts

Assessment Requirements

(i) Assessment of the magnitude and frequency of pollutant discharge loads and their potential scope of impairment to the water quality of receiving water courses in the vicinity of, or linked to, the Project Site.

(ii) During the construction stage the principal pollutant loads discharged to water courses will be in the form of suspended particulates that are generated through land clearing and earthworks activities. The denuded land area stripped of its vegetative cover will increase surface run-offs during rainy periods resulting in enhanced soil erosion process and carry over of soil particles to receiving water courses. In addition, disposal of biomass, leakage of toxic and hazardous substances (oil and grease, solvents etc.) through

spillage, and sewage and solid waste discharges from construction worker camps could induce significant adverse water quality impacts if not managed effectively. During the testing and commissioning stage, large amounts of water may be used for pressure testing of pipelines, vessels, fuel burning equipment and incinerators, the discharge of which could carry with it chemical additives that could impair the water quality status of receiving waters.

(iii) During operations, improper treatment of sewage flows arising from toilets and canteens, and of process effluent streams, and from erosion and sedimentation of material stockpiles can also contribute to increased discharges of oxygen demand substances, nutrients and suspended particulates into waterways, leading to their degradation of water resource capability, ecological biodiversity, and economic value. As such the discharge of such pollutants and their impacts on downstream users need to be evaluated. Furthermore, stockpiling of raw materials and fuels without proper protection can result in the discharge of run-offs that are acidic and contain high levels of suspended particulates. There are potentials for fire episodes to occur if fuel oil is not adequately stored and consumed in a timely manner.

Evaluation of Impacts

(i) There are a variety of established quantitative models that can be applied to assess potential changes in ambient water quality status of water courses arising from the discharge of point source pollutant loadings into their system. A suitable, compatible, model must be selected to simulate the effects of pollutant loadings on downstream receptors which are dependent on the same watercourse for their socio-economic activities. The simulations should take into consideration the hydraulic properties of the receiving watercourse; particularly for the case when drought flows occur. Changes in water pollutant indicators that need to be assessed include Biochemical Oxygen Demand (BOD), Ammoniacal Nitrogen (AN) and coliforms. The magnitude of increases in these pollutant levels need to be assessed, and a determination made as to whether a water quality class shift has occurred. If in the affirmative, then mitigation measures need to be identified to ameliorate the negative impacts to tolerable levels.

(ii) It is suggested that the following procedures are considered for assessing water quality impacts arising from the construction and operations of a Lime Plant:

(a) Identify the significant pollutants that are potentially emitted from the Lime Plant. In this respect continuous, large volumes of highly contaminated water sources should be given priority. This will determine the development of BMPs for the site.

(b) Water quality prediction and assessment scenarios should encompass:

- Normal operation conditions (with Industrial Effluent Treatment System (IETS) and Sewage Treatment systems) designed to meet the specified guaranteed performance limits), and
- Worst case scenario (no effluent treatment).

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

(d) 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.

(e) Reliable estimations of the quality (concentration of pollutant) and quantity (effluent flowrate) of effluent generated should be carried out in order. This is important to ensure that the proposed treatment technology is effective, and the capacity of the treated effluent is sufficient.

(f) Reference to assessment criteria such as the national river and marine water quality standards, 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 consider 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 Project implementation. When the prediction shows the water quality of the receiving waterbodies may have been significantly compromised due to discharges from the Project, then suitable mitigation measures shall be considered to alleviate the concern to either remove or mitigate the impacts to acceptable levels.

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 it’s Zone of Impact.

In this respect key information to be reported include:

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

(ii) Discussion with respect to the accuracy of the predictions.

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

(iv) Suitable BMPs and treatment systems identified to minimise the effects of discharges to the waterways, e.g. silt traps, sewage and effluent treatment systems, etc.

(v) Effectiveness of these BMP's can be simulated to estimate load reductions, ensuring pollutants are controlled at-site to reduce off-site impacts to meet the requirements and standards of various agencies.

5.2.5 Public Health Impacts

Assessment Requirements

A health hazard may be categorized as biological, chemical or physical in nature. The recommended of general requirement for assessing health impact and existing public health status of the local community, are provide for reference in **Appendix H**.

During the Lime Plant's Construction Stage, the common health hazards are:

(i) Respiratory effects from exposure to gaseous and particulate pollutants such as particulate matter below 10 microns (PM_{10}) in size, SO_2, and NO_2 from fuel combustion machinery on Sites; and by dust dispersion from unpaved surfaces.

(ii) Vector-borne diseases (dengue fever, malaria which are caused by the unhygienic construction Sites or living workers quarters).

(iii) Waterborne disease and food-borne disease like cholera, typhoid and Hepatitis A due to improper sewage and solid waste disposal in the worker's camp area.

(iv) Physical injuries due to work accidents, road traffic accidents, noise induced hearing impairment from exposure to operating vehicles or machineries.

(v) Accidents and explosion hazards from handling highly flammable materials on Site (pipelines, storage tanks etc.).

Evaluation of Impacts

The health risk assessment for EIA reporting is guided by the Guidance Document of Health Impact Assessment (HIA) in Environmental Impact Assessment published by DOE Malaysia (2012). Health risk is an outcome of exposure to hazardous substances. Approaches to health risk assessment can be namely qualitative or quantitative.

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

The assessment should encompass the following:

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

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

In the case of a Lime Plants Project, the impact assessment procedure should take the following procedural steps:

- Employ acceptable risk assessment models to ascertain the level of risk from specific Project activities.
- Determine the level of risk to neighbouring receptors to ascertain whether the level is within acceptable levels.

- In terms of health, surveys on existing health conditions of surrounding population/communities can assist in monitoring for sudden increase/ decrease in disease outbreaks during pre- and post-Project implementation.

- For workers, possible impacts on their safety and health in the line of work shall be assessed, e.g. working in high noise areas, in confined spaces, at heights, handling hazardous materials etc.

Outputs

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

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

- Hazard Index is a summation of the hazard quotients for all chemicals to which an individual is exposed. For non-carcinogenic risk, a Hazard Index value of less than or equal to 1.0 indicates that no adverse human health effects (non-cancer) are expected to occur.

- For carcinogenic risk: values of 10^{-6} to 10^{-4} (i.e. one in a million or one in a thousand) are given as a range of "generally acceptable risk"

- The qualitative/quantitative risk to receptors can assist to determine the types of BMPs necessary to reduce the risks.

- Findings from the Health Impact Assessment (HIA) can also indicate potential preventive and mitigation measures that need to be adopted to safeguard worker and community health status during the Project's construction and operation stages

5.2.6 Drainage Impacts

Assessment Requirements

(i) Assess the scale of land clearing required, and potential alterations to the hydrological and drainage characteristics of the Site.

(ii) Determine the scope and characteristics of external and internal drainage systems, especially the former, that may be impacted upon to accommodate storm flows discharged from the Project Site(s).

(iii) Evaluate the hydraulic conditions before and after Project development, such as release of higher peak flows, and induced increases in flow velocities at critical points along external receiving drainage networks, which are located downstream of the Project Site(s), for potential induced localised flooding.

(iv) Determine the potential impacts to downstream receptors, e.g. Water Treatment Plants (WTPs), Water Intake Points (WIPs), aquaculture areas, recreational areas; and to instream ecological resources.

Evaluation of Impacts

(i) Delineate the river basins encroached on by the development of the Project; and in particular the river systems that are specifically affected.

(ii) Collect hydrological data and assess long-term rainfall trends.

(iii) Use mathematical or simulation models to ascertain the different hydraulic conditions, vis-a-vis pre- and post-Project implementation, prevailing along specific receiving watercourses.

(iv) Determine the potential impacts and provide appropriate mitigation measures as part of the Land Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2), to minimise any adverse effects within and surrounding the Project Site.

Output

(i) Runoff hydrographs detailing pre- and post-development runoff scenarios and flood risk maps.

(ii) The hydrological and drainage systems of the Project Site and its impacts on surrounding receiving watercourses will form part of the technical and engineering works.

(iii) The types of mitigation measures needed will be proposed by the Qualified Person to be incorporated in the LD-P2M2, mainly to ensure reductions in flow velocity and volume of discharge of surface flows during the land clearing, construction and operational phases.

5.2.7 Waste Management Impacts

Assessment Requirements

(i) Identify the types of wastes generated during the Project's construction and operating phases. These may include biomass generation, spent scheduled wastes (e.g. spent lubricating oil, spent hydraulic oil, etc.), construction, domestic and municipal wastes (e.g. timber, concrete, scrap material, paper,

plastics food wastes green wastes, etc.); and assess their potential impacts on the local and regional environment.

(ii) Determine the range of management measures required to be carried out to curtail adverse impacts being impacted on the ambient water, air and land quality associated with the surrounding environment.

Evaluation of Impacts

(i) Identify and estimate the quantum of all waste sources with the assistance of the Project's technical and engineering consultants.

(ii) Assess the severity of impacts from improper management of such wastes on water quality, odour, air quality and public health.

(iii) Identify locations of suitable temporary storage areas within the Project Site.

(iv) Identify locations where the wastes will be eventually disposed off.

(v) Ascertain the potential there exists to reuse, recycle and repurpose wastes that are produced to promote a circular economic approach towards waste management.

Output

(i) Identification of proper temporary disposal sites and storage facilities for wastes generated on-site including mitigation measures against spillage, erosion, carry over of sediments to waterways pest proliferation, and other impacts.

(ii) Mitigation measures for proper waste management to be incorporated into Project Site management to ensure that all wastes are properly managed and disposed off at designated and approved locations so as not to pollute the environment.

5.2.8 Ecology Impacts

Assessment Requirements

(i) Mapping of important habitats and ESAs, e.g. forest reserves, mossy forests, lakes and wetlands, etc. in the vicinity of the selected Project Site(s).

(ii) Undertake an Inventory of existing flora and fauna (terrestrial, aquatic and/or marine) within the Project area and its surroundings to ascertain the level of biodiversity.

(iii) Identify critical species benchmarked against the International Union for Conservation of Nature (IUCN) published red list; or other relevant references. The assessment can be based on field surveys (animal trapping, baiting, camera traps, and observations of secondary animal signs) or literature review to produce the inventory.

(iv) Recommendation of mitigation measures if there are any important flora and fauna that need relocation or protection.

Evaluation of Impacts

(i) Determine the level of encroachment into ESAs such as ecologically rich habitats.

(ii) Indication of possible loss of habitat and its flora and fauna species and their associated populations, which may include endemic, rare, endangered, threatened and/or near extinct species.

(iii) Identify Project activities that could disturb animal behaviour, leading to their dispersal afar or limiting their range of movement.

(iv) Effects of increased accessibility to the Project Site and opening up of forested or pristine areas, e.g. to establish access roads, leading to poaching risks.

(v) Forest fragmentation and its consequences to fauna and their habitats.

(vi) Increase in roadkill and poaching of animals in the newly developed areas.

(vii) Impacts from increased Human-Wildlife Conflicts (HWC).

Output

(i) Highlight important areas (through a habitat map) which should not be built-upon or if there is no other option, to determine suitable mitigation measures to minimise the impacts, or to replace the lost area (compensation process).

(ii) Identification of critical areas to incorporate mitigation measures such as viaducts, or culverts, to allow for safe passage of animals across linear corridors; or need to translocate important species at risk from the Project, and how to execute the implementation of such measures.

(iii) Develop wildlife management plans.

5.2.9 Social Economic Impacts

Assessment Requirements

(i) Determine whether the Project entails land and property acquisition and relocation of communities and businesses. These issues often cause psychological, emotional and economic impacts to those who are affected, and have to be handled with great care.

(ii) Assessment of the extent of impacts from, *inter-alia*, dust and other gaseous dispersions, pollution of surface and ground waters, noise and vibration, fire hazards, etc. that are imparted on nearby communities and on workers at-site. However, the Project may also generate benefits such as creating increased job and business opportunities to the local population; such positive impacts should be elucidated.

(iii) An assessment of the views and perceptions voiced by potentially impacted stakeholders with regard to Project development and operations should be given due consideration; and their suggestions/recommendations with regard to adoption of specific mitigation and abatement measures to address their concerns must be considered seriously in finalising the Project's detail designs.

Evaluation of Impacts

(i) Identify the extent of land acquisition required and inventorise those affected stakeholders.

(ii) Demarcate the survey catchment boundaries to gather information on existing population distribution and determine statistically the number of surveys required to ensure that information sourced is reliable and is representative of stakeholders resident in the potentially impacted area. For the EIA study, the impacts are evaluated mainly on the communities living within the Zone of Study (ZOS). If there is a need, those in the ZOI will also be assessed in terms of potential impacts that could be imposed on them.

(iii) Pertinent information can be obtained through FGDs, interviews and site questionnaire surveys. Findings shall be analysed, and deductions arrived at.

(iv) The main findings from the Social Impact Assessment (SIA) shall be incorporated in the EIA.

Output

(i) Land and property acquisition and relocation of communities must be first be settled by the Project Proponent prior to undertaking an EIA study.

(ii) The findings from the social impacts, mainly from surveys and Focus Group Discussions (FGDs) can be contentious and often skewed. Therefore, the assessments should have overall on-the-ground reviews even after the surveys are interpreted by the Qualified Person.

5.2.10 Hydrology Impacts

Assessment Requirements

(i) Assessment of the scale of land clearing and alterations to the hydrological and drainage characteristics of the site.

(ii) Determination of the scale of the drainage system that may also be altered to take in the storm flows from the Project development.

(iii) Evaluation of the hydrological conditions before and after Project development such as higher peak flows, increased velocities at critical points in the lowlands downstream for any localised flooding.

(iv) Determination of the impacts to downstream users, e.g. Water Treatment Plants (WTPs), Water Intake Points (WIPs), aquaculture areas, recreational areas, etc.

Evaluation of Impacts

(i) Delineate the river basins encroached on by the Project and particular river systems that are affected.

(ii) Collect hydrological data and assess long-term rainfall trends.

(iii) Use mathematical or simulation models to ascertain the different hydrological conditions pre- and post-Project implementation.

(iv) Determine the potential impacts and provide appropriate mitigation measures as part of the Land Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2), to minimise any adverse effects within and surrounding the Project Site.

Output

(i) Runoff hydrographs detailing pre- and post-development runoff scenario and flood risk maps.

(ii) The hydrological and drainage systems of the Project Site and its impacts on surroundings will form part of the technical and engineering works.

(iii) The types of mitigation measures needed will be proposed by the Qualified Person to be incorporated in the LD-P2M2, mainly to ensure reductions in flow velocity and volume during the land clearing, construction and operational phases.

5.2.11 Geotechnical Hazards

Assessment Requirements

(i) Assessment of areas of the Project Site and surroundings for risk, e.g. slope failure, erosion, landslides, seismic activities, etc.

(ii) Determination of the adequacy of buffer to avoid or reduce risk of hazards to the Project area.

(iii) Identification of suitable engineering and geotechnical measures required to ensure that hazards are fully addressed.

Evaluation of Impacts

(i) Develop risk map and determine Factor of Safety (FOS) for all engineered slopes and hazard areas.

(ii) Assess the impact and extent of damages/losses in the event of slope failure, landslide, etc. and sensitive receptors that may be affected.

(iii) Determine areas in need for mitigation measures or engineering/geotechnical solutions to reduce risk.

Output

(i) Hazard areas shall be clearly mapped out as part of the Geological Terrain Mapping (GTM) to determine construction suitability.

(ii) Areas of high risks shall be avoid being built upon or provided with adequate geotechnical and engineering measures.

(iii) Monitoring programme for slopes.

5.2.12 Groundwater/Hydrogeology

Assessment Requirements

(i) Provide an overview of the existing hydro-geological setting of the study area, describing the aquifers, hydraulic characteristics, groundwater quality and the interaction between surface and groundwater systems.

(ii) Determination of the adequacy of buffer zones to avoid or reduce risk of exposures hazards on the Project area.

(iii) Identification of suitable measures to ensure that hazards are fully addressed.

(iv) To locate and construct suitable test wells for aquifer pumping tests and groundwater quality analysis

(v) To assess the expected effects of groundwater withdrawals associated with the proposed Project on any existing water wells and structures located in the surrounding environment.

Evaluation of Impacts

(i) Develop risk map and determine Factor of Safety (FOS) for all engineered slopes and hazard areas.

(ii) Assess the impact and extent of damages/losses in the event of slope failure, landslide, etc. and sensitive receptors that may be affected.

(iii) Determine areas in need for mitigation measures or engineering solutions to reduce risk of damage.

(iv) To determine and assess the potential impacts and mitigation measures due to Project activities such as increased runoff due to the clearing of existing vegetation, and that causes changes to groundwater regime.

Output

(i) Areas of high risks shall be avoided from being developed or provided with adequate hydrogeological and engineering mitigation measures.

(ii) To recommended that an appropriate well construction and must comment on the potential for cross contamination between aquifers.

(iii) Monitoring programme for groundwater

(iv) To propose mitigation measures, including contingency plans where applicable, to address any identified water quality or quantity concerns.

5.2.13 Traffic Impacts

Assessment Requirements

(i) Describe how construction materials, workers and machinery are mobilised to, and from, the construction site and also transportation of raw material to the Lime Plants. High vehicle volume can cause congestion on public thoroughfares, damage roads, bridges and culverts, and increased risk of road accidents. Spillage from vehicles can also occur causing traffic flow disruptions.

(ii) Identification of the need for mitigation measures during construction and operational phases for traffic management.

Evaluation of Impacts

(i) Review and incorporate the main findings from the Traffic Impact Assessment (TIA) into the EIA. The TIA is carried out separately by a Traffic Consultant and endorsed by the Public Works Department (JKR).

(ii) The main impact elements to be addressed in the EIA study (e.g. risk of accidents, adverse air quality and public health impacts) are focused on communities residing alongside roads employed for transporting materials and spoils during the Project's construction stage.

(iii) During the operation phase, the extra volume of traffic generated by the Project will also affect communities' resident by the side of transportation routes; and the potential and magnitude of such impacts should be investigated.

Output

(i) Identify potential issues related to Project induced traffic flow along public roads during construction and operational stages; and recommend incorporation of structural and non-structural measures to address these issues as proposed by the TIA Consultants.

(ii) Identification of risk factors from various Project related activities imposed on nearby communities, such as from accidents, health, etc.

5.2.14 Safety and Health

Assessment Requirements

(i) Construction activities entails higher risks to the safety and health of Project workers and to surrounding communities from pollution episodes, transmission of diseases by immigrant workers, from accidents and fire hazards; these risks are to be assessed for their propensity of occurrence.

(ii) For these development Projects, the risk assessment should tie in with the assessment on Geotechnical Hazards (see **Section 5.2.11**) as it also relates to public safety.

Evaluation of Impacts

(i) Employ acceptable risk assessment models to ascertain the level of risk from specific Project activities.

(ii) Determine the level of risk to neighbouring receptors to ascertain whether the level is within acceptable levels.

(iii) In terms of health, surveys on existing health conditions of surrounding population/communities can assist in monitoring for sudden increase/decrease in disease outbreaks during pre- and post-Project implementation.

(iv) For workers, possible impacts on their safety and health in the line of work shall be assessed, e.g. working in high noise areas, in confined spaces, at heights, handling hazardous materials etc.

Output

(i) The qualitative/quantitative risk to receptors can assist to determine the types of BMPs necessary to reduce the risks.

(ii) Findings from the Assessment (HIA) can also provide possible preventive and mitigation measures to safeguard worker and community health status during construction and operation stages.

5.2.15 Risk Assessment

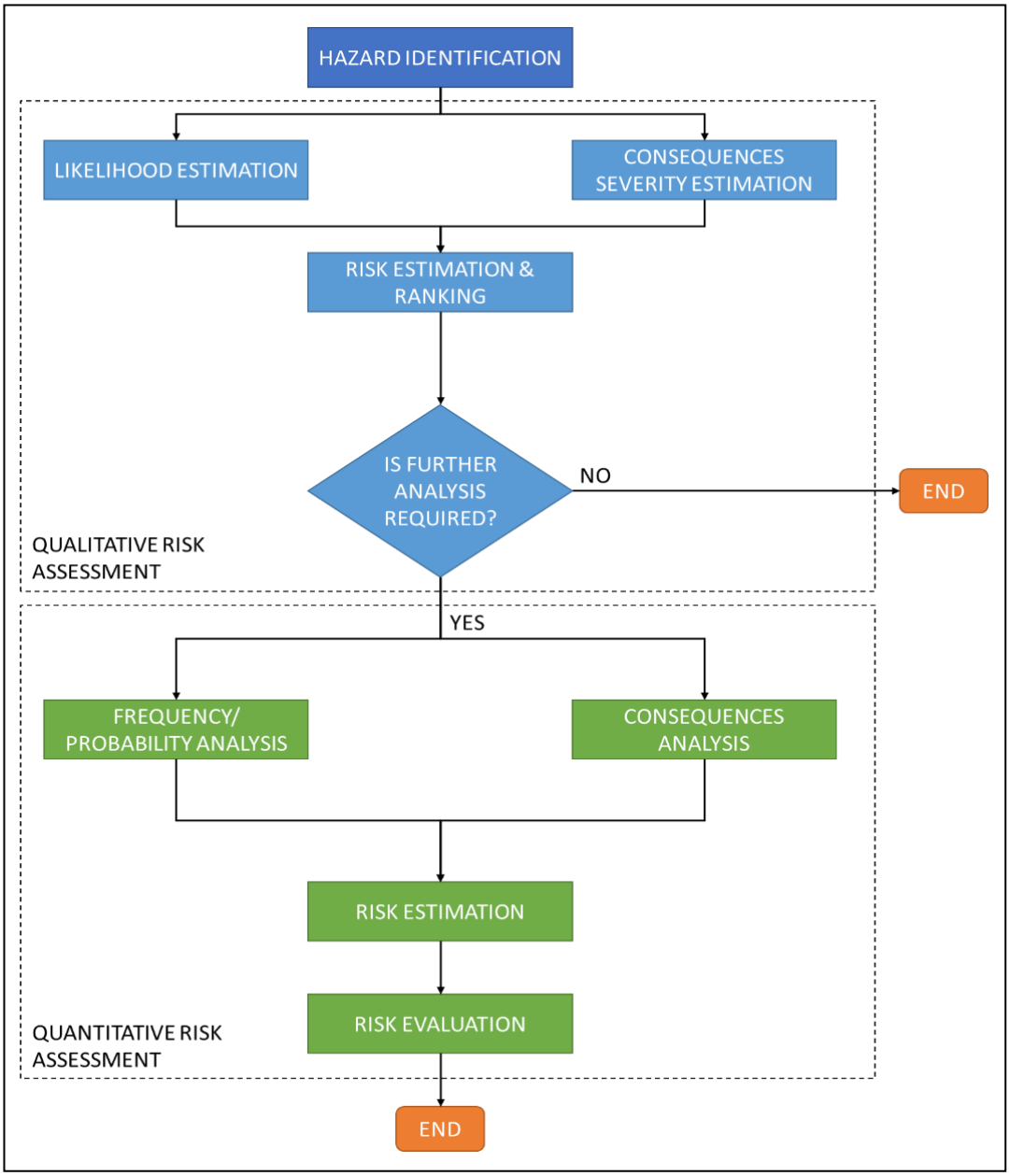
Assessment Requirements

The Risk Assessment study as required by Department of Environment (DOE) is to determine quantitatively the risk posed to the population in the area where the Project is to be implemented. The assessment is guided by EIA Guidelines for Risk Assessment by DOE Malaysia (2004). The process flow of the risk assessment flow is as per **Figure 5.4**.

Qualitative Risk Assessment is based upon subjective and qualitative judgment while, quantitative estimates the expected frequency and consequence of potential accidents associated with a facility or operation based on engineering evaluation and mathematical techniques.

Quantitative Risk Assessment is the application of methodology to produce a numerical representation of the frequency and extent of a specified level of exposure

or harm, to specified people or the environment, due to the operation of the proposed Project.



Source: EIA Guideline for Risk Assessment (2004)

Figure 5.4: Risk Assessment Flow

Evaluation of Impacts

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.

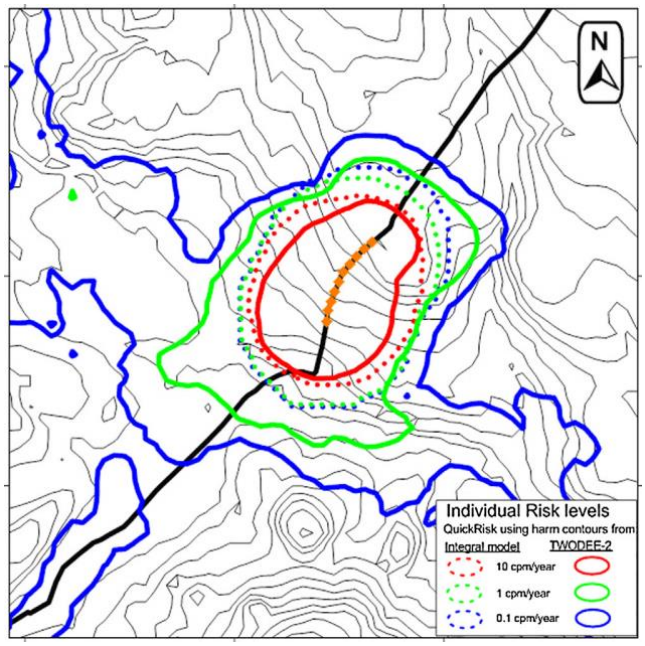
The risk assessment results will be presented in terms of individual risk in comparison against the risk criteria established by DOE.

Output

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 contour lines on a map as illustrated in **Figure 5.5.**



(Source: Risk assessment methodology for high-pressure CO2 pipelines incorporating topography by Diego L. et. al (2014) Process Safety and Environmental Protection p.27)

Figure 5.5: Sample of Individual Risk Contour

(ii) Societal Risk

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

(iii) Risk Tolerability

Outcome from the risk assessment is usually compared to the risk tolerability criteria so that a decision can be made whether the risk is broadly acceptable or tolerable or if it is unacceptable.

The risk tolerability criteria recommended in the EIA Guidelines for Risk Assessment by DOE Malaysia (2004) are:

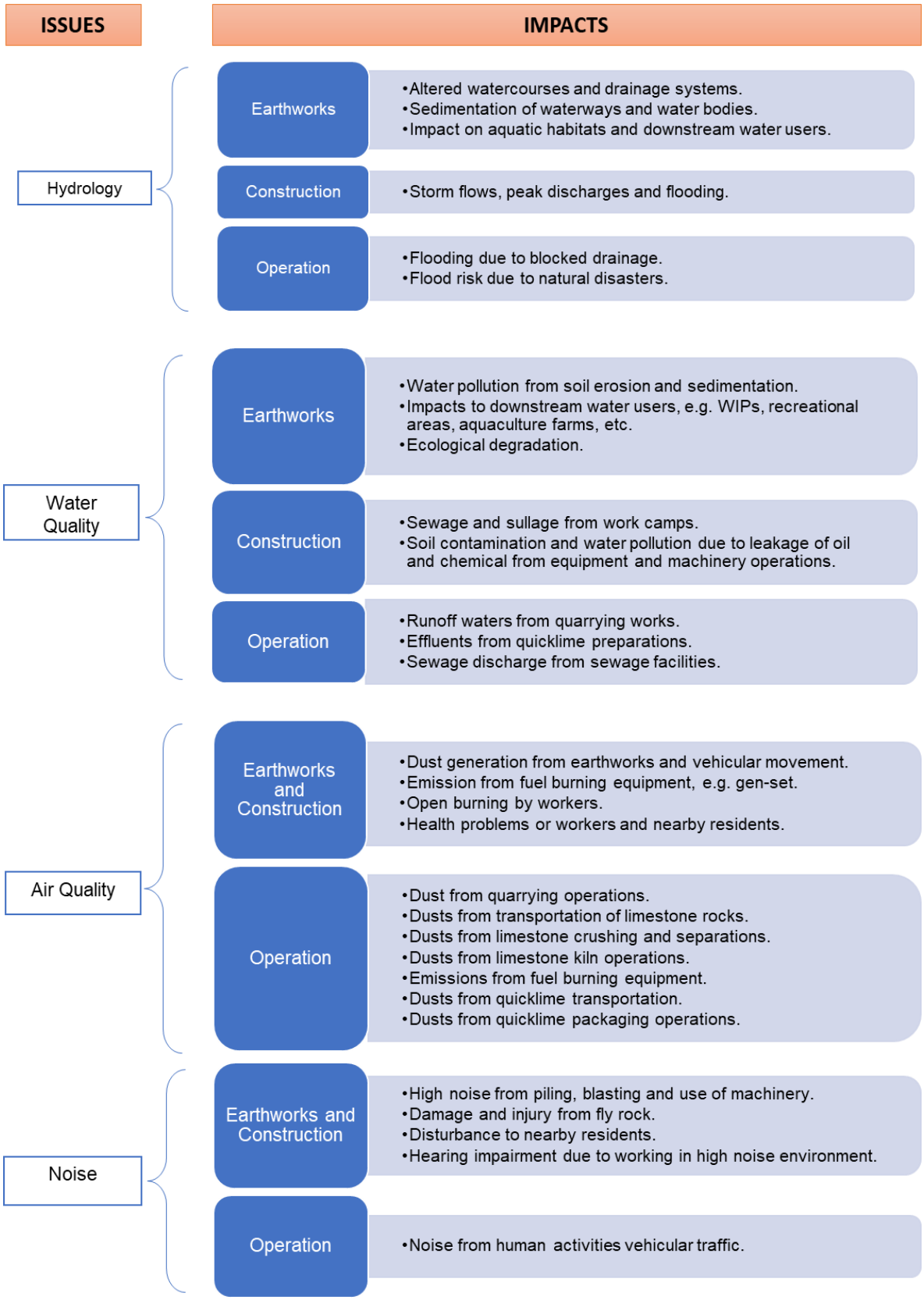
- The 1 x 10^{-6} fatalities / person per year individual risk contour should not encompass involuntary recipients of industrial risks such as residential areas, schools, hospitals and places of continuous occupancy, etc.

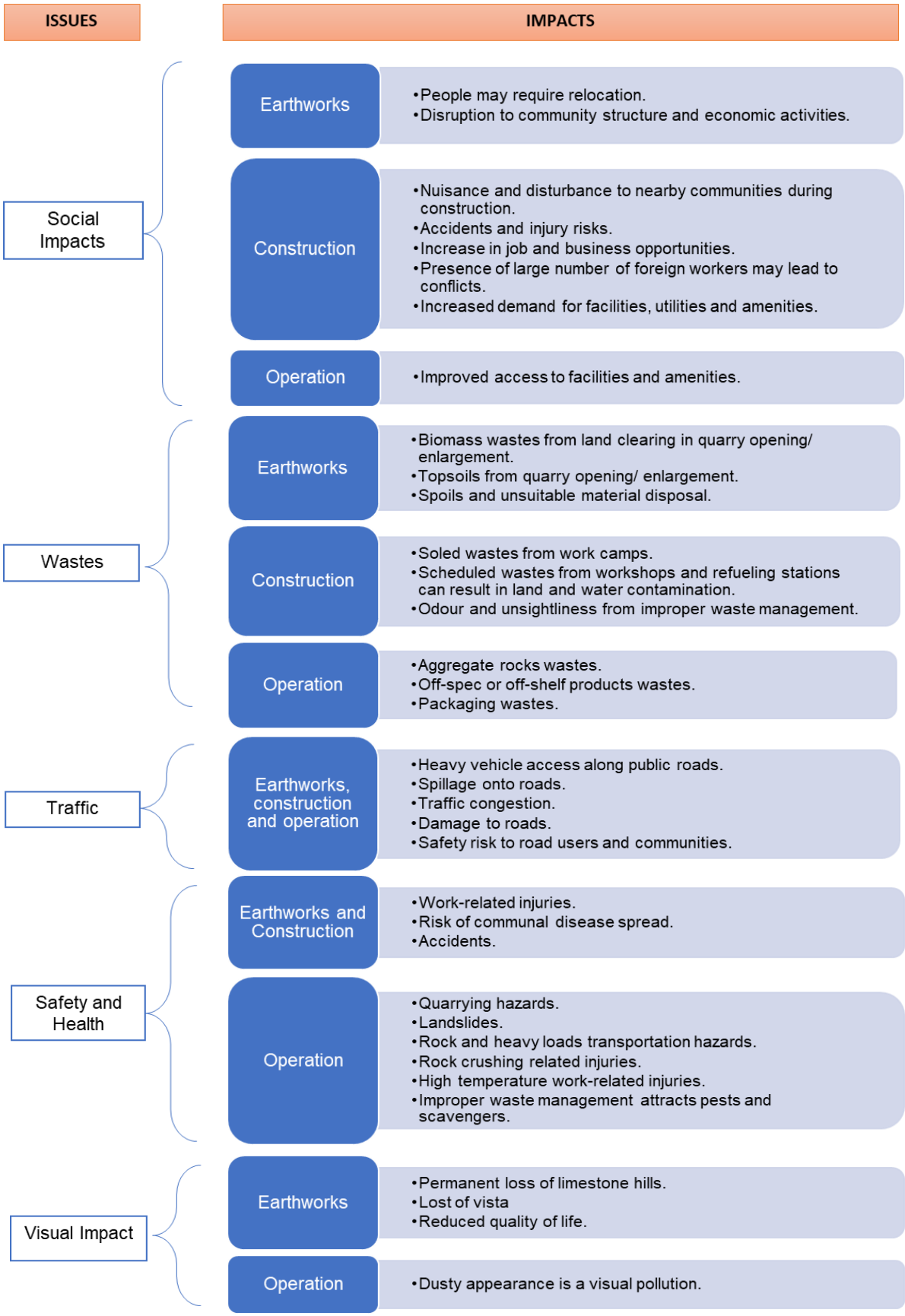
- The 1 x 10^{-5} fatalities / person per year individual risk contour should not extend beyond industrial boundaries.

5.2.16 Summary

Table 5.1: Typical Issues and Impacts from Lime Plant Developments

ISSUES	IMPACTS	
Ecology	Earthworks and construction	•Loss of habitat (forests, aquatic , lakes, etc.). •Flora and fauna may be affected and may have to be relocated to adjacent sites. •Poaching.
	Operation	•Forest fragmentation. •Roadkill. •Human-wildlife conflicts (HWC).
Erosion and Sedimentation	Earthworks	•Soil erosion •Soil creep and loss. •Riverbank collapse and erosion. •Damage to constructed platforms. •Sedimentation of waterways and water bodies. •Terrestrial and aquatic ecological damage.
Geotechnical Hazards	Construction and Operation	•Seismic events. •Slope instability/failure. •Loss of life and damages to property. •Mud flows. •Sedimentation of waterways and water bodies.


ISSUES
IMPACTS
Hydrology
Earthworks
•Altered watercourses and drainage systems.
•Sedimentation of waterways and water bodies.
•Impact on aquatic habitats and downstream water users.
Construction
•Storm flows, peak discharges and flooding.
Operation
•Flooding due to blocked drainage.
•Flood risk due to natural disasters.
Water Quality
Earthworks
•Water pollution from soil erosion and sedimentation.
•Impacts to downstream water users, e.g. WIPs, recreational areas, aquaculture farms, etc.
•Ecological degradation.
Construction
•Sewage and sullage from work camps.
•Soil contamination and water pollution due to leakage of oil and chemical from equipment and machinery operations.
Operation
•Runoff waters from quarrying works.
•Effluents from quicklime preparations.
•Sewage discharge from sewage facilities.
Air Quality
Earthworks and Construction
•Dust generation from earthworks and vehicular movement.
•Emission from fuel burning equipment, e.g. gen-set.
•Open burning by workers.
•Health problems or workers and nearby residents.
Operation
•Dust from quarrying operations.
•Dusts from transportation of limestone rocks.
•Dusts from limestone crushing and separations.
•Dusts from limestone kiln operations.
•Emissions from fuel burning equipment.
•Dusts from quicklime transportation.
•Dusts from quicklime packaging operations.
Noise
Earthworks and Construction
•High noise from piling, blasting and use of machinery.
•Damage and injury from fly rock.
•Disturbance to nearby residents.
•Hearing impairment due to working in high noise environment.
Operation
•Noise from human activities vehicular traffic.



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.

5.3 PREDICTIVE METHODS AND TOOLS

There is a wide range of predictive tools and models for identifying, evaluating and assessing potential impacts. Common methods and tools are as follows:

(i) Expert opinions.

(ii) Consultations and questionnaires.

(iii) Checklists.

(iv) Spatial analysis.

(v) Network and system analysis.

(vi) Matrices.

(vii) Carrying capacity analysis.

(viii) Mathematical and computer modelling.

(ix) Case studies.

Simple methodologies are preferred, though this depends on the complex nature of the impacts. Whichever method is chosen, it must be appropriate to address the identified problems, taking into consideration local conditions at the Project Site.

The EIA Report must be scientifically and technically sound and whenever necessary, quantitative impact prediction on the more significant impacts should be carried out. If computer modelling is carried out, e.g. for water and air quality assessment, flooding etc, the following information have to be furnished:

(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).

(vii) Limitations in data collection or method chosen.

All modelling exercises carried out shall elucidate impacts under various scenarios, for short-, mid- and long-term for the worst-case scenarios. The outputs of the

modelling studies shall be presented in a concise manner, with all uncertainties discussed.

Technical reports, data analysis and tables and raw data, where necessary, shall be included as appendix in the EIA report to support the impact assessment methodology and findings reached.

Ultimately, the impact assessment chapter in the EIA report shall present and discuss the predictive results and outputs of studies taken; which have to be in sufficient technical detail to support the assessment. It must also be written in a manner that is easily understood by decision makers and the public.
Table 5.4 summarises examples of accepted prediction methods for impact assessment and expected outputs. The list is not exhaustive. The Qualified Person has to propose the best methods relevant to the Project under study or may select one of the methods in the list.

Table 5.4: Examples of Prediction Methods for Environmental Impacts

Impacts	Prediction Methods	Output
Erosion and Sedimentation	• Revised Universal Soil Loss Equation (RUSLE). • Modified Universal Soil Loss Equation (MUSLE). • Computer models.	• Soil loss rates and sediment yield. • Erosion risk and potential soil loss maps.
Landslide and Slope Failure	• Soil investigations. • Geological Terrain Mapping (GTM). • Site assessment by qualified geotechnical engineer and/or geologist. • Risk analysis. • Engineering design and estimation of Factor of Safety (FOS).	• Identification and mapping of high-risk areas to avoid or to apply mitigation measures.
Hydrology	• Hydrological procedures (DID). • Computer models for estimating peak flood, runoff, watershed, analysis, flood plain hydraulics, etc. examples include HEC-HMS, HEC-RAS, FLO-2D, TUFLOW, EXTRAN and Storm Water Management Model (SWMM).	• Estimation of pre-construction and post-construction runoff. • Flood risk map.

Impacts	Prediction Methods	Output
	• Hydrological analysis in accordance with *Manual Saliran Mesra Alam Edisi-2* (MSMA-2).	
Water Quality	• Mathematical models (one, two or three-dimensional) analysis of pollution loads and dispersion in the waterways, such as QUAL2K, MIKE11, etc. • Simple mass balance models, e.g. Streeter-Phelps Model. Operational sewage and effluent discharges modelled employing Qual2k or Delft3D or MIKE11.	• Estimation of TSS (erosion) and BOD, COD and AN (sewage/effluent) concentration affecting a stretch of river and downstream sensitive areas. • Estimation of pollution.
Air Quality	• Gaussian plume dispersion models to assess dust and gas dispersion over an area under the worst case scenario.	• Dispersion contour map indicating levels at sensitive receptions. • Comparison of computed values with the New Malaysia Ambient Air Quality Standards. • Determination of location of maximum air pollution concentration.
Noise Level	• Mathematical models to assess noise levels for point source of linear sources. • Noise modelling software, such as SoundPlan, CadNa or Geographic Information System (GIS) acoustic models. • Traffic noise models.	• Quantitative values for noise level at sensitive receptors. • Noise contour map indicating levels at sensitive areas. • Comparison of computed values to DOE's permissible noise limits.
Ecology	• Comparative assessment of conservation status and sensitivity of habitat, flora and fauna.	• Habitat map. • Species inventory, especially of rare, endangered, threatened

Impacts	Prediction Methods	Output
	• Ecological models for species diversity and population change. • Limit of Acceptable Change (LAC). • Spatial models, such as GLOBIO3.	and near extinct species that may require protection.
Social Impacts	• Social and economic surveys on affected population. • Perception survey to ascertain acceptance of Project. • Social Impact Assessment (SIA).	• Socio-economic profiling. • Public opinion survey results. • Stakeholder feedback for EIA including possible mitigation measures.
Landuse	• Compatibility assessment based on structure plan, local plan and other guidelines. • Adherence to required setback based on national and state guidelines.	• Landuse compatibility and buffer requirements.
Public Health	• Qualitative/quantitative Health Risk Assessment (HRA) encompassing hazard identification exposure assessment and risk characterization.	• Potential health impacts to nearby population.
Biomass	• Estimation on total biomass based on vegetation types and published values.	• Predicted biomass waste generation.
Scheduled Wastes	• Identification of potential scheduled wastes generation during construction and operations based on Project activities.	• Predicted scheduled waste generation.

Impacts	Prediction Methods	Output
Solid Wastes	• Waste generation estimation based on population/workforce/ employees.	• Predicted waste generation.
Traffic	• Traffic impact assessment including simulation of peak traffic flows under various scenarios and junction analysis, e.g. Signalized and Unsignalized Intersection Design and Research Aid.	• Comparison of traffic scenario pre- and post-Project and need for road improvements.
Infrastructure and Utilities	• Existing demand estimation methods by regulators, e.g. population equivalent (P.E.) calculations [National Water Services Commission (SPAN)]. • Comparison of existing supply to meet future demand to determine adequacy.	• Estimates of demand.
Aesthetics	• Visual assessment on scenic and aesthetic value of the area. • 2-D and 3-D Viewshed Analysis.	• Before and after scenario.

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 method required for environmental assessment and compliance.

5.4 CRITERIA AND STANDARDS

The method to determine the degree of significance of an impact is to benchmark the findings against the stipulated current criteria and standard limits imposed by DOE and/or various Government Agencies (GAs) (refer to **Appendix D to Appendix G**).

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

Table 5.5 provides a list of the evaluation criteria for various environmental components to be used as a guide. Based on the prediction methods and tools, the outcomes shall be derived (see **Box 7**).

Table 5.5: Examples of Criteria and Standards for Environmental Parameters

Impacts	Evaluation Criteria
Erosion and Sedimentation	**Guidelines Documents** (a) Guidelines Document for Addressing Soil Erosion and Sediment Control Aspects in the EIA Report (DOE, 2016). (b) Guidance Document for the Preparation of the Document on LD-P2M2 (DOE, 2016). (c) Guidelines for Erosion and Sediment Control in Malaysia (DID, 2010). (d) *Manual Saliran Mesra Alam Edisi-2* (MSMA-2) (DID, 2012). **Sediment Basin/Silt Trap Discharge** (a) TSS: 50 mg/L or 100 mg/L, depending on locality. (b) Turbidity: 250 NTU.
Water Quality and Pollution Control	(a) Ambient water quality: National Water Quality Standards (NWQS). (b) Sewage discharges: Environmental Quality (Sewage) Regulations 2009. (c) Effluent discharges: Environmental Quality (Industrial Effluent Regulations. (d) Toilets and septic tanks: SPAN approved design and requirements.
Flood/Runoff Management	*Manual Saliran Mesra Alam Edisi-2* (MSMA-2) (DID, 2012) requirements.
Air Quality	(a) Environmental Quality (Clean Air) Regulations 2014. (b) New Malaysia Ambient Air Quality Standards.

Impacts	Evaluation Criteria
Noise Level	(a) Guidelines for Environmental Noise Limits & Control 3rd Edition (DOE, 2019). (b) Occupational Safety and Health (Noise Exposure) Regulation 2019.
Vibration	(a) The Planning Guidelines for Environmental Vibration Limits and Control 2nd Edition (DOE, 2007). (b) JMG requirements for blasting operations.
Ecology	(a) International Union on the Conservation of Nature (IUCN) and Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) listing. (b) Wildlife Conservation Act 2010. (c) Feedback from PERHILITAN and Forestry Department Peninsular Malaysia (JPSM).
Landuse	(a) Structure Plans, Local Plans, Special Area Plans (SAP), Special Management Areas (SMAs) Guidelines. (b) Environmental Sensitive Area (ESA) Listing under the National Physical Plan-3 (NPP-3) (JPBD, 2016). (c) Guidelines for Hillside and Highland Development (National and State). (d) Guidelines for Siting and Zoning of Industry and Residential Areas (DOE, 2012). (e) Local Authority requirements.
Land Traffic	(a) Acceptance Level of Service (LOS) for traffic flows. (b) Local authority/Public Works Department (JKR) requirement.
Safety and Health	(a) Occupational Safety and Health Act 1994. (b) Factory and Machinery Act 1967. (c) Department of Occupational Safety and Health (DOSH) Requirements.

Impacts	Evaluation Criteria
	(d) International Labour Organisation (ILO) and other guidelines. (e) Guidance Document on HIA in EIA (DOE, 2004). (f) EIA Guidelines for Risk Assessment (DOE, 2004).
Social Impacts/ Heritage, Culture and Archaeology	(a) Public perception on acceptability. (b) National Heritage Register (National Heritage Department). (c) Preservation of cultural, heritage, historical and archaeological items and sites of significance. (d) Social Impact Assessment (SIA) requirements in the context of the Town and Country Planning Act (Amendment) 2017 (Act A1522) for three categories: (i) SIA 1: Development Projects under subsection 20B(1) and (2) of act A1522 for coastal reclamation Projects and major national infrastructure. (ii) SIA 2: Development Projects under subsection 22(2A) Act 172 for new township development for population over 10,000 people or covering area over 100 ha or both, major national infrastructure and development in slope and hill areas. (iii) SIA 3: Any other development Projects with significant social impacts as ordered by the National Physical Planning Council (MPFN) from time to time.
Wastes	**Scheduled wastes** Environmental Quality (Scheduled Wastes) Regulations 2005. **Other wastes** (a) Solid Waste and Public Cleaning Management Act 2007. (b) Local authority requirements.
Treatment Systems	(a) Technical Guidance Document on the Design and Operation of Industrial Effluent Treatment Systems (DOE, 2015).

Impacts	Evaluation Criteria
	(b) Technical Guidance Document on Performance Monitoring of Industrial Effluent Treatment Systems (DOE, 2015). (c) Technical Guidance Document on Performance Monitoring of Air Pollution Control Systems (DOE, 2005).
Visual Aesthetics	Public perception on acceptability.

Notes:

(i) Refer to **Appendix D to Appendix G** for details on specific standards and limits.

(ii) The list is not exhaustive and not all the above may be relevant to the Project. The Project Proponent and Qualified Person shall make reference to the latest standards and requirements by the authorities.

Box 7:

Outcomes from Impact Assessment

(i) No Impact: This scenario occurs when there are very low to no sensitive receptors in the vicinity of the Project to be subjected to impacts. Examples are communities living very far away, where they are only indirectly affected such as through traffic along the main roads. Another scenario is when there are terrain constraints such as steep slopes, but the Project Proponent has decided to redesign the layout without affecting these areas.

(ii) 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.

(iii) Non-significant Impact: Impacts will inevitably occur in Project development but it may not result in significant exceedance of the accepted criteria or standards. An example is TSS from erosion and sedimentation. The TSS emanating from land clearance that abides by Class II waters of the NWQS is acceptable. Under this scenario, the impact is classified as non-significant, with the level of impact abiding with the stipulated criteria and standards.

CHAPTER 6

ENVIRONMENTAL IMPACT ASSESSMENT: MITIGATION MEASURES

6.1 INTRODUCTION

This Chapter focuses on the Pollution Prevention and Mitigation Measures (P2M2) which can be considered for implementation in order to quell potentially adverse environmental impacts, which are capable of being induced by activities associated with the construction and operations of Lime Plants, to tolerable or acceptable levels so as to safeguard and maintain the pre-development status of the local environment, as well as to sustain the integrity of the Project. This objective can be attained through adoption of the following steps:

(i) Avoidance of negative impacts through selection of best options or alternatives.

(ii) When an adverse impact cannot be avoided, to adopt appropriate preventive measures and Best Management Practices (BMPs) to reduce and minimise the impacts.

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

(iv) Adopt circular economic waste management principles by application of reduce, reuse, recycle and repurposing principles.

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

6.2.1 P2M2 Principles

Recommendations for adopting P2M2s is an important outcome of an EIA study. It evolves from the findings of multi-faceted impact assessments carried out with respect to Lime Plants construction and operational activities and their interaction with the local and regional environments.

P2M2s are required if there are Project activities which can impact negatively on surrounding air and water qualities, on ambient noise and vibration levels, on the integrity of existing ecological systems, and on the health, safety and wellbeing of surrounding communities.

In most, if not all, Project developments, Land Disturbance (LD) activities occur in order to clear the Project Site of vegetation (denudation process) and thereafter to carry out earthworks operations in order to establish suitable platforms to support

Project facilities. These activities can induce significant negative water and air quality impacts leading to public health impairments, flooding episodes and induce diminishing of the economic and social resource capability of watercourses. P2M2s are required to quell impacts to tolerable levels and are referred to as LD-P2M2.

Guidelines for preparation of LD-P2M2 documents are described under **Appendix 4** contained in the publication entitled "Environmental Impact Assessment Guidelines in Malaysia (EGIM) (DOE 2016)". In this respect a LD-P2M2 checklist must be submitted together with relevant sectional drawings and maps. The version of a typical checklist is presented in **Table 6.1**:

Table 6.1: Standard Requirements for the LD-P2M2 Submission

REQUIREMENT AND INFORMATION TO BE INCLUDED					
Project Activity and Implementation	• Phasing plan. • Project implementation schedule. • Description of construction activities. • Construction schedule complete with timeline or charts for P2M2s installation. • Construction method statements.	Information and Analysis on Project Development	• Selected weather and rainfall data. • Site runoff velocity and flowrates (pre- and post-development). • Description of soil and geological characteristics (type, erodibility, hydrologic group, percentage dispersible material, excavation depth, etc.) • Description of adjacent areas that may be affected by land disturbance. • List of drainage, streams and river systems located onsite as well as receiving streams and rivers. • Lists of P2M2s proposed. • Access roads and Project components located outside of Project boundary. • Earthworks cut and fill volume. • Availability of rocks materials. • Biomass management. • Solid (construction waste) and domestic waste management. • Spill prevention and control plan. • Hazardous waste management. • Soil loss prediction (pre, during and post-development) for with and without LD-P2M2 implementation scenarios. • Calculation for sediment traps/basins and projected runoff flows.	Map of Site Plan with Existing Conditions	• Topographic Survey Map. • Geological Terrain Map. • Erosion Risk Map. • Landuse Map. • Site Development Plan Map.

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

The Department of Environment (DOE) has made it a mandatory requirement to recommend P2M2 for all development Projects; and to mainstream the environmental agenda towards a culture of Guided Self-Regulation (GSR) by placing the onus of environmental protection and management clearly on the Project Proponent to comply.

6.2.2 Application of P2M2

The underpinning principles of P2M2s 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 is by means of the following:

(i) The extent of the P2M2s shall correspond to the degree of significance of the predicted impact. Once an impact is identified as significant, P2M2s shall be recommended in the EIA (e.g. as part of the engineering designs for slope reinforcement works, sediment control, etc.). For minor issues, simple management actions will suffice, e.g. water browsing for dust control at site and installation of hoardings for noise attenuation and visual screening.

(ii) Priority shall be given to controlling pollution at source (e.g. reducing erosion and surface runoff within the Project Site), rather than to permit its translocation to adjacent areas (e.g. maintenance of silt traps and removal of accumulated silt from the drainage system).

(iii) Mitigation has to be site and Project specific. The P2M2s need not be complex and costly, but shall instead be practical, easy to implement and effective.

(iv) The P2M2 shall be adequately described based on its design intent and functional attributes. The proposed measures shall be supported by diagrams, illustrations, photos and maps. The technical reports and specifications relating to the P2M2 shall be included as an Appendix to the EIA Document.

(v) The application of innovative state-of-the-art technologies is encouraged if it can be proven to be effective in mitigating the impacts to acceptable levels.

(vi) P2M2s 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 and personnel to carry out these tasks.

(vii) Effectiveness of P2M2s shall be recorded and documented as part of the monitoring and audit programmes (refer to **Chapter 7**).

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

(ix) The P2M2s and BMPs shall be incorporated early into the overall Project design and as part of the LD-P2M2 document.

The submission of the EIA, and the pledges given by the Project Proponent to adopt measures that will protect the integrity of the surrounding environment and resident communities shall reflect a commitment towards ensuring that the recommended P2M2s are implemented during all stages of work activities. These efforts shall include, but not be limited, to executing measures, actions or due diligence principles in accomplishing the overarching goal of protecting the environment during Project implementation and operations.

6.3 POLLUTION CONTROL SYSTEMS

6.3.1 General Considerations

Prior to the commencement of a Project's land clearing and earthworks operation, it is recommended that a Plan be formulated for adopting effective and efficient pollution control systems as part of an overall LD-P2M2 strategy. This is to ensure that adverse impacts imposed on the surrounding environment be avoided during this short-term phase of Project development. One of the main features in the LD-P2M2 is the use of pollution control systems.

During the operational phase of a Lime Plant, the conduct of various activities will generate and release different types of pollutants, mainly in the form of sullage and sewage discharges, toxic, hazardous and particulate gaseous emissions, and discharges of surface flows containing suspended solids, oil and grease, etc. Depending on the scale and volume of discharge of such pollutants, a pollution control system plan incorporating appropriate P2M2s needs to be evolved, together with specifications relating to control equipment and maintenance works. The most common facilities Lime Plants will adopt will include for the Sewage Treatment Plant Systems [STS, Air Pollution Control Systems (APCS)], Oil and Grease removal basins and suspended particulate removal facilities.

The Project Proponent shall engage a Qualified Consultant to prepare the detailed designs of any Pollution Control Systems for the EIA study. The Qualified Consultant must be a professional engineer who holds a current registration certificate issued by the Board of Engineers, and also be a certified Competent Person under Section 49A of the Environmental Quality Act (EQA) 1974.

Detailed requirements for specific pollution control systems and their applicability can be referred to in the Announcement by DOE dated March 2017.

Consultant shall refer to the Best Available Technique published by DOE as guidance. If the proposed technology is new and has not been previously employed in the country, the Project Proponent shall provide detailed information on the new technology, especially with regards to its performance.

6.3.2 Erosion and Sediment Management

(a) Site Clearing and Earthworks

Objective: To arrest or mitigate soil erosion and sediment translocation phenomena at source (i.e. within the Project area), in order to reduce adverse impacts being imposed on communities and environmental sensitive areas located downstream of the Project Site

Implementation Steps:

(i) Establish proper scheduling and phasing of P2M2 implementation in accordance with the Project implementation schedule.

(ii) Retain as much of the natural vegetation as possible by reducing the total worked area. Minimise disturbed area. Demarcate site and buffer areas.

(iii) Reduce the period of exposure for slopes and cleared areas. Exposed areas to be securely covered immediately; cover security to be regularly checked and repaired.

(iv) Stabilise bare slopes, and apply protective covers, when they are not subject to construction activities.

(v) Protect stockpile areas from being eroded by air flows and rainfalls

(vi) Implement P2M2s to curtail soil losses within the Project Site due to erosion processes and install sediment control measures to reduce translocation of loose sediments to external drainage/watercourse systems.

(b) Runoff and Stormwater Management

Objective: To effectively manage the rate of surface runoffs discharged from the Project Site in order to prevent localised flooding, as well as to reduce or eliminate the risk of inducing potential flooding episodes at downstream locations, especially during rainy seasons.

Implementation Steps:

The EIA shall assess the impacts imposed on external drainage systems by storm water discharges from the Project Site, and as a consequence to identify flow retardation measures, as specified in the *Manual Saliran Mesra Alam Edisi-2* (MSMA-2), which can be implemented for intercepting the rapid stormwater flows in an adequate manner.

These measures include, but are not limited to, the following:

(i) Installation of temporary drains to minimise concentrated water flows during construction. In sites with limited areas, Pipe Slope Drains (PSD) can be used to convey runoff into sediment containment system.

(ii) Channelling discharges via a series of check dams to a sediment pond to reduce run-off velocities and peak flows. Temporary energy dissipation structures are often used to reduce flow velocity.

(iii) The size and capacity of the drains must be sufficient to accommodate at least a 10-year ARI storm event (see also MSMA-2).

(iv) All drainage and waterway banks shall be stabilised, e.g. by rock cover, turf reinforcement mats, etc.

(v) Proper stream crossing and culverts are required along waterways to prevent blockages that can restrict storm water flows.

(c) Sediment Control

Objective: To ensure effective control of sediments at-site, employing both structural and non-structural measures in order to reduce water pollution episodes and sedimentation of watercourses.

Implementation Steps

(i) Installation of sediment control devices and structures such as silt fences, silt traps, sediment basins, barriers and use of active treatment systems where space is a constraint.

(ii) Retardation/capture structures and devices are to be designed to retain the calculated runoff volume for a sufficient period of time to allow for suspended sediments to settle.

(iii) Use of Active Treatment Systems (ATS) such as flocculants, anionic polymers, etc. in space constraint locations to accelerate entrapment and settlement of fine sediments.

(iv) Regular inspection and maintenance of the structures to ensure their performance efficiency, especially after heavy storm events.

(v) Sediment control also extends to spillage of materials and mud trekking from vehicles and measures to address these must be put in place, including tyre washing facilities, road cleaning and dust control.

The checklist for erosion and sediment management for site clearing and earthworks are given in **Box 8**.

Box 8:

P2M2 Checklist for Erosion and Sediment Management

Site Clearing and Earthworks

Erosion and sedimentation management during earthworks and construction include:

(i) Development of phased clearing and subsequent earthworks operation plan.

(ii) Adoption of erosion, sediment and drainage control measures as outlined in the prepared LD-P2M2 strategy Document.

(iii) Stabilise entrance and access roads.

(iv) Adequate turfing of slopes. Temporary cover for exposed areas, e.g. erosion control mats, mulching, etc.

Runoff and Storm Water Management

Flooding and drainage issues are prevalent for disturbance on hill sides and slopes major to minimise such occurrences include:

(i) Implementation if temporary drainage system based on MSMA-2 criteria and concepts.

(ii) Cascading and Pipe Slope Drains (PSD) along berms and steep slopes.

(iii) Inlet and outlet protection.

(iv) Provision and maintenance of riparian reserves alongside watercourses.

(v) Stream crossings to be adequately designed to pass through flows.

(vi) River alteration to have approval from the DID.

Sediment Control

Entrap and retain sediments prior to discharge out of the Project Site. Examples include:

(i) Sediment basin/silt trap.

(ii) Active Treatment System (Anionic).

(iii) Wash trough/wheel washing at main entrance/exit.

(iv) Road cleaning.

(v) BMP inspection and maintenance.

Operation

Erosion and sedimentation will not be major impacts and no mitigation measures are necessary except for slope maintenance and rehabilitation in the case of erosion and failure.

Permanent drainage network and retention systems (e.g. detention ponds, dry ponds, rain harvesting system, etc.) to be installed at-site to attenuate peak runoffs to external watercourses.

6.3.3 Air Pollution Control

Objective: To minimise fine dust dispersion and emissions from construction activities and transportation of materials to and from site.

Implementation Steps:

(i) Clean up all spillage along transportation routes and maintain entrances/exits in a clean condition.

(ii) Any potential emission sources such as fuel burning equipment must comply with the relevant agencies' requirements and limits. The Project Proponent shall ensure that the proposed flue gas treatment system is able to handle the estimated flow rates and are treated based on the type of fuel used. Project proponent shall also provide description and verification on the flue gas treatment used, especially with regards of materials imported from other countries.

(iii) Regular housekeeping to remove mud trekking along roads.

(iv) All emissions shall be ensured to meet the latest DOE emission standards and compliance limit as per New Malaysia Ambient Air Quality Standard and Environmental Quality (Clean Air) Regulations 2014 while open burning is prohibited at all times.

Checklist for air pollution control measures is given in **Box 9**.

Box 9:

P2M2 Checklist for Air Pollution Control

Earthworks and Construction

The measures to include dust suppression methods, especially if dust pollution affects sensitive receptors. Some examples include:

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

(ii) Measures to reduce equipment and vehicular emissions by enforcing periodic maintenance of vehicles and machineries.

(iii) Measures during blasting operations should include supervisions and adherence to safety measures, among others, to prevent injuries and safety concerns, e.g. from fly rock, vibration and noise.

Operation

(i) Most emissions will be from vehicles and fuel burning equipment. All emissions must abide by the emission standards of DOE and install Air Pollution Control Systems (APCS) as needed.

(ii) Application of appropriate Best Available Techniques (BAT) by referring to the Guidance Document pertaining to Fuel Burning Equipment and Air Pollution Control Systems.

(iii) Control of fugitive dust emissions from exposed raw material stockpiles.

(iv) Application of suitable fugitive emission controls by referring to the Guidance Document pertaining to Fugitive Emission Control.

(v) Carry out periodic performance monitoring schedules with respect to process controls.

(vi) Carry out performance monitoring of air pollution control systems referring to the Technical Guidance Document on Performance Monitoring of Air Pollution Control Systems (DOE-APCS-5 First Edition, 2006).

(vii) Conduct continuous and/or periodic emission monitoring in compliance with the Environmental Quality (Clean Air) Regulation requirements; and to DOE's requirement on Predictive Emission monitoring System (PEMS) and Continuous Emission Monitoring System (CEMS).

6.3.4 Noise and Vibration Control

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

Implementation Steps

(i) Noise and vibration impacts can be addressed through measures such as phasing construction work; erecting perimeter hoardings around the worksites, provision of acoustic silencers on noisy machines and equipment and use of physical barriers; or maintaining natural ones.

(ii) Protection of workers using personal protection equipment (PPE) (ear plugs) is important within a work environment.

(iii) Periodic maintenance of vehicles and machinery to control the intensity of noise and vibration emissions to tolerable levels.

(iv) Schedule piling and blasting works during day-time and week days. Employ delayed firing blasting techniques.

(v) Besides DOE's guideline on the environmental noise limits and also vibration noise limits, the Project should also adhere to relevant guideline and regulations from DOSH such as OSHA, Industry Code of Practice (ICOP) for Management of Occupational Noise Exposure and Hearing Conservation 2019 and Occupational Safety and Health (Noise Exposure) Regulations 2019 [P.U. (A) 60/2019].

Operation Stage

Landscaping and natural buffers can help reduce noise impacts from human activities. In the case of noisy machinery, such as gen-sets, compressors, fans etc. they can be acoustically enclosed to reduce noise impacts.

Checklist for noise and vibration control measures are given in **Box 10.**

Box 10:

P2M2 Checklist for Noise and Vibration Control

Earthworks and Construction

Examples of measures include:

(i) Perimeter hoarding.

(ii) Regular machinery and vehicle servicing.

(iii) PPE for workers.

(iv) Scheduling of piling and blasting work.

Operation

Landscaping and natural buffers can help soften the noise from human activities. For noisy machineries such as gen-sets, these can be enclosed to reduce noise.

6.3.5 Water Quality

Objective: To prevent water pollution of rivers and other watercourses located within and in the surrounding areas of the Project Site during the Project's construction and operating phases. Where possible, to maintain water quality at baseline conditions or better, and be within DOE prescribed limits for specific uses of the waterways.

Implementation Stage

(i) Potential water pollutants include suspended solids, sewage, sullage, process effluent, machinery discharges, Oil and Grease (O&G), etc. Silt traps and sedimentation basins/ponds will be able to trap most of the physical constituents such as silt and sediments, but not dissolved pollutants and O&G, before final discharge.

(ii) Proper storage areas including adequate bunding are to be provided for scheduled wastes, concrete batching Plants, chemicals, spoils, fuel tanks and temporary waste disposal areas. Containment facilities to be designed to retain 110% of the largest inventory of liquid wastes. Containment facilities shall be made from impermeable.

(iii) Suitable treatment systems especially for sewage and sullage effluents (from on-site toilets and construction labour camps) shall be adopted to ensure that the discharge quality meets the agencies and local authority's standards during the construction and operational phases of the Project.

(iv) In case of spillage and accidental release of toxic and hazardous wastes, measures are to be in place to contain, remediate and remove the contaminants from entering watercourses.

(v) For industries that are located near to a recreational water area, Project Proponent need to ensure that their effluent discharge to the environment complies with the relevant standard.

Checklist for water pollution control measures are given in **Box 11.**

Box 11:

P2M2 Checklist for Water Pollution Control

Earthworks and Construction

Measures to prevent TSS, organic pollutants and O&G from entering into the downstream rivers and drainage systems during the construction phase must be proposed such as:

(i) Implement appropriate LD-P2M2s.

(ii) Discharges from Industrial Effluent Treatment Plants and toilet facilities at site and at base camps to follow the National Water Services Commission (SPAN) requirements.

(iii) Establish proper workshop areas.

(iv) Bunded storage for scheduled wastes, concrete batching Plants, chemical storage and fuel tank areas.

(v) For batching Plants, to include measures to prevent releases of concrete wastes and washouts outside of the Project boundary.

(vi) Include a proper closure plan on Plant shut-down.

Operation

During the operational period, high loadings of process effluents containing recalcitrant and degradable organics, sewage and sullage, surface run-offs to be treated to conform with stipulated standards on effluent discharges to inland waters as promulgated by DOE.

A proper STS and effluent treatment system shall be required if there are any sewage generated. O&G traps are required to be installed to intercept discharges from canteens and kitchens and be regularly maintained to ensure their functional reliability.

Operation Stage

(i) Install separate drainage systems for stormwater flows and effluent discharges.

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

(iii) Apply suitable Best Available Techniques (BAT) to control discharge of sewage and process effluents; e.g. by referring to the Design and Operation of Industrial Effluent Treatment System (DOE-IETS-9).

(iv) Carry out Performance Monitoring with respect to process controls (e.g. Incinerator operations).

(v) Carry out Performance Monitoring with respect to sewage and industrial effluent treatment systems by referring to the Technical Guidance Document on Performance Monitoring of Industrial Effluent Treatment systems (DOE-IETS-1).

(vi) Carry out continuous and/or periodic effluent quality monitoring in compliance with Environmental Quality (Sewage) Regulation, and/or Environmental Quality (Industrial Effluent) regulation requirements.

(vii) The effluent from a Plant's treatment system shall be discharged into a "check pond" before being released to the environment. The check pond shall function as an important biomarker for assessing the quality of effluent and to be discharged to the environment.

6.3.6 Waste Management

Objective: To minimise the amount of waste generated from the site and to ensure proper collection, storage and disposal of the different types of wastes generated during construction, operations and abandonment stages.

Implementation Steps

(i) Wastes comprising biomass, municipal, Construction and Demolition (C&D) and scheduled wastes require specific management strategies.

(ii) The key approach is to ensure proper regular collection and disposal of wastes generated and to dispose them at well managed temporary/permanent repositories located within the Project Site, or to temporarily store them at site prior to disposal off-site at approved facilities.

(iii) General housekeeping of the construction site is also important. No open burning of wastes should be permitted.

(iv) The processes in the industry must be designed to be in-line with DOE's "cradle-to-cradle" policy wherever possible in order to minimize generation of waste.

Checklist for waste management are given in **Box 12.**

Box 12:

P2M2 Checklist for Waste Management

Earthworks and Construction

Solid Wastes

The measures for proper solid waste management include:

(i) Temporary disposal area to be provided and well managed.

(ii) Waste bins to be provided at active work areas.

(iii) Regular housekeeping practices to be carried out.

(iv) Disposal of wastes at a local authority licensed landfill.

(v) Practice circular economic principals in the management of wastes by encouraging reduce, recycle, repurposing activities.

Scheduled Wastes

The measures include proper scheduled waste management controls in adherence to the Environmental Quality (Scheduled Wastes) Regulations 2005. Some examples include:

(i) Scheduled waste storage area with bunding.

(ii) Maintaining scheduled waste inventory.

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

(iv) Provision of chemical or oil spill kits.

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

(vi) Competent person trained in scheduled waste management.

Operation

Adequate bins and disposal sites need to be provided to collect and store wastes. Regular disposal services shall be required.

6.3.7 Safety and Health

Objective: To ensure that the general public and worker safety and health are not compromised with ongoing construction works and Project operation.

Implementation Steps

(i) Safety and health measures are intended to address issues such as workplace conditions and worker's health. These include preventive checks on any communicable diseases among the workers, provision of Personal Protective Equipment (PPE), provision of firefighting equipment, safety trainings and having an Emergency Response Plan (ERP) in place.

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

(iii) Project Proponent shall also refer to relevant guidelines such as OSHA and Guidelines on Occupational Safety and Health in Construction Industry (Management) (OSHCIM) from DOSH that provides practical guidance to the client, designer and contractor on the management of safety, health and welfare when carrying out construction Projects.

Checklist for safety and health management are given in **Box 13.**

Box 13:

P2M2 Checklist for Safety and Health Management

Earthworks and Construction

The measures for safety and health are:

(i) Develop and maintain an Emergency Response Plan (ERP).

(ii) Safety officer to be employed.

(iii) Instil PPE requirements.

(iv) Workers to have CIDB green card.

(v) Health checks on workers to prevent spread of communicable diseases.

(vi) Periodic Staff Training to be conducted especially regarding safety and health.

6.3.8 Visual

Objective: To reduce the impact of visual intrusion during and after construction.

Implementation Steps

(i) Wherever possible, preserve natural areas not affected by construction activities. This includes all river courses and associated riparian areas.

(ii) Use of hoardings or barriers can also reduce the direct visual impacts.

(iii) Rehabilitation of the site through landscaping and replanting will help to soften and even reverse some of the impacts during construction.

6.4 RESIDUAL IMPACTS

Residual impacts are those that persist even after all mitigation measures are judiciously implemented. The extent of residual impacts shall be clearly detailed in the EIA report; and associated impact monitoring shall be recommended.

CHAPTER 7

ENVIRONMENTAL IMPACT ASSESSMENT: ENVIRONMENTAL MANAGEMENT PLAN

7.1 INTRODUCTION

The Environmental Management Plan (EMP) is a legal document prepared by the Project Proponent incorporating Pollution Prevention and Mitigation Measures (P2M2s) 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 the Guided Self-Regulation (GSR) requirements, an environmental monitoring plan and an audit programme to assess the effectiveness of the P2M2s 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.

It is recommended for the Project Proponent to apply the 5S principles in order to keep track with the latest environmental requirements, and to improve a Project's environmental management strategy. Explanation of the principal content of 5S strategies is presented in **Box 14.**

Box 14:

Application of 5S in Upkeeping Environmental Compliances

Seiri	Organise, Sort and Eliminate things that are obsolete and not in use and store them away.
Seiton	Set in Order, and promote Neatness i.e. arrange items or information used regularly so that they can be easily accessible and quickly stored.
Seiso	Clean, Shine in order to ensure everything is checked and functioning properly.
Seiketsu	Standardise - develop routine programmes 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

7.2 EMP FRAMEWORK

Insufficient information concerning the Project's work plan may not be available during the EIA stage to formulate a comprehensive EMP. The EMP chapter in the EIA should only be an EMP framework for eventual morphing into a full EMP during the post EIA approval stage.

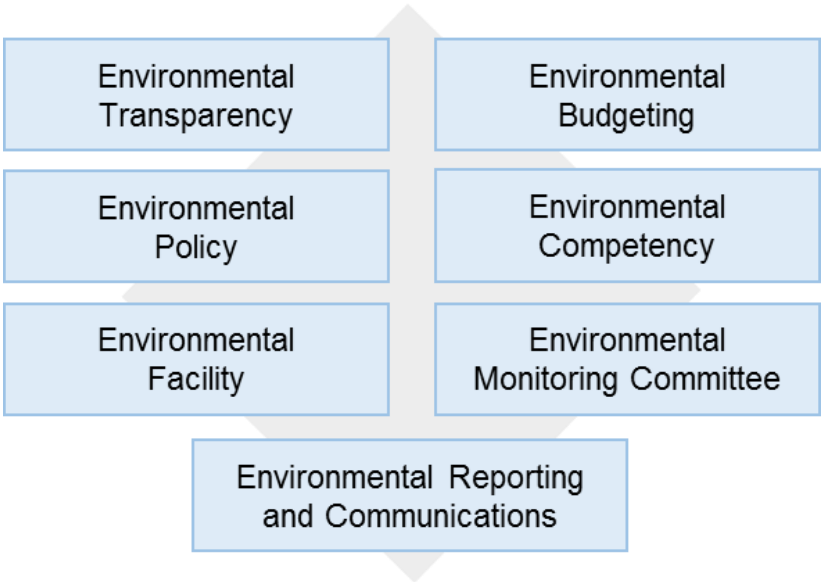
The Project Proponent can submit the detailed EMP concurrently with the EIA Report if there is sufficient information for the EMP. The EMP can later be updated to incorporate the requirements of the COAs.

The format for the EMP shall be based on requirements stated within the EGIM Document (DOE, 2016); and shall contain pertinent details abstracted from the principal Land Disturbing Pollution Prevention and Mitigation Measures LD-P2M2 Documents. The proposed monitoring and audit programmes should also be a part of the EMP.

7.3 GUIDED SELF-REGULATION (GSR)

DOE has initiated a Guided Self-Regulation (GSR) requirement that must be adopted by Projects that are categorised as prescribed activities, during all its implementation stages. In this respect, the EMP shall incorporate the required Environmental Mainstreaming Tools.

There are seven basic environmental streaming tools, the being:



7.3.1 Environmental Policy

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

7.3.2 Environmental Budgeting

The Project Proponent has to provide for an environmental budget to cover environmental-related commitments, e.g. recruitment of environmental working level and supervisory personnel, implementing P2M2s, undertaking monitoring and auditing of impacts, executing remedial and rehabilitation works, and training of staff on environmental related matters.

If a budget has not been firmed up during the EIA study stage, the Project Proponent shall commit to a pledge to allocate an adequate budget to cover for expenses to be incurred to execute and comply with activities outlined in the EMP during the post-EIA stage to ensure compliance.

The budget requirements shall also be reflected in the Project's construction Contract Documents, as part of the Bills-of-Quantities, for contractors to price for execution of specified environmental related works.

7.3.3 Environmental Monitoring Committee

The Project Proponent is required to establish an Environmental Regulatory Compliance Monitoring Committee (ERCMC) to be headed by the Chief Executive Officer (CEO), or organisation chairman. This is to ensure that there is a high-level commitment towards environmental protection and conservation during Project implementation and operations.

An Environmental Performance Monitoring Committee (EPMC), chaired by a senior officer of the organisation, shall oversee the execution of day-to-day environmental management activities at the working level.

For large-scale Projects involving multiple contractual work packages executed by many contractors, the respective main contractors are required to form their respective Environmental Management Teams (EMTs), comprising of at least an Environmental Manager (EM) and an Environmental Officer (EO), and supported by several technical assistants.

An organisation chart shall be developed to portray all parties involved in the environmental management of the Project, together with a listing of all participating personnel and their respective roles and responsibilities. This Organisation Chart shall be included in the EMP framework.

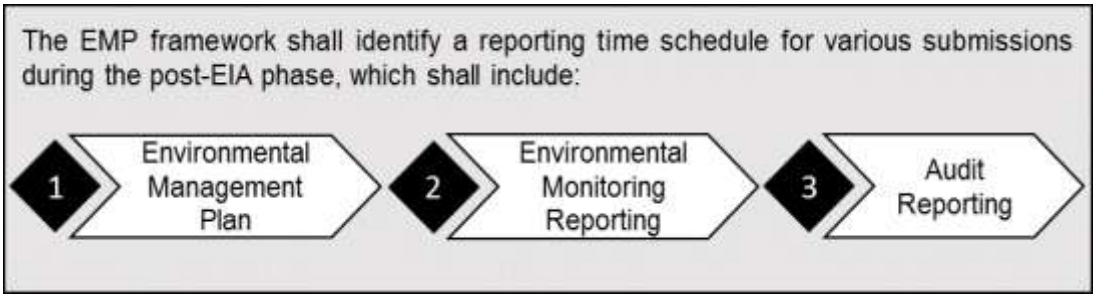
7.3.4 Environmental Facility

The EMP shall specify the range of environmental facilities to be incorporated in the Project. Such facilities would encompass Industrial Effluent Treatment Systems (IETS), Sewage Treatment Systems (STS), Air Pollution Control Systems (APCS), BMPs, P2M2 structures, and associated supporting utilities and facilities, all of which would require operational and maintenance support.

7.3.5 Environmental Competency

Personnel training requirements are required for all relevant site personnel in order to ensure environmental management competency. The proposed training requirements and execution programmes shall be described in the EMP document.

7.3.6 Environmental Reporting and Communication



The mode of communication between the ERCMC, EPMC and the respective EMTs must be clearly defined in the EMP document.

Lines of communication between the Project Proponent, the EPMC and the relevant stakeholders, must be clearly defined. This is not only limited to Project Site management activity, but also to cover engagements with affected communities, and the general public, so as to manage adequately any potential grievances and expectations related to Project development and operations.

7.3.7 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.

7.4 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.

7.4.1 Monitoring Category

Environmental monitoring can be categorised into three main categories:

(a) Performance Monitoring (PM)

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

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

(b) Compliance Monitoring (CM)

(i) Relates to the monitoring of P2M2s within the site to ascertain their performances. This is carried out by representative sampling of waste discharges at specific points within the site, and at its boundaries. The level of pollutants measured, and their comparison with established limits of discharge, are performed to gauge the level of performance of P2M2s. Sampling of waste emissions are usually taken either at points of release (in the case of noise, air and vibration), or at discharge points from treatment Plants (in the case of sewage, process effluents, sediment basin discharges).

(ii) The sampling and testing of waste discharges/emissions shall be carried out by a Competent Person engaged by an accredited laboratory.

(c) Impact Monitoring (IM)

(i) Impact monitoring may only be required in cases where there is a possibility that residual waste discharges may still induce adverse impacts on receptors located external to the Project Site boundaries despite having been subjected to P2M2s. In these cases, monitoring of ambient air and water quality, and noise and vibration levels, at the identified receptors shall be carried out and compared with similar levels monitored prior to commencement of Project construction activities. Samplings and measurements may also be carried out at other sensitive receptors such as flora and fauna habitats.

(ii) This shall be carried out by Competent Person employed by an accredited laboratory.

7.4.2 Monitoring Programme

The scope of a monitoring programme shall be dependent on the scale of the Project and in relation to the nature of predicted impacts. Monitoring will encompass areas within the Project Site, and at sensitive receptors located external to the Project area that are likely to be impacted by Project induced waste emissions.

Details of the monitoring programmes are outlined and specified by the Qualified Person; and have to be approved by DOE before they are implemented. Details such as monitoring locations, frequencies, monitoring parameters, recommended limits, instrumentation and personnel requirements have to be presented and discussed in the EMP.

The monitoring programme shall take into consideration the range and scope of potential waste emissions generated and released by Project activities, and the state of existing environmental resources and receptors and physical development profiles surrounding the Project Site. A typical monitoring for Lime Projects is summarised in **Table 7.1.**

DOE has the right to mandate any monitoring programme changes or seek additional information and data to support the proposed programmes.

7.4.3 Environmental Audit

Environmental auditing is a post-EIA evaluation process to determine the effectiveness and performance of the mitigation measures adopted by the Project Proponent to comply with the COAs.

Audit requirements are guided by the Environmental Audit Guidance Manual published by DOE. The audit must be undertaken by an independent third party who is certified as a DOE registered auditor.

The typical audit process involves:

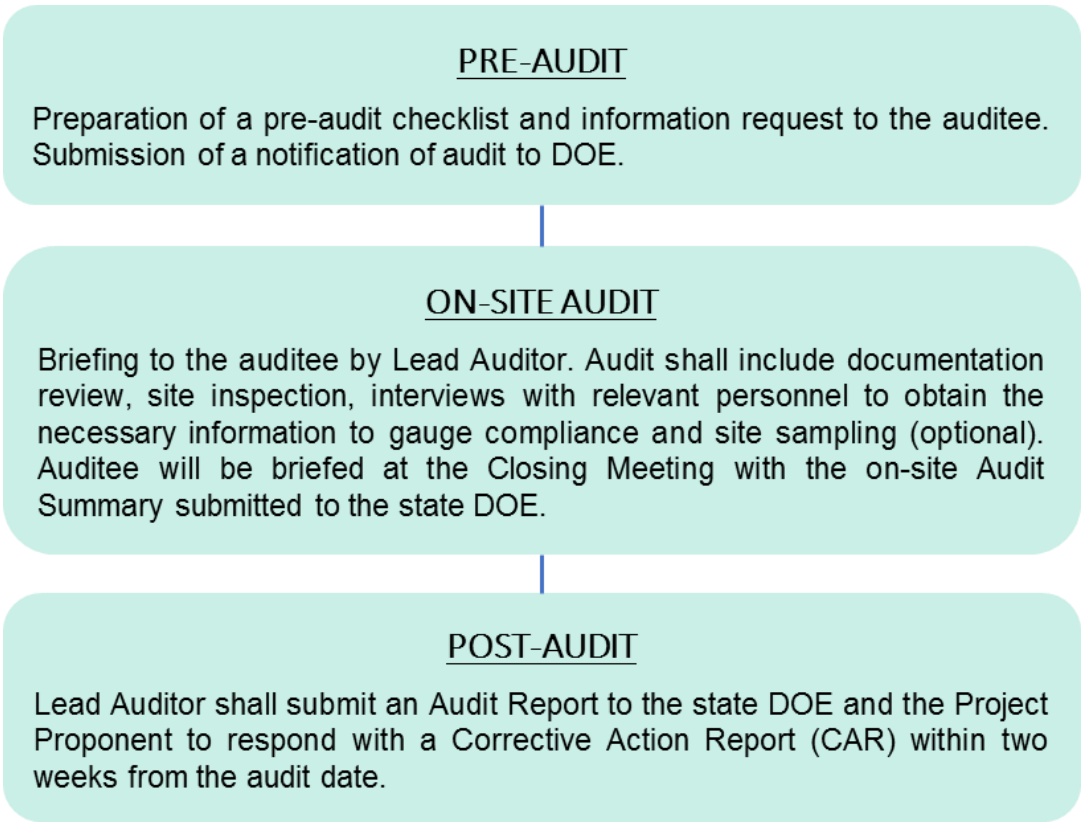


Table 7.1: Proposed Environmental Monitoring Parameters for Development of Lime Plants

Types of monitoring/ Test Parameters	Sampling Point		Compliance Requirement	Monitoring Frequency
Compliance Monitoring				
Stack Emission PM_{10}, $PM_{2.5}$, NO_2, SO_2, Total Suspended Particles, Carbon Dioxide, Dioxin, Hydrogen Fluoride, Total Fluoride, Perfluorocarbon.	Sampling port of fuel burning and incinerator stacks		Relevant Schedule of the Environmental Quality (Clean Air) Regulation 2014	Quarterly
Effluent pH, Temperature, BOD_5, COD, Total Suspended Solids, Mercury, Lead, Copper, Manganese, Nickel, Tin, Zinc, Boron, Iron, Silver, Aluminium, Selenium, Barium, Fluoride, Formaldehyde, Phenol, Free Chlorine, Sulphide, Oil and Grease, Ammoniacal Nitrogen, Colour	Effluent discharge from Industrial Effluent Treatment System (IETS)		Environmental Quality (Industrial Effluent) Regulations 2009	Monthly
Noise L_{Aeq}, L_{max}, L_{min}, L_{10}, L_{90}	NB1	North Plant Boundary	Guidelines for Environmental Noise Limits and Control	Quarterly
	NB2	East Plant Boundary		
	NB3	South Plant Boundary		
	NB4	West Plant Boundary		
Vibration Peak particle velocity be measured simultaneously in the three orthogonal x, y, z axes, computed vectorial sum	Plant or Project boundaries and at the vibration sensitive receptors		The Planning Guidelines for Vibration Limits and Control in the Environment, 2nd Edition (DOE, 2007)	Quarterly

Types of monitoring/ Test Parameters	Sampling Point		Compliance Requirement	Monitoring Frequency
Impact Monitoring				
Ambient Air PM_{10}, $PM_{2.5}$, NO_2, SO_2, Hydrogen Fluoride.	A1	Within Project Site	Ambient Air Quality Guidelines	Quarterly
	A2	Residential areas located external to Project Site		
Surface Water Temperature, pH, DO, Turbidity, BOD_5, COD, Total Suspended Solids, Ammoniacal Nitrogen, Oil and Grease, Total Coliform Count, Faecal Coliform Count.	W1	Upstream of waste discharge point	National Water Quality Standard for Malaysia	Quarterly
	W2	Downstream of waste discharge point		
Groundwater pH, Temperature, Salinity, DO, Conductivity, As, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Se, Sn, V, Zn, VOC, TPH	G1	Upstream of Project Site	National Groundwater Quality Standard (DOE) and National Drinking Water Quality Standard (MOH).	Baseline to be conducted before commencement of operation As per DOE requirement
	G2	Downstream of Project Site		

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 monitoring requirements based on the COA or as required by DOE.

CHAPTER 8

ENVIRONMENTAL IMPACT ASSESSMENT: ABANDONMENT PLAN

8.1 INTRODUCTION

An Abandonment Plan is a document prepared by the Project Proponent detailing the decommissioning and abandonment strategies and action plans to be implemented when a Project has to be abandoned. **Box 15** lists the example of scenarios associated with the Project Abandonment.

Box 15:

Scenarios Associated with Project Abandonment

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

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

(iii) Temporary curtailment of activities due to change in Project ownership or change in Project contractor.

(iv) Temporary or permanent curtailment of activities due to changes in government policies.

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

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

(vii) Decommissioning and closure of a Plant upon reaching its design life, or at the end of its useful life.

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

The Abandonment Plan shall also incorporate P2M2s and BMPs that should be implemented when carrying out abandonment procedures and associated activities.

8.2 ABANDONMENT PLAN

8.2.1 Pre-Abandonment Activities

In order to determine the best decommissioning/abandonment strategy, a Best Practical Environmental Option (BPEO) assessment should be performed. The resulting findings and conclusions shall be outlined and described, and the principal conclusions presented in the Abandonment Plan. **Figure 8.1** illustrates a potential BPEO Concept.

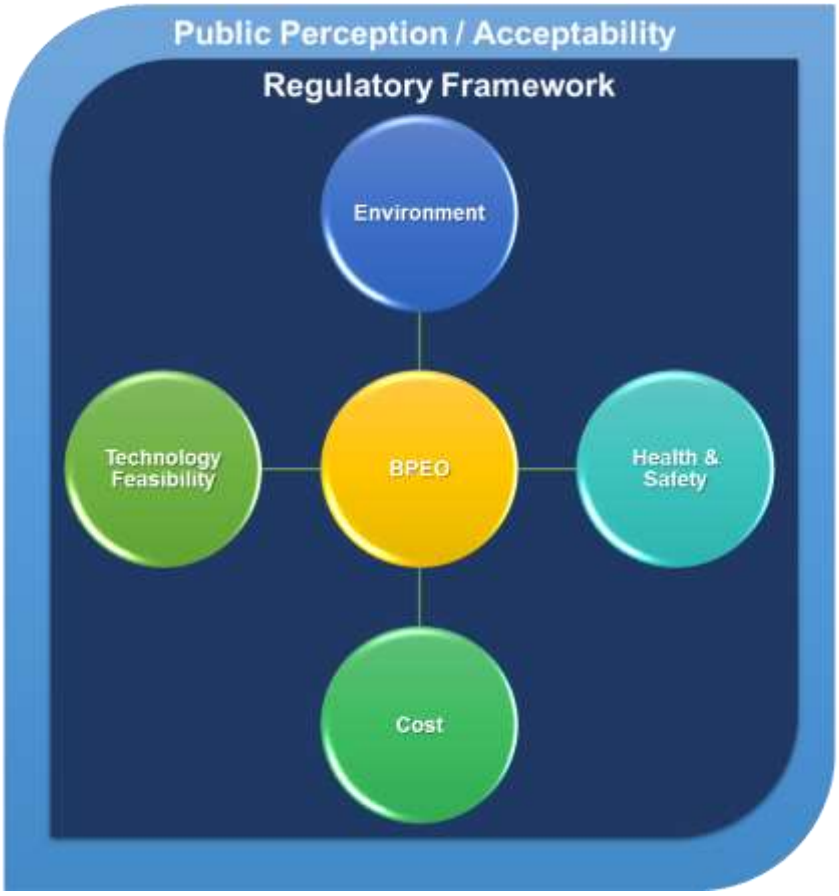


Figure 8.1: Best Practical Environmental Option (BPEO) Concept

The process of decommissioning an industrial Plant can raise complex issues. It is widely accepted that in selecting the "best" decommissioning plan, it is essential that due consideration be given to the critical and inter-related requirements of human health and safety, environmental protection, technological feasibility and economic stewardship, all within the broader context of public perception/stakeholder acceptability. A BPEO assessment provides a means of determining which decommissioning strategy is the most suitable for a particular Plant or facility.

The strategy for decommissioning and abandonment of the industrial Plant shall also be assessed using criteria and framework as set out in the **Contaminated Land Management and Control Guidelines (CLMCG)**. The guidelines among

others provide the guiding principles and contaminated land management frameworks for different type of land use that would be of subsurface contamination concerns.

The framework is defined through a series of three (3) specific guidelines namely:

- Contaminated Land Management and Control Guidelines No. 1: Malaysian Recommended Site Screening Levels for Contaminated Land.
- Contaminated Land Management and Control Guidelines No. 2: Assessing and Reporting Contaminated Sites.
- Contaminated Land Management and Control Guidelines No. 3: Remediation of Contaminated Sites.

All three (3) guidelines need to be read in sequence as each one describes requirement that is part of the overall framework to determine required remediation works in the Abandonment Plan which is explained in the CLMCG No. 3.

8.2.2 Abandonment Activities

During the abandonment phase of a Project, the following activities are normally carried out,via:

(i) Identifying work packages and outlining pertinent specifications for undertaking the identified tasks;

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

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

(iv) Disassembling of equipment and Plant;

(v) Removal of Plant piping, cabling, storage facilities and segregation of reusable/recyclable and repurposing components;

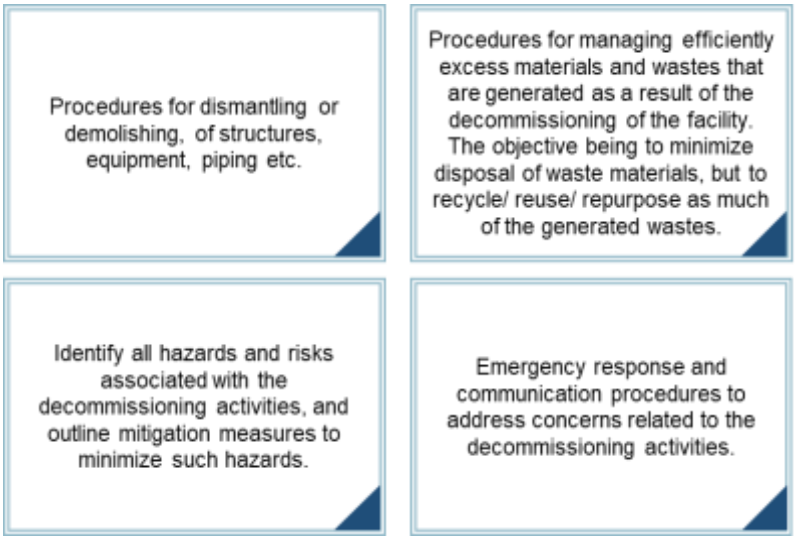
(vi) Demolition of a building, and separating those components that can be reutilised and recycled prior to disposing the residual materials to approved repositories;

(vii) Site levelling and filling and re-vegetation; and

(viii) Site stabilisation/rehabilitation.

Details of the selected or preferred decommissioning strategies/options shall be described in the Abandonment Plan.

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



Potential environmental impacts associated with a Project Abandonment stage are summarized in **Table 8.1**.

Table 8.1: Example of Impacts Associated with Abandonment of Project

Environmental	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 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 and treated. • Leaching from demolition works and mishandling of wastes and chemicals.
Socio-economic	• Decommissioning and abandonment of a Project may bring an end to the direct and indirect employment opportunity afforded to local and regional communities.

Environmental	Potential Impact During Project Abandonment
Noise	• Noise from hacking, demolition and transportation works.
Wastes	• A variety of wastes can be generated during decommissioning and demolition works. These wastes may include unused machinery, metals wastes, concrete wastes, plastics 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 as well as contamination of water resources.

The Abandonment Plan shall also describe the implementation of an environmental management plan to gauge the impact which abandonment activities can impart on the surrounding ambient air and water qualities, noise and vibration levels, drainage impedances due to siltation effects, siltation of other watercourses, etc. A description is also warranted with respect to the adoption of a waste management plan based on circular economic principles that gives credence to enforcing recycling/reuse/repurpose strategies.

8.2.3 Post Abandonment Activities

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 should be conducted to assess environmental changes and implications of the selected decommissioning strategy/options and to monitor any potential residual impacts imposed on the local environment. Depending on the sensitivity of the site, additional surveys may be conducted to monitor and trace the recovery of the site to acceptable levels.

8.3 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.

An Environmental Sustainability Report, which shall include a post abandonment environmental monitoring scheme, BMP inspections and wastes inventories, shall be submitted to the state DOE office during the post Project abandonment stage.

CHAPTER 9

ENVIRONMENTAL IMPACT ASSESSMENT: REPORTING AND REVIEW

9.1 INTRODUCTION

This Chapter describes the format and procedures for preparation of an Environmental Impact Assessment (EIA) for submission to the Department of Environment (DOE) for approval. The submission can be performed only after the completion of all other necessary studies and requirements.

9.2 EIA REPORT

9.2.1 Format of EIA Report

The **Environmental Impact Assessment Guideline in Malaysia (EGIM)** (DOE, 2016) describes the content and format for EIA reporting under **Section 4.6** and **Appendix 9**.

The EIA report shall typically include the following contents:

(i) A declaration from the Project Proponent and Qualified Person in the format detailed in **Appendix 9 of the EGIM Document** (DOE, 2016). The declaration must be printed in the Project Proponent's company letterhead and attached to the EIA Report.

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

(iii) Brief Introduction to the Project, providing salient information, on *inter-alia*, the Project Proponent (address, key person and contact information); the Environmental Firm engaged to carry out the EIA Study (address, key person and contact information); and the composition of the EIA Team Members (name, academic, qualifications, areas of study, signature).

(iv) Review of the policy, regulatory and legal requirements for implementation of the Project (refer to **Chapter 2** for details).

(v) Terms of Reference (TOR) for the EIA Study as endorsed by the DOE (refer to Chapter 3 of this EIA Guideline for further details). An endorsement letter from DOE approving and endorsing the TOR has to be attached as an Appendix to the EIA Report.

(vi) Statement of Need for Project implementation. This narrative shall include supporting statements to justify the need and necessity to implement the Project. This Statement shall form part of the EIA report. Key points to be addressed are summarised in **Box 16**.

Box 16:

Key Points to be Addressed in Need Statement

Key justifications for supporting the implementation of a Project may include, but are not limited, to the following, points:

(i) Meet increasing market demands for the manufactured products.

(ii) Fulfilment of, or adherence to, the goals of National and State policies and plans.

(iii) Enhancing social and economic benefits to communities.

(iv) Application of new green and sustainable technologies that will benefit both the community and the country.

(vii) Deliberation on Project alternatives and options (refer to **Section 3.4** of this EIA Guideline).

(viii) Detailed description of the Project including site information, manufacturing concepts, breakdown of major process streams, material and manpower requirements, and Project activities and their execution time schedules (refer **Table 9.1**).

(ix) Description of the baseline conditions (physical-chemical, biological and human environment) prevailing within the ZOS prior to Project implementation that may be impacted upon by Project activities (see **Chapter 4** of this EIA Guideline).

(x) Assessment of significant impacts (both positive and negative) that may be imposed on nearby sensitive receptors, and identification of Pollution Prevention and Mitigation Measures (P2M2s) which should be adopted to minimise or enhance these impacts. Any potential residual impacts should be highlighted (see **Chapter 4 to Chapter 6** of this EIA Guideline).

(xi) Details of public consultation and engagement carried out as part of EIA study.

(xii) Environmental Management Plan (EMP) incorporating both general P2M2s and LD-P2M2, monitoring and audit programmes (see **Chapter 7** of this EIA Guideline).

(xiii) Appendices detailing the technical studies carried out as part of the EIA study together with supporting documentation, result of analysis, list of references, etc.

An EIA Checklist is provided in **Appendix I** as a reference.

Table 9.1: Recommended Project Scope and Content for EIA Report

Project Details	• Project title. • Name and contact details of the Project Proponent. • Name and contact details of EIA Team. • Location of Project (coordinates, lot no, district, etc.) • Relevant map of Project location and accessibility.
Location	• General site plan including ZOS (5-km radius) • Project boundary and layout (with coordinates). • Description of location in relation to identifiable landmarks (e.g. city centres, main roads, towns, etc.).
Project Component and Design Details	• Project details (land area, buffer, lots and land status). • Project concept, layout and component. • Technology use. • Examples of similar Project type and scale. • Supported with drawings, illustration and diagrams.
Project Activities	• Method statement for major Project activities during pre-construction, construction and operational stages. • Manpower requirements. • Resource requirements (e.g. soil and aggregate sources, spoil disposal area, etc.).
Infrastructure, Utilities and Amenities Requirement	• Details of the estimated demand for: - Water supply - Electricity/ fuels - Sewerage - Telecommunications. - Transport system. - Waste management.

Project Implementation Schedule	• Estimated timeline for phases implementation from planning, to construction and operational phases. • Details of each stages of implementation.

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

9.2.2 Executive Summary

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

- Title of the Project.
- Name and contact details of the Project Proponent.
- Name and contact details of EIA Study Team members.
- Location of the Project Site.
- Relevant maps showing spatial relationship between Project location and sensitive receptors and the spatial extent of the ZOS.
- Process manufacturing alternatives considered.
- A tabulation of significant impacts and proposed P2M2s to quell adverse impacts to acceptable levels and to heighten positive impacts (format as detailed in EGIM (DOE, 2016).
- Description of monitoring and audit programmes.
- Conclusion of the Study.

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

9.2.3 Data Deliverables

The Project Proponent shall include all available relevant data sourced and collated 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, hydrographical data and climate data), metadata files, etc. This data shall also be provided to the relevant Government Agencies (GAs) upon request.

9.2.4 Conclusion of 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 negative 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 content and findings of the EIA study that has been carried out; and are conversant with proposed recommendations for P2M2s to be implemented, and shall implement all of the P2M2s that are recommended in the EIA Report.

9.3 PUBLIC DISPLAY

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

Public Engagement: Public engagement is recommended for a First Schedule EIA. This can take many forms, but the common approach is through conduct of focus group discussions or through public briefings with identified stakeholders resident or having connection with the ZOI. In the briefing sessions, the Project Proponent and EIA Team members shall present the Project Brief. This will be followed by a question and answer session. All discussions will be recorded and reported in the EIA Report.

Public display and review of EIA Report: The EIA Report will be displayed after it is submitted to the DOE Office. The display shall be for a period of a month, during which time 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 the EIA Report shall be advertised 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 offices, public libraries and local authority offices) where the public can access and view the documents easily. The Project Proponent and Qualified Person can propose other suitable locations for display to DOE.

Online display: The Executive Summary (now the whole report can be downloaded at the website) of EIA Reports will be uploaded to the DOE website for the duration of the review period.

9.4 EIA REPORT SUBMISSION AND REVIEW PROCESS

The EIA Report submission shall be in accordance with the procedural steps outlined in the EGIM document (DOE, 2016).

A TOR/ ESI Checklist and EIA Checklist as appended in **Appendix I** can be used by the Project Proponent and the Qualified Person to assist in conducting a self-check of the content of the EIA Report prior to submission to DOE.

When the EIA is approved, DOE will issue an approval letter with Conditions of Approval addressed to the Project Proponent. Potential outcomes from an EIA review are presented in **Box 17**. If the EIA Report is rejected on the grounds that the EIA Report is lacking in key information and/ or detailed impact assessments; 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 17:

Outcomes from EIA Review Process

The possible outcomes of the EIATRC meetings are:

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

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

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

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GLOSSARY

Air Pollution Control Systems (APCS)	Equipment or machinery used in the capture and treatment of emissions from fuel burning equipment, incinerators and other types of engines to ensure it meets with the standards of the Malaysian Ambient Air Quality Standards (MAAQS).
Appointed Individuals (AIs)	Persons appointed to be part of the TRC 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	Evaluation process carried out by an independent auditor to determine effectiveness and performance of P2M2 and to ensure compliance of a project with the COA.
Baseline Data	Site specific data pertaining to the existing environment (physical, chemical, biological and human). It establishes the ambient situation, usually before some drastic change occurs, e.g. a major project.
Best Available Technology (BAT)	The most current and advanced technologies and methods available for pollution prevention and management.
Best Management Practices (BMPs)	Using the best controlling measures to prevent or mitigate pollution of other sources of environmental impact.
Biological Diversity/ Biodiversity	The variability among living organisms from all sources including, *inter-alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.
Buffer Zone	An area designated around the boundary of a project and/or adjacent to environmentally sensitive areas where no or limited development is allowed for the purpose of mitigating against any environmental impact from the site to the surrounding areas or vice versa.
Catchment	The area determined by landform within which falling rain will contribute to runoff at a particular point such as a stream or river. Often, it is used synonymously with basin or watershed.

Central Forest Spine (CFS)	The backbone of Peninsular Malaysia's ESA network which comprises of four major forest complexes i) Banjaran Titiwangsa-Banjaran Bintang-Banjaran Nakawan ii) Taman Negara-Banjaran Timur iii) South East Pahang, Chini and Bera Wetlands, and iv) Endau Rompin Park-Kluang Wildlife Reserves.
Conditions of Approval (COA)	A set of legally binding instructions and requirements prepared by DOE after the end of EIA process for the Project Proponent to abide by for all phases of the development.
Cumulative Impact	The total sum from combination of various activities or sources resulting in accumulation and aggregation of multiple impacts which would be significantly expanded as compared to a single event.
Cut and Fill	Procedure in which the elevation of a landform surface is modified by the removal or addition of surface material.
Disposal Area	A designated or gazette area specifically for the storage of wastes or excess materials generated from construction.
Drainage	Natural or artificial removal of surface and sub-surface water from an area.
Earthworks	Excavation and relocation of large quantities of soil and earth to form slopes, platforms, embankments, etc.
Ecology	The study of the habits and modes of life-living organisms (such as plants and animals), and their relationships to each other and their environment.
Ecosystem	A dynamic complex of plant, animal and microorganism communities and their non-living environment that interact as a functional unit.
EIA Adequacy Check	Initial review of the EIA by a technical committee comprising of DOE HQ/state officers to determine compliance with the TOR.
Emergency Response Plan (ERP)	A manual incorporating all measures, actions, roles and responsibilities for the project team to take action during emergencies and crisis, covers various scenarios that may occur during construction and operations.

Endemic Species	Native to, and restricted to, a particular geographical region. Highly endemic species, those with very restricted natural ranges, are especially vulnerable to extinction if their natural habitat is eliminated or significantly disturbed.
Environment	The area (specific zone to be affected by the project), and all natural resources (physical, biological and human resources), people, economic development and quality-of-life values.
Environmental Impact Assessment (EIA)	A study to identify, predict, evaluate and communicate information about the impacts (both beneficial and adverse) on the environment of a proposed development activity and to detail out the mitigating measures prior to project approval and implementation.
Environmental Management Plan (EMP)	A legally binding document which spells out in concise details the environmental requirements and P2M2 as detailed in the EIA and LD-P2M2 as well at other information, e.g. environmental budget, monitoring and audit programmes and roles and responsibilities of the EMT.
Environmental Management Team (EMT)	Specialist team comprising of relevant personnel of a project with specific roles and responsibilities in the management of environmental matters at-site.
Environmental Manager (EM)	A person mandated to oversee all aspects of managing environmental compliance for a project, usually heads the EMT.
Environmental Officer (EO)	The site personnel directly in charge of supervising a site to ensure that all P2M2 are in place, maintained and repaired and that all requirements within the COA are adhered by the contractors. Other tasks include training of staff, taking samples for reporting and attending site walkabouts and meetings.
Environmental Performance Monitoring Committee (EPMC)	Organisational setup within the Project Proponent which shall management environmental compliance at the working level during construction and operational phases of a project.
Environmental Regulatory Compliance Monitoring Committee (ERCMC)	Organisational setup within the Project Proponent which shall management environmental compliance at the policy level during construction and operational phases of a project.

Environmental Quality Act 1974 (EQA)	The main legislation governing environmental management in Malaysia, contains provisions on setting up of an environmental management body; rules and regulations for specific activities within its jurisdiction; powers for enforcement and licensing; etc.
Environmental Scoping Information (ESI)	A report detailing the findings of the environmental scoping carried out for a site to allow for decision making through identification of significant impacts, proposals for mitigation measures and required studies. Forms and important part of the EIA process.
Environmental Scoping Matrix	Technique to integrated large amounts of information for a rapid assessment in identifying significant impacts based on project activities and their impacts on different aspects of the environment.
Environmentally Sensitive Areas (ESAs)	Areas of critical importance which has characteristics of significant biodiversity value; natural heritage; scenic beauty; provision of important ecosystem services: and/or is easily degraded due to natural and anthropogenic impacts, warranting its protection and conservation.
Erosion	The detachment or wearing away of the earth's surface, particularly soil or loose materials, by flowing water, wind or other geological agents.
Erosion and Sediment Control Plan (ESCP)	Document incorporating all erosion and sediment control measures as required by the Department of Irrigation and Drainage (DID) for a site.
Geological Terrain Mapping (GTM)	Report prepared by a licensed Geologist required by the Minerals and Geoscience Department (JMG) to be submitted for Development Order (DO) approval, contains information on the terrain, geological makeup, soils and slope classification to allow for assessment of site suitability for construction.
Geology	The science which has for its object the investigation of the earth's crust, of the strata which enter into its composition with their mutual relations, and of the successive changes to which their present condition and position are due.
Government Agencies (GAs)	Personnel from government ministries, agencies and/or department with a role in specific committees, approving authorities or decision making bodies.

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.
Health Impact Assessment (HIA)	A report which assesses the health impacts of policies, plans and projects using quantitative, qualitative and participatory techniques for decision making. Usually required by the Ministry of Health (MOH) or Department of Health (DOH) for projects with health implications to nearby populations.
Hill/Highland	Areas above elevations of 300m from MSL characterised by undulating and mountainous hills and ridges.
Hydrology	The study of the rainfall and runoff process and relates to the derivation of hydrographs for given floods, droughts and seasonal pattern of inundation.
Impact Monitoring (IM)	Monitoring of impacts outside of the project site to ascertain its origin and magnitude.
Industrial Effluent Treatment System (IETS)	Systems used in the treatment of industrial effluent to ensure that the discharges meet the quality specified under Standard A/B of the Environmental Quality (Industrial Effluent) Regulations 2009.
Land Acquisition/ Alienation	The act of obtaining, either voluntarily or by law, the necessary land from existing landowners. May involve relocation of existing population on the said piece of land.
Land-Disturbing Activities	Activities such as clearing of trees or vegetation, excavating, raising or sloping of ground, trenching, grading and blasting.
Land Disturbing Pollution Prevention & 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.
Method Statement	A detailed scope and account of proposed construction techniques, equipment and machinery usage and structural and non-structural measures applied in carrying out construction, usually prepared by the contractors.

Modelling	To simulate a particular feature of the world using mathematical and computer aids to better understand, define, quantify and visualise the process.
Monitoring	To measure, systematically and repeatedly, the continuing conditions to track change(s).
Noise	A sound, especially one that is loud or unpleasant or that causes disturbance.
Orang Asli	Collective term for ethnic groups who are widely regarded as comprising Peninsular Malaysia's original inhabitants.
Performance Monitoring (PM)	Monitoring of performance systems, e.g. IETS, STS and APCS.
Permanent Reserved Forest (PRF)	The total area of forest land that has been legally designated for retention for forestry as defined under the Forestry Act 1985.
Personal Protective Equipment (PPE)	Equipment designed to safeguard a user against harm when working in risk and hazard areas.
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 a result of a project.
Prescribed Activity	Any activity specified by the Director General of Environment under the Environmental Quality (Prescribed Activity) (Environmental Impact Assessment) Order 2015, as requiring to undergo an EIA.
Project Activities	Specific tasks undertaken throughout the course of a project (earthworks, construction or operational) which serves to meet certain objectives.
Project Brief	Information pertaining to a project or development, including the details of the project, layout, method statement, location, etc. which can assist in assessment of the project.
Project Proponent	The main person, organisation or body which is proposing to undertake a project or activity. He/she shall bear responsibility to ensure that the project meets all environmental requirements mandated by DOE and other GAs or is liable to be held accountable under the law.

Public Display	Mandatory viewing of a Second Schedule EIA for a fixed period of time whereby the public can forward recommendations and objections to the report for consideration by DOE in the EIA approval process.
Public Participation/ Engagement	The process whereby the public and related stakeholders are allowed the opportunity to participate in the planning, decision making, objection, idea sharing and/or approval of a project which may affect them. Can be mandated or voluntary.
Qualified Person	A person appointed by the Director General of Environment or is certified by/registered with DOE under Section 34A (2B) to carry out an EIA study, e.g. Environmental Consultant.
Recreation	Activity of leisure, leisure being discretionary time.
Residual Impacts	Impacts that still persist despite P2M2 and BMPs put in place.
Revised TOR	Final version of the TOR after incorporation of comments from the TRC and additional information.
Risk	A combination of the likelihood of an occurrence of a hazardous event with specified period or in specified circumstances and the severity of injury or damage to the health of people, property, environment or any combination of these caused by the event.
Runoff	The portion of precipitation that runs off the surface as opposed to soaking in.
Sampling Station	Locations identified and designated for collection of environmental data (air, water, noise, vibration, ecology, etc.).
Schedule	Categorisation of Prescribed Activities divided into the First Schedule (EIA without need for public display and will be processed by DOE State) and Second Schedule (EIA requiring public display and will be processed by DOE HQ).
Scheduled Wastes	Any form of toxic and hazardous wastes listed under the First Schedule of the Environmental Quality (Scheduled Wastes) Regulations 2005 (Amendment 2007).
Scoping	Initial phase in an EIA to identify the key environmental issues and the study spatial and temporal boundaries. The scoping will identify the required investigations and assessment of significant impacts during the subsequent phases of the EIA process.

Screening	Process by which a proposed development project is identified as being subjected to a regulatory provision requiring an EIA.
Sedimentation	The deposition of sediment from suspension in water.
Seismicity	The occurrence or frequency of ground vibrations or earthquakes in a region.
Self-regulation	The adoption and implementation of measures and practices by a Project Proponent on their own initiative without requiring intervention of the authorities to safeguard the environment and meet all regulatory requirements of the country.
Setback	Distance which a building or other structure is set back from a street or road, a river, a shore or any other place which is deemed to need protection.
Sewage	Any liquid waste, wastewater discharge containing human, animal, domestic or putrescible matter in suspension or solution, and includes liquids containing chemicals in solution either in the raw, treated or partially treated form.
Sewage Treatment System (STS)/ Plant (STP)	Any facility designed and constructed for the purpose of reducing the potential of the sewage to cause pollution.
Siltation	The deposition or accumulation of silt that is suspended in a body of water.
Site Suitability Assessment (SSA)	A study on the suitability of various sites and the determination based on specific criteria on the best possible site for a project.
Slope	A ratio of run (horizontal) to rise (vertical).
Social Impact Assessment (SIA)	A process to identify, predict, evaluate and communicate information about the social impacts of a proposed project, policy, programme or plan on a community and their activities, and to choose the best development option and subsequently propose mitigation measures.
Soil Investigation (SI)	Technical study on the soil and sub-surface strata of a project site to determine the sub-surface conditions and engineering requirements needed prior to a development.
Spoil	Rock and debris produced by tunnelling, dredging and other excavations.

Statement of Need	A brief on the justifications for a project, including supporting arguments and evidence on the necessity of the project and benefits that will be generated.
Storm water	Water that originates during precipitation events, e.g. rainfall.
Suspended Sediment	Sediment suspended in a fluid by its (fluid) turbulent flow.
Technical Review Committee (TRC)	A panel of decision makers comprising DOE officers, AIs and GAs that are selected to review the TOR and/or EIA to provide approval based on the reports submitted by the Project Proponent and Qualified Person(s).
Terms of Reference (TOR)	Product from scoping process which sets the objectives, defines the scope, and establishes the strategy and schedule for EIA process to address identified significant issues.
Terrain	Pertaining to the physical features of a land or area.
Topography	The configuration of the surface of the earth, including its relief, the position of its streams, roads, cities, etc. The earth's natural and physical features collectively.
TOR Adequacy Check (TORAC)	A review by a selected panel of DOE officers, IAs and/or GAs on whether a TOR has been prepared in accordance with DOE requirements and contains all necessary information for decision making to be made.
Traffic Impact Assessment (TIA)	A study/report on the condition of the roads and traffic in an area and if there is adequate capacity to meet the increasing demand from a project or to identify measures required to ensure that traffic will be smooth and uninterrupted.
Visual/Aesthetics	Pleasing scenery, vistas and view to an audience.
Wastes	Any substance which is discarded after primary us. Comprises of various types of wastes, such as municipal wastes, scheduled wastes, biomass wastes, etc.
Water Quality	A term to describe the chemical, physical and biological characteristics of water, usually with respect to its suitability for a particular purpose.
Water Quality Index (WQI)	An index integrating six water quality parameters to provide a general categorisation to determine the condition of the water source.

Zone of Impact (ZOI)	The maximum area which will receive the impacts from the project.
Zone of Study (ZOS)	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

APPENDIX A

SAMPLE OF PROCESS FLOW DIAGRAM (PFD)

APPENDIX A

SAMPLE OF PROCESS FLOW DIAGRAM (PFD)

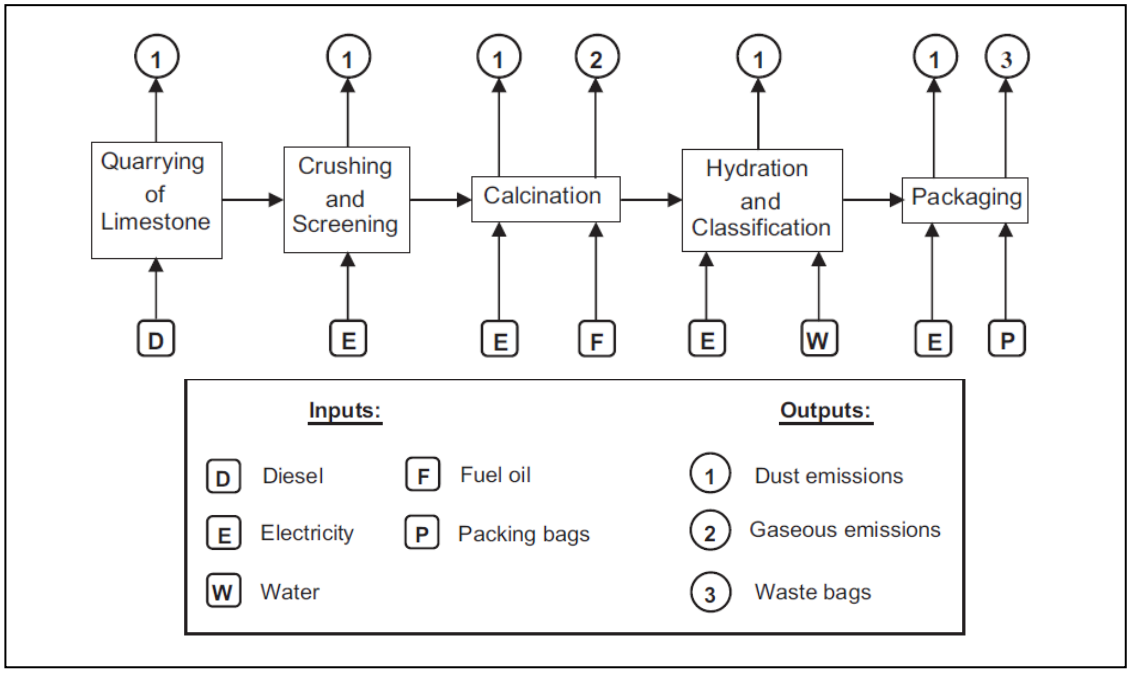


Figure 1: Sample of Process Flow Diagram of Lime Production

The sample process sequence in quicklime production is listed as below:

1) Limestone is quarried and transported down to the Lime Plant.

2) Limestone rocks are crushed and screened.

3) Qualified limestone (20 ~ 50 mm) are conveyed to pre-heater.

4) The limestones are heated to ~900℃ heated by kiln flue gas of 1150℃.

5) About 30% is decomposed into Calcium Oxide, CaO, and CO_2.

6) Decomposed limestones are cooled to 100℃ and lifted into silo.

7) Exhaust gas is cooled through multi-pipe cooler and blown into bag filter.

8) Filtered gases from bag filters are released through chimneys.

9) Decomposed lime rocks and lime dust from silo are transported to lime based products or quicklime Plants.

10) At these quicklime Plants, the CaO is dissolved in water, concentrated by settling and packaged for sale. The under composed limestone are disposed or used as road aggregate.

A typical CaO Plant and quicklime Plant are shown in **Figure 2, Figure 3** and **Figure 4.**

Source: http://www.terruzzifercalxgroup.co.uk

Figure 2: Calcium Oxide Plant

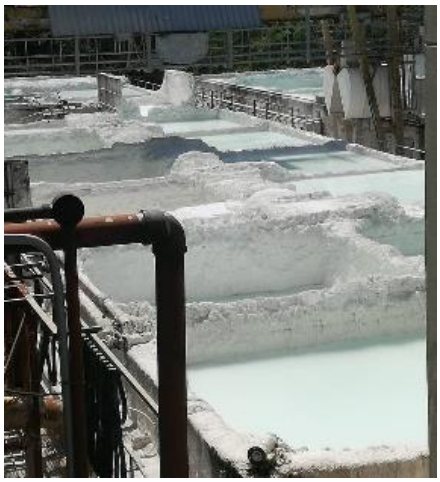


Figure 3: Quicklime Settling (Malaysia)

Figure 4: Quicklime Packaging (Malaysia)

APPENDIX B

LIST OF GUIDELINES AND GUIDANCE DOCUMENTS

APPENDIX B

LIST OF GUIDELINES AND GUIDANCE DOCUMENTS

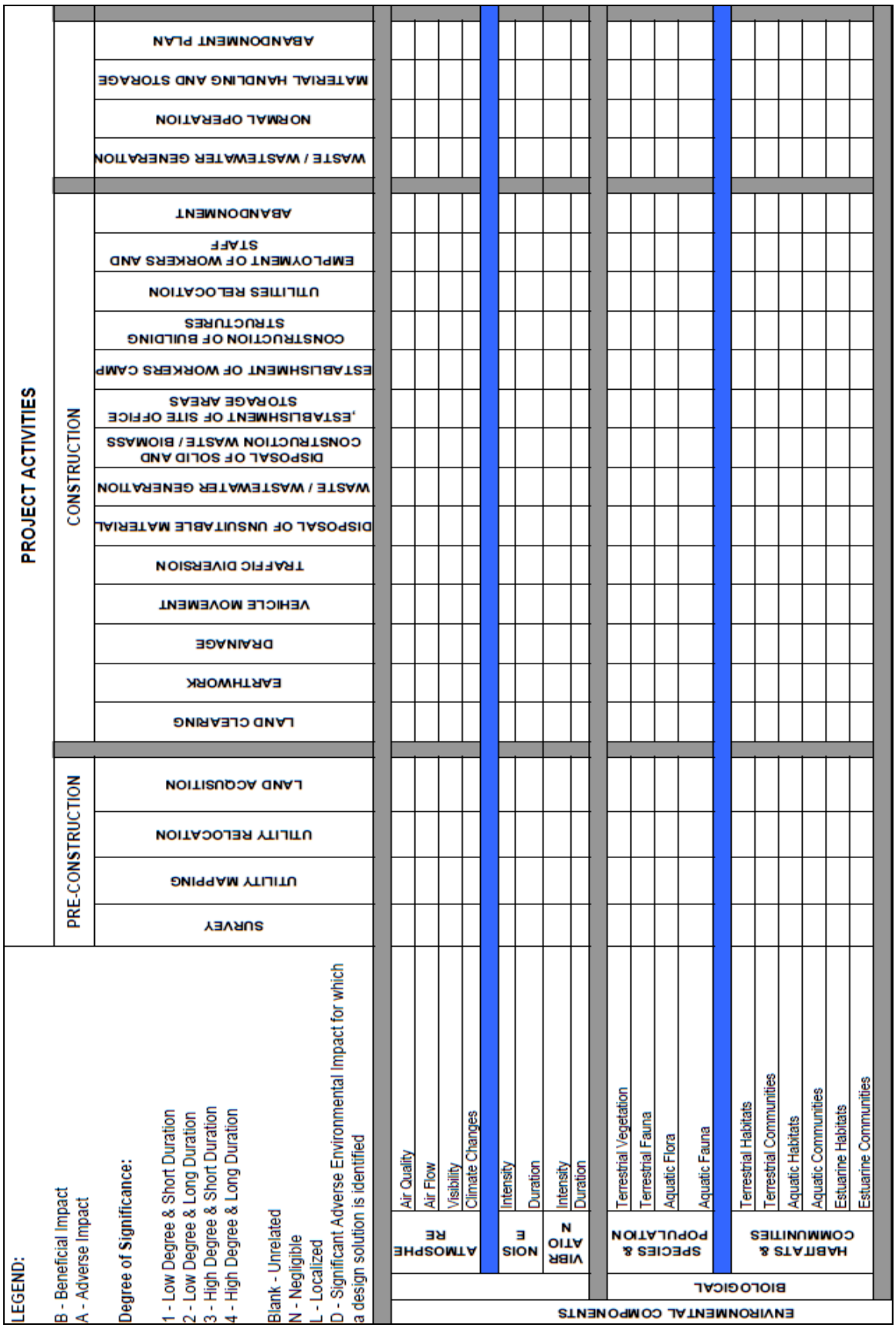
No.	Guidelines / Guidance Documents	Source
1	Contaminated Land Management and Control Guidelines No. 1: Malaysian Recommended Site Screening Levels for Contaminated Land, 2015.	www.doe.gov.my
2	Contaminated Land Management and Control Guidelines No. 2: Malaysian Recommended Site Screening Levels for Contaminated Land, 2015.	www.doe.gov.my
3	Contaminated Land Management and Control Guidelines No. 3: Malaysian Recommended Site Screening Levels for Contaminated Land, 2015.	www.doe.gov.my
4	Environmental Essentials for Siting of Industries in Malaysia, 2017.	www.doe.gov.my
5	Environmental Impact Assessment Guidance in Malaysia, 2016.	www.doe.gov.my
6	Environmental Impact Assessment Guidelines for Risk Assessment, 2004.	DOE Office
7	Guidance Document of Health Impact Assessment (HIA) in Environmental Impact Assessment (EIA), 2012.	DOE Office
8	Guidance Document on Implementation of Self-Regulation Initiative in Industrial Manufacturing Premises – Environmental Mainstreaming Tools, 2016.	www.doe.gov.my
9	Guidelines for Environmental Noise Limits and Control (Third Edition, 2019).	www.doe.gov.my DOE Office
10.	Guidelines for Siting and Zoning of Industry and Residential Areas (2012)	www.doe.gov.my
11	Guidelines on Land Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2), 2017.	www.doe.gov.my
12	Technical Guidance Document for on the Design and Operation of Industrial Effluent Treatment System (DOE-IETS-9 2015).	www.doe.gov.my DOE Office
13	Technical Guidance Document on Performance Monitoring of Industrial Effluent Treatment Systems (DOE-IETS-1 2015).	www.doe.gov.my DOE Office
14	Technical Guidance on Performance Monitoring of Air Pollution Control Systems (DOE-APCS-5 First Edition 2006).	www.doe.gov.my DOE Office
15	The Planning Guidelines for Vibration Limits and Control, 2007.	www.doe.gov.my DOE Office

APPENDIX C

SAMPLE OF ENVIRONMENTAL SCOPING MATRIX

APPENDIX C

SAMPLE OF ENVIRONMENTAL IMPACTS ASSESSMENT SCOPING MATRIX



LEGEND:

B - Beneficial Impact
A - Adverse Impact

Degree of Significance:

1 - Low Degree & Short Duration
2 - Low Degree & Long Duration
3 - High Degree & Short Duration
4 - High Degree & Long Duration

Blank - Unrelated
N - Negligible
L - Localized
D - Significant Adverse Environmental Impact for which a design solution is identified

		PROJECT ACTIVITIES																					
		PRE-CONSTRUCTION				CONSTRUCTION																	
		SURVEY	UTILITY MAPPING	UTILITY RELOCATION	LAND ACQUSITION	LAND CLEARING	EARTHWORK	DRAINAGE	VEHICLE MOVEMENT	TRAFFIC DIVERSION	DISPOSAL OF UNSUITABLE MATERIAL	WASTE / WASTEWATER GENERATION	DISPOSAL OF SOLID AND CONSTRUCTION WASTE / BIOMASS	,ESTABLISHMENT OF SITE OFFICE STORAGE AREAS	ESTABLISHMENT OF WORKERS CAMP	CONSTRUCTION OF BUILDING STRUCTURES	UTILITIES RELOCATION	EMPLOYMENT OF WORKERS AND STAFF	ABANDONMENT	WASTE / WASTEWATER GENERATION	NORMAL OPERATION	MATERIAL HANDLING AND STORAGE	ABANDONMENT PLAN
	Surrounding Population																						
	Employees																						
	Parasitic Disease																						
	Communicable Disease																						
	Physiological Disease																						
SOCIAL & ECONOMIC	Employment																						
	Housing																						
	Education																						
	Utilities																						
	Amenities																						
	Property & Settlement																						
ESTHETIC & CULTURAL	Landforms																						
	Biota																						
	Wilderness																						
	Water Quality																						
	Atmospheric Quality																						
	Climate																						
	Tranquility																						
	Sense of Community																						
	Community Structure																						
	Man Made Objects																						

LEGEND:	PROJECT ACTIVITIES				
B - Beneficial Impact A - Adverse Impact	PRE-CONSTRUCTION	SURVEY			
		UTILITY MAPPING			
Degree of Significance:		UTILITY RELOCATION			
		LAND ACQUISITION			
1 - Low Degree & Short Duration	CONSTRUCTION	LAND CLEARING			
2 - Low Degree & Long Duration		EARTHWORK			
3 - High Degree & Short Duration		DRAINAGE			
4 - High Degree & Long Duration		VEHICLE MOVEMENT			
		TRAFFIC DIVERSION			
Blank - Unrelated		DISPOSAL OF UNSUITABLE MATERIAL			
N - Negligible		WASTE / WASTEWATER GENERATION			
L - Localized		DISPOSAL OF SOLID AND CONSTRUCTION WASTE / BIOMASS			
D - Significant Adverse Environmental Impact for which a design solution is identified		ESTABLISHMENT OF SITE OFFICE, STORAGE AREAS			
		ESTABLISHMENT OF WORKERS CAMP			
		CONSTRUCTION OF BUILDING STRUCTURES			
		UTILITIES RELOCATION			
		EMPLOYMENT OF WORKERS AND STAFF			
		ABANDONMENT			
	OPERATION	WASTE / WASTEWATER GENERATION			
		NORMAL OPERATION			
		MATERIAL HANDLING AND STORAGE			
		ABANDONMENT PLAN			
		Historic Places or Structure			
		Religious Places or Structure			
		Landscape			

APPENDIX D

MALAYSIA AMBIENT AIR QUALITY STANDARD

APPENDIX D

MALAYSIA AMBIENT AIR QUALITY STANDARD

Pollutants	Averaging Time	Ambient Air Quality Standard (µg/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 ($PM_{2.5}$)	1 year	35	25	15
	24 hour	75	50	35
Sulphur Dioxide (SO_2)	1 year	350	300	250
	24 hour	105	90	80
Nitrogen Dioxide (NO_2)	1 year	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 shall strive to achieve the Interim Target 3.

APPENDIX E

MALAYSIA NATIONAL WATER QUALITY STANDARDS

APPENDIX E

MALAYSIA NATIONAL WATER QUALITY STANDARD

Parameter	Unit	River Class					
		I	IIA	IIB	III	IV	V
AN	mg/L	0.1	0.3	0.3	0.9	2.7	>2.7
BOD_5	mg/L	1	3	3	6	12	>12
COD	mg/L	10	25	25	50	100	>100
DO	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	-	-	-
Electric Conductivity*	µS/cm	1000	1000	-	-	6000	-
Floatables	-	N	N	N	-	-	-
Odour	-	N	N	N	-	-	-
Salinity	%	0.5	1	-	-	2	-
Taste	-	N	N	N	-	-	-
Total Dissolved Solids	mg/L	500	1000	N	-	4000	-
TSS	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 (20000)[a]	5000 (20000)[a]	-
Total Coliform	Count/ 100ml	100	5000	5000	50000	50000	>50000

Source : Malaysia Environmental Quality Report (EQR) DOE, 2015.

Notes : N = No visible floatable materials or debris, no objectionable odour or no objectionable taste
* = Related parameters, only one recommended for use
** = Geometric mean
[a] = Maximum not to be exceeded

Parameter	Unit	Class				
		I	IIA/IIB	III	IV	V
Aluminium, Al	mg/L	Natural Levels or Absent	-	(0.06)	0.5	Levels Above IV
Arsenic, As	mg/L		0.05	0.4	0.1	
Barium, Ba	mg/L		1	(0.05)	-	
Cadmium, Cd	mg/L		0.01	-	0.01	
Chromium, Cr(IV)	mg/L		0.05	0.01* (0.001)	0.1	
Chromium, Cr(III)	mg/L		-	1.4 (0.05)	-	
Copper, Cu	mg/L		0.02	2.5	0.2	
Hardness	mg/L		250	-	-	
Calcium, Ca	mg/L		-	-	-	
Magnesium, Mg	mg/L		-	-	-	
Sodium, Na	mg/L		-	-	3 SAR	
Potassium, K	mg/L		-	-	-	
Iron, Fe	mg/L		1	1	1 (Leaf) 5 (Others)	
Lead, Pb	mg/L		0.05	0.02* (0.01)	5	
Manganese, Mn	mg/L		0.1	0.1	0.2	
Mercury, Hg	mg/L		0.001	0.004 (0.0001)	0.002	
Nickel, Ni	mg/L		0.05	0.9*	0.2	
Selenium, Se	mg/L		0.01	0.25 (0.04)	0.02	
Silver, Ag	mg/L		0.05	0.0002	-	
Stanium, Sn	mg/L		-	0.004	-	
Uranium, U	mg/L		-	-	-	
Zinc, Zn	mg/L		5	0.4*	2	
Boron, B	mg/L		1	(3.4)	0.8	
Chlorine, Cl	mg/L		200	-	80	
Chlorine gas, Cl_2	mg/L		-	(0.02)	-	
Cyanide, CN	mg/L		0.02	0.06 (0.02)	-	
Flouride, F	mg/L		1.5	10	1	

Source : Malaysia Environmental Quality Report (EQR) DOE, 2015.

Notes : * = At hardness 50 mg/L $CaCO_3$.

\# = Maximum (un-bracketed) and 24-hour average (bracketed) concentrations.

N = Free from visible film sheen, discolouration 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.

National Groundwater Quality Standard for Industry

Parameter	Threshold (mg/L)
Alkalinity	300
COD	30
Chloride	100
Fe	0.3
Mn	0.2
pH	6.5 – 8.0
Silica	20.0
Sulphate	200
TDS/ Cond (mS/m)	450/70
SS	5
Total Hardness	250

Source: Malaysia Index and Standard for Groundwater Quality (DOE, 2019)

Recommended Raw Water Quality - Criteria and Frequency of Monitoring

Group	Parameters	Column I	Column II			Column III
		Acceptable Value (mg/L unless otherwise stated)	Frequency to be monitored			Source of reference
			Surface	Ground	Direct impounding	
1	Total Coliform	5,000 MPN/100ml or cfu/100ml	W	M	M	WHO1
	Turbidity	1,000 NTU	W	M	M	WHO2
	Colour	300 TCU	W	M	M	WHO1
	pH	5.5 - 9.0	W	M	M	MAL
2	Total dissolved solids	1,500	M	Y/4	Y/4	WHO1
	BOD	6	M	Y/4	Y/4	WHO1
	COD	10	M	Y/4	Y/4	WHO1
	Chloride	250	M	Y/4	Y/4	MAL
	Anionic Detergent MBAS	1.0	M	Y/4	Y/4	WHO1
	Ammonia (As N)	1.5	M	Y/4	Y/4	WHO1
	Nitrate (As N)	10	M	Y/4	Y/4	MAL
	Iron (As Fe)	1.0	M	Y/4	Y/4	MAL
	Fluoride	1.5	M	Y/4	Y/4	WHO1
	Hardness	500	M	Y/4	Y/4	MAL
	Manganese	0.2	M	Y/4	Y/4	WHO1
3	Mercury	0.001	Y/4	Y/4	Y/4	MAL
	Cadmium	0.003	Y/4	Y/4	Y/4	MAL
	Selenium	0.01	Y/4	Y/4	Y/4	WHO1
	Arsenic	0.01	Y/4	Y/4	Y/4	MAL
	Cyanide	0.07	Y/4	Y/4	Y/4	MAL

Group	Parameters	Column I	Column II			Column III
		Acceptable Value (mg/L unless otherwise stated)	Frequency to be monitored			Source of reference
			Surface	Ground	Direct impounding	
	Lead	0.05	Y/4	Y/4	Y/4	MAL
	Chromium	0.05	Y/4	Y/4	Y/4	WHO1
	Silver	0.05	Y/4	Y/4	Y/4	MAL
	Copper	1.0	Y/4	Y/4	Y/4	MAL
	Magnesium	150	Y/4	Y/4	Y/4	MAL
	Sodium	200	Y/4	Y/4	Y/4	MAL
	Zinc	3	Y/4	Y/4	Y/4	MAL
	Sulphate	250	Y/4	Y/4	Y/4	MAL
	Mineral oil	0.3	Y/4	Y/4	Y/4	MAL
	Phenol	0.002	Y/4	Y/4	Y/4	WHO1
4	Organochlorine Pesticides:					
	Aldrin/Dieldrin	0.00003	Y/4	Y/4	Y/4	MAL
	DDT	0.002	Y/4	Y/4	Y/4	MAL
	Heptachlor & Heptachlor Epoxide	0.00003	Y/4	Y/4	Y/4	MAL
	Methoxychlor	0.02	Y/4	Y/4	Y/4	MAL
	Non-organochlorine Pesticides:					
	Hexachlorobenzene	0.001	Y/4	Y/4	Y/4	MAL
	Lindane	0.002	Y/4	Y/4	Y/4	MAL
	Chlordane	0.0002	Y/4	Y/4	Y/4	MAL

Group	Parameters	Column I	Column II			Column III
		Acceptable Value (mg/L unless otherwise stated)	Frequency to be monitored			Source of reference
			Surface	Ground	Direct impounding	
	Herbicides: 2,4-D (Dichlorophenoxyacetic acid)	0.03	WN	Y/4	Y/4	MAL
5	Radioactivity: Gross α Gross β	 0.1Bq/L 1.0Bq/L	 WN WN	 WN WN	 WN WN	 MAL MAL

Note:

Collection of samples of both raw and treated water for examination for toxic substances should be carried out more frequently if values above the acceptable values are known to be present in the source of supply, or where such potential pollution exists.

W : Indicates parameters to be monitored at least once a week
M : Indicates parameters to be monitored at least once a month
Y/4 : Indicates parameters to be monitored at least once in 3 months
Y : Indicates parameters to be monitored at least once a year
WHO1 : Refers to WHO International Standards for Drinking Water 1963
WHO2 : Refers to WHO Guidelines for Drinking Water Quality Vol. 1 & 2 1984
MAL : Refers to values adapted for Malaysian conditions

Drinking Water Quality Standards and Frequency of Monitoring

Group	Parameters	Column I	Column II				Column III
		Acceptable Value (mg/L unless otherwise stated)	Frequency to be monitored				Source of reference
			Water Treatment Plant outlet	Service reservoir outlet	Distribution system	Well/ spring	
1	Microbiological:						
	Total Coliform	MPN method/ membrane filtration method: Must not be detected at any 100ml sample	W	W	M	2Y	MAL
	E. Coli or Thermotolerant Coliform bacteria	Absent in 100ml sample	W	W	M	2Y	WHO2
	Faecal Streptococci	Membrane filter method: Absent in 100ml sample MPN Method: <1 in 100ml sample	WN	WN	WN	WN	EEC
	Clostridium perfringens	Absent	WN	WN	WN	WN	MAL 1990
	Viruses	Absent in 100ml	WN	WN	WN	WN	NZ
	Protozoa	Absent in 100ml	WN	WN	WN	WN	NZ
	Helminths	Absent in 100ml	WN	WN	WN	WN	NZ

Group	Parameters	Column I	Column II				Column III
		Acceptable Value (mg/L unless otherwise stated)	Frequency to be monitored				Source of reference
			Water Treatment Plant outlet	Service reservoir outlet	Distribution system	Well/ spring	
	Physical:						
	Turbidity	5 NTU	W	W	M	2Y	WHO2
	Colour	15 TCU	W	W	M	2Y	WHO2
	pH	6.5 – 9.0	W	W	M	2Y	MAL
	Free residual chlorine	0.2 – 5.0	W	W	M	2Y	WHO1
	Combined residual chlorine	Not less than 1.0	W	W	M	2Y	MAL 1990
	Monochloramine	3	WN	WN	WN	WN	WHO2
2	Inorganic:						
	Total dissolved solids	1000	M	M	Y/2	2Y	WHO2
	Chloride	250	M	M	Y/2	2Y	WHO2
	Ammonia (As N)	1.5	M	M	Y/2	2Y	WHO2
	Nitrate (As N)	10	M	M	Y/2	2Y	WHO1
	Iron	0.3	M	M	Y/2	2Y	WHO2
	Fluoride	0.4 – 0.6	M	M	Y/2	2Y	MAL
	Hardness	500	M	M	Y/2	2Y	WHO1
	Aluminium	0.2	M	M	Y/2	2Y	WHO2
	Manganese	0.1	M	M	Y/2	2Y	WHO2
3	Mercury (Total)	0.001	Y/4	Y/2	Y	2Y	WHO2
	Cadmium	0.003	Y/4	Y/2	Y	2Y	WHO2
	Arsenic	0.01	Y/4	Y/2	Y	2Y	WHO2
	Cyanide	0.07	Y/4	Y/2	Y	2Y	WHO2
	Lead	0.01	Y/4	Y/2	Y	2Y	WHO2
	Chromium	0.05	Y/4	Y/2	Y	2Y	WHO2
	Copper	1	Y/4	Y/2	Y	2Y	WHO1
	Zinc	3	Y/4	Y/2	Y	2Y	WHO2
	Sodium	200	Y/4	Y/2	Y	2Y	WHO2

Group	Parameters	Column I	Column II				Column III
		Acceptable Value (mg/L unless otherwise stated)	Frequency to be monitored				Source of reference
			Water Treatment Plant outlet	Service reservoir outlet	Distribution system	Well/ spring	
	Sulphate	250	Y/4	Y/2	Y	2Y	WHO2
	Trihalomethane: The sum of the ratio of the concentration to each of guideline value should not exceed 1.						
	Chloroform	0.2	Y/4	Y/2	Y	2Y	WHO3
	Bromoform	0.1	Y/4	Y/2	Y	2Y	WHO2
	Dibromochloromethane	0.1	Y/4	Y/2	Y	2Y	WHO2
	Bromodichloromethane	0.06	Y/4	Y/2	Y	2Y	WHO2
	Selenium	0.01	Y/4	WN	WN	WN	WHO2
	Silver	0.05	Y/4	WN	WN	WN	MAL 1990
	Magnesium	150	Y/4	WN	WN	WN	MAL 1990
	Antimony	0.005	WN	WN	WN	WN	WHO2
	Barium	0.7	WN	WN	WN	WN	WHO2
	Boron	0.5	WN	WN	WN	WN	WHO3
	Molybdenum	0.07	WN	WN	WN	WN	WHO2
	Nickel	0.02	WN	WN	WN	WN	WHO2
	Uranium	0.002	WN	WN	WN	WN	WHO3
	Hydrogen sulfide	0.05	WN	WN	WN	WN	WHO2
	Mineral oil	0.3	WN	WN	WN	WN	MAL 1990
	Phenol	0.002	WN	WN	WN	WN	WHO1
	Bromate	0.025	WN	WN	WN	WN	WHO2

Group	Parameters	Column I	Column II				Column III
		Acceptable Value (mg/L unless otherwise stated)	Frequency to be monitored				Source of reference
			Water Treatment Plant outlet	Service reservoir outlet	Distribution system	Well/ spring	
	Chlorite	0.2	WN	WN	WN	WN	WHO2
	2-Chlorophenol	0.0001	WN	WN	WN	WN	WHO2
	2,4-Dichlorophenol	0.0003	WN	WN	WN	WN	WHO2
	2,4,6-Trichlorophenol	0.2	WN	WN	WN	WN	WHO2
	Formaldehyde	0.9	WN	WN	WN	WN	WHO2
	Dichloroacetic Acid	0.05	WN	WN	WN	WN	WHO2
	Trichloroacetic Acid	0.1	WN	WN	WN	WN	WHO2
	Chloral Hydrate (Trichloroacetaldehyde)	0.01	WN	WN	WN	WN	WHO2
	Dichloroaceto-nitrile	0.09	WN	WN	WN	WN	WHO2
	Dibromoaceto-nitrile	0.1	WN	WN	WN	WN	WHO2
	Trichloroaceto-nitrile	0.001	WN	WN	WN	WN	WHO2
	Cyanogen Chloride (As CN)	0.07	WN	WN	WN	WN	WHO2
4	Aldrin/Dieldrin	0.00003	Y/4	WN	WN	WN	WHO2
	DDT	0.002	Y/4	WN	WN	WN	WHO2
	Heptachlor& Heptachlor Epoxide	0.00003	Y/4	WN	WN	WN	WHO2
	Methoxychlor	0.02	Y/4	WN	WN	WN	WHO2
	Lindane (BHC)	0.002	Y/4	WN	WN	WN	WHO2
	Endosulfan	0.03	Y/4	WN	WN	WN	AUS
	Chlordane	0.0002	WN	WN	WN	WN	WHO2
	1,2-Dichloropropane	0.04	WN	WN	WN	WN	WHO3
	1,3-Dichloroporpene	0.02	WN	WN	WN	WN	WHO2
	Hexachlorobenzene	0.001	WN	WN	WN	WN	WHO2
	Pentachlorophenol	0.009	WN	WN	WN	WN	WHO3

Group	Parameters	Column I	Column II				Column III
		Acceptable Value (mg/L unless otherwise stated)	Frequency to be monitored				Source of reference
			Water Treatment Plant outlet	Service reservoir outlet	Distribution system	Well/ spring	
	Alachlor	0.02	WN	WN	WN	WN	WHO2
	Aldicarb	0.01	WN	WN	WN	WN	WHO2
	Ametryn	0.05	WN	WN	WN	WN	AUS
	Atrazine	0.002	WN	WN	WN	WN	WHO2
	Bentazone	0.3	WN	WN	WN	WN	WHO3
	Carbofuran	0.007	WN	WN	WN	WN	WHO3
	Chlorotoluron	0.03	WN	WN	WN	WN	WHO2
	Cyanazine	0.0006	WN	WN	WN	WN	WHO3
	2,4-Dichlorophenoxyacetic acid (2,4D)	0.03	WN	WN	WN	WN	WHO3
	Diquat	0.01	WN	WN	WN	WN	WHO3
	1,2-Dibromo-3-chloropropane	0.001	WN	WN	WN	WN	WHO2
	1,2-Dibromoethane	0.0004	WN	WN	WN	WN	WHO3
	Isoproturon	0.009	WN	WN	WN	WN	WHO2
	MCPA	0.002	WN	WN	WN	WN	WHO2
	Metolachlor	0.01	WN	WN	WN	WN	WHO2
	Molinate	0.006	WN	WN	WN	WN	WHO2
	Pendimethalin	0.02	WN	WN	WN	WN	WHO2
	Permethrin	0.02	WN	WN	WN	WN	WHO2
	Propanil	0.02	WN	WN	WN	WN	WHO2
	Pyridate	0.1	WN	WN	WN	WN	WHO2
	Simazine	0.002	WN	WN	WN	WN	WHO2
	Trifuralin	0.02	WN	WN	WN	WN	WHO2
	2,4 DB	0.09	WN	WN	WN	WN	WHO2
	Dichlorprop	0.1	WN	WN	WN	WN	WHO2

Group	Parameters	Column I	Column II				Column III
		Acceptable Value (mg/L unless otherwise stated)	Frequency to be monitored				Source of reference
			Water Treatment Plant outlet	Service reservoir outlet	Distribution system	Well/ spring	
	Fenoprop	0.009	WN	WN	WN	WN	WHO2
	Mecoprop	0.01	WN	WN	WN	WN	WHO2
	2,4,5-T	0.009	WN	WN	WN	WN	WHO2
	Terbuthylazine	0.007	WN	WN	WN	WN	WHO3
	Organic substances:						
	Carbon tetrachloride	0.002	WN	WN	WN	WN	WHO2
	Dichloromethane	0.02	WN	WN	WN	WN	WHO2
	1,2-Dichloroethane	0.03	WN	WN	WN	WN	WHO2
	1,1,1-Trichloroethane	2	WN	WN	WN	WN	WHO2
	Vinyl chloride	0.005	WN	WN	WN	WN	WHO2
	1,1-Dichloroethene	0.03	WN	WN	WN	WN	WHO2
	1,2-Dichloroethene	0.05	WN	WN	WN	WN	WHO2
	Trichloroethene	0.07	WN	WN	WN	WN	WHO2
	Tetrachloroethene	0.04	WN	WN	WN	WN	WHO2
	Benzene	0.01	WN	WN	WN	WN	WHO2
	Toulene	0.7	WN	WN	WN	WN	WHO2
	Xylene	0.5	WN	WN	WN	WN	WHO2
	Ethylbenzene	0.3	WN	WN	WN	WN	WHO2
	Styrene	0.02	WN	WN	WN	WN	WHO2
	Benzo (A) Pyrene	0.0007	WN	WN	WN	WN	WHO2
	Monochlorobenzene	0.3	WN	WN	WN	WN	WHO2
	1,2-Dichlorobenzene	1	WN	WN	WN	WN	WHO2
	1,4-Dichlorobenzene	0.3	WN	WN	WN	WN	WHO2
	Trichlorobenzene (Total)	0.02	WN	WN	WN	WN	WHO2
	Di (2-ethylhexyl) Adipate	0.08	WN	WN	WN	WN	WHO2

Group	Parameters	Column I	Column II				Column III
		Acceptable Value (mg/L unless otherwise stated)	Frequency to be monitored				Source of reference
			Water Treatment Plant outlet	Service reservoir outlet	Distribution system	Well/ spring	
	Di (2-ethylhexyl) Phthalate	0.008	WN	WN	WN	WN	WHO2
	Edetic Acid (EDTA)	0.6	WN	WN	WN	WN	WHO3
	Acrylamide	0.0005	WN	WN	WN	WN	WHO2
	Epichlorohydrin	0.0004	WN	WN	WN	WN	WHO2
	Hexachlorobutadiene	0.0006	WN	WN	WN	WN	WHO2
	Microcystin-LR	0.001	WN	WN	WN	WN	WHO3
	Nitrilotriacetic acid (NTA)	0.2	WN	WN	WN	WN	WHO2
	Tributylin oxide	0.002	WN	WN	WN	WN	WHO2
5	Radioactivity:						
	Gross α	0.1Bq/L	WN	WN	WN	WN	WHO2
	Gross β	1.0Bq/L	WN	WN	WN	WN	WHO2

Notes:
Any toxic substances not listed shall be deemed as not allowable in drinking water

W	:	Indicates parameters to be monitored at least once a week.
M	:	Indicates parameters to be monitored at least once a month.
Y/2	:	Indicates parameters to be monitored at least once in 6 months.
Y/4	:	Indicates parameters to be monitored at least once in 3 months.
Y	:	Indicates parameters to be monitored at least once a year.
2Y	:	Indicates parameters to be monitored at least once in 2 years.
WN	:	Indicates parameters to be monitored when necessary.
WHO1	:	Refers to WHO Guidelines for Drinking Water Quality 1984.
WHO2	:	Refers to WHO Guidelines for Drinking Water Quality 1993/96.
WHO2	:	Refers to WHO Guidelines for Drinking Water Quality (Addendum to Vol. 1) 1998.
MAL	:	Refers to values adapted for Malaysian conditions.
AUS	:	Indicates Australian Drinking Water Quality Guidelines, 1996.
EEC	:	Indicates EEC Standard Council Directive (80/778/EEC).
NZ	:	Indicates Drinking Water Standards for New Zealand 1995.

APPENDIX F

MALAYSIA MARINE WATER QUALITY CRITERIA AND STANDARD

APPENDIX F

MALAYSIA MARINE WATER QUALITY CRITERIA AND STANDARD

Parameters	Unit	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 Field	Mangroves, Estuarine and Rivermouth Water
Temperature	°C	≤ 2°C increase over maximum ambient	≤ 2°C increase over maximum ambient	≤ 2°C increase over maximum ambient	≤ 2°C increase over maximum ambient
Dissolved Oxygen	mg/L	>80% saturation	5	3	4
Total Suspended Solids	mg/L	25 mg/L or ≤ 10% increase in seasonal average, whichever is lower	50 mg/L (25mg/L) or ≤ 10% increase in seasonal average, whichever is lower	100 mg/L or ≤ 10% increase in seasonal average, whichever is lower	100mg/L or ≤ 30% increase in seasonal average, whichever is lower
Oil & Grease	mg/L	0.01	0.14	5.0	0.14
Mercury*	µg/L	0.04	0.16 (0.04)	50	0.5
Cadmium	µg/L	0.5	2 (3)	10	2
Chromium (VI)	µg/L	5	10	48	10
Copper	µg/L	1.3	2.9	10	2.9
Arsenic (III)*	µg/L	3	20 (3)	50	20 (3)
Lead	µg/L	4.4	8.5	50	8.5
Zinc	µg/L	15	50	100	50
Cyanide	µg/L	2	7	20	7
Ammonia (unionized)	µg/L	35	70	320	70
Nitrite (NO_2)	µg/L	10	55	1,000	55
Nitrate (NO_3)	µg/L	10	60	1,000	60

Parameters	Unit	Class 1	Class 2	Class 3	Class E
Phosphate	µg/L	5	75	670	75
Phenol	µg/L	1	10	100	10
Tributylyin (TBT)	µg/L	0.001	0.01	0.05	0.01
Faecal Coliform	-	70 faecal coliform count/ 100 ml	100 faecal coliform count/ 100 ml & (70 faecal coliform count/ 100ml)	200 faecal coliform count/ 100ml	100 faecal coliform count/ 100ml & (70 faecal coliform count/ 100ml)
Plycyclic Aromatic Hydrocarbons	µg/L	100	200	1000	1000

Source : Malaysia Environmental Quality Report (EQR) DOE, 2015.

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

APPENDIX G

NOISE & VIBRATION GUIDELINE STANDARDS

APPENDIX G

NOISE & VIBRATION GUIDELINE STANDARDS

Noise - Schedule of Permissible Sound Levels

First Schedule – Recommended Permissible Sound Level (L_{aeq}) By Receiving Land Use for New Development

Receiving Land Use Category	L_{Aeq} Day 7.00 am – 10.00 pm	L_{Aeq} Night 10.00 pm – 7.00 am
Low Density Residential, Noise Sensitive Receptors, Institutional (School, Hospital, Worship)	55 dBA	50 dBA
Suburban Residential (Medium Density), Recreational	60 dBA	55 dBA
Urban Residential (High Density), Mixed Development	65 dBA	60 dBA
Commercial Business Zones.	65 dBA	60 dBA
Industrial Zones	70 dBA	65 dBA

Second Schedule – Recommended Permissible Sound Level (L_{aeq}) By Receiving Land Use for Existing Built Up Areas

Receiving Land Use Category	L_{Aeq} Day 7.00 am – 10.00 pm	L_{Aeq} Night 10.00 pm – 7.00 am
Low Density Residential, Noise Sensitive Receptors, Institutional (School, Hospital, Worship)	60 dBA	55 dBA
Suburban and Urban Residential, Mixed Development.	65 dBA	60 dBA
Commercial Business Zones.	70 dBA	65 dBA
Industrial Zones	75 dBA	75 dBA

Note: The above prescribed L_{Aeq} limits are representative noise levels consistent with developed areas without noise disturbance generally deemed acceptable to majority of receptors occupying in premises at the respective land category.

Third Schedule – Recommended Permissible Sound Level (L_{aeq}) To Be Maintained at The Existing Noise Climate

Existing Levels	Recommended Permissible Sound Levels*
L_{Aeq}	Existing L_{Aeq}

Notes:

1. Existing L_{Aeq} is determined from baseline measurements of the prevailing noise in the absence of the new noise sources(s); typically undertaken just prior to the operations of the new road, railway line or industrial premises operations, or alternatively with the noise source(s) being assessed to be temporarily disabled.
2. Due to uncertainty in measurements, noise levels within + 1.5 dBA of the Existing L_{Aeq} is acceptable and deemed maintained at the existing noise climate.

Sixth Schedule –Maximum Permissible Sound Level (L_{10} and L_{max}) Of Construction, Maintenance and Demolition Work by Receiving Land Use

Receiving Land Use Category	Noise Parameter	Day 7.00 am – 10.00 pm	Evening 7.00 pm – 10.00 pm	Night 10.00 pm – 7.00 am
Residential, Sensitive Areas (**Note 2)	**L_{10}**	75 dBA	70 dBA	70 dBA*
	L_{max}	90 dBA	85 dBA	85 dBA*
	L_{Aeq}	-	-	*Note 1
Commercial, Mixed Development	**L_{10}**	80 dBA	80 dBA	75 dBA
Industrial	**L_{10}**	80 dBA	80 dBA	80 dBA

Note:

*1. At night time, the maximum permissible levels as stipulated in Schedule 3 for respective residential density type shall apply.

**2. Limits for daytime L_{Aeq} or reduction of L_{10} levels in vicinity of sensitive premises (such as schools and hospitals) may be exercised by the Local Authority or Department of Environment. In such situations, limits for daytime L_{Aeq} +3 dBA based on Schedule 3 may apply.

3. There are no prescribed limits for L_{max} and L_{Aeq} levels for construction noise for commercial and industrial land use. Assessment of L_{Aeq} levels if required shall be based on comparison against prevailing ambient noise (Schedule 3).

For the full guideline, please refer to ‘Guidelines for Environmental Noise Limits and Control (Third Edition) by DOE, 2019’.

Vibration – Schedule of Recommended Vibration Limits

Schedule 2 – Recommended Limit for Damage Risk in Buildings from Short Term Vibration

Type of Structure	Vibration Velocity V_i (mm/s) at Foundation (as Defined by the Respective Rating Curves of Figure 1)	Vibration Velocity V_i (mm/s) at plane of floor of uppermost full storey (all frequencies)
Industrial buildings and buildings of similar design	Curve C	40
Commercial building, dwelling and buildings of similar design and/or use	Curve B	15
Structures that, because of their particular sensitivity to vibration, do not correspond to those listed above, or of great intrinsic value (e.g. residential houses, or buildings that are under preservation order)	Curve A	8

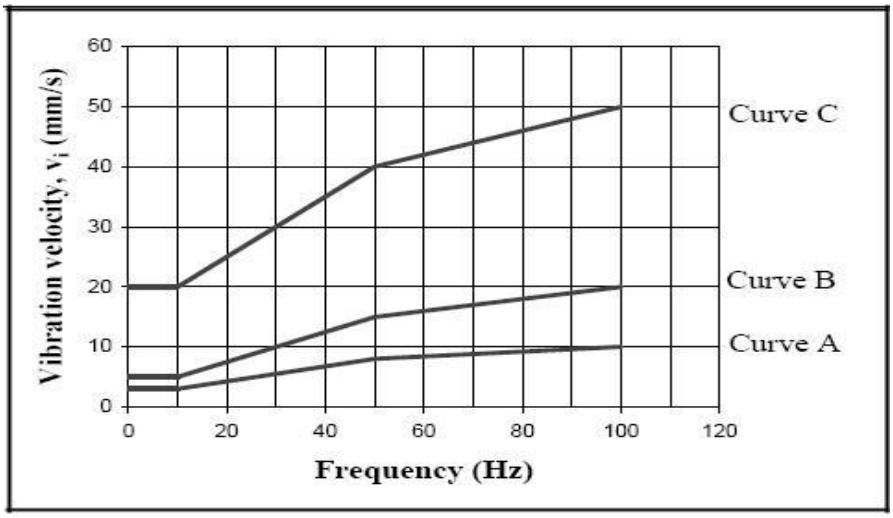


Figure 1: Foundation Vibration Velocity Limiting Values for Vectoral Sum of Vibration Levels in Three Orthogonal Axes

For the full guideline, please refer to 'The Planning Guidelines for Vibration Limits and Control in the Environment, 2nd Edition, DOE 2007'.

APPENDIX H

GENERAL REQUIREMENT FOR ASSESSING HEALTH IMPACT

EXISTING PUBLIC HEALTH STATUS OF LOCAL COMMUNITY

APPENDIX H

GENERAL REQUIREMENT FOR ASSESSING HEALTH IMPACT

1. Health Impact Assessment (HIA) subject specialist must be a qualified person, registered with the Department of Environment.

2. Methodology of Health Impact Assessment (HIA) should be in accordance to the published guideline, the Guidance Document of Health Impact Assessment (HIA) in Environmental Impact Assessment published by DOE Malaysia (2012) or equivalent guidelines.

3. Approaches to health risk assessment can be qualitative or quantitative depending on the type of health hazard identified. Qualitative health risk assessment involves listing and describing the possible changes in health outcomes or endpoints resulting from the proposed Project. For example, inappropriate waste handling during the construction stage may lead to potential breeding site 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 difficult to be quantified.

4. Quantitative health risk assessment generates a risk value on the potential adverse health effects of human exposures to environmental hazards. Quantitative methodology of HRA should be in accordance to the Guidance Document of Health Impact Assessment (HIA) in Environmental Impact Assessment published by DOE Malaysia (2012) or equivalent guidelines.

5. Assessment of health impact should include acute and chronic health effects as well as lifetime cancer risk when applicable.

6. Assessment of health impact should be conducted for construction stage and operational phase of the Project. During the construction stage, the common health hazards are (not exhaustive):

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

    ii. Vector-borne diseases (dengue fever, malaria which is caused by the unhygienic construction sites or living workers quarters).

    iii. Waterborne diseases and food-borne diseases like cholera, typhoid and hepatitis A due to improper sewage and solid waste disposal in the worker's camp area.

    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.).

7. Assessment of health impact needs to consider worst case scenario.

8. For relevant hazards identified, their abilities to cause cancer should be clearly stated in the report. The weight of evidence for cancer and their mode of action should be reported.

9. For carcinogen Group 1, Group 2A and 2B or equivalent, lifetime cancer risk assessment must be conducted for all receptors with completed or potential exposure pathways.

10. For carcinogen with mutagenic mode of action, lifetime cancer assessment must consider early life exposure. Aged Adjustment Factor (ADAF) need to be applied for assessing cancer risk from carcinogen with mutagenic mode of action. Details information on methodology for assessing early life exposure to carcinogen is available/stated/explained in the guideline produced by the U.S Environmental Protection Agency [EPA/630R-03/003F (2005) entitled “supplemental guidance for assessing susceptibility from early-life exposure to carcinogens].

11. The location of highly vulnerable receptors such as schools, health care facilities, aged care facilities and source of water intake must be identified and the distance from the Project Site must be clearly stated.

12. Multiple chemical exposure: cumulative and aggregate health risk assessment should be conducted for both cancer and non-cancer risk assessment. Aggregate health risk assessment is a combined exposure to a single stressor across multiple routes and multiple pathways. Cumulative health risk assessment evaluates combined exposure to multiple stressors via multiple exposure pathways that affect a single biological target.

13. The sources for toxicological information, health reference values, standards or guideline used in HIA must be written in the report for evaluation purpose.

14. Formula used in Health Risk Assessment (HRA) should be reported for the purpose of evaluation.

15. It is the responsibility of the consultants/subject specialist to check and refer to the latest requirement by Ministry of Health (if any).

EXISTING PUBLIC HEALTH STATUS OF THE LOCAL COMMUNITY

Profiling of existing community health status is an integral part of HIA in EIA framework. To profile the existing health status of the local community, the consultant can obtain health data through:

1. Primary data collection – Obtained through local population survey. The survey should cover all potential impacted community and survey sample should be representative of the community. The primary data will provide prevalence of the relevant health outcome as the baseline data.

2. Secondary data on relevant diseases from local health clinics/ hospitals can be requested from State Health Department.

3. In case of primary data collection, the questionnaire used for data collection must be attached in the appendices.

APPENDIX I

CHECKLIST FOR TOR/ESI

CHECKLIST FOR EIA REPORT

APPENDIX I

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 task?**			
	(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			
	(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			

Item		Adequacy Check		Remarks
		Yes	No	
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)			
8.0	**Project information provided**			
	(a) Project concept and layout			
	(b) Project activities			
	(c) Material sources and storage			
	(d) Infrastructure, utilities and			
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?			
10.0	**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

Items	Mark	Page No.	Remarks
CHAPTER 1: INTRODUCTION			
1.1 Project Title This Chapter shall contain at a minimum the following information: i. Name / Title of project ii. Name and contact details of the Project Proponent (Contact person, address, telephone number, e-mail address) iii. Name of the registered EIA Consulting firm (EIA team leader, address, telephone number, e-mail address) iv. Location of the project (including where applicable, coordinates, lot numbers, sub-district and district name) v. Relevant maps showing project location and sensitive receptors			
1.2 Project Proponent and Qualified Person Details provided on the identity of the Project Proponent (public or private organization). The details of the EIA consulting firm and the consultants engaged for the EIA study are also provided. All the members of the EIA consulting team (the team leader and the subject matter consultants (SMCs) are Qualified Persons registered with the DOE under the EIA Consultant Registration Scheme (www.doe.gov.my.)			
1.3 Legal Aspects 1.3.1 Prescribed activity is subject to section 34A, Environmental Quality Act, 1974 1.3.2 Conformance of proposed project to government's development plans			

Items	Mark	Page No.	Remarks
CHAPTER 2: TERMS OF REFERENCE OF EIA STUDY			
TOR of the EIA study which has been endorsed by the DOE has been provided and the reference of the endorsement are cited			
CHAPTER 3: STATEMENT OF NEED			
The statement has stated the outline of the background of the project and the reasons for it being proposed. Social, economic or other needs for the project has been establish and concluded with a definitive statement of the aim of the project.			
CHAPTER 4: PROJECT OPTIONS			
Details on the project options including the advantages and disadvantages from the perspective of technical, economic, social, and environmental aspects of the following alternatives (wherever applicable): (i) Site Options (ii) Project Options (including "no project option", and "scaled-down project option") (iii) Technology Options (iv) Raw Materials Options (v) Construction Method Options (vi) Layout Options (vii) Alignment Options (viii) Operation Options			
CHAPTER 5: PROJECT DESCRIPTION			
This chapter shall provide information and discuss the following aspects: (i) Description of the project concept with the following details: size and capacity, land requirements, raw materials, energy source and consumption, water source and consumption, labour requirements, transportation, support facilities, investment, market, and special infrastructural requirements			

Items	Mark	Page No.	Remarks
(ii) Maps and diagrams to describe projects. (iii) A summary of the technical, economic, and environmental features that are essential to the project (iv) Proposed project implementation schedule and project lifespan (wherever applicable) (v) Comparison with the existing plant/project in Malaysia or elsewhere (vi) Operation and maintenance activities			
CHAPTER 6: EXISTING ENVIRONMENT			
The description of the existing environment shall conform to the following specifications, wherever appropriate: (i) The zone of study is a minimum 5 km radius from project boundaries except for linear projects where the zone of study is a minimum of 0.5 km (ii) The baseline conditions of the physico-chemical, biological, social, and economic setting prior to the implementation of the project is described in qualitative and quantitative terms. • Physico-chemical ➢ Topography ➢ Soil investigations ➢ Geological terrain mapping ➢ Geotechnical report ➢ Seismic study ➢ Landuse (5-km radius) ➢ Hydrology/drainage ➢ Climate ➢ Water quality ➢ Ambient air quality ➢ Ambient noise and vibration levels			

Items	Mark	Page No.	Remarks
• Biological ➢ Terrestrial (Flora and fauna) ➢ Aquatic/Marine (Flora and fauna) • Socio-economy ➢ Demography ➢ Historical, cultural and archaeological aspects ➢ Environmental sensitive areas, and areas of special or unique scientific, socio- economic or cultural values • Other studies ➢ Traffic Impact Assessment ➢ Health Impact Assessment ➢ Social Impact Assessment			
CHAPTER 7: EVALUATION OF IMPACTS			
7.1 Identification and Prediction Assessment of Impacts (i) Assessment matrix (ii) Discussion on the impact identification covers the following aspects and conform the following requirement: • ZOI identified based on size and complexity of the project and supported by appropriate modelling exercise • The nature of the environmental effect • The source of the impact • The nature of impact			
7.2 Detailed Examination of Impacts (i) Impacts predicted as the result of the implementation of the project at different phase and description on how the impacts were assessed.			

Items	Mark	Page No.	Remarks
➢ Pre-construction phase - Site access - Site surveys, soil and geotechnical studies - Environmental assessment - Land acquisition ➢ Construction phase - Access road and stream crossing (if any) - Base camp and site facilities establishment - Worker recruitment, mobilization of equipment and materials - Site clearing and biomass removal - Earthworks - Blasting - Drainage works - Waste disposal - Establishment of permanent access - Landscaping ➢ Operational phase - Slope maintenance - Infrastructure, utility and amenities maintenance - Operation of project ➢ Decommissioning phase - Site decommissioning - Rehabilitation works - (ii) Description of the methodology used for predicting the impacts - Figures explaining the pollutant emission prediction e.g. noise contours			

Items	Mark	Page No.	Remarks
7.3 Project Evaluation Quantification of the environmental and development trade-offs anticipated from the proposed project			
CHAPTER 8: MITIGATION MEASURES			
Identification of appropriate P2M2s applicable to all stages of project implementation including construction and implementation stages **8.1 Adherence to DOE Guidelines** (a) Guidance Document for addressing soil erosion and sediment control aspect in EIA Report as per Appendix 3 of EGIM. (b) Guidance Document for the preparation of Land Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2) as per Appendix 4 of EGIM. (c) Other relevant guidelines and guidance documents issued by the DOE pertaining to environmental-related system and management as per Appendix 5 of EGIM.			
8.2 Proposed Mitigation Measures (a) Description of mitigation measures to be adopted and incorporated into the design of the project to effectively eliminate, prevent, and minimize predicted adverse impacts. (b) Evidence from Project Proponent showing commitment to implement the proposed P2M2s.			

Items	Mark	Page No.	Remarks
CHAPTER 9: ENVIRONMENTAL MANAGEMENT PLAN (EMP)			
9.1 Land Disturbing Pollution Prevention and Mitigation Measures Guided Self-regulation is detailed out in the report. Preparation and compliance of LD-P2M2 based on the Guidance Document for the Preparation of Document on Land Disturbing and Pollution Prevention Mitigation Measures (LD-P2M2)			
9.2 Proposed Monitoring Programme (i) Performance monitoring (PM) (ii) Compliance monitoring (CM) (iii) Impact monitoring (IM) (iv) Environmental auditing			
CHAPTER 10: STUDY FINDINGS			
Conclusion of study findings based from the perspective of the impacts of the proposed projects.			
REFERENCES			
APPENDICES			
(i) Input data and results of modelling studies (ii) Supporting documents e.g. COA (iii) Other relevant documents e.g. photographs, supporting letter from GAs			