



ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES FOR DEVELOPMENT IN SLOPE AND HILL AREAS



Department of Environment
Ministry of Natural Resources and Environment Malaysia



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Department of Environment
Ministry of Natural Resources and Environment
Malaysia

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Department of Environment, Malaysia

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PREFACE

This is the first edition of the **Environmental Impact Assessment Guidelines for Development In Slope And Hill Areas** following the amendments to the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015 of the Environmental Quality Act (EQA) 1974 on 28 August 2015.

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

Slopes and hill areas of more than 25° are prone to topographical changes, landslides and slope failures. Land clearing activities and physical development result in increased erosion and sedimentation risks, especially during heavy rains, which lead to siltation of waterways and affect downstream users. Cut and fill slopes can also fail if not properly protected, resulting in loss of lives and property. All these factors mean that any development on slope and hill areas must be properly planned and provided with suitable mitigation measures to minimise the significant impacts.

The Guidelines aim to improve the quality of the environment when developing on slopes and hill areas by:

- Defining environmental requirements for managing the development.
- Providing a range of tools and methods to avoid and/or to reduce and minimise the sources of environmental pollution to an acceptable level.
- Guiding the selection and application of these tools and methods to maintain a healthy environment during different phases of project implementation.

The Guidelines shall provide guidance to the Project Proponents, Qualified Person (i.e. DOE-registered EIA Consultants), and other EIA-related practitioners in the preparation and submission of EIA reports for activities related to development on **slope and hill areas** stated in the Order.

The Guidelines shall only be used within the framework of the EQA 1974 including its future updates, and its subsidiary regulations. While it is not legally applicable to the States of Sabah and Sarawak, the Guidelines can still be used as reference and guide for similar projects in these two states.



(DATO' DR. HAJI AHMAD KAMARULNAJIB BIN CHE IBRAHIM)
Director General of Environmental Quality
Malaysia

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ABBREVIATIONS

Als	Appointed Individuals
APCS	Air Pollution Control Systems
BATs	Best Available Technologies
BMPs	Best Management Practices
BOD	Biochemical Oxygen Demand
BQ	Bill of Quantities
C&D	Construction and demolition
CAR	Corrective Action Report
CEO	Chief Executive Officer
CFS	Central Forest Spine
CIDB	Construction Industry Development Board/ <i>Lembaga Pembangunan Industri Pembinaan Malaysia</i>
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CM	Compliance Monitoring
COA	Conditions of Approval
COD	Chemical Oxygen Demand
DAMAI	Darulnaim Agro Management Industries
DEM	Digital Elevation Model
DG	Director General
DID	Department of Irrigation and Drainage/ <i>Jabatan Pengairan dan Saliran</i>
DO	Dissolved Oxygen/Development Order
DOA	Department of Agriculture/ <i>Jabatan Pertanian</i>
DOE	Department of Environment/ <i>Jabatan Alam Sekitar</i>
DOF	Department of Fisheries/ <i>Jabatan Perikanan</i>
DOSH	Department of Occupational Safety and Health/ <i>Jabatan Keselamatan dan Kesihatan Pekerja</i>
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 and Sediment Control
ESCP	Erosion and Sediment Control Plan
ESI	Environmental Scoping Information

ESM	Environmental Scoping Matrix
etc.	<i>Et cetera</i>
FGDs	Focal Group Discussions
FOS	Factor of Safety
FRIM	Forest Research Institute of Malaysia
GAP	Good Agricultural Practices
GAs	Government Agencies
GIS	Geographic Information System
GSR	Guided Self-Regulations
GTM	Geological Terrain Mapping
HEP	Hydroelectric Project
HIA	Health Impact Assessment
HQ	Headquarters
HRA	Health Risk Assessment
HWC	Human-wildlife conflicts
i.e.	<i>id est</i>
IETS	Industrial Effluent Treatment Systems
ILO	International Labour Organisation
IM	Impact Monitoring
IUCN	International Union on the Conservation of Species
JAKOA	<i>Jabatan Kemajuan Orang Asli Malaysia</i>
JKPTG	Department Of Director General Of Lands And Mines/ <i>Jabatan Ketua Pengarah Tanah dan Galian</i>
JKR	Public Works Department/ <i>Jabatan Kerja Raya</i>
JMG	Minerals and Geoscience Department Malaysia/ <i>Jabatan Mineral dan Geosains</i>
JPBD/ PLANMalaysia	Department of Town and Country Planning/ <i>Jabatan Perancangan Bandar dan Desa</i>
JPSM	Forestry Department of Peninsular Malaysia/ <i>Jabatan Perhutanan Semenanjung Malaysia</i>
JPSPN	National Solid Waste Management Department/ <i>Jabatan Pengurusan Sisa Pepejal Negara</i>
KPKT	Ministry of Urban Wellbeing, Housing and Local Government/ <i>Kementerian Kesejahteraan Bandar, Perumahan dan Kerajaan Tempatan</i>
KSAS	<i>Kawasan Sensitif Alam Sekitar</i>
L ₁₀	Ten percentile level
L ₅₀	Fifty percentile level
L ₉₀	Ninety percentile level
LAC	Limit of Acceptable Change
L _{Aeq}	Equivalent A-Weighted Continuous Sound Level
LCP	<i>Laporan Cadangan Pemaju</i>
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/ <i>Jabatan Meteorologi Malaysia</i>
MOH	Ministry of Health/ <i>Kementerian Kesihatan</i>
MOM	Minutes of Meeting
MOSTI	Ministry of Science, Technology and Innovation/ <i>Kementerian Sains, Teknologi dan Inovasi</i>
MPFN	National Physical Planning Council/ <i>Majlis Perancang Fizikal Negara</i>
MRT	Mass Rapid Transit
MSL	Mean Sea Level
MSMA-2	<i>Manual Saliran Mesra Alam Edisi-2</i>
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/ <i>Kementerian Sumber Asli dan Alam Sekitar</i>
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/ <i>Pihak Berkuasa Tempatan</i>
PERHILITAN	Department of Wildlife and National Parks Peninsular Malaysia/ <i>Jabatan Hidupan Liar dan Taman Negara Semenanjung Malaysia</i>
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/ <i>Pejabat Tanah dan Daerah</i>
PTG	Land and Minerals Office/ <i>Pejabat Tanah dan Galian</i>
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	<i>Skim Akreditasi Makmal Malaysia</i>
SAPs	Special Area Plans
SI	Soil Investigation
SIA	Social Impact Assessment
SIDRA	Signalised and Unsignalised Intersection Design and Research Aid
SMA	Special Management Areas
SPAN	National Water Commission of Malaysia/ <i>Suruhanjaya Perkhidmatan Air Negara</i>
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/ <i>Unit Perancang Ekonomi Negeri</i>
WIPs	Water Intake Points
WQI	Water Quality Index
WTPs	Water Treatment Plants
WWF	World Wildlife Fund for Nature
ZOI	Zone of Impact
ZOS	Zone of Study

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The ‘**Environmental Impact Assessment (EIA) Guidelines for Development in Slope and Hill Areas**’ (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, of 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 divided into the **First Schedule** (21 Prescribed Activities) and **Second Schedule** (17 Prescribed Activities).

Inter alia to the above, the Department of Environment (DOE) has rationalised the EIA process to make it more reflective of the scope, functions and visions of the Department in line with its Environmental Management Strategic Plan, with a focus on environmental mainstreaming and guided self-regulation (GSR).

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

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

1.2 EIA FOR SLOPE AND HILL PROJECTS

The Guidelines for slope and hill projects, together with the EIA procedures therein, are produced to assist the Project Proponent when planning and developing new or expanding existing projects during the four major phases of project development – planning, pre-construction, construction and operations.

The EIA process will entail a range of actions to identify, predict, evaluate and assess the impacts (both beneficial and adverse) with the main objective of protecting the slope and hill environment and the surrounding areas where the project is sited on.

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).
- (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 EIA

- (i) Purposive: The EIA should meet its aims of informing decision making and ensuring an appropriate level of environmental protection and human health.
- (ii) Focused: EIA should concentrate on significant environmental effects, taking into account the issues that matter.
- (iii) Adaptive: The EIA should be adjusted to the realities, issues and circumstances of the proposals under review.
- (iv) Participative: The EIA should provide appropriate opportunities to inform and involve the interested and affected publics, and their inputs and concerns should be addressed explicitly.
- (v) Transparent: The EIA should be a clear, easily understood and open process, with early notification procedure, access to documentation, and a public record of decisions taken and reasons for them.
- (vi) Rigorous: The EIA should apply the 'best practicable' methodologies to address the impacts and issues being investigated.
- (vii) Practical: The EIA should identify measures for impact mitigation that work and can be implemented.
- (viii) Credible: The EIA should be carried out with professionalism, rigor, fairness, objectivity, impartiality and balance.
- (ix) Efficient: The EIA should impose the minimum cost burden on proponents consistent with meeting process requirements and objectives.

Source: 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 guidance document on EIA preparation to the stakeholders, Project Proponents, Qualified Persons (i.e. DOE-registered Environmental Consultants), Government Agencies (GAs), Enforcement Officers (EO) and other EIA-related practitioners.
- (b) Facilitate integration of the EIA into the overall project planning and development cycle, to ensure compliance with and adherence to the legal requirements within the framework of environmental sustainability.
- (c) Provide a detailed step-by-step guidance with explanations of the EIA procedures and submissions, comprising:
 - (i) Environmental Scoping Information (ESI).
 - (ii) Terms of Reference (TOR).
 - (iii) EIA Reporting.
- (d) Define the scope of the EIA with a focus on the significant environmental issues relevant to the DOE's three functional areas (water, air and wastes), whilst also taking into consideration other environmental requirements by other authorities or agencies, to facilitate overall decision-making and project approval.
- (e) Provide a succinct framework for the DOE to assess the EIA reports.

1.4 SCOPE OF THE GUIDELINES

The scope of the Guidelines covers land development on slope and hill areas, which fall within the criteria provided in the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015 (refer to **Section 2.3**).

1.5 OVERVIEW OF ENVIRONMENTAL ASSESSMENT PROCESS

This Section provides an overview of the step-by-step guide to the environmental assessment of a slope and hill development project:

Step 1: Provide the Project Brief and Carry Out Slope Analysis

When a Project Proponent wants to develop a project on a slope or hill area, 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).

All projects on slopes will require a slope analysis to determine the percentage areas under various gradients of slopes within the overall project site, expressed in degrees. The important factor to consider is slopes of 25° and above, which are subject to development restrictions imposed by various authorities. Details on the calculations of slopes are provided in **Section 2.2 (Box 3)**.

For DOE, slopes of 25° and above covering 50% of the area, are used to determine whether the project will fall under the First or Second Schedules of the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015 (refer to **Chapters 2 and 3** for details).

Step 2: Identify the Legal Requirements

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

- (i) **Section 2.3:** Overview of legislation and regulatory requirements.
- (ii) **Section 2.4:** Common terms and definitions relevant to the Guidelines.
- (iii) **Section 3.2:** Methods to carry out environmental screening.

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

The Project Proponent shall clear all policy and administrative matters relating to the project prior to submitting the EIA report to DOE.

Section 2.5 lists the policies and guidelines to meet environmental compliance by the Project Proponent.

Step 4: Carry Out Preliminary Stakeholder Engagement

Section 2.6 provides details of stakeholder engagements for slope and hill projects.

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

Step 5: Preparation of the TOR and ESI

Upon determining that the project requires either a First or Second Schedule EIA, an ESI and the TOR shall be prepared. At this point of the study, qualitative data will suffice (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 scoping shall be reviewed for preparation of the TOR report based on DOE requirements stated in the EGIM (DOE, 2016), and in this Guidelines. The TOR shall be submitted to DOE for review and endorsement as detailed in **Section 3.11**.

Step 7: Baseline Data Collection for EIA

After endorsement of the TOR by DOE, baseline data collection (primary and/or secondary) shall be carried out to obtain information of the project environment and its surrounding areas.

Chapter 4 provides the types of baseline data required for the EIA.

Step 8: Carry Out the EIA Studies

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

- (i) **Chapter 5:** Impact assessment of the significant environmental issues.
- (ii) **Chapter 6:** Identification of suitable pollution prevention and mitigation measures (P2M2s) to avert and/or to minimise the significant environmental issues arising from implementation of the project and identification of residual impacts.
- (iii) **Chapter 7:** Provision of the Environmental Management Plan (EMP) framework.
- (iv) **Chapter 8:** Conclusion to the EIA.

Step 9: Draft the EIA

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

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

Step 10: Carry Out Public Engagement

A Second Schedule EIA requires 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 engagement is encouraged.

The main objective of these public engagements is to brief the stakeholders regarding the project, the potential environmental issues and the proposed mitigation measures, to address their concerns and to seek any further required feedbacks. Some small-scale projects may not need this session, since there is already a stakeholders' engagement prior to carrying out the TOR.

All findings from any public engagements shall be incorporated into the final EIA report (refer to **Sections 2.6 and 8.3** 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 Schedules, the EIA report shall be submitted to DOE State or DOE headquarters (HQ) for review, respectively.

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

Details of the submission and review process are detailed in **Section 8.4**.

1.6 STRUCTURE OF THE GUIDELINES

The Guidelines for slope and hill areas are structured according to the step-by-step procedures highlighted in **Section 1.5**, divided into eight Chapters with their respective supporting sections below:

Chapter	Details
Chapter 1: Introduction	<ul style="list-style-type: none"> Provides an introduction to the Guidelines covering the objectives, scope and structure.
Chapter 2: Environmental Project Planning	<ul style="list-style-type: none"> Provides an overview on project planning and approaches to integrate the EIA process. Outlines the necessary requirements for the project to undergo initial screening and assessment. Provides a concise review of legislations, policies and relevant to development on slope and hill areas, and how they relate to the EIA process. Provides the terms and definitions associated with slope and hill development and their interpretations. Details out the stakeholder engagement process.
Chapter 3: Terms of Reference (TOR)	<ul style="list-style-type: none"> Provides the procedures to conduct screening and scoping the significant issues to prepare the TOR from the ESI. Presents the structure and content for TOR reporting, including an overview of the review and approval process.
Chapter 4: Environmental Impact Assessment: Baseline Data	<ul style="list-style-type: none"> Provides an outline of the relevant baseline information required for incorporation into the EIA report.
Chapter 5: Environmental Impact Assessment: Evaluation of Impacts	<ul style="list-style-type: none"> Provides the methodology and tools to identify, predict, evaluate and assess the significant environmental impacts.
Chapter 6: Environmental Impact Assessment: Mitigation Measures	<ul style="list-style-type: none"> Identifies appropriate P2M2s to minimise any negative impacts arising from the development of the project; and the types of measures to manage any residual impacts.
Chapter 7: Environmental Impact Assessment: Environmental Management Plan	<ul style="list-style-type: none"> Provides an EMP framework for post-EIA. Details out the GSR process for a project. Provides the environmental monitoring and audit programmes for post-EIA.
Chapter 8: EIA Reporting and Review	<ul style="list-style-type: none"> Presents the structure and content for EIA reporting, including an overview of the review and approval process.

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CHAPTER 2

ENVIRONMENTAL PROJECT PLANNING

2.1 INTRODUCTION

2.1.1 Environmental Impact Assessment Process

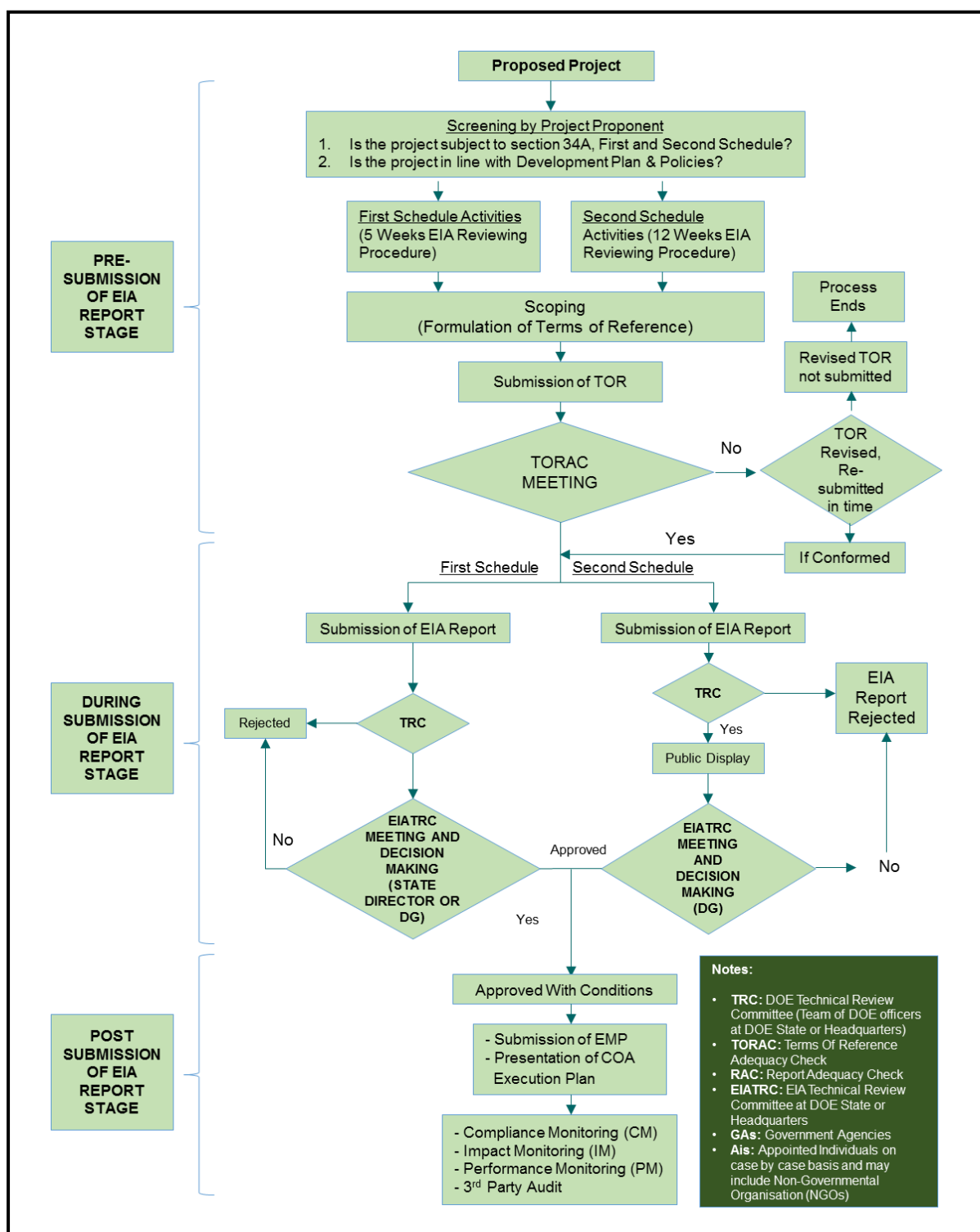
An Environmental Impact Assessment (EIA) is an integral part of an overall project development. Incorporation of the EIA process early during planning for the project provides significant benefits and value add to the project (see **Box 2**).

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

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

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

An overview of the EIA process is shown in **Figure 2.1.1**.



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

Figure 2.1.1: 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 Slope and Hill Project Planning

A typical project cycle involves many phases requiring inputs from various technical specialists and consultants to provide reports for submissions to the approving authorities. Throughout the ambit of this project cycle, incorporation of environmental compliance can be carried out in three phasing steps as follows:

(a) Step 1: Planning Phase

The Project Proponent is surmised to have an initial feasibility assessment of suitable sites for development. Once a suitable site has been identified and selected, the Project Proponent will request for land alienation (if state or federal land) or through acquisition of private land for development of the project.

The Project Proponent shall ensure all national and state policies and administrative matters relating to the project are addressed with the relevant authorities.

Environmental Screening: The Project Proponent, working closely with the Qualified Person, shall carry out a screening exercise to determine which prescribed activities and under which Schedule, the project will fall under, within the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015, or not at all.

Environmental Scoping: After the screening exercise, there is a need to gauge the potential environmental significance to the site and 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 serious environmental and engineering problems/damage later on, such as from landslides, floods, etc. The findings, termed the Environmental Scoping Information (ESI) will form the basis to develop the Terms of Reference (TOR) for the Department of Environment (DOE) endorsement.

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

The technical engineering designs of the Project 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 EIA report.

Environmental Impact Assessment (EIA): If a project is a prescribed activity under the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015, an EIA is mandatory for approval by the DOE before a project can proceed for development. The Project Proponent and the Qualified Person shall carry out the EIA based on the endorsed TOR.

The EIA 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 recommendations to manage the significant environmental impacts 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.

(c) Step 3: Construction and Operational Phase

Construction and operational activities have to comply with the Conditions of Approval (COA) issued by the DOE on approval of the EIA. The COA contains mitigation requirements for activities that may include site access establishment, mobilisation of machineries and equipment, setting up base camp, land clearing, earthworks and structural works.

Post-EIA: Environmental controls and management will be done through the Environmental Management Plan (EMP). The EMP and the plans for environmental monitoring and auditing have to accompany 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 information of the project, as an overview to the Qualified Person.

Table 2.2.1 lists the types of information and components required to facilitate identification of the scope and requirements for environmental assessment.

The most important step for slope and hill projects is to carry out the slope analysis to determine the percentage of the project area falling within slopes 25° and above to determine which Schedule (First or Second) the project falls within.

If the development or land clearing is less than 50 percent of the total project area involving slopes greater than or equal to 25° but less than 35°, then it falls under Activity 13 of the First Schedule. If more, it will be under Activity 13 (a) of the Second Schedule.

The method of slope gradient calculation is shown in **Box 3** and detailed in Appendix A.

Table 2.2.1: Sample Project Brief by the Project Proponent

Information	Details
Project Information	<ul style="list-style-type: none"> • Project title. • Details of Project Proponent [Company, address, contact person(s) and contact details]. • Project concept and description. • Project components. • Project layout plan. • Details of project activities. • Sources of materials. • Material storage areas. • Transport route and temporary access. • Project implementation schedule. • List of infrastructure, utilities and amenities.
Project Location	<ul style="list-style-type: none"> • Description of project location including boundary coordinates. • Maps (topographic, aerial, satellite, etc.) the locations of the site in relation to surrounding landuse, sensitive receptors and landmarks. • Supporting photographs and documentation. • Future landuse map (e.g. structure and local plans). • Zoning and landuse policies related to the project. • Identification of sensitive receptors (affected communities, areas of ecological importance, heritage and archaeological significance, etc.). • Buffer and setback requirements, if any.
Associated Studies (If Applicable)	<ul style="list-style-type: none"> • Geological Terrain Mapping (GTM). • Geotechnical Report. • Social Impact Assessment (SIA). • Traffic Impact Assessment (TIA).

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.

Box 3:**Determining Slope Ranges using Slope Analysis**

Geographic Information System (GIS) software is recommended for the purpose of producing slope maps, which overrides any variations of computational means, significant margins of error, and time consumption involved in manual calculations.

The recommended process for slope analysis for the EIA is as follows:

- (i) Obtain a Digital Elevation Model (DEM) or land survey data for the overall project site from a licensed surveyor. The survey and model shall include part of the slope and contours outside of the project site.
- (ii) Input the DEM model/survey information into GIS software.
- (iii) The GIS software uses a slope function to calculate the maximum rate of change in elevation values for each cell or grid square, relative to its neighbours, through formulae such as:

$$\text{Slope_radians} = \text{ATAN} \left(\sqrt{[dz/dx]^2 + [dz/dy]^2} \right)$$

- (iv) The different values of slopes are collated and tabled to provide an overview of the slope distribution within the project site.
- (v) The overall output will be the slope map represented in terms of area and percentage area for slope range categories of <15°, 15 to <25°, 25° to <35° and ≥ 35°.
- (vi) If the total percentage of slope area ≥ 25° is 50% or more, the project site falls under the requirements of a Second Schedule EIA; otherwise, it falls under the requirements of a First Schedule EIA.
- (vii) For further details, refer to **Appendix A: Method for Determining Slope Distribution.**

2.3 ENVIRONMENTAL LEGISLATIVE REQUIREMENTS

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

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

The DOE under the Ministry of Natural Resources and Environment (NRE) 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 were enforced or to be enforced in Malaysia.

2.3.1 EIA Requirements for Development in Slope and Hill Areas

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 on slope and hill areas, the prescribed activities are:

(i) First Schedule

Activity 12: Development in Coastal and Hill Area:

- (b) Construction of hill-station resort or hotel at 300 meters or more above mean sea level covering an area of 20 hectares or more.

Activity 13: Development in Slope Area:

Development or land clearing less than 50 percent of an area with slope greater than or equal to 25° but less than 35°.

(ii) Second ScheduleActivity 13: Development in Slope Area:

- (a) Development or land clearing of 50 percent or more of an area with slope greater than or equal to 25° but lesser than 35°.
- (b) Construction of road, tunnel or bridge traversing an area with slope greater than or equal to 35°.

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.*

The prescribed activities mentioned above shall 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 2.3.1**.

Table 2.3.1: Environmental Legislation for Sabah and Sarawak

State	Legislation	Authority
Sabah	Environment 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)

2.4 TERMS AND DEFINITIONS

All legal definitions and interpretations shall be based on the Interpretation Acts 1948 and 1967 (Act 388). Terms and interpretations shall also be based on any interpretation and relevant documents published or to be published by DOE.

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

(a) 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.

(b) 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.

(c) Hill-Station

A hill-station refers to a town or village located in the hills or highland areas.

(d) Resort, Hotel, Serviced Apartments and Commercial Residences

“Resort” or “Hotel” as defined in the Tourism Industry Act 1992 (Act 482), are categorised as “Accommodation premises”, meaning any buildings including hostels, hotels, inns, boarding-houses, rest houses and lodging houses, offered as lodging or sleeping accommodations for hire to tourists.

“Serviced apartments” or “commercial residences” are furnished apartments available for short-term or long-term stay, often providing hotel-like amenities, facilities and services.

(e) 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 2.4.1**.

Table 2.4.1: 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	50
		R4	40
	Secondary Road	R4	30
		R3	25
	Minor Road	R2	20
		R1	20
Urban	Expressway	U6	65
	Arterials	U5	65
		U4	40
	Collector	U4	40
		U3	40
	Local Street	U3	40
		U2	30
		U1	25

Source: A Guide on Geometric Design of Roads (JKR, 2015).

Note: Values are for road standards in flat areas and will need to be increased accordingly for areas involving deep cuts and fills.

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.

(f) Slopes

Slope gradients are quantified in degrees (refer **Appendix A** for calculation method). The slope ranges are generally categorised as shown in **Table 2.4.2**.

Table 2.4.2: 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.

(g) Hills

Hill areas and highlands are defined in terms of elevations (meters above mean sea level, MSL) which shall be any areas ≥ 300 m above MSL, with respect to the First Schedule Activity 12 of the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015.

(h) 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 (refer to **Appendix B**).

2.5 POLICY AND GUIDELINES COMPLIANCE

Slope and hill areas form part of the Environmentally Sensitive Areas (ESAs) network in Malaysia. Any proposed development in these areas 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.

2.5.1 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 regards 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 2.5 and 2.6** 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 2.5.1** (also refer to **Sections 2.5.2 and 2.5.3** 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 2.5.1: General Policy Adherence for Slope and Hill Projects Prior to EIA Submission

Requirements/Compliance	Agencies/Department	Legal Requirements	Required Outputs
<ul style="list-style-type: none"> Project approvals and/or supporting documents. 	1. National Physical Planning Council of Malaysia (MPFN) 2. Regional Development Authority 3. State Planning Committee (SPC) 4. <i>Jawatankuasa Teknikal Pembangunan Kawasan Sensitif Alam Sekitar</i> (KSAS) 5. Local Authority (PBT)	<ul style="list-style-type: none"> Town and Country Planning Act 1976 (Act 172) 	<ul style="list-style-type: none"> To ensure that the project complies with the national and state policies and requirements for slope and hill development.
<ul style="list-style-type: none"> Adherence to landuse compatibility (structure/local/special area plan). Development requirements in/near ESAs. Social Impact Assessment (SIA) requirements. 	6. PLANMalaysia (JPBD)	<ul style="list-style-type: none"> Town and Country Planning Act 1976 (Act 172) 	<ul style="list-style-type: none"> 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.

Requirements/Compliance	Agencies/Department	Legal Requirements	Required Outputs
<ul style="list-style-type: none"> Land status compliance. Land acquisition. Minerals release. 	7. Department of Director General of Land and Mines (JKPTG) 8. Land and Mines Office (PTG) 9. District and Land Office (PTD)	<ul style="list-style-type: none"> National Land Code 1965 (Act 56) 	<ul style="list-style-type: none"> 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.
<ul style="list-style-type: none"> Geological Terrain Mapping (GTM) requirements. Geotechnical report requirements. Slope stability and protection requirements. Traffic Impact Assessment (TIA) requirements. 	10. Minerals and Geoscience Department (JMG) 11. Public Works Department (JKR)	<ul style="list-style-type: none"> National Land Code 1965 (Act 35) Minerals Development Act 1994 (Act 525) Geological Survey Act 1974 (Act 129) Road Transport Act 1987 (Act 333) 	<ul style="list-style-type: none"> 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.
<ul style="list-style-type: none"> Development requirements in Central Forest Spine (CFS) areas and linkages (primary and secondary) and in permanent reserved forests (PRF). 	12. Forestry Department of Peninsular Malaysia (JPSM)	<ul style="list-style-type: none"> Forestry Act 1984 (and amendments thereof) (Act 313) 	<ul style="list-style-type: none"> To determine the status of the forest, ensuring it can be developed and is not within PRF, water catchment, etc.

Requirements/Compliance	Agencies/Department	Legal Requirements	Required Outputs
<ul style="list-style-type: none"> Development requirements in/near wildlife sanctuaries and other protected areas. Protection of flora and fauna. Requirement for animal relocation plan, viaduct crossings, etc. 	13. Department of Wildlife and National Parks Peninsular Malaysia (PERHILITAN)	<ul style="list-style-type: none"> Wildlife Conservation Act 2010 (Act 716) 	<ul style="list-style-type: none"> To determine the sensitivity of the site in terms of flora and fauna species and constraints for development.
<ul style="list-style-type: none"> Permission for river diversion. Requirement for river reserves. Stormwater management requirements (MSMA-2). Erosion and Sediment Control Plan (ESCP). 	14. Department of Irrigation and Drainage (DID) 15. State Water Authority	<ul style="list-style-type: none"> Street, Drainage and Building Act 1974 (Act 133) State enactments on water resources, river basins and coastal areas 	<ul style="list-style-type: none"> Determine the hydrological condition of the site and requirements pertaining to changes in river system and runoff management requirements.
<ul style="list-style-type: none"> Development requirements within Orang Asli settlements and their roaming areas, agriculture plots, cultural, heritage, religious and archaeological sites. 	16. Jabatan Kemajuan Orang Asli (JAKOA)	<ul style="list-style-type: none"> Aboriginal Peoples Act 1954 (Revision 1974) (Act 134) 	<ul style="list-style-type: none"> 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.

2.5.2 National and State Policies and Plans

The relevant policies and plans for development in slope and hill areas are listed in **Table 2.5.2**. 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 2.5.2: List of Policies and Plans Relevant to Development on Slope and Hill Areas

Policies and Plans	Details and Scope
National Physical Plan-3 (NPP-3) (JPBD, 2016)	National spatial planning guidelines: covers slope and hill areas.
State Structure and Local Plans (Various local authorities and publishing dates)	State and local level planning guidelines for slope and hill areas: 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.
<i>Pelan Pengurusan Khusus (Pemuliharaan) Tanah Tinggi:</i> (i) Kinta-Cameron Highlands-Lojing (JPBD, 2014). (ii) Genting Highlands-Bukit Tinggi-Janda Baik.	Guidelines for landuse and agricultural development in the two Special Management Areas (SMAs).
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 Science, Technology and Innovation (MOSTI), 2002]	Specifies eight principles to harmonise economic development goals with environmental imperatives. It seeks to integrate environmental considerations into development activities and in all related decision-making processes, foster long-term economic growth and human development, and protect and enhance the environment.

Notes:

- (i) Refer to **Appendix B** for further details.
- (ii) The list is not exhaustive and not all the above may be relevant to the project. It is the responsibility of the Project Proponent and Qualified Person to determine the relevant information required for environmental assessment and compliance.

2.5.3 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 system and 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 2.5.3** provides a list of guidelines and guidance documents for EIA reporting.

Table 2.5.3: List of Relevant Guidelines and Guidance Documents Related to Development Planning on Slope and Hill Areas

Guidelines/Guidance Documents	Details and Scope
<i>Garis Panduan Perancangan Kawasan Sensitif Alam Sekitar</i> (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.
<i>Manual Panduan Pemeriksaan BMPs untuk Kawalan Hakisan dan Sedimen</i> (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
Safety Guideline for Hill Site Development in Penang (Penang State Government, 2012)	Guidelines for development restrictions at steep slope areas for the State of Penang.
Planning Guidelines for Development in Hill Areas and Highlands for Selangor (Selangor State Government, 2010)	Guidelines for development restrictions at steep slope areas for the State of Selangor.
Guidelines for Hillside and Slope Areas Development Planning for the Federal Territory of Kuala Lumpur (Ministry of Federal Territories and Urban Wellbeing, 2010)	Guidelines for development restrictions at steep slope areas for the Federal Territories.
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.
Guidelines for Hillside and Highland Areas Development Planning (JPBD, 2009)	Guidelines for development restrictions at steep slope areas for states without specific guidelines.
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 of soil erosion and siltation for specific projects including examples of control measures and BMPs.
Stream Crossing Guidelines: An Ecological Approach (DID, 2008)	Details on stream crossing requirements.
Guidelines for the Development in Highland Areas (NRE, 2005)	Development controls and restrictions for development in highland areas.
Geotechnical Terrain Mapping Manual (JMG, 2006)	A manual detailing the requirements to carry out GTM for hill and slope projects and the studies and maps required to be produced for any projects in these areas.

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 STAKEHOLDER ENGAGEMENT

2.6.1 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 taken into account 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 relevant approving authority.”

Engaging with stakeholders can have general benefits to a project as shown in **Box 4**.

Box 4:**Aims of the Stakeholder Engagement**

- (i) To understand the GA's key requirements, especially approvals process, and guidelines to be cleared for the project.
- (ii) To convey the aims and scope of the development to the affected stakeholders, inform of potential impacts from the development and mitigation measures put in place to address them. This builds public trust and confidence towards the project.
- (iii) To obtain feedbacks from the stakeholders on their concerns so that adjustments can be made for incorporation into the project designs and EIA for project implementation.
- (iv) To allow early resolution of any conflicts and impasses, avoiding costly delays.

2.6.2 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 land owners 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 2.6.1 presents an indicative, but non-exhaustive, list of stakeholders for engagements with, for projects in slope and hill areas.

Table 2.6.1: Key Stakeholders and their Roles and Responsibilities

Stakeholder	Roles and Responsibilities
Department of Environment (DOE)	<ul style="list-style-type: none"> • 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.

Stakeholder	Roles and Responsibilities
Project Proponent	<ul style="list-style-type: none"> The party to carry out the development and responsible for obtaining all necessary approvals for the site. Involved in the management of the project at all stages of development.
Relevant GAs	<ul style="list-style-type: none"> GAs which have roles and functions in the project and are responsible for the issuance of approvals for studies, technical reports and plans for the project. Engagements 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 shown in Table 2.5.1.
Affected Public and Local Population	<ul style="list-style-type: none"> The public or local population that may be directly or indirectly 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 feedback on mitigation measures.
NGOs	<ul style="list-style-type: none"> Provide input and feedback on issues of special interests.

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.

2.6.3 Methods of Engagement

The engagements are to be conducted based on the following steps:

- (i) Step 1: Identify key areas of policy, regulatory and guidelines compliance from the relevant GAs.
- (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 to the initial technical project design and concept.
- (iv) Step 4: Review and assess all information and feedback obtained to determine those relevant for incorporation into TOR and EIA.

Types of stakeholder engagement are provided in **Table 2.6.2**.

Table 2.6.2: Public Engagement Methods and Expected Outputs

Stakeholder	Type of Consultation	Information Requirement
DOE	<ul style="list-style-type: none"> Meeting and/or pre-consultations. 	<ul style="list-style-type: none"> Comments on TOR/ESI and EIA process and requirements.
Project Proponent and Consultants	<ul style="list-style-type: none"> Meetings and/or private consultations. 	<ul style="list-style-type: none"> Information required for the project. Consultation on changes in project design. Incorporation of P2M2s.
Relevant GAs	<ul style="list-style-type: none"> Meetings and/or pre-consultations. Official correspondence. 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Questionnaire surveys. Interviews (formal and informal). Focal group discussion (FGD). Public briefing. Project brief. Website. 	<ul style="list-style-type: none"> Project briefing. Views and concerns on the project. Inputs for project incorporation. Conflict resolution mechanism.
NGOs	<ul style="list-style-type: none"> Meetings and/or private consultation. 	<ul style="list-style-type: none"> Concerns and inputs on project.

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

2.6.4 Documentation and Reporting

Findings from the stakeholder engagement shall be incorporated into the TOR, especially in regards 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.
- (vi) **Section 3.7:** Determination of Key Project Activities.
- (vii) **Section 3.8:** Identification of Significant Impacts and Priority Setting.
- (viii) **Section 3.9:** Establishment of Study Requirements for EIA.
- (ix) **Section 3.10:** Outlining of 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 3.2.1**).

If the slope and hill project has components falling within both the First and Second Schedule prescribed activities, the Second Schedule EIA shall take precedence.

Potential outcome criteria of project screening are shown in **Box 5**.

Table 3.2.1: Criteria for Screening of Development on Slope and Hill Areas

Activity	Applicability
<p><u>First Schedule</u></p> <p>Activity 12 (b): Construction of hill-station resort or hotel at 300 meters or more above MSL covering an area of 20 hectares or more</p>	<p><u>Type of Development</u></p> <p>The scope of this prescribed activity refers to any development associated with the <u>tourism and hospitality industry</u> at ≥ 300 m above mean sea level (MSL) covering an area of ≥ 20 ha; which includes resorts, hotels, and serviced apartments/commercial residences used for paid short to long-term accommodation (refer to Section 2.4).</p> <p><u>Elevation</u></p> <p>(a) <u>$\geq 1,000$ m</u>: No development allowed except for construction of infrastructure (roads, tunnels, bridges, telecommunications and electricity) of low intensity and of national importance [National Physical Plan 3 (NPP-3), Department of Town and Country Planning (JPBD), 2016].</p> <p>However, a First Schedule EIA is required for hill-station resorts and hotels under the Special Management Areas (SMAs), subject to slope and development restrictions, for:</p> <ul style="list-style-type: none"> (i) Kinta-Cameron Highland-Lojing. (ii) Genting Highlands-Bukit Tinggi-Janda Baik. (iii) Existing development areas gazetted in Special Area Plans (SAPs). <p>(b) <u>$300 - 1,000$ m</u>: First Schedule EIA required subject to slope and development restrictions.</p> <p>(c) <u>< 300 m</u>: No EIA required unless subject to slope requirements or part of other prescribed activities in the Order 2015.</p> <p><u>Project Size</u></p> <p>(a) <u>< 20 ha</u>: No EIA required, unless subject to slope requirements or part of other prescribed activities in the Order 2015.</p> <p>(b) <u>≥ 20 ha</u>: First Schedule EIA required.</p>

Activity	Applicability
<p><u>First Schedule</u></p> <p>Activity 13: Development or land clearing less than 50 percent of an area with slope greater than or equal to 25° but less than 35°</p>	<p><u>Type of Development</u></p> <p>(a) First Schedule EIA is required for any development and land disturbing activities as defined in Section 2.4.</p> <p>(b) The above is subject to the slope criterion (see <u>Slope Degree</u> below).</p> <p><u>Project Size</u></p> <p>All projects which fall within the <u>slope degree</u> requirements shall require a First Schedule EIA regardless of size.</p> <p><u>Slope Degree</u></p> <p>(a) <u><25°</u>: No EIA required unless subject to other prescribed activities in the Order 2015.</p> <p>(b) <u>≥ 25° to <35°</u>: <50% total area – First Schedule EIA; ≥ 50% total area – Second Schedule*.</p> <p>(c) <u>≥ 35°</u>: To adhere to the requirements of existing national and state policies as detailed in Table 2.5.2 for allowable development project.</p> <p>Note: * Calculations for determining total percentage area of slopes for this prescribed activity are provided in detail in Appendix A.</p>
<p><u>Second Schedule</u></p> <p>Activity 13 (a): Development or land clearing of 50 percent or more of an area with slope greater than or equal to 25° but less than 35°</p>	<p>All interpretations are similar with those of the First Schedule Activity 13 with exception of:</p> <p><u>Project Size</u></p> <p>All projects which fall within the <u>slope degree</u> requirements shall require a Second Schedule EIA regardless of size.</p>

Activity	Applicability
<p><u>Second Schedule</u></p> <p>Activity 13 (b): Construction of road, tunnel or bridge traversing an area with slope greater than or equal to 35°.</p>	<p><u>Type of Development</u></p> <p>Second Schedule EIA is required for road projects and associated infrastructure (road tunnels and bridges) based on the slope criterion of $\geq 35^\circ$ degree slope. Private roads are excluded, as defined in Section 2.4.</p> <p>Includes roads, tunnels and bridges which are part of an overall development, e.g. township, which meets the slope degree criteria.</p> <p>Does not apply to construction of standalone tunnels and bridges or non-road related projects [e.g. dam intakes, Mass Rapid Transit (MRT) tunnel, water transfer tunnels, etc.] as these come under separate prescribed activities.</p> <p><u>Slope Degree</u></p> <p>(a) <u>Slopes of $< 35^\circ$</u>: No EIA required unless subject to other prescribed activities in the Order 2015.</p> <p>(b) <u>Slopes of $\geq 35^\circ$</u>: Second Schedule EIA is required.</p> <p><u>Road Type</u></p> <p>Applies to any roads which fall under the JKR definition for urban roads (U1 – U6) and rural roads (R1 – R6).</p> <p>Roads of 20 m Right of Way (ROW) and above, which meets the slope degree requirement, shall be subject to a Second Schedule EIA (refer Table 2.4.1).</p>

Box 5:**Potential Outcomes from Project Screening**

- (i) No EIA is required: If the project does not fall within any prescribed activities under the First or Second Schedule, and/or has insignificant impacts on the environment.
- (ii) EIA is required: If the project will have potentially significant environmental impacts and/or falls within the prescribed activity under the First or Second Schedule.
- (iii) Further studies and clarification from DOE: If the potential impacts from the project are uncertain, indeterminate, ambiguous or may not fall neatly within any prescribed activities, i.e. involving new technologies, DOE shall be consulted upon on the need for an EIA.

3.3 ENVIRONMENTAL SCOPING

The main objective of environmental scoping is to identify the environmental attributes and issues to determine the focus, depth, spatial and temporal boundaries of the EIA that are deemed significant and requiring assessment. Scoping shall be carried out in the early stage of the project cycle. It enables the EIA to focus only on the significant issues, impacts and sensitive receptors.

Scoping shall encompass all environmental aspects (physico-chemical, biological and 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 and pre-judge any issues of concern.

The scoping exercise (also refer to **Figure 3.3.1**) comprises the following steps, which are elaborated on in the accompanying Sections:

- (i) Site Suitability Assessment (SSA): The SSA shall consider all alternatives or options to refine and improve upon the original concept design (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 site conditions and environmental sensitivity (refer to **Section 3.5**).
- (iii) Baseline Data Review: The Qualified Person shall carry out qualitative assessment based on desktop study and literature review. These may be supplemented by initial site investigations and stakeholder engagements (refer to **Section 3.6**). Quantitative assessment can be provided where necessary and available.
- (iv) Determination of Key Project Activities: The Project Proponent shall outline the key project activities that will be carried out during the various phases of project implementation (pre-construction, construction and operations) (refer to **Section 3.7**).
- (v) Identification of Significant Impacts and Priority Setting: This step will involve preliminary identification of significant issues for further detailed assessment in the EIA. Non-significant issues shall also be addressed accordingly in the EIA study but through general/qualitative impact prediction and evaluation (refer to **Section 3.8**).
- (vi) Establishment of Study Requirements for EIA: Identify and detail out the methodologies and assessment tools to be carried out in the EIA for identified significant impacts (refer to **Section 3.9**).
- (vii) Outlining of Mitigation Measures: Based on the identified significant impacts, the Qualified Person shall determine and select suitable mitigation measures to abate the impacts (refer to **Section 3.10**).
- (viii) Preparation and Submission of ESI and TOR: Findings from the scoping exercise shall be compiled, collated and analysed to prepare the TOR for submission to DOE (refer to **Section 3.11**).

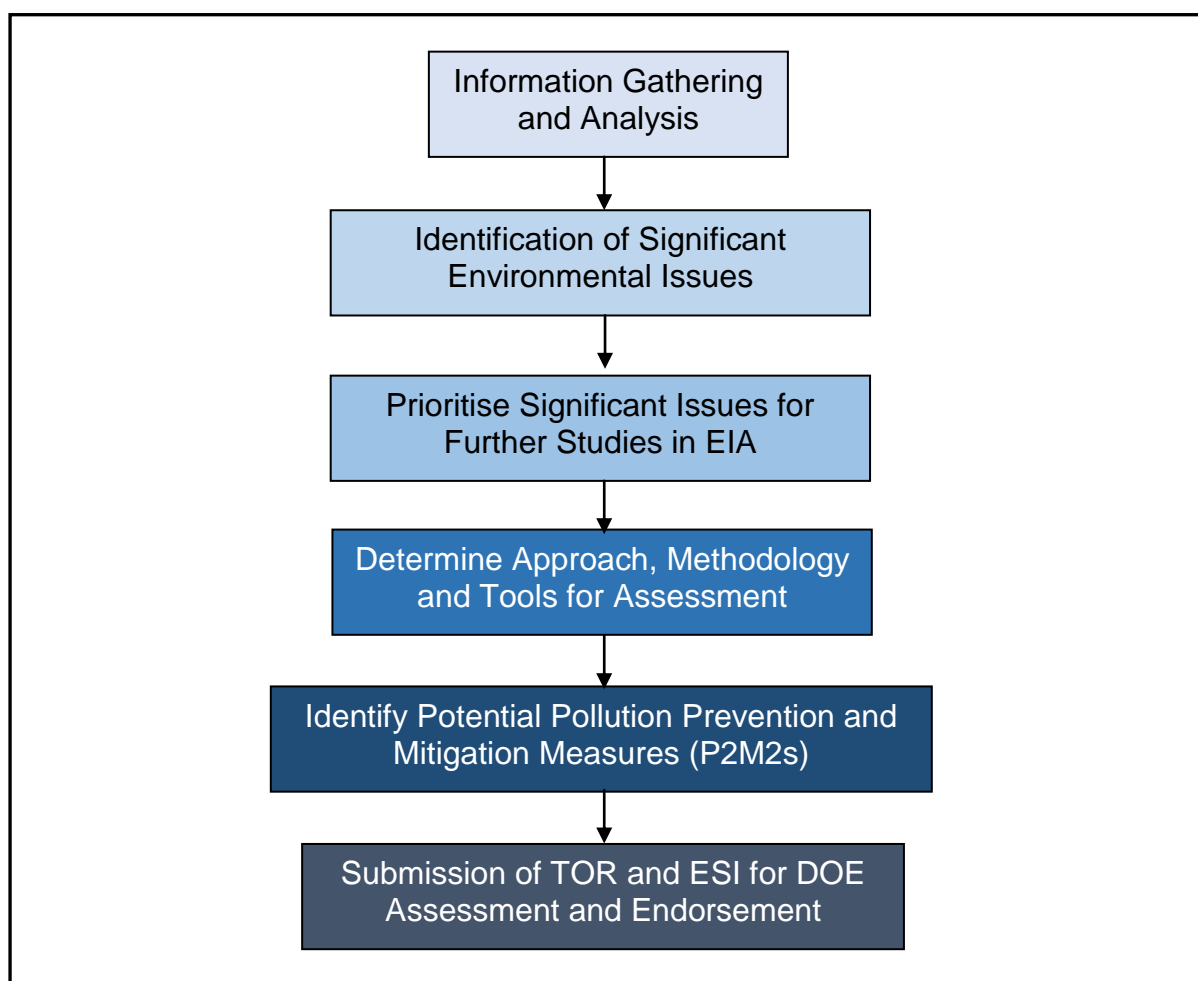


Figure 3.3.1: Flow Path for Environmental Scoping

3.4 SITE SUITABILITY ASSESSMENT (SSA)

The SSA is detailed in the EGIM (DOE, 2016). Generally, this is carried out at the feasibility stage where alternatives and options to the proposed concept and layout will be amended and finalised, which will form the basis in the scoping exercise (refer to **Table 3.4.1** for examples).

The scoping exercise will value add to this SSA through recommendations of pragmatic mitigation measures such as P2M2s and best management practices (BMPs), where potential environmental degradation is anticipated when developing on slope and hill areas.

Table 3.4.1: Considerations in Project Alternatives and Options

Options	Considerations
Project Siting	<ul style="list-style-type: none"> • Adherence to national and state policies and guidelines. • Site constraints to the project and <i>vice versa</i>. • Location and proximity to sensitive receptors. • Availability of adequate buffers. • Any alternative sites proposed for the project.
Terrain and Topography	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Availability of access. • Proximity to construction/source materials. • Strategic locational advantages. • Traffic conditions.
Technology Options	<ul style="list-style-type: none"> • Availability of technology to minimise impacts. • Best available technology (BAT) options. • Benchmarking with alternative technology. • Green technology adoption.
Project Component and Design	<ul style="list-style-type: none"> • Adaptive design to suit terrain. • Layout consideration. • Choice of construction methods. • Maintenance issues.
Social Constraints	<ul style="list-style-type: none"> • Location within or close to existing communities. • Need for land acquisition and relocation.
Economy and Finance	<ul style="list-style-type: none"> • Potential employment and business. • Cost and benefit considerations. • Supply and demand scenarios. • Potential loss of income.
Operations	<ul style="list-style-type: none"> • 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 study boundary is an important component in the TOR/ESI/EIA. Two types of study boundaries shall be used:

- (i) The study boundary, which defines the ZOS. In terms of criteria, the ZOS is the study area generally encompassing a 5-km radial zone from the project boundary (refer to **Figure 3.5.1**). In terms of criteria, the ZOS is left to the Qualified Person to define the limits of the spatial boundary.

For linear projects on slope and hill areas, such as roads, railways and transmission lines, the ZOS shall cover a 1-km corridor (500 m on either side of the ROW) (refer to **Figure 3.5.2**).

- (ii) The impact boundary, which defines the spatial area of potential impacts to extend beyond the ZOS, and hence, this impact area is termed the ZOI (refer to **Figures 3.5.1 and 3.5.2**).

The ZOI may decrease or extend further afield, depending on the attributes of the terrain, alignment of hills and mountain ranges amidst deep valleys, among other factors. For slope and hill development projects, the extent of the ZOI shall also be subject to the findings of the geotechnical engineer and as advised by the Minerals and Geoscience Department (JMG) and of Public Works Department (JKR).

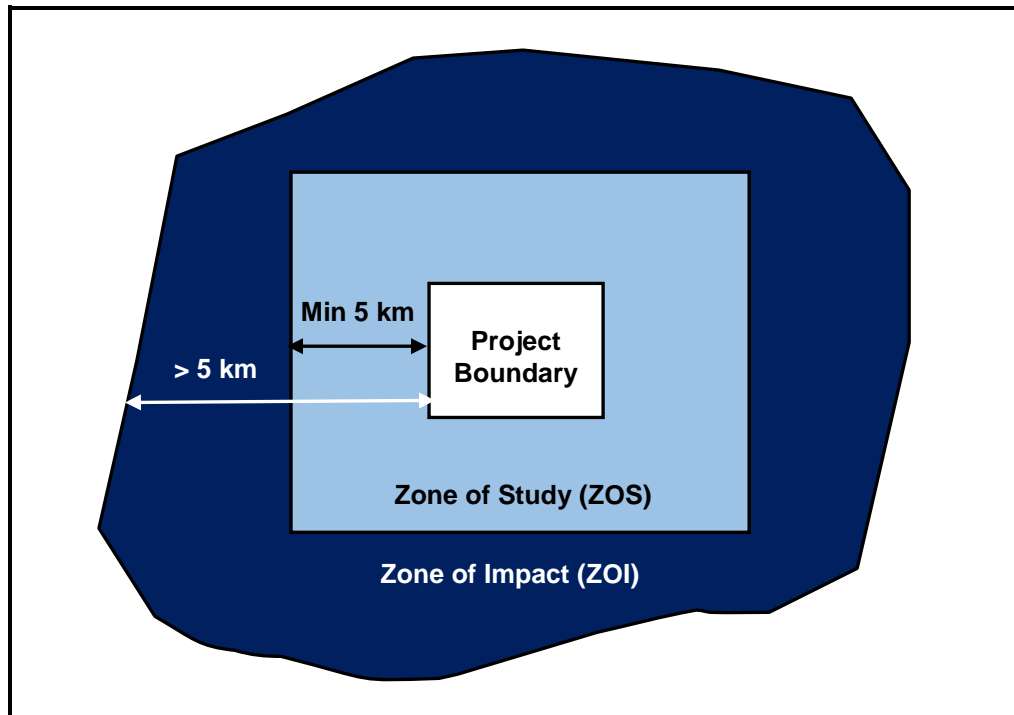


Figure 3.5.1: Diagram Showing the Difference between the ZOS and ZOI

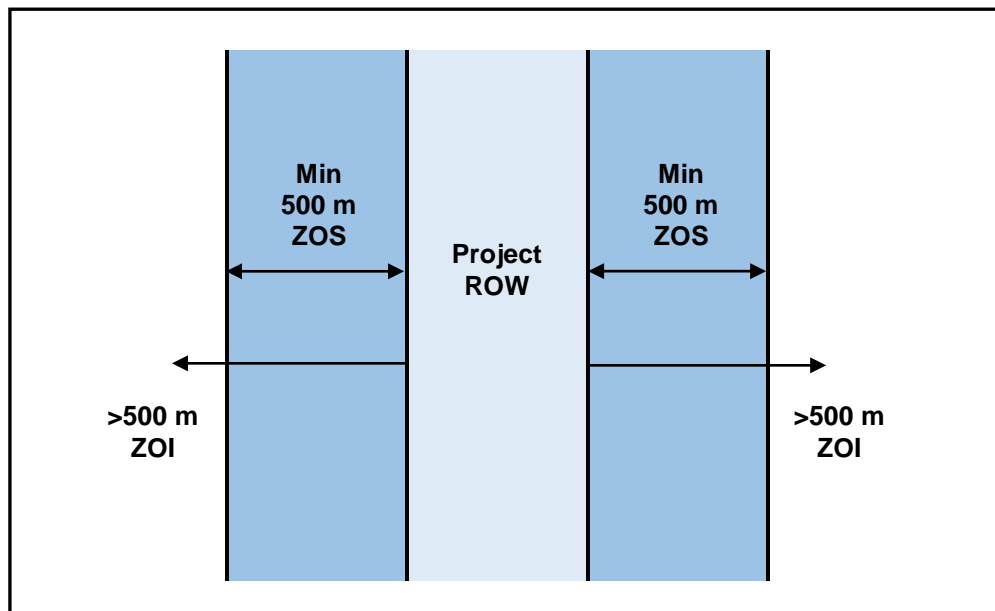


Figure 3.5.2: Diagram Showing the Difference between the ZOS and ZOI for Linear Projects

3.6 BASELINE DATA REVIEW

Table 3.6.1 lists the indicative requirements for baseline description in the environmental scoping exercise. The baseline information shall be qualitative but shall be sufficiently adequate to assess the potential impacts on the sensitive receptors. Quantitative data and findings wherever available, shall be provided to support the assessment.

The level of details shall be based on factors such as project terrain, area, size, slope gradients, types of activities and potential impacts to the surrounding slopes and hills including the lowlands, valleys and the river systems.

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 the levels of significance.

Table 3.6.1: Baseline Requirements for Environmental Scoping

Baseline	Requirements	Data Source
Physico-chemical		
Landuse	<ul style="list-style-type: none"> Landuse maps and photos. Description of existing and future landuse (5-km ZOS). Identification of ESAs. 	<ul style="list-style-type: none"> Topography maps. Aerial or satellite imagery. Structure and local plans (PLANMalaysia). Site investigations.
Geology/ Hydrogeology	<ul style="list-style-type: none"> Description of local and regional geology. Locations of aquifer and groundwater abstraction wells. 	<ul style="list-style-type: none"> Geological and hydrogeological maps by JMG. Geological Terrain Mapping (GTM) report.
Soil and Terrain	<ul style="list-style-type: none"> Topography and slopes. Soil investigation (SI). Construction suitability map. 	<ul style="list-style-type: none"> Site survey. Soil map by Department of Agriculture (DOA). SI report. GTM report.

Baseline	Requirements	Data Source
Climate	<ul style="list-style-type: none"> Climate data (min 5 years). 	<ul style="list-style-type: none"> Malaysian Meteorological Department (METMalaysia).
Hydrology	<ul style="list-style-type: none"> River systems and catchment areas. Flood prone areas. Downstream receptors. 	<ul style="list-style-type: none"> Topography maps. Department of Irrigation and Drainage (DID) flood maps. Site observations.
Water Quality	<ul style="list-style-type: none"> Water quality data (if any). Locations of water pollution sources. Locations of water intake points (WIPs) and water treatment plants (WTPs). 	<ul style="list-style-type: none"> State water resources departments. Published reports by water agencies and DOE.
Air Quality	<ul style="list-style-type: none"> Air quality data (if any) Locations of air polluting sources. 	<ul style="list-style-type: none"> DOE published data. Site observations.
Noise and Vibration Level	<ul style="list-style-type: none"> Locations of high noise and vibration generators. 	<ul style="list-style-type: none"> Site observations.
Biological		
Ecosystem	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> 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). <i>Buku Kawasan Sensitif Alam Sekitar</i> (DOE). Site observations.
Social Aspects		
Demography	<ul style="list-style-type: none"> Details of demographics. Identification of social impact stakeholders. 	<ul style="list-style-type: none"> Population census from Department of Statistics. Local plans from PLANMalaysia. Interviews.
Public Health	<ul style="list-style-type: none"> Description of public health status. 	<ul style="list-style-type: none"> Morbidity statistics and public health data from Ministry of Health (MOH).
Heritage, Culture and Archaeology	<ul style="list-style-type: none"> Locations of historical and cultural sites. Location of Orang Asli areas and settlements. 	<ul style="list-style-type: none"> Data from Department of Museums, National Heritage Department, Jabatan Kemajuan Orang Asli (JAKOA), etc.

Baseline	Requirements	Data Source
Traffic	<ul style="list-style-type: none"> Access to project site. Transport options. 	<ul style="list-style-type: none"> Road maps. Site visit.
Infrastructure, Utilities and Amenities	<ul style="list-style-type: none"> Water, electricity, sewerage, road, telecommunication and waste. 	<ul style="list-style-type: none"> 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 the potential impacts. **Tables 3.7.1 – 3.7.3** provide a summary list of activities in a typical slope and hill development project by phases. The list is not exhaustive and the Qualified Person shall add or delete to the list, whenever and wherever necessary.

Table 3.7.1: List of Typical Project Activities with Issues of Concern during Pre-Construction Phase

Activities	Issues of Concern
<u>Site access</u> <ul style="list-style-type: none"> Vegetation and biomass clearing. Establish temporary stream/river crossing. 	<ul style="list-style-type: none"> Soil erosion Loss of biodiversity and wildlife disturbance Water pollution (silt) Air and noise pollution
<u>Site surveys</u> <ul style="list-style-type: none"> Commissioning of surveys. Establishment of temporary camp sites. Vegetation clearing for survey works. 	
<u>Geological terrain mapping</u> <ul style="list-style-type: none"> Site analysis (survey and computer modelling). Development of GTM maps. 	
<u>Soil investigation and geotechnical studies</u> <ul style="list-style-type: none"> Commissioning of surveys. Establishment of temporary camp sites. Vegetation clearing for survey works. Drilling of boreholes/digging of pits to obtain samples. Lab analysis of samples. 	

Activities	Issues of Concern
<u>Environmental assessment</u> <ul style="list-style-type: none"> • Site assessment. • Collection of samples. • Analysis of samples. 	<ul style="list-style-type: none"> • Soil erosion • Loss of biodiversity and wildlife disturbance • Water pollution (silt) • Air and noise pollution
<u>Land acquisition (if any) under Social Impact Assessment (SIA) and local authorities' scope</u> <ul style="list-style-type: none"> • Identification of affected lots and population. • Issue notice and undertake compensation. • Develop relocation plans through consultation. • Acquire property. • Demolition of structures and buildings. 	<ul style="list-style-type: none"> • Socio-economy (relocation) as part of the SIA requirement by PLANMalaysia • Land use change • Wastes (demolition)

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

Activities	Issues of Concern
<u>Access road and stream crossings</u> <ul style="list-style-type: none"> • Cut new path to project site or rehabilitate existing track. • Establish temporary stream crossing. • Establish drainage and culverts. • Levelling and compacting of the road surface. • Laying of aggregates and slope protection works. 	<ul style="list-style-type: none"> • Soil erosion • Loss of biodiversity and wildlife disturbance • Water pollution (silt) • Air and noise pollution
<u>Base camp and site facilities establishment</u> <ul style="list-style-type: none"> • Construct site office, worker quarters, canteen, toilets and bathing areas, stockpile areas, storage facilities and workshops. • Establish utilities and infrastructure: power supply, water, telecommunications, etc. • Provide temporary treatment systems, e.g. septic tanks for toilets, waste collection areas. 	<ul style="list-style-type: none"> • 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
<u>Worker recruitment, mobilisation of equipment and materials</u> <ul style="list-style-type: none"> • Employ workers to carry out construction work. • Transport equipment and materials required for construction to the storage areas. • Setup workshop areas for servicing and maintenance work. 	<ul style="list-style-type: none"> • Socio-economy (employment, social conflicts – from SIA) • Safety and health (communicable disease, sanitary conditions, accidents and injury) • Air and noise pollution • Wastes (municipal and construction wastes) • Traffic (congestion from heavy vehicle transport)
<u>Site clearing and biomass removal</u> <ul style="list-style-type: none"> • Cut, removal and disposal of vegetation. • Establish temporary biomass disposal site. 	<ul style="list-style-type: none"> • 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)
<u>Earthworks (cut and fill)</u> <ul style="list-style-type: none"> • 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 works (compaction, turfing, lining, etc.). 	<ul style="list-style-type: none"> • 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
<u>Blasting (if needed)</u> <ul style="list-style-type: none"> • Application of chemical cracking or explosive blasting works for boulders and hard surfaces. • Removal of aggregates to temporary storage areas. 	<ul style="list-style-type: none"> • Air pollution (dust) • Noise and vibration • Safety and health (fly rock, structural damage, accident) • Wastes (aggregates, spoils)

Activities	Issues of Concern
<u>Drainage works</u> <ul style="list-style-type: none"> • Diversion of streams and existing drainage. • Establish temporary drainage lines, sediment basins/silt traps and outlets. • Drainage protection works (lining, check dams, compaction, etc.). 	<ul style="list-style-type: none"> • River bank erosion. • Water pollution (silt) • Aquatic habitat deterioration (river alteration, silt) • Flood risk
<u>Structural works and facilities establishment</u> <ul style="list-style-type: none"> • Piling and foundation works. • Batching plant establishment/concrete mixing. • Formworks and concrete pouring for building structures. • Brickworks, roofing and finishing. • Construction of associated facilities (power supply, water supply, telecommunications, waste disposal, etc.). 	<ul style="list-style-type: none"> • 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)
<u>Waste disposal</u> <ul style="list-style-type: none"> • Provision of temporary waste collection and disposal sites. • Collection of accumulated wastes for disposal at designated disposal sites. • Sewage management. 	<ul style="list-style-type: none"> • Wastes (spoil, municipal, scheduled wastes) • Air pollution (odour) • Health impact (disease, vectors, accidents) • Water pollution (floatables, sewage, leachate)
<u>Establishment of permanent access</u> <ul style="list-style-type: none"> • Construction of permanent access road. • Closure of temporary access. 	<ul style="list-style-type: none"> • Soil erosion • Slope stability/failure • Water pollution (silt)
<u>Final finishing and landscaping</u> <ul style="list-style-type: none"> • Installation of street lighting, utilities and amenities. • Planting of trees and vegetation in completed areas. 	<ul style="list-style-type: none"> • 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 3.7.3: List of Typical Project Activities with Issues of Concern during Operational and Closure/Exit Phases

Activities	Issues of Concern
<u>Occupation and operation of project</u> <ul style="list-style-type: none"> • Management of impacts from human activities in the project area. • Traffic management. • Solid waste management. 	<ul style="list-style-type: none"> • Air and noise pollution (traffic, human activities) • Traffic (congestion) • Wastes (municipal wastes) • Socio-economy (employment, economic growth)
<u>Slope maintenance</u> <ul style="list-style-type: none"> • Periodic slope inspection by Qualified Person to ensure safety. • Grass cutting and clearing of drains. • Conduct repairs and rehabilitation as required. 	<ul style="list-style-type: none"> • Soil and geology • Drainage • Safety and health
<u>Infrastructure, utility and amenities maintenance</u> <ul style="list-style-type: none"> • Maintenance of sewage treatment system. • Monitoring of effluent quality. • Conduct repairs as necessary. • Maintenance of infrastructure: roads, drainage, power supply, telecommunications, etc. • Maintenance of landscaping. 	<ul style="list-style-type: none"> • Water pollution (sewage and sullage) • Air and noise pollution • Safety and health • Wastes (municipal wastes) • Visual/aesthetics
<u>Agricultural development</u> <ul style="list-style-type: none"> • Slope maintenance. • Monitor effectiveness of erosion and sediment control measures. • Maintain rainwater collection system and drainage networks. • Management of solid wastes. • Monitor pollutants, e.g. pesticides, fertilizer runoff, silt, etc. • Worker safety and health. 	<ul style="list-style-type: none"> • Soil erosion • Water quality (silt, pesticides, nutrients) • Hydrology (runoff) • Wastes (agricultural wastes, biomass, plastics) • Safety and health (health effects due to pesticide and chemical exposure) • Socio-economy (employment, economic growth)
<u>Site decommissioning</u> <ul style="list-style-type: none"> • Demolition of unwanted temporary structures and buildings. • Removal of machinery, materials and workers from the site. • Fill in depressions and holes. • Removal of wastes. 	<ul style="list-style-type: none"> • Soil erosion • Water pollution (silt) • Air and noise pollution • Safety and health • Wastes (demolition wastes)

Activities	Issues of Concern
<u>Rehabilitation works (Earth platforms and slopes; drainage, mitigation measures)</u> <ul style="list-style-type: none"> Erect hoarding. Establish protection measures for slopes and exposed areas (compaction, turfing and structural measures). 	<ul style="list-style-type: none"> 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 to conduct the scoping exercise. These include checklists, matrices, or any other accepted methods, to assist in systematically organising, collating and analysing the data for the project. At the TOR stage, qualitative assessment is adequate but quantitative data can be provided to support the assessment.

Table 3.8.1 lists the advantages and disadvantages of the various common methods used. The list given is not exhaustive and any other suitable method can be used, if relevant.

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

The Qualified Person and the Project Proponent's input is vital at this stage as their knowledge and experience would ensure appropriate weightage is given to the issues under assessment (see **Box 6**).

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

Table 3.8.1: Advantages and Disadvantages of Impact Identification Methods

Method	Advantages	Disadvantages
Checklists	<ul style="list-style-type: none"> • Easy to understand and use. • Good for site selection and priority setting. • Simple ranking and weightages. 	<ul style="list-style-type: none"> • Do not distinguish between direct and indirect impacts. • Do not link action and impact. • The process of incorporation of values can be controversial.
Matrices	<ul style="list-style-type: none"> • Link action to impacts. • Good method for displaying EIA results. 	<ul style="list-style-type: none"> • Difficult to distinguish direct and indirect impacts. • Have potential for double-counting of impacts.
Networks	<ul style="list-style-type: none"> • Link actions to impacts. • Useful in simplified form to check for second order impacts. • Handles direct and indirect impacts. 	<ul style="list-style-type: none"> • Can be very complex if used beyond simplified version.
Overlays	<ul style="list-style-type: none"> • Easy to understand. • Focus and display spatial impacts. • Good siting tool. 	<ul style="list-style-type: none"> • Can be cumbersome. • Poorly suited to address impact duration or probability.
GIS and Computer Expert Systems	<ul style="list-style-type: none"> • Good for impact identification and spatial analysis. • Good for experimenting. 	<ul style="list-style-type: none"> • 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 6:**Criteria for Determining Significance of Environmental Impacts**

- (i) Magnitude: Defined as the degree and scale of an impact (may be detrimental or beneficial) towards sensitive receptors due to a proposed activity.
- (ii) Permanence: Defined as to whether the effects are temporary in nature (e.g. only during certain work activities or only during the construction stage), or may result in permanent effects (e.g. landform alteration due to cut and fill).
- (iii) Reversibility: A measure of whether mitigation measures can be implemented in rehabilitating the site back to its original state or better.
- (iv) Cumulative Effects: A measure of whether the effects will be accumulative singly or in combination with other effects from nearby sites/activities (that may be detrimental or beneficial) over a time period.

3.8.2 Key Issues Related to Development on Slopes and Hill Areas

Slope and hill projects cover a variety of terrain which poses many constraints compared to development in lowland areas.

Some of the key environmental impacts that should be highlighted in the TOR and EIA for slopes and hill areas are:

- (i) Ecological sensitivity: Hills and highlands are home to a variety of flora and fauna. Since their habitats vary with elevations, e.g. from lowland to montane forests, any development encroaching on these habitats will result in a loss of endemic, endangered, rare and threatened species. Likewise, forest fragmentation (especially from road construction) can restrict the free movement of animals within their roaming range and human disturbance may drive many away from their habitats.

For all the above, the Project Proponent and the Qualified Person will have to engage with the Forestry Department of Peninsular Malaysia (JPSM) and the Department of Wildlife and National Parks Peninsular Malaysia (PERHILITAN) on measures for ecological sustainability before proceeding with the EIA.

- (ii) Space constraints: Hills and highlands have space constraints. Development generally requires cut and fill with little space for temporary storage and/or disposal of biomass, overburden/spoils and wastes materials. The overburden is often bulldozed along the steep slopes some forming berms and platforms causing increased risk of erosion and landslide hazards.

Similarly, there is a lack of space to construct the silt and sediment traps essential to control runoff and sediments. This situation may require improvisation or adoption of site suitable measures or mitigation measures such as use of pipe slope drains (PSD) to address the impacts. Best available technology (BAT) options need also be considered such as advanced treatment systems using polymers to speed up removal of sedimentation from runoff.

- (iii) Soil erosion and sedimentation: The soil, geology and terrain of steep slopes (*tanah curam*) pose challenges whereby any land disturbing activities will result in significant soil erosion, landslides and sedimentation in rivers. Erosion can be exacerbated by entrainment of surface runoff and mudflows to cause damage to residential areas, agriculture lands, infrastructure, etc. along its downward path. Hence, mitigation measures using P2M2 are central to the overall mitigation measures to control erosion in slope and hill areas.

Polluted runoff affects the quality of waterways and impact the downstream environment and users. Silt washed into rivers and drainage can lead to choking of the river, affect aquatic life, pollute water sources and affect economic activities (aquaculture, recreational activities, water supply, etc.).

- (iv) Slope hazards: The steeper the slope the more geotechnical and engineering measures are required to maintain slope stability. Improperly protected slopes or badly drained slopes may undermine slope protection to result in slope failure and landslides, endangering nearby landuse and communities.
- (v) Site access: Due to the hilly terrain, accessing the site poses logistics problems. The project may require construction of temporary access, which cuts into the hill slopes, causing erosion, water pollution and slope stability issues. The effects are also felt downstream where the eroded materials accumulate and cause localised ponding and

flooding, some of which are also caused by improperly constructed stream crossings that obstruct the natural stream flows.

- (vi) Hydrology: During and after land clearing and platforming, the natural physical terrain and drainage of the area will change hydrologically and morphologically. Silt from erosion will result in shallower streams, which are already quite shallow in highland areas. The local groundwater table and the drainage structure may also change.
- (vii) Visual effects: Removal of vegetation and exposure of the bare areas will have a negative visual impact compared to a natural scenery with greenery. The design of buildings and landscaping can help to blend in with the natural environment to provide a positive visual appeal.

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

The Qualified Person shall provide the methodologies, assessment/modelling tools, and expected outputs derived from the assessment of the significant impacts, as part of the TOR. **Table 3.9.1** provides a list of applicable studies. This list is only indicative and non-exhaustive as site conditions can vary from project to project. Hence, it is the responsibility of the Qualified Person to check and verify the applicability and extent of the relevant studies to be conducted for a specific project.

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

Table 3.9.1: List of Applicable Studies to be Considered in the EIA

Study Reference	Approving Authority	Prescribed Activity				
		First Schedule			Second Schedule	
		Activity 12 (b)	Activity 13		Activity 13 (a)	Activity 13 (b)
			≤ 5 ha	>5 ha		
Slope Analysis • Terrain and slope classification	JMG/JKR	√	√	√	√	√
Geological Terrain Mapping (GTM)* ¹ • Erosion • Terrain Classification • Terrain Component • Construction Suitability	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 Modeling • Total suspended solids (TSS) • Sewage loading	DOE	√	√	√	√	√
Soil Investigations (SI)* ²	JMG/JKR	√	√	√	√	√
Geotechnical Report* ²	JMG/JKR	√	-	√	√	√

Study Reference	Approving Authority	Prescribed Activity				
		First Schedule			Second Schedule	
		Activity 12 (b)	Activity 13		Activity 13 (a)	Activity 13 (b)
			≤ 5 ha	>5 ha		
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	Department of National Heritage					
Wastes Assessment • Biomass, Scheduled Wastes, Construction and Demolition, Domestic, etc.	DOE/ National Solid Waste Management Department (JPSPN)/ Local Authority (PBT)					

Notes:

- (i) First Schedule Activity 12 (b): Construction of hill-station resort or hotel at 300 meters or more above MSL covering an area of 20 hectares or more.
- (ii) First Schedule Activity 13: Development or land clearing less than 50 percent of an area with slope greater than or equal to 25° but less than 35°.
- (iii) Second Schedule Activity 13 (a): Development or land clearing of 50 percent or more of an area with slope greater than or equal to 25° but less than 35°.

- (iv) Second Schedule Activity 13 (b): Construction of road, tunnel or bridge traversing an area with slope greater than or equal to 35°.
- (v) *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.
- (vi) *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.
- (vii) *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.
- (viii) 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 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 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) 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.
- (e) 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.
- (f) Study Boundary: Delineate the study boundaries and identify the environmentally sensitive areas (ESAs) within the zone of study/zone of impacts.
- (g) Assessment Standards: List the standards, criteria, acceptable limits, etc. that will be used to assess the environmental impacts.
- (h) Timeline of Study: Detail our all studies/investigations to be carried out, including indicative dates.
- (i) Consideration of Concurrent Projects: List potential concurrent or planned projects that may result in cumulative impacts.
- (j) Description of Modelling Tools and Assessment Methodologies: List the modelling tools and methodologies to undertake the impact assessment and evaluation of significance.
- (k) 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 7** for possible outcomes).

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

Box 7:
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).

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CHAPTER 4

ENVIRONMENTAL IMPACT ASSESSMENT: BASELINE DATA

4.1 INTRODUCTION

This Chapter provides a range of baseline data for the Environmental Impact Assessment (EIA). There are two types of data forming the baseline for a slope and hill project. These are secondary and primary data.

4.2 SECONDARY DATA COLLECTION

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

All sources of information and statistics have to be clearly referenced and acknowledged alongside the date of publications in the EIA [Department of Environment (DOE) Notice 1/2012 dated 6 Jan 2012]. References for all maps, photos and diagrams will also need to be included in the EIA.

4.3 PRIMARY DATA COLLECTION

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

The sampling and assessment area shall be bounded by the Zone of Study (ZOS). However, if the impact is much further away, then the Zone of Impact (ZOI) shall be part of the sampling and assessment area. This has to be clearly defined in the EIA. An example of this is erosion and water pollution, for which the impacts are felt much further away than the ZOS to the ZOI. Hence, the latter must be included in the assessment study.

Data collection covers three major environmental components:

4.3.1 Physico-chemical Environment

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

A baseline sampling plan, which includes locations, methods of sampling, frequency and parameters to be sampled, shall be decided based on the project site. Details of the sampling plan and schedule (person in charge, time, date and location of sampling) must be clearly stated in the EIA.

Table 4.3.1 provides a range of baselines for sampling and studies. The recommended parameters for water, air, noise and vibration, and the standards to benchmark them against, are provided as reference (refer to **Appendix D** for details).

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 the appendix of the EIA as supporting evidence (DOE Notice 1/2012 dated 6 Jan 2012).

4.3.2 Biological Environment

The biological environment is very wide ranging in scope. 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, surveys and assessments of the results.

A lot of general information already exists in the various agencies for slopes and hill areas that are part of 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 published research and inventories of flora and fauna in selected forest areas and conservation zones.

Specific to the project site when secondary data is unavailable, primary data will be collected because land clearing and earthworks in forested areas will

cause direct impacts to the fauna in the area. 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 types of animals found in the area, population and their 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 and requirement for the terrestrial and aquatic biological environment are determined by the respective government agencies (GAs). The assessment reports are to be approved by the said GAs before incorporation of the findings in the EIA report (refer to **Table 4.3.2**). If the biological impact of the Project is not significant, secondary data would suffice.

4.3.3 Human Environment

Relevant data collection will be required for the section on socio-economic environment in the EIA. Secondary data includes the population census but for an accurate population statistics, these data is best collected from the local authorities, district offices (PTD) and the *ketua kampungs*. Socio-economic data such as population profiles will have to be obtained from focal group discussion (FGDs) and direct person-to-person interviews.

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.

Other aspects that may affect communities within the vicinity of the project site shall be considered if they are deemed as significant issues. The requirements may include, but not be limited to, public health, heritage and culture, archaeology and traffic (refer to **Table 4.3.2**). The findings of these studies must be incorporated into the EIA.

Table 4.3.1: Recommended Sampling Requirements for EIA Studies

Aspect	Recommended Parameter*	Guidelines/Standards	Recommended Requirements
River Water Quality	<p><u>In-situ Measurements</u></p> <ul style="list-style-type: none"> Dissolved Oxygen (DO) Temperature Conductivity pH <p><u>Ex-situ Analysis</u></p> <ul style="list-style-type: none"> Biochemical Oxygen Demand (BOD) Chemical Oxygen Demand (COD) Total Suspended Solids (TSS) Ammoniacal Nitrogen (AN) Mercury (Hg) Cadmium (Cd) Chromium Trivalent (Cr^{3+}) 	National Water Quality Standards of Malaysia (NWQS)	<ul style="list-style-type: none"> One time composite sampling. Upstream and downstream of major rivers and streams within the ZOI. 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. Pesticides testing required for agricultural and/or forestry projects. Water quality parameters shall be selected based on the site conditions.

Aspect	Recommended Parameter*	Guidelines/Standards	Recommended Requirements
Air Quality	<ul style="list-style-type: none"> PM_{2.5}^{*1} PM₁₀^{*1} Carbon Monoxide (CO)^{*2} Sulphur Dioxide (SO₂)^{*2} Nitrogen Dioxide (NO₂)^{*2} Ozone (O₃)^{*2*3} <p>Source: DOE Notice 1/2015 dated Mar 2015</p>	Malaysian Ambient Air Quality Standards (MAAQS)	<ul style="list-style-type: none"> Parameters to be sampled are dependent on site conditions. One time sampling at minimum two stations (upwind and downwind). Project boundary and nearest receptors. <p>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.</p>
Noise Level	<ul style="list-style-type: none"> L_{Aeq} L_{Max} L_{Min} L₁₀ L₅₀ L₉₀ 	Guidelines for Environmental Noise Limits and Control (DOE)	<ul style="list-style-type: none"> Parameters to be sampled are dependent on site conditions and need. One time sampling (24-hrs for day time and night time). Project boundary and nearest receptors.

Aspect	Recommended Parameter*	Guidelines/Standards	Recommended Requirements
Vibration	<ul style="list-style-type: none"> Requirements as per Schedules 1 – 6 of the Planning Guidelines for Vibration Limits and Control 	The Planning Guidelines for Vibration Limits and Control	<ul style="list-style-type: none"> Parameters to be sampled are dependent on site conditions and need. One time sampling (1-hr for day time 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 4.3.2: Additional Sampling and Study Requirements

Aspect	Recommended Parameter	Reference	Sampling Requirements	Approving Authority
Geology and Soil	<ul style="list-style-type: none"> Site topography based on land surveys Seismicity Soil profile analysis including K-value for erosion analysis. Hazard mapping 	<ul style="list-style-type: none"> JMG and JKR requirements 	<ul style="list-style-type: none"> Soil Investigation (SI). Hand auger (determine K-value) Field survey of slope areas and hazards (as part of Geological Terrain Mapping). 	<ul style="list-style-type: none"> Minerals and Geoscience Department (JMG) Public Works Department (JKR)
Hydrology	<ul style="list-style-type: none"> Stream flow Riverbed cross section 	<ul style="list-style-type: none"> DID requirements 	<ul style="list-style-type: none"> Site survey to verify river system and drainage. Stream gauging to ascertain flow and river bed cross-section. Identification of downstream sensitive receptors. 	<ul style="list-style-type: none"> Department of Irrigation and Drainage (DID)
Hydrogeology	<ul style="list-style-type: none"> Groundwater profile Groundwater quality 	<ul style="list-style-type: none"> JMG requirements 	<ul style="list-style-type: none"> Groundwater table. Hydrogeological mapping. Groundwater quality sampling (minimum two locations depending on project size). 	<ul style="list-style-type: none"> JMG

Aspect	Recommended Parameter	Reference	Sampling Requirements	Approving Authority
Ecological Assessment	<ul style="list-style-type: none"> Habitat mapping Species inventory (including photographs) Abundance and diversity assessment 	<ul style="list-style-type: none"> International Union on the Conservation of Nature (IUCN) Red List Wildlife Conservation Act 2010 (Act 317) 	<ul style="list-style-type: none"> <u>Terrestrial</u>: Surveys within project site and adjacent. <u>Aquatic</u>: Within project site and nearby ESAs (fishery resources, aquaculture sites, etc.). 	<ul style="list-style-type: none"> JPSM PERHILITAN Department of Fisheries (DOF)
	<u>Terrestrial Flora</u> <ul style="list-style-type: none"> Flora inventory 		<ul style="list-style-type: none"> ESAs (within ZOI). Identify any endemic, rare, endangered, threatened and near extinct species within the project site and surrounding ZOI. 	
	<u>Terrestrial Fauna</u> <ul style="list-style-type: none"> Mammals Avian Herpetofauna 		<ul style="list-style-type: none"> Level of sampling and data collection shall depend on the sensitivity of the site. 	
	<u>Aquatic Flora and Fauna</u> <ul style="list-style-type: none"> Fishery resources Phytoplankton and zooplankton Benthic organisms 			

Aspect	Recommended Parameter	Reference	Sampling Requirements	Approving Authority
Landuse	<ul style="list-style-type: none"> • Current landuse • Future and committed landuse • Sensitive receptors • Zoning and compatibility 	<ul style="list-style-type: none"> • Structure and local plans 	<ul style="list-style-type: none"> • Site surveys. • Mapping to update information. • Within the ZOI. 	<ul style="list-style-type: none"> • PLANMalaysia
Social Impact Assessment (SIA)	<ul style="list-style-type: none"> • Population profile • Identification of stakeholders • Perception survey 	<ul style="list-style-type: none"> • Manual for SIA of Project Development 	<ul style="list-style-type: none"> • Carried out as part of the SIA. • Surveys on target groups potentially affected by the project. • Surveys shall represent the stakeholders in the ZOI. • Stakeholder engagement conducted. 	<ul style="list-style-type: none"> • PLANMalaysia
Public Health	<ul style="list-style-type: none"> • Population profile • Public health status 	<ul style="list-style-type: none"> • Guidance Document on Health Impact Assessment (HIA) in EIA 	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • Ministry of Health (MOH)

Aspect	Recommended Parameter	Reference	Sampling Requirements	Approving Authority
Traffic	<ul style="list-style-type: none"> Traffic count for peak traffic periods 	<ul style="list-style-type: none"> JKR requirements 	<ul style="list-style-type: none"> Carried out as part of the Traffic Impact Assessment (TIA). Traffic surveys at major junctions leading to project site. 	<ul style="list-style-type: none"> JKR
Wastes	<ul style="list-style-type: none"> Estimation of biomass from site clearing. Potential waste (biomass, domestic, construction & demolition, scheduled wastes) generation. 	<ul style="list-style-type: none"> DOE and local authorities (PBT) requirements 	<ul style="list-style-type: none"> Site surveys to ascertain existing site conditions. 	<ul style="list-style-type: none"> DOE PBT
Heritage, Culture and Archaeology	<ul style="list-style-type: none"> Identify and determine significance of value of such sites within or near to project site. 	<ul style="list-style-type: none"> National Heritage Register 	<ul style="list-style-type: none"> Site surveys and interviews with authorities and locals. 	<ul style="list-style-type: none"> National Heritage Department. Department of Museum. Jabatan Kemajuan 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. 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 for any software, it 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 details in the impact identification shall commensurate with the following factors:

- (i) Scale of the project (land area, total disturbed areas, etc.).
- (ii) Intensity of development (total land clearing, phasing of land clearing).
- (iii) Potential pollution sources from the project.

- (iv) Magnitude and complexity of impacts.
- (v) Area of impacts (localised versus transboundary).
- (vi) Probability of cumulative impacts (effects of project on adjacent land areas and *vice versa*).
- (vii) Sensitivity of nearby receptors [e.g. Environmentally Sensitive Areas (ESAs)].

Table 5.2.1 provides a list of typical significant components and impacts related to development on slope and hill areas as a guide. Photo inventories are very important evidences in the evaluation exercise and should be provided (see examples in **Figure 5.2.1**).

Key assessments include, but are not limited to, the following:

5.2.1 Ecology

Assessment Requirements

- (i) Mapping of important habitats and ESAs, e.g. forest reserves, mossy forests, lakes and wetlands, etc.
- (ii) Inventory of existing flora and fauna (terrestrial, aquatic and/or marine) in the project area and surrounding impact zones to ascertain the level of biodiversity.
- (iii) Identification of critical species benchmarked with the lists published by the International Union for Conservation of Nature (IUCN) red list or similar 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 are in need of relocation or protection.

Evaluation of Impacts

- (i) Determine the level of encroachment into ESAs such as permanent reserved forests (PRF) or ecologically rich habitats.
- (ii) Indication of possible loss of habitat and its flora and fauna, 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.

- (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 the 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 replace the lost area.
- (ii) Identification of critical areas to incorporate mitigation measures such as viaducts to allow for safe passage of animals or need to translocate important species at risk from the project, and how to go about it.
- (iii) Develop wildlife management plan.

5.2.2 Erosion and Sedimentation

Assessment Requirements

- (i) Assessment of the scale of land clearing and removal of vegetative cover at the site to determine the rate of erosion.
- (ii) Assessment of the conditions of the hydrological and drainage systems and how they may be altered as streams and rivers are diverted and/or become silted up or filled in, leading to increased runoff volume and velocity while their retention time and infiltration rates are reduced (see also **Section 5.2.4**).
- (iii) Assessment of the extent of erosion and sedimentation that will likewise affect the aquatic ecology and water pollution downstream (see also **Sections 5.2.1 and 5.2.5**).
- (iv) 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.
- (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.

5.2.3 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.

5.2.4 Hydrology

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 river systems within 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.

5.2.5 Water Quality

Assessment Requirements

- (i) Assessment of the types and scale of impairment to water quality of the rivers and streams at the project site and the surrounding areas.
- (ii) Determination of potential sources that include siltation from land clearing and earthworks (see also **Section 5.2.2**), biomass degradation, sewage and sullage discharge from worker quarters and oil and grease (O&G) spills.
- (iii) During operations, improper treatment of sewage can also contribute to increased nutrients into the waterways, leading to their ecological degradation and thus its impacts on downstream users need to be ascertained.

Evaluation of Impacts

- (i) There is a variety of models to determine pollution loadings in the rivers and waterways. Choose the most suitable model to simulate the loading and determine the magnitude and extent of the impacts further downstream especially for key water pollutants indicators [biochemical oxygen demand (BOD), ammoniacal nitrogen (AN) and coliform].
- (ii) At the project site, identify potential water polluting sources (toilets, worker quarters, canteen, batching plant, workshops, etc.). This will determine the development of BMPs for the site.
- (iii) For the downstream section of the rivers, to identify the users and sensitive habitats and determine the impacts if any.
- (iv) Determine whether the pollution load will affect any WIPs, WTPs, sensitive ecological habitats, etc.

Output

- (i) Suitable BMPs and treatment systems identified to minimise the effects of discharges to the waterways, e.g. silt traps, sewage treatment systems, etc.
- (ii) Effectiveness of these BMPs 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.

5.2.6 Air Quality and Noise

Assessment Requirements

- (i) Air Quality: Identification of potential air pollution generating sources from the project site and nearby sensitive receptors that may result in elevated dust levels and dispersions from construction and rock blasting works. During operations, impacts from vehicular emission and fuel burning equipment shall be assessed.
- (ii) Noise Levels: Assessment of high ambient noise environment and activities that pose impairment hazards to the workers and any nearby receptors from machineries and equipment on-site.

Evaluation of Impacts

- (i) Air Quality: Air quality models are mainly Gaussian-based and many are available in the market. Use the most suitable one to simulate the air pollutant dispersion patterns and map it to determine the range of impacts. The level of pollutants pre and post-development shall be assessed for the major sensitive receptors.
- (ii) Noise Levels: This again can be modelled or calculated based on increase in noise levels, mapped as noise contours over a given area.

Output

- (i) Both air and noise model simulations shall identify the extent of the potential impacts to any nearby sensitive receptors.
- (ii) Critical levels for pollutants at sensitive receptors shall be identified to be mitigated to ensure the levels are within acceptable limits and to ensure those working in such areas are protected against.

5.2.7 Social Impacts

Assessment Requirements

- (i) Determination of whether there is land and property acquisition and relocation of communities. These issues often cause psychological, emotional and impacts to those who are affected and have to be handled with great care.

- (ii) Assessment of extent of impacts from dust, pollution, noise, hazards, etc. on nearby communities and worker at-site. However, the project can also provide positive benefits such as increased job opportunities and business to the local population.
- (iii) Assessment of the views and perception of the affected stakeholders and if their inputs, recommendations and requirements of the project and mitigation measures to address their concerns.

Evaluation of Impacts

- (i) Identify the extent of land acquisition and affected stakeholders.
- (ii) Delineate the survey catchment and determine statistically, the number of representative surveys required to ensure reliability and representativeness of the stakeholders. For the EIA, 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 the impacts on them.
- (iii) Data for surveys can be obtained through FGDs, interviews and site questionnaire surveys. Findings shall be analysed and the output assessed.
- (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 EIA commissioning and submissions.
- (ii) The findings from the social impacts, mainly from surveys and focal 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.

5.2.8 Waste Management

Assessment Requirements

- (i) Identification of the types of wastes generated during construction and operations such as biomass, scheduled, construction, domestic and municipal wastes and their impacts.

- (ii) Assessment of the impacts from these wastes and required management measures required to be carried out.

Evaluation of Impacts

- (i) Identify and estimate the quantum of all waste sources with the assistance of the technical and engineering consultants.
- (ii) Assess the severity of impacts from improper management of such wastes on water quality (leachate), odour, air quality and public health.
- (iii) Identify locations of temporary storage areas within the project site.
- (iv) Identify locations where the wastes will be eventually disposed off.

Output

- (i) Identification of proper temporary disposal sites and storage facilities for wastes generated on-site including mitigation measures against spillage 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 locations so as not to pollute the environment.

5.2.9 Traffic

Assessment Requirements

- (i) Description of how construction materials, workers and machinery are mobilised to/fro from the construction site. Higher vehicle volume can cause congestion, damaged roads, material spillage and increased risk of road accidents.
- (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 (risk to accidents, air quality, public health) for the EIA are communities living along the logistic road during construction.
- (iii) During the operation phase, the extra volume of traffic generated by the project will also affect any communities along the road, and should be studied.

Output

- (i) Identification of potential issues related to traffic during construction and operations and incorporation of structural and non-structural measures to address these issues as proposed by the TIA Consultants.
- (ii) Identification of risk factors from various activities to nearby communities, such as from accidents, health, etc.

5.2.10 Safety and Health

Assessment Requirements

- (i) Construction entails higher risks to the safety and health of the workers and any surrounding communities from pollution, diseases, accidents and hazards, and these risks are to be assessed.
- (ii) For slopes and hill projects, the risk assessment should tie in with the assessment on geotechnical hazards (see **Section 5.2.3**) as it also relates to safety of the public.

Evaluation of Impacts

- (i) Use risk assessment models to ascertain the level of risk from specific 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 receptors can assist in monitoring for sudden decrease in community health 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, handling hazardous materials, confined spaces, at height, 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 Health Impact Assessment (HIA) can also provide possible preventive and mitigation measures to safeguard worker and community health during construction and operation.

5.2.11 Summary

Table 5.2.1: Typical Issues and Impacts from Slope and Hill Development

Issues	Impacts
Ecology	<p><u>Earthworks and construction</u></p> <ul style="list-style-type: none"> • Loss of habitat (forests, aquatic, lakes, etc.). • Flora and fauna may be affected and have to relocate to adjacent sites. • Poaching. <p><u>Operation</u></p> <ul style="list-style-type: none"> • Forest fragmentation. • Roadkill. • Human-wildlife conflicts (HWC).
Erosion and Sedimentation	<p><u>Earthworks</u></p> <ul style="list-style-type: none"> • 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	<p><u>Construction and operation</u></p> <ul style="list-style-type: none"> • Seismic events. • Slope instability/failure. • Loss of life and damages to property. • Mud flows. • Sedimentation of waterways and water bodies.

Issues	Impacts
Hydrology	<p><u>Earthworks</u></p> <ul style="list-style-type: none"> • Altered watercourses and drainage systems. • Sedimentation of waterways and water bodies. • Impact on aquatic habitats and downstream water users. <p><u>Construction</u></p> <ul style="list-style-type: none"> • Storm flows, peak discharges and flooding. <p><u>Operation</u></p> <ul style="list-style-type: none"> • Flooding due to blocked drainage. • Flood risk due to natural disasters.
Water Quality	<p><u>Earthworks</u></p> <ul style="list-style-type: none"> • Water pollution from soil erosion and sedimentation. • Impacts to downstream water users, e.g. WIPs, recreational areas, aquaculture farms, etc. • Ecological degradation. <p><u>Construction</u></p> <ul style="list-style-type: none"> • Sewage and sullage from work camps. • Soil contamination and water pollution due to leakage of oil and chemicals from equipment and machinery operations. <p><u>Operation</u></p> <ul style="list-style-type: none"> • Sewage discharge from sewage facilities. • Eutrophication.
Air Quality	<p><u>Earthworks and construction</u></p> <ul style="list-style-type: none"> • Dust generation from earthworks and vehicular movement. • Emission from fuel burning equipment, e.g. gen-set. • Open burning by workers. • Health problems of workers and nearby residents. <p><u>Operation</u></p> <ul style="list-style-type: none"> • Increased emission from vehicular traffic. • Emissions from fuel burning equipment.

Issues	Impacts
Noise	<p><u>Earthworks and construction</u></p> <ul style="list-style-type: none"> • 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. <p><u>Operation</u></p> <ul style="list-style-type: none"> • Noise from human activities and vehicular traffic.
Social Impacts	<p><u>Earthworks</u></p> <ul style="list-style-type: none"> • People may require relocation. • Disruption to community structure and economic activities. <p><u>Construction</u></p> <ul style="list-style-type: none"> • Nuisance and disturbance to nearby communities during construction. • Accidents and injury risks. • Increase in job and business opportunities. • Presence of large number of foreign workers may lead to conflicts. • Increased demand for facilities, utilities and amenities. <p><u>Operation</u></p> <ul style="list-style-type: none"> • Improved access to facilities and amenities.
Wastes	<p><u>Earthworks</u></p> <ul style="list-style-type: none"> • Biomass wastes from land clearing. • Construction and demolition (C&D) wastes. • Spoil and unsuitable material disposal. <p><u>Construction</u></p> <ul style="list-style-type: none"> • Solid wastes from work camps. • Scheduled wastes from workshops and refuelling stations can result in land and water contamination. • Odour and unsightliness from improper waste management. <p><u>Operation</u></p> <ul style="list-style-type: none"> • Waste management.

Issues	Impacts
Traffic	<p><u>Earthworks, construction and operation</u></p> <ul style="list-style-type: none"> • Heavy vehicle access along public roads. • Spillage onto roads. • Traffic congestion. • Damage to roads. • Safety risk to road users and communities.
Safety and Health	<p><u>Earthworks and Construction</u></p> <ul style="list-style-type: none"> • Work-related injuries. • Improper waste management attracts pests and scavengers. • Risk of communal disease spread. • Accidents. <p><u>Operation</u></p> <ul style="list-style-type: none"> • Landslides. • Safety and health risks.
Visual Impact	<p><u>Earthworks</u></p> <ul style="list-style-type: none"> • Loss of vista. • Reduced quality of life. <p><u>Operation</u></p> <ul style="list-style-type: none"> • Landscaping will improve overall 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.



Soil erosion from worked slopes



Landslides and mudflows



Degraded waterways



Water pollution



Poor scheduled waste management



Improper management of spoils

Figure 5.2.1: Photo Inventory of Common Impacts associated with Slope and Hill Development



Figure 5.2.1: Photo Inventory of Common Impacts associated with Slope and Hill Development

5.3 PREDICTIVE METHODS AND TOOLS

There is a wide range of predictive tools and models for prediction, evaluation and assessment of impacts. Among the methods and tools are:

- (i) Expert opinion.
- (ii) Consultations and questionnaires.
- (iii) Checklists.
- (iv) Spatial analysis.
- (v) Network and system analysis.
- (vi) Matrices.
- (vii) Carrying capacity analysis.
- (viii) Mathematical and computer modelling.
- (ix) Case studies.

Simple methodology is preferred, though this depends on the complexity of the impacts. Whichever method is chosen, it must be appropriate to address the problem, taking into consideration the local conditions of the 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 is required:

- (i) Name and description of method/model.
- (ii) Model set-up.
- (iii) Data collection and analysis.
- (iv) Calibration and validation.
- (v) Detail of scenarios for modelling.
- (vi) Presentation of results (raw data, table form, graphs).
- (vii) Limitations in data collection or method chosen.

All modelling exercises carried out shall capture the impacts under various scenarios, either for short-, mid- to long-term for the worst-case scenario. The outputs of the modelling studies shall be presented in a concise manner and all uncertainties shall be discussed.

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

Ultimately, the main text for impact assessment in the EIA shall be the predictive results and outputs of studies, which have to be in sufficient technical details to support the assessment. It must also be written in a manner that is easily understood by decision makers and the public.

Table 5.3.1 summarises examples of the available and 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 to select one of the methods in the list.

Table 5.3.1: Examples of Prediction Methods for Environmental Impacts

Impacts	Prediction Methods	Output
Erosion and Sedimentation	<ul style="list-style-type: none"> Revised Universal Soil Loss Equation (RUSLE). Modified Universal Soil Loss Equation (MUSLE). Computer models. 	<ul style="list-style-type: none"> Soil loss rates and sediment yield. Erosion risk and potential soil loss maps.
Landslide and Slope Failure	<ul style="list-style-type: none"> 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). 	<ul style="list-style-type: none"> Identification and mapping of high risk areas to avoid or to apply mitigation measures.
Hydrology	<ul style="list-style-type: none"> 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). Hydrological analysis in accordance with <i>Manual Saliran Mesra Alam Edisi-2</i> (MSMA-2) and approved by DID. 	<ul style="list-style-type: none"> Estimation of pre-construction and post-construction runoff. Flood risk map.

Impacts	Prediction Methods	Output
Water Quality	<ul style="list-style-type: none"> 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 discharge modelled using Qual2K or Delft3D or MIKE11. 	<ul style="list-style-type: none"> Estimation of TSS (erosion) and BOD and AN (sewage) concentration affecting a stretch of river and downstream sensitive areas. Estimation of pollution load and extent of effect on sensitive receptors.
Air Quality	<ul style="list-style-type: none"> Gaussian plume dispersion model to assess dust generation and gas dispersion over an area under the worst case scenario. 	<ul style="list-style-type: none"> Dispersion contour map indicating levels at sensitive receptors. Comparison of computed values with the Malaysian Ambient Air Quality Standards (MAAQS). Determination of location of maximum air pollution concentration.
Noise Level	<ul style="list-style-type: none"> Mathematical models to assess noise levels for point source or linear sources. Noise modelling software, such as SoundPlan, CadNa or Geographic Information System (GIS) acoustic models. Traffic noise models. 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Comparative assessment of conservation status and sensitivity of habitat, flora and fauna. Ecological models for species diversity and population change. Limit of Acceptable Change (LAC). Spatial models, such as GLOBIO3. 	<ul style="list-style-type: none"> Habitat map. Species inventory, especially of rare, endangered, threatened and near extinct species that may require protection.

Impacts	Prediction Methods	Output
Social Impacts	<ul style="list-style-type: none"> • Social and economic surveys on affected population. • Perception survey to ascertain acceptance of project. • Social Impact Assessment (SIA). 	<ul style="list-style-type: none"> • Socio-economic profiling. • Public opinion survey results. • Stakeholder feedback for EIA including possible mitigation measures.
Landuse	<ul style="list-style-type: none"> • Compatibility assessment based on structure plan, local plan and other guidelines. • Adherence to required setback based on national and state guidelines. 	<ul style="list-style-type: none"> • Landuse compatibility and buffer requirements.
Public Health	<ul style="list-style-type: none"> • Qualitative/quantitative health risk assessment (HRA) encompassing hazard identification, exposure assessment and risk characterisation. 	<ul style="list-style-type: none"> • Potential health impacts to nearby population.
Biomass	<ul style="list-style-type: none"> • Estimation on total biomass based on vegetation types and published studies values. 	<ul style="list-style-type: none"> • Predicted biomass waste generation.
Scheduled Wastes	<ul style="list-style-type: none"> • Identification of potential scheduled wastes generation during construction and operations based on project activities. 	<ul style="list-style-type: none"> • Predicted scheduled waste generation.
Solid Wastes	<ul style="list-style-type: none"> • Waste generation estimation based on population. 	<ul style="list-style-type: none"> • Predicted waste generation.
Traffic	<ul style="list-style-type: none"> • Traffic impact assessment including simulation of peak traffic flows under various scenarios and junction analysis, e.g. Signalised and Unsignalised Intersection Design and Research Aid (SIDRA). 	<ul style="list-style-type: none"> • Comparison of traffic scenarios pre- and post-project and need for road improvements.
Infrastructure and Utilities	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • Estimates of demand.

Impacts	Prediction Methods	Output
Aesthetics	<ul style="list-style-type: none"> Visual assessment on scenic and aesthetic value of the area. 2-D and 3-D Viewshed Analysis. 	<ul style="list-style-type: none"> 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 level of significant impact is to benchmark the results against the stipulated current criteria and standard limits imposed by DOE and/or various Government Agencies (GAs) (refer to **Appendix D**).

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

Table 5.4.1 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 8**).

Table 5.4.1: Examples of Criteria and Standards for Environmental Parameters

Impacts	Evaluation Criteria
Erosion and Sedimentation	<p><u>Guidance Documents</u></p> <ul style="list-style-type: none"> (a) Guidance 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) <i>Manual Saliran Mesra Alam Edisi-2</i> (MSMA-2) (DID, 2012). <p><u>Sediment basin/silt trap discharge</u></p> <ul style="list-style-type: none"> (a) <u>TSS</u>: 50 mg/L or 100 mg/L, depending on locality. (b) <u>Turbidity</u>: 250 NTU.

Impacts	Evaluation Criteria
Water Quality and Pollution Control	<ul style="list-style-type: none"> (a) <u>Ambient water quality</u>: National Water Quality Standards (NWQS). (b) <u>Sewage discharge</u>: Environmental Quality (Sewage) Regulations 2009. (c) <u>Toilets and septic tanks</u>: SPAN approved design and requirements.
Flood/Runoff Management	MSMA-2 (DID, 2012) requirements.
Air Quality	<ul style="list-style-type: none"> (a) Environmental Quality (Clean Air) Regulations 2015. (b) Malaysian Ambient Air Quality Standards (MAAQS).
Noise Level	<ul style="list-style-type: none"> (a) The Planning Guidelines for Environmental Noise Limits and Control 2nd Edition (DOE, 2007). (b) Factories and Machinery (Noise Exposure) Regulations 1989.
Vibration	<ul style="list-style-type: none"> (a) The Planning Guidelines for Environmental Vibration Limits and Control 2nd Edition (DOE, 2007). (b) JMG requirements for blasting operations.
Ecology	<ul style="list-style-type: none"> (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	<ul style="list-style-type: none"> (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	<ul style="list-style-type: none"> (a) Acceptable level of service (LOS) for traffic flows. (b) Local authority/Public Works Department (JKR) requirement.
Safety and Health	<ul style="list-style-type: none"> (a) Occupational Safety and Health Act 1994. (b) Factory and Machinery Act 1967. (c) Department of Occupational Safety and Health (DOSH) requirements. (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).

Impacts	Evaluation Criteria
Social Impacts/ Heritage, Culture and Archaeology	<ul style="list-style-type: none"> (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: <ul style="list-style-type: none"> (i) <u>SIA 1</u>: Development projects under subsection 20B(1) and (2) of Act A1522 for coastal reclamation projects and major national infrastructure. (ii) <u>SIA 2</u>: 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 <u>development in slope and hill areas</u>. (iii) <u>SIA 3</u>: Any other development projects with significant social impacts as ordered by the National Physical Planning Council (MPFN) from time to time.
Wastes	<p><u>Scheduled wastes</u> Environmental Quality (Scheduled Wastes) Regulations 2005.</p> <p><u>Other wastes</u></p> <ul style="list-style-type: none"> (a) Solid Waste and Public Cleaning Management Act 2007. (b) Local authority requirements.
Treatment Systems	<ul style="list-style-type: none"> (a) Technical Guidance Document on the Design and Operation of Industrial Effluent Treatment Systems (DOE, 2015). (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, 2006).
Visual Aesthetics	Public perception on acceptability.

Notes:

- (i) Refer to **Appendix D** 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 8:**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 receive the 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 by the stipulated criteria and standards.

CHAPTER 6

ENVIRONMENTAL IMPACT ASSESSMENT: MITIGATION MEASURES

6.1 INTRODUCTION

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

- (i) Avoidance of negative impacts through selection of best options/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.

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

The LD-P2M2 is a mandatory requirement under the Department of Environment (DOE), 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.

The P2M2 is the most important section in an Environmental Impact Assessment (EIA) report. The P2M2 is required as long as there are land disturbing activities, or land-based activities that interface with the sea; subject to Section 34A of the Environmental Quality Act (EQA) 1974.

The Guidance Document for the *Preparation of the Document on LD-P2M2* is provided in Appendix 4 of the Environmental Impact Assessment Guideline in Malaysia (EGIM) (DOE, 2016).

6.2.1 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 bowring for dust control at site and hoardings for noise.
- (ii) Priority shall be given to control at source (e.g. reducing erosion and surface runoff) than to rectify the impacts later on (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 include adequate explanations based on the design and function; and supported by diagrams, illustrations, photos and maps. The technical reports and specifications of the P2M2 shall be included as an appendix in the EIA.
- (v) The use of new technology is encouraged if it can be proven to be effective in mitigating the impacts.
- (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 for such a purpose.
- (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 pledge given by the Project Proponent shall reflect a commitment towards ensuring the P2M2s are implemented during all stages of work activities. These efforts shall include but not limited, to measures, actions or due diligence in accomplishing the overarching goal of protecting the environment in project implementation.

6.2.2 LD-P2M2 Checklist

The information to be included is as per the LD-P2M2 Submission Checklist in **Table 6.2.1** adapted from the EGIM (DOE, 2016). All submissions shall be accompanied by relevant technical drawings and maps.

Table 6.2.1: Standard Requirements for the LD-P2M2 Submission

Requirement	Information to be Included
Project Activity and Implementation	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Selected weather and rainfall data. • Site runoff velocity and flow rates (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 onsite as well as receiving streams and rivers. • List of P2M2s proposed. • Access roads and project components located outside of project boundary.

Requirement	Information to be Included
	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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.

6.3 POLLUTION CONTROL SYSTEMS

One of the main features in the LD-P2M2 is the use of pollution control systems. During construction on slope and hill areas, the concerns are mainly erosion, slope stability and water pollution. It is judicious to plan and install P2M2s before land clearing and construction commence.

During the operational phase, top-side development will generate different types of pollutants, mainly from discharges of sullage, sewage and surface flows. Depending on the scale and volume of such pollutants, a pollution control system plan incorporating appropriate P2M2s is advocated together with specifications of the control equipment and the technical engineering maintenance works. The most common is for the Sewage Treatment Systems (STS). Other systems, whenever necessary, may include Industrial Effluent Treatment Systems (IETS), Air Pollution Control Systems (APCS) and Leachate Treatment Systems (LTS), if they are part of the overall project.

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.

6.4 P2M2S FOR SLOPES AND HILL PROJECTS

The following sections provide the objectives and implementation steps for P2M2 for slope and hill projects:

6.4.1 Ecological Management

Objective: To safeguard the critical habitats and biodiversity of important flora and fauna from degradation during pre- and post-project implementation.

Implementation Steps:

- (i) Slopes and hill areas are sensitive environments. They are covered by vegetation, which provides vital habitats to wildlife. Therefore, the implementation approach is to use the avoidance principle as a conservation strategy as far as possible, for the forested hill areas.
- (ii) The application of the avoidance principle could be difficult on slope and hill areas due to space constraints. The approach shall then be on minimising the impacts by confining land clearing and construction activities to within the plinths and designated work area, leaving the remaining project area untouched. Although this may require more planning and time, it is worthwhile as a conservation strategy.

Box 9:**P2M2 Checklist for Ecological Management****Earthworks and Construction**

Measures to minimise disturbances to wildlife and flora. Examples include:

- (i) Ban on poaching.
- (ii) Delineate work area.
- (iii) Wildlife Management/Relocation Plan.
- (iv) Notify the relevant authorities of any sighting of rare, endangered, threatened and near extinct wildlife such as the Forestry Department of Peninsular Malaysia (JPSM) and Department of Wildlife and National Parks Peninsular Malaysia (PERHILITAN) for appropriate actions.

Operation

In areas with important habitats and forest connectors, the following measures may be required, especially for road projects:

- (i) Viaduct/animal crossings.
- (ii) Signage to warn motorists.
- (iii) Human-Wildlife Conflict (HWC) resolution mechanism.

6.4.2 Erosion and Sediment Management**(a) Site Clearing and Earthworks**

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

Implementation Steps

- (i) Establish proper scheduling and phasing of P2M2 implementation in accordance to the project implementations schedule.
- (ii) Retain much of the natural vegetation by reducing the total worked area. Demarcate site and buffer areas.

- (iii) Reduce the period of slope and cleared areas exposure.
- (iv) Stabilise bare slopes and apply protective covers when not working on them.
- (v) Properly protect stockpile areas.
- (vi) Implement P2M2 for erosion and sediment control measures to reduce soil erosion and surface flows downstream.

(b) Runoff and Stormwater Management

Objective: To properly manage runoff from the project site to prevent localised flooding and risk of flooding downstream, especially during the rainy seasons.

Implementation Steps

The EIA shall assess the impacts of the drainage system to intercept the rapid conveyance of stormwater by using a series of retardation methods from P2M2 and *Manual Saliran Mesra Alam Edisi-2* (MASMA-2) designed to manage the volume of flows down the slopes. These include, but are not limited to, the following:

- (i) Installation of temporary drains to minimise concentrated water flows during construction. In area constraint sites, 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 velocity and peak flows. Temporary energy dissipater structures are often used to reduce flow velocity.
- (iii) The size and capacity of the drains must be sufficient to take in at least a storm of 10-year ARI event (see also MSMA-2).
- (iv) All drainage and waterway banks shall be stabilised, e.g. rock cover, turf reinforcement mats, etc.
- (v) Proper stream crossing and culverts are required along waterways to prevent blockage or restriction in flows.

(c) Sediment Control

Objective: To ensure effective control of sediments at-site, using tools in P2M2 (both structural and non-structural) to reduce water pollution and sedimentation of rivers.

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.
- (ii) Retardation/capture structures and devices are to be designed to accommodate the calculated runoff volume to allow adequate time for suspended sediments to settle before the runoff is conveyed further.
- (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, entrance stabilisation, road cleaning and dust control.

Box 10:**P2M2 Checklist for Erosion and Sediment Management****Site Clearing and Earthworks**

Erosion and sedimentation management during earthworks and construction include:

- (i) Phased construction.
- (ii) Erosion, sediment and drainage controls in the LD-P2M2.
- (iii) Stabilised entrance and access roads.
- (iv) Slope turfing.
- (v) Temporary cover for exposed areas, e.g. erosion control mats, mulching, etc.

Runoff and Stormwater Management

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

- (i) Temporary drainage system based on MSMA-2.
- (ii) Cascading and pipe slope drains (PSD) along berms and steep slopes.
- (iii) Inlet and outlet protection.
- (iv) River buffer provision.
- (v) Stream crossing.
- (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 with the exception of 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 capture runoff from the site.

6.4.3 Slope Stabilisation and Protection

Objective: To ensure cut and fill slopes are properly protected against potential geo-hazards that may result in severe erosion, landslides, mudslides and slope failures, which may endanger the workers and nearby receptors.

Implementation Steps

- (i) The measures under the LD-P2M2 shall be incorporated in the slope designs early to ensure slope stability. The critical factors for slope failures are rainfall with accompanying poor drainage on cut and fill slopes, soil conditions and geological structures.
- (ii) Slopes shall be designed as per technical engineering calculations. All slopes have to be properly protected, monitored and rehabilitated during the different phases of project implementation.
- (iii) The level of details in the geotechnical engineering solutions for slopes shall be provided by the qualified geotechnical team based on the requirements of the technical agencies such as the Minerals and Geoscience Department (JMG) and Public Works Department (JKR).

Box 11:

P2M2 Checklist for Slope Stabilisation and Protection

Earthworks and Construction

The measures to prevent landslides and slope failures from occurring before, during and after the implementation of the project. Examples include:

- (i) Adequate buffer zone/setback provided.
- (ii) Slope benching with suitable protection measures (runoff and erosion control).
- (iii) Geotechnical measures for identified hazard areas.

Note:

Reference can be made to JMG and JKR requirements for slope design and monitoring.

Operation

The measures are intended to ensure that slopes are well maintained and not at risk of failure. Slopes are required to be monitored and periodic maintenance carried out.

6.4.4 Water Pollution Control

Objective: To prevent water pollution in rivers and waterways within and in the surrounding areas of the project site. Where possible, to maintain water quality at baseline conditions or better within the DOE prescribed limits.

Implementation Steps

- (i) Potential water pollutants are constituents of silt, sewage, sullage, machinery discharges, nutrients, oil and grease (O&G), etc. Silt traps and sediments ponds will be able to trap most of the physical constituents such as silt and sediments except for dissolved materials and O&G before final discharge.
- (ii) Proper storage areas including adequate bunding are to be provided for scheduled wastes, chemicals, spoils, fuel tanks and waste disposal areas.
- (iii) Suitable treatment system especially for sewage and sullage shall be utilised 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 accidental release, measures are to be in place to contain, remediate and remove the contaminants from the waterways.

Box 12:**P2M2 Checklist for Water Pollution Control****Earthworks and Construction**

Measures to prevent TSS and O&G from entering into the downstream rivers and drainage systems during the construction phase must be proposed.

- (i) LD-P2M2.
- (ii) Septic tank and toilet facility at base camp to follow the National Water Services Commission (SPAN) requirements.
- (iii) Establish proper workshop area.
- (iv) Bunded storage for scheduled waste storage, chemical storage and fuel tank area.
- (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 sewage and sullage to be treated to the stipulated standards.

A proper STS shall be required if there are any sewage generated. O&G traps required in commercial areas, canteens and kitchens.

6.4.5 Air Pollution Control

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

Implementation Steps

- (i) Clean up all spillage along logistic roads and entrances/exits cleaned up.
- (ii) Any potential emission sources such as fuel burning equipment have to comply with the relevant agencies' requirements and limits.
- (iii) Regular housekeeping to remove mud trekking along roads.

- (iv) All emissions shall be ensured to meet the DOE emission standards while open burning is prohibited at all times.

Box 13:

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 logistic routes and earth stockpiles.
- (ii) Measures to reduce equipment and vehicular emissions.
- (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

Most emissions will be from vehicles and fuel burning equipment, if any. All emissions must abide by the emission standards of DOE and install air pollution control systems (APCS) as needed.

6.4.6 Noise and Vibration Control

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

Implementation Steps

- (i) Noise and vibration impacts can be addressed through measures such as phasing construction work; use of measures to reduce, enclose and suppress machinery; use of physical barriers; or maintaining natural ones.
- (ii) Protection of workers through the use of personal protection equipment (PPE) is important to a work environment.

Box 14:**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.

6.4.7 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 and operations.

Implementation Steps

- (i) Wastes comprise biomass, municipal, construction and demolition (C&D) and scheduled wastes, all of which require specific management strategies.
- (ii) The key approach is to ensure proper storage facilities or disposal sites are provided on-site and the regular collection and disposal of such wastes to their designated sites.
- (iii) General housekeeping of the construction site is also important. No open burning of wastes is allowed.

Box 15:**P2M2 Checklist for Waste Management****Earthworks and Construction****Solid Wastes**

The measures for proper solid waste management include:

- (i) Temporary disposal area.
- (ii) Waste bins in active work areas.
- (iii) Regular housekeeping.
- (iv) Disposal at a local authority licensed landfill.

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) Scheduled waste inventory.
- (iii) Proper scheduled waste labelling.
- (iv) Spill kit.
- (v) 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.

6.4.8 Safety and Health

Objective: To ensure the workers and the general public's safety and health are not compromised with ongoing construction works.

Implementation Steps

- (i) Safety and health measures are intended to address issues such as work place conditions, worker's health. This include preventive checks on any communicable diseases among the workers, provision of

personal protective equipment (PPE), fire fighting equipment, safety trainings and having an emergency response plan (ERP) in place.

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

Box 16:

P2M2 Checklist for Safety and Health

Earthworks and Construction

The measures for safety and health are:

- (i) Emergency Response Plan (ERP).
- (ii) Safety officer employed.
- (iii) PPE requirements.
- (iv) Workers to have CIDB green card.
- (v) Health checks on workers to prevent spread of communicable diseases.
- (vi) Training

6.4.9 Land Traffic Management

Objective: To manage traffic along logistic roads to reduce the risk of accidents and inconvenience to the general public.

Implementation Steps

- (i) A traffic management plan is necessary in the case of road logistics and closures or partial closure to accommodate heavy vehicular traffic to and from the project site throughout the construction and the operation period.
- (ii) P2M2 such as improvements in road infrastructure will be necessary to ensure future traffic to and from the project site is smooth to minimise congestion.

Box 17:**P2M2 Checklist for Land Traffic Management****Earthworks and Construction**

The measures should include proper land traffic control and management plans and mechanisms to minimise traffic woes.

- (i) Schedule heavy vehicle traffic.
- (ii) Have a transportation plan ready.
- (iii) Impose speed limits.

Note:

Shall abide by local authorities and JKR requirements for traffic management and transportation requirements.

6.4.10 Visual

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

Implementation Steps

- (i) Wherever possible, preserving natural areas not affected by construction, should be carried. This includes all river courses and slope buffers.
- (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.

6.5 P2M2S FOR AGRICULTURAL DEVELOPMENT IN HIGHLAND AREAS

This Section applies only to cases of agriculture and floriculture development in highland areas, which are permitted under the existing national and state policies and regulations.

The National Physical Plan-3 (NPP-3) allows for development of highland areas, even those exceeding 1,000 m above Mean Sea Level (MSL) for township development and agricultural activities within designated Special Management Areas (SMAs). The designated SMAs are:

- (i) Kinta-Cameron Highlands-Lojing
- (ii) Genting Highlands-Bukit Tinggi-Janda Baik

However, agriculture activities are governed under the Guidelines for Agricultural Development in Slope Areas [Department of Agriculture (DOA), 2010], which set the limitations on the types of crops to be grown on various slope degrees (refer **Appendix B**).

Impacts from agricultural development during the land clearing phase will be similar to land clearing and earthworks for projects on slope areas. However, the unique challenge is during the operational phase.

During the operational phase in agricultural areas in the highlands, there is an increase in solid and liquid wastes. Solid waste pollution comes from plastic sheets (as rain shelters) over the short-term crops, wastes from cocopeat disposal, farm materials, crop residues and packaging remnants. Liquid wastes are from partially treated sewage, sullage, leachates from fertilisers and pesticides. All of these will cause water contamination and pollution issues.

Table 6.5.1 provides a checklist of the P2M2 and BMPs to address these agricultural issues. A case study (see **Box 18**) was carried out at Lojing Highlands to better understand the issues faced in this type of development in the highland areas.

6.6 RESIDUAL IMPACTS

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

Table 6.5.1: Checklist of Required P2M2 and BMPs for Land Disturbing Activities for Agriculture in Highland Areas

Aspect	P2M2s and BMPs
Erosion and Sedimentation	The measures shall incorporate all relevant and practical erosion and sedimentation controls. Examples include: (i) Phased land clearing (2 ha per time). (ii) LD-P2M2. (iii) Erosion control measures on slopes and cleared areas. (iv) Slope turfing/hydroseeding (signal grass). (v) Buffer. (vi) Access roads to be paved.
Landslides and Slope Failures	The measures must prevent landslides and slope failures from occurring before, during and after the implementation of the project. Examples include: (i) Structured platforms. (ii) Slope protection measures.
Drainage and Flooding	Measures to be put in place to address runoff from the site and provide facilities to store stormwater or to properly convey them to other areas. (i) Rainwater harvesting system. (ii) Drainage system.
Water Pollution	Measures to address sedimentation from exposed areas while controlling other sources of pollution related to agricultural activities. Examples include: (i) LD-P2M2. (ii) Good Agricultural Practices (GAP) – fertilisers, pesticides and herbicides. (iii) Bunding for fuel storage.
Biomass Management	The measures must include proper biomass management controls including the selection of proper disposal areas.
Solid Waste Management	The measures must include proper solid waste management controls including the selection of proper disposal areas. Some examples include: (i) Waste bins. (ii) Waste collection and disposal.
Scheduled Wastes	The measures must include proper scheduled waste management controls in adherence to the Environmental Quality (Scheduled Wastes) Regulations 2005.

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 any additional requirements for BMPs to address significant issues for the project.

Box 18:**Case Studies for Slope and Hill Development: Cameron Highlands and Lojing****Site Description**

Cameron Highlands (elevations 1,100 m to 1,600 m above MSL) is located in Pahang sharing a common border with Kelantan in the north and Perak in the west. Cameron Highlands is well-known for its highland agriculture and tourism.

Jajahan Kecil Lojing, under Jajahan Gua Musang in Kelantan, shares the border with Cameron Highlands in the southwest. The area is dominated by highland agricultural activities.



Typical view of agricultural area development in Lojing Highlands

Challenges

The terrain and steep slopes make land clearing and development a challenge. Over the years, habitat degradation, erosion and landslides, water pollution, sedimentation and downstream flooding, are common occurrences.

Many farming activities not adhering to BMPs remain a problem. Other major issues are water pollution from suspended solids (SS); nutrient leaching and pesticides.

Silt and sediments have left the rivers and dams shallow, affecting the generation of hydropower by Tenaga Nasional Berhad (TNB).



Landslide along Simpang
Pulai Road to Kg Raja



Erosion and sedimentation
due to land clearing

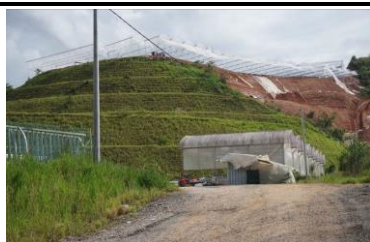


Siltation of Sultan Abu Bakar
Dam and Reservoir

Box 18:**Case 1: Agricultural BMPs at Lojing Highlands**

Darulnaim Agro Management Industries (DAMAI) Sdn Bhd, is a pilot project for sustainable agricultural development in Lojing to showcase on effective highland agricultural BMPs:

- (i) Earthworks carried out only in phases and during the dry season.
- (ii) Maintenance of river buffer zones.
- (iii) Construction of silt trap and sediment basin.
- (iv) Temporary and permanent erosion and sediment control measures put in (slope benching, signal grass, structured platforms, etc.).
- (v) Provision of proper drainage system and paved roads.
- (vi) Rainwater capture and harvesting facilities.
- (vii) Structured platforms for steep slopes.



Development phasing



Established vegetable farms



Rainwater harvesting system



Plastic sheet for erosion control



Sediment basin for sediment control



Drainage system to convey runoff

Box 18:**Case 2: Slope Protection Works for Access Road at Ulu Jelai Hydroelectric Project**

TNB's Ulu Jelai Hydroelectric Project (HEP) has put in place slope protection works as part of its environmental management for its access road across the steep terrain to the dam site and associated facilities. Among the measures included:

- (i) DOE approved the EIA and DID approved the Erosion and Sediment Control Plan (ESCP) for access road construction.
- (ii) An Environmental Management Team (EMT) was established and carried out monitoring on the road throughout the construction and operational phases.
- (iii) Road was built along natural terrain contours.
- (iv) Existing vegetation covers were maintained in areas not involved in construction works and used as buffers.
- (v) Slope protection works included shotcrete treatment, slope benching and signal grass establishment to control erosion and sedimentation.
- (vi) Slope drainage (berm, bench, slope, etc.).
- (vii) Proper tarred/paved road.
- (viii) Bank and outlet protection for dam discharge tunnel.
- (ix) Slope monitoring and maintenance of failed areas.
- (x) Proper establishment and mitigation of spoil disposal area.



Proper tarred road



Slope benching and signal grass establishment



Slope protection work (shotcrete treatment)



Aggregate layer as slope protection



Slope protection works at Dam site



Soil nailing and concrete treatment along Jalan Lembah Bertam

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).

Key contents of the EMP are formatted as the scope of works in the Bill of Quantities (BQ) for the contractors to bid for project implementation.

Other than mitigation measures, the EMP includes the guided self-regulation requirements (GSR), 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.

7.2 EMP FRAMEWORK

In the Environmental Impact Assessment (EIA) phase, the project may not have sufficient information of the project work plan to produce a comprehensive EMP. The EMP chapter in the EIA will only be an EMP framework for eventual morphing into a full EMP after the 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 the requirements stated within the Environmental Impact Assessment Guideline in Malaysia (EGIM) (DOE, 2016), and shall contain details from the Land Disturbing Pollution Prevention

and Mitigation Measures (LD-P2M2) Document and the proposed monitoring and audit programmes.

7.3 GUIDED SELF-REGULATION (GSR)

Details on the GSR for the project shall be incorporated into the EMP framework as required in the Environmental Mainstreaming Directive issued by DOE.

This shall cover the seven environmental mainstreaming tools:

- (i) Environmental Policy.
- (ii) Environmental Budgeting.
- (iii) Environmental Monitoring Committee.
- (iv) Environmental Facility.
- (v) Environmental Competency.
- (vi) Environmental Reporting and Communications.
- (vii) Environmental Transparency.

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 an environmental budget for environmental-related commitments, e.g. personnel, P2M2, monitoring, auditing, training, remedial and rehabilitation works.

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

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

7.3.3 Environmental Monitoring Committee

The Project Proponent is required to identify and setup an Environmental Regulatory Compliance Monitoring Committee (ERCMC) at the policy level to be headed by the Chief Executive Officer (CEO) or organisation chairman.

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

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

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

7.3.4 Environmental Facility

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

7.3.5 Environmental Competency

Training requirements are needed to ensure competency for environmental management for all relevant site personnel.

The proposed training programme and requirements shall be included in the EMP framework.

7.3.6 Environmental Reporting and Communication

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

- (i) Environmental Management Plan.
- (ii) Monitoring Reporting.
- (iii) Audit Reporting.

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

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, but also in engagements with affected communities and the general public.

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 and their performance. Samplings and measurements are usually taken either of the ambient parameters (water, air and noise) or of the discharges (sewage, sediment basin).
- (ii) This shall be carried out by a Qualified Person such as the EO and/or the Environmental Consultant.

(c) Impact Monitoring (IM)

- (i) Impact monitoring may only be required in cases where there is a possibility that the impacts may still affect receptors outside of the project boundary despite implementation of P2M2s on-site.
- (ii) This task must be carried out by a Qualified Person such as the Environmental Consultant.

7.4.2 Monitoring Methodology

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

Details of the monitoring programme are decided upon by the Qualified Person and Environmental Consultants, and to be approved by DOE before implementation. The monitoring locations, frequencies, parameters to monitor, recommended limits, instrumentation and personnel requirements have to be identified in the EMP.

The monitoring programme shall be tailored for all slope and hill projects based on site conditions and types of development. **Table 7.4.1** shows a typical monitoring programme for slope and hill projects.

DOE has the right to mandate any changes to/or require or delete any requirements apart from those specified in the said Table.

7.4.3 Environmental Audit

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

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

The typical audit process involves:

- (i) Pre-audit: Preparation of a pre-audit checklist and information request to the auditee. Submission of a notification of audit to DOE.
- (ii) On-site Audit: Briefing to the auditee by Lead Auditor. Audit shall include documentation review, site inspection, interviews with relevant personnel to obtain the necessary information to gauge compliance and site sampling (optional). Auditee will be briefed at the Closing Meeting with the on-site Audit Summary submitted to the state DOE.
- (iii) Post-audit: Lead Auditor shall submit an Audit Report to the state DOE and the Project Proponent to respond with a Corrective Action Report (CAR) within two weeks from the audit date.

Table 7.4.1: Proposed Environmental Monitoring Parameters for Slope and Hill Projects

Aspect	Phase	Method	Parameters	Frequency
Water Quality	Construction	Grab sampling or other accepted standard methods (upstream and downstream of waterways)	Ambient Relevant parameters of the National Water Quality Standards (NWQS)	Monthly
		In-situ sampling at final discharge point	Sediment basin/silt trap discharge TSS and turbidity	After every heavy rain event (12.5 mm measured by rain gauge)
Air Quality	Operational	Sampling at sewage treatment plant (STP) final discharge outlet	Sewage Environmental Quality (Sewage) Regulations 2009	Monthly
	Construction	Measurement by approved air sampler (boundary and nearest receptors)	Ambient Relevant parameters of the Malaysian Ambient Air Quality Standards (MAAQS)	Quarterly
Noise Level	Construction	Measurement by approved noise meter (boundary and nearest receptors)	Ambient The Planning Guidelines for Environmental Noise Limits and Control, 2 nd Edition (DOE, 2007)	Quarterly (ambient) and/or during blasting works
Vibration	Construction	Measurement by approved vibration meter	Ambient The Planning Guidelines for Vibration Limits and Control in the Environment, 2 nd Edition (DOE, 2007)	During piling and blasting works

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.

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CHAPTER 8

EIA REPORTING AND REVIEW

8.1 INTRODUCTION

This Chapter provides the format and procedures for an Environmental Impact Assessment (EIA) Report to be submitted to the Department of Environment (DOE) for approval, after the completion of all other necessary studies and requirements.

8.2 EIA REPORT

8.2.1 EIA Report Format

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

The EIA report shall typically include the following contents:

- (a) Declaration from the Project Proponent and Qualified Person in the format detailed in Appendix 9 of EGIM (DOE, 2016). The declaration must be printed in the respective company's letterhead and attached to the EIA.
- (b) Executive Summary of the EIA Report in Bahasa Malaysia and English.
- (c) Brief introduction to the project, Project Proponent (address, key person and contact information), Environmental Firm (address, key person and contact information) and EIA Team Members (name, academic qualifications, areas of study, signature).
- (d) Review of the policy, regulatory and legal requirements for the project (refer to **Chapter 2** for details).

- (e) Terms of Reference (TOR) for the EIA Study as endorsed by the DOE (refer to **Chapter 3** for details). Endorsement letter from DOE to be attached as an appendix to the EIA report.
- (f) Statement of need for the project. Supporting arguments for the project to justify its needs and necessity shall be included as part of the report. Key points to include can include the examples in **Box 19**.

Box 19:

Key Points for Statement of Need

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

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

- (g) Deliberation on the alternatives and project options (refer to **Section 3.4**).
- (h) Detailed description of the project including site information, concept and breakdown of major components, material and manpower requirements, project activities and time schedule (refer to **Table 8.2.1**).
- (i) Description of the baseline conditions (physical, chemical, ecology and socio-economy) within the Zone of Study (ZOS) that may be impacted by the project (see **Chapter 4**).
- (j) Assessment of the significant impacts (positive and negative), prediction of the extent and effects on nearby sensitive receptors and proposal of pollution prevention and mitigation measures (P2M2s) to

minimise or enhance these impacts and any potential residual impacts (see **Chapters 5 and 6**).

- (k) Details of public consultation and engagement as part of EIA requirements.
- (l) Environmental Management Plan (EMP) incorporating the Land-Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2), monitoring and audit programme (see **Chapter 7**).
- (m) Appendices containing technical studies, supporting documentation, results of analysis, list of references, etc to be included.

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

Table 8.2.1: Recommended Project Description in EIA Report

<u>Project Details</u>	
(i)	Project title.
(ii)	Name and contact details of the Project Proponent (contact person, address, telephone number, e-mail address).
(iii)	Name of registered EIA Consulting Firm (EIA Team Leader, address, telephone number, e-mail address).
(iv)	Location of project (coordinates, lot no, district, etc.).
(v)	Relevant map showing project location and accessibility.
<u>Location</u>	
(i)	General site plan including Zone of Study (ZOS) (5-km radius from project boundary and/or 1-km corridor [0.5 km on either side along the Right of Way (ROW) for linear projects].
(ii)	Project boundary and layout including boundary coordinates.
(iii)	Description of location in relation to identifiable landmarks (e.g. city centres, main roads, towns, etc.).
<u>Project Component and Design Details</u>	
(i)	Project details (land area, buffer requirements, lots and land status).
(ii)	Project concept.
(iii)	Project components.
(iv)	Technology use.
(v)	Examples of similar project type and scale.
Note: The above shall be supported with technical drawings, illustration and diagrams.	

Project Activities

- (i) Method statement to be provided for major project activities during pre-construction, construction and operational stages.
- (ii) Manpower requirements.
- (iii) Resource requirements (e.g. soil and aggregate sources, spoil disposal area, etc.).

Infrastructure, Utilities and Amenities Requirement

Details of the estimated demand for:

- (i) Water supply.
- (ii) Electricity.
- (iii) Sewerage.
- (iv) Telecommunications.
- (v) Transport system.
- (vi) Waste management.

Project Implementation Schedule

- (i) The estimated timeline for various phases of project implementation from planning, to construction and operational phases.
- (ii) Details of each stages of implementation.

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

8.2.2 Executive Summary

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

- (i) Title of the project.
- (ii) Name and contact details of the Project Proponent.
- (iii) Name and contact details of EIA Team members.
- (iv) Location of the project site.
- (v) Relevant maps showing project location and sensitive receptors and extent of the ZOS.
- (vi) Alternatives considered.
- (vii) A tabulation of significant impacts and proposed P2M2s (format as detailed in EGIM).
- (viii) Description of monitoring and audit programme [Performance Monitoring (PM), Compliance Monitoring (CM) and/or Impact Monitoring (IM)].
- (ix) Conclusion to the Study.

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

8.2.3 Data Deliverables

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

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

8.2.4 Conclusion to the EIA Report

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

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

8.3 STAKEHOLDER ENGAGEMENT AND PUBLIC DISPLAY

The stakeholder engagement process shall be ongoing since the project planning stage (see **Section 2.6** for details). In the EIA phase, stakeholder engagement is essential for the Project Proponent to brief the stakeholders about the project and the potential impacts, and to obtain their feedback on the suggested mitigation measures.

For a Second Schedule EIA, there are additional mandatory requirements prior to the approval of the EIA report. These include:

Public briefing: For EIAs under the Second Schedule, public engagement is mandatory. It can take many forms but the common one is through a public briefing with the stakeholders within the Zone of Impact (ZOI). In the briefing, the Project Proponent and EIA Team shall present the project brief followed

by a questions and answers (Q&A) session. All discussions will be recorded and reported in the EIA.

Public display and review of EIA report: Likewise, after submission of the EIA, there is a one month review period whereby the public will officially be requested to submit their responses and comments in writing to the DOE. Notification of the public display is published in two local newspapers consecutively, once every week for three weeks.

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

Online display: For both First and Second Schedule activities, the EIA will be uploaded into the DOE website for the duration of the review period.

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

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

- (i) Details of the programme (dates, venue, itinerary).
- (ii) Attendance list of participants.
- (iii) Copies of survey forms.
- (iv) Brief summary of findings from the event e.g. reports, minutes of meeting, list of questions and responses, photograph of event.
- (v) Video or voice recordings (optional and only as reference).

The report shall form part of the appendix in the EIA, and the issues brought up and responses from the Project Proponent, must be clearly stated and discussed in the EIA report.

Box 20 provides some examples of good practices when engaging with the stakeholders:

Box 20:**Good Practices in Stakeholder Engagement**

- (i) Stakeholder Identification: Selection of stakeholders should be inclusive, encompassing and without bias. The focus should be those that are directly affected by the project within the zone of impact (ZOI) but may include any other relevant stakeholders.
- (ii) Transparency: The stakeholder engagement process shall be carried out in a transparent and inclusive manner, with ample opportunities for the relevant stakeholders to obtain information, provide comments and submit feedbacks.
- (iii) Information Disclosure: Information provided should be adequate and relevant to allow for stakeholders to understand the project and make informed decisions. Sufficient time should be allowed for information assessment and feedback.
- (iv) Communication Tools: Communication can be in many forms – reports, formal meetings, focal group discussions (FGDs), information sheets, surveys, websites, etc. The method should best be suited to the target audience, with information communicated in simple to understand language and none too technical.
- (v) Notification: All stakeholders should be informed and notified appropriately of any meetings or discussions to be held and given ample time to make arrangements. All efforts shall be made to ensure representative attendance by the stakeholders.
- (vi) Selection of Venue: Meeting locations should be in a venue close by, convenient and accessible to the stakeholders. This would ideally be near the project site. For public display of EIA reports, these shall be at locations open and accessible to the public, e.g. public library, police station, local authority office, etc.
- (vii) Documentation: All engagements shall be properly documented and reported in the EIA. Actions taken to address the issues brought up shall be clearly spelled out and mitigation measures incorporated as part of the project design. It is a good practice to follow up with the stakeholders on actions taken.
- (viii) Accountability and Continuity: All comments and feedbacks from stakeholders shall be assessed and reviewed objectively. Actions shall be taken by the Project Proponent to address legitimate concerns. Stakeholder management should be throughout the project lifespan. Provision of platforms for stakeholders' engagement post-EIA is a best practice that should be adopted.

8.4 EIA REPORT SUBMISSION AND REVIEW PROCESS

The EIA report submission shall be in line with the steps and procedures outlined in the EGIM (DOE, 2016). The EIA Report Quality Self-Assessment Tool (RQSAT) in the EGIM (DOE, 2016) can be used by the Project Proponent and the Qualified Person to assist in conducting self-check of the quality of the EIA prior to submission to the DOE, to avoid rejection.

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

If the EIA is approved, DOE will issue the Conditions of Approval (COA) to the Project Proponent. If the EIA is rejected, a fresh EIA can be submitted. Details in **Box 21**. This marks the end of the EIA process.

Box 21:

Outcomes from EIA Review Process

The possible outcomes of the EIATRC meetings are:

- (i) Approval of the EIA Report, provided that the report meets with the requirements of Section 34A (3) of the Environmental Quality Act (EQA) 1974.
- (ii) Rejection of the EIA Report, where the report does not meet the requirements of Section 34A (3) of the EQA 1974.

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GLOSSARY



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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.
Bill of Quantities (BQ)	Itemised list of construction works and management requirements for a project issued to a contractor to quote.
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.

Competent Person	A person with the necessary skills and knowledge to carry out the specific technical task, usually gained through certification, work experience or training.
Compliance Monitoring (CM)	Monitoring of P2M2 installed within the project site to ensure they are functional and effective in treating pollutants.
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.
Development Order (DO)	A legal approval for a Project Proponent to proceed with the construction of a project once they have satisfied the requirements of the approving authority, i.e. One Stop Centre (OSC).
Digital Elevation Model (DEM)	Digital model or 3D representation of a terrain's surface created from terrain elevation data.
Disaster Risk Factor	The level of risk and susceptibility of an area towards natural or man-made disasters, such as tsunamis, wildfires, landslides, flood, drought, etc.
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 as 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 manage environmental compliance at the working level during construction and operational phases of a project.
Environmental Pledge/Declaration	Statement by the Project Proponent and/or Qualified Person preparing the EIA that they have carried out the study in the proper manner and all facts and figures are to their knowledge true and correct and that they will carry out the recommendations and P2M2 for the project as described in the EIA.
Environmental Regulatory Compliance Monitoring Committee (RMCMC)	Organisational setup within the Project Proponent which shall manage 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 an 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. Usually prepared by a professional engineer (PE) to be endorsed by DID.
Gazette	The official publication of a government organisation institution, or protected area.
Geological Terrain Mapping (GTM)	Report prepared by a licensed Geologist required by the Minerals and Geoscience Department (JMG) to be submitted for 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 300 m from MSL characterised by undulating and mountainous hills and ridges.
Hill-Station	Town or village located in the low mountains or highland areas.
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 and Mitigation Measures (LD-P2M2)	Document incorporating construction methods, processes, materials and practices intended to prevent, reduce or eliminate the generation of pollutants at the source (development area) during any land-disturbing activity through the protection of natural resources through incorporation of BMPs.
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 persists despite P2M2 and BMPs put in place.
Revised TOR	Final version of the TOR after incorporation of comments from the TRC and additional information.
Right of Way (ROW)	A type of easement granted or reserved over the land for transportation purposes.
Riparian Area	Pertaining to the banks of streams, wetlands, lakes or tidewater. A relatively narrow strip of land that borders a stream or river, which often coincides with the maximum water surface elevation of the 100-year storm.
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 or 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 tunneling, 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.

Stormwater	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.
Tourism	Activity of traveling to a place for pleasure and/or the business of providing hotels, restaurants, entertainment, etc. to cater to the needs of travelers.
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 use. 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



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APPENDIX A

METHOD FOR DETERMINING SLOPE DISTRIBUTION



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APPENDIX A

METHOD FOR DETERMINING SLOPE DISTRIBUTION

1.1 DEFINING THE SITE

For any land-disturbing activities falling under the Prescribed Activity of the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015, the Project Proponent shall engage a qualified surveyor to produce topographic maps of the total project area that reflects present conditions. The total project area includes the area of the current implementation phase, as well as all future phases and areas left undeveloped within the site.

The topographic map will ideally utilise contour intervals of 1 meter or 2 meters for accurate representation of the area to be developed, particularly for cut and fill volume calculations and structural design. Contour intervals of up to 5 meters may be considered in highland areas or other areas of significant elevation variation, but larger contour intervals than 5 meters are not recommended.

If it is necessary to define grid sizes, such as when purchasing Digital Elevation Model (DEM) data to derive contour maps, a grid size of 10 m x 10 m will be sufficiently detailed for project areas of 1 ha to 5 ha. For larger project areas of >5 ha, grid sizes are recommended to be defined such that each grid square is at most 1% of the total project area, for a total of at least 100 grid squares per map. Regions of steep or complex slope shall maintain a 10 m x 10 m grid size at the discretion of Qualified Person.

1.2 DETERMINING SLOPE DISTRIBUTION

The slopes within the total project area can be determined using Geographic Information System (GIS) software such as Surfer or ArcGIS. It is important to utilise the same definitions of contour intervals and/or grid sizes as per **Section 1.1** for model input. This will define the slope according to degrees.

Using the same definitions, the slope areas can be mapped using AutoCAD software to determine the distribution of slope according to the percentage of total project area.

Under the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015, a project area of less than 50% slope of above 25 degrees is only required to undertake a First Schedule Environmental Impact Assessment (EIA); while a project area of more than 50% slope of above 25 degrees, is required to undertake a Second Schedule EIA. An example has been provided, in **Section 1.3**, to show the calculation method for determining which prescribed activity the project falls within, either First or Second Schedule.

1.3 METHOD TO DETERMINE SLOPE DISTRIBUTION

The Qualified Person may utilise any appropriate methods to calculate the slope distribution. The following are some of the common and recommended methods available.

Project Proponent has plans to develop 40-ha land into mixed development. The area comprises undulating to hilly areas within.

The following steps were undertaken to determine the slope distribution for the project area as part of the Environmental Screening exercise:

Step 1: Data Collection

The Project Proponent can either:

- (a) Engage a licensed surveyor to carry out topographical survey to produce a contour map with contour lines of 1 m intervals, which is recommended as it allows a comprehensive understanding of the project area; or
- (b) Purchase DEM data based on an overall survey grid size of 20 m x 20 m (1% of total project area per grid square), with grid size of 10 m x 10 m along steep slopes identified during site visit. This option is suited if site accessibility is limited or the development area is of a large parcel.

Step 2: Determine the Slope Distribution

It is strongly recommended that GIS software to be utilised for determining slope distribution in a project area, due to the variation of computational means; significant margin of error; and time consumption for manual calculation.

If an estimation of a project area is required, with only contour line information and no access to GIS software, a rough slope distribution can be estimated manually.

(a) Slope Analysis using GIS Software

The DEM data purchased can be used directly for slope analysis using GIS Software.

Contour maps produced from topographical survey have to be derived, with the integration of GIS Software, into DEM data with grid size of 10 m x 10 m, prior to slope analysis.

Table A.1 shows the general slope distribution derived from the output of a slope analysis.

Table A.1: General Slope Distribution for Project Site

Slope in degree (°)	Area	
	ha	%
<15°	4	10
≥ 15° to <25°	10	25
≥ 25° to <35°	10	25
≥ 35°	16	40
Total	40	100

Based on the information in **Table A.1**, the slope (in degree) will be reclassified by grouping slopes ≥ 25 degrees into the same category, as shown below:

Slope in degree (°)	Area	
	ha	%
<15°	4	10
≥ 15° to <25°	10	25
≥ 25°	26	65
Total	40	100

The new distribution shows a total of 65% of the total project area as being ≥ 25 degrees of slope. Based on this categorisation, the project falls under Prescribed Activity 13 (a), which requires a Second Schedule EIA.

The Project Proponent will have to consider all development phases accordingly, with appropriate slope protection measures.

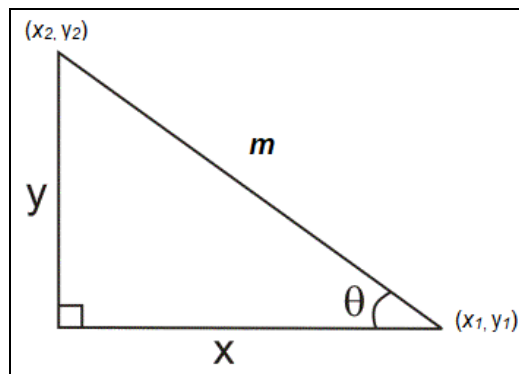
(b) Manual Slope Analysis

For the determination slope distribution manually, the contour map produced from the topographical survey can be used as the basis for slope analysis of the project area.

The slope can be estimated from a point to point basis with the following method:

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{vertical change}}{\text{horizontal change}}$$

Where m is the gradient or slope between two points defined as (x_1, y_1) and (x_2, y_2) separated by horizontal distance X and vertical distance Y as shown below:



The Slope Angle θ (in degrees) can be calculated from the inverse tangent of the ratio of vertical to horizontal difference, or $\tan^{-1}(y/x)$, or $\tan^{-1}(m)$. This gives the slope angle for the selected surface line, and can be repeated as many times as necessary to provide a rough slope distribution for the entire project area.

An example of slope estimation (manually) by using a contour map with 2 m contour intervals (**Figure A.1**) is shown below:

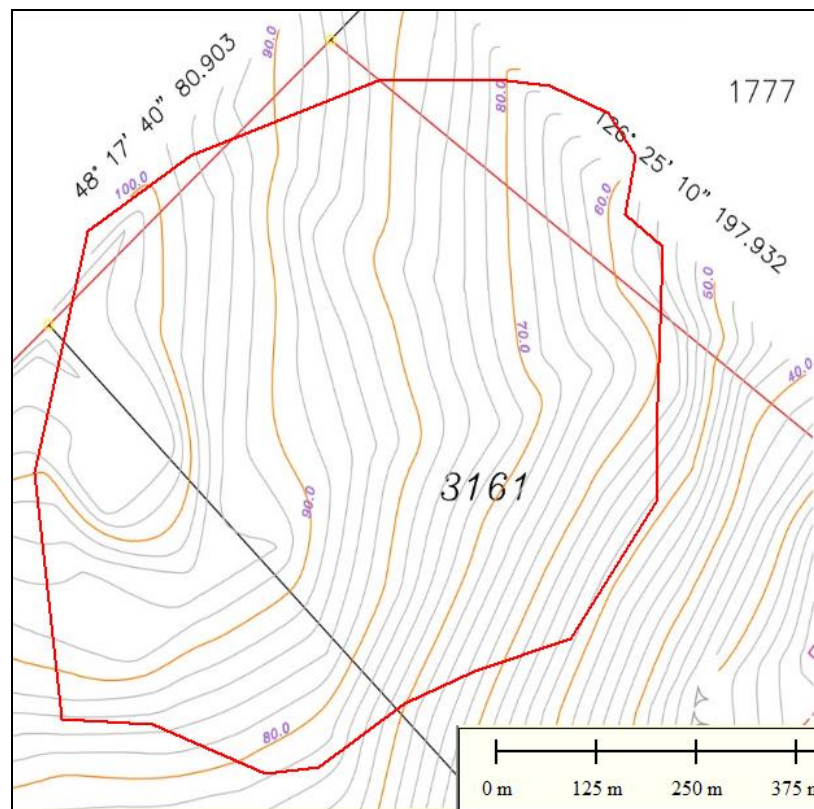
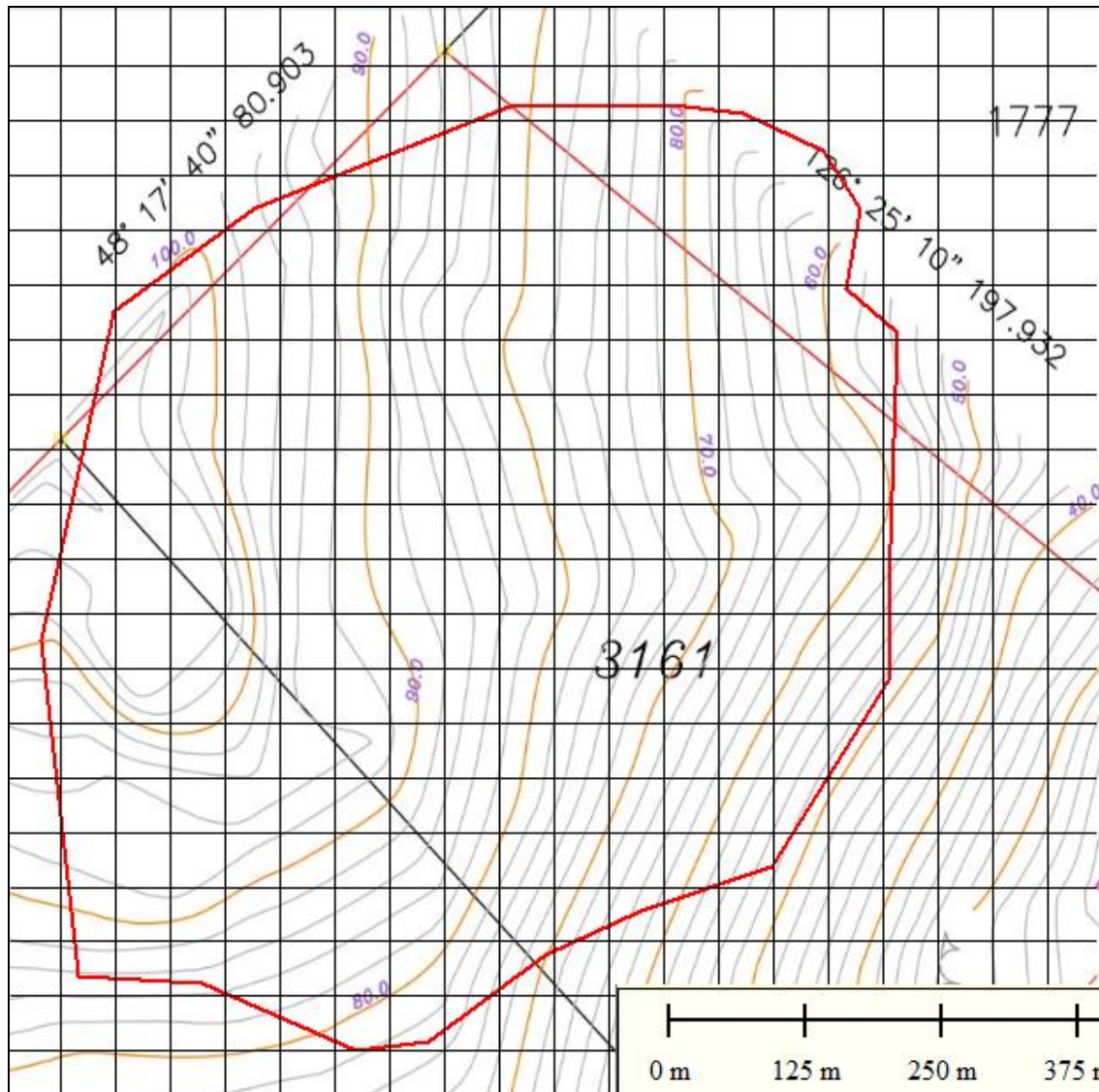


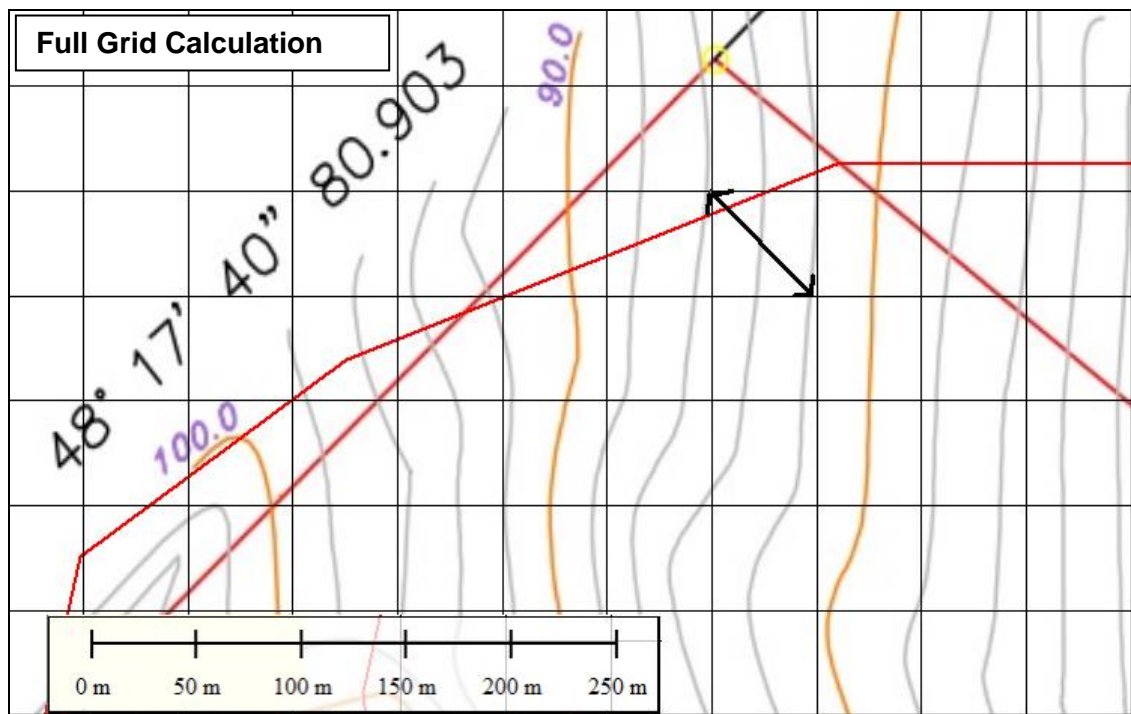
Figure A.1: Example of Slope Estimation (Manually)

Step 1: Separate the contour map of the project area into grids, preferably at least 100 grids. For this example, a grid spacing of 50 m x 50 m was selected to represent the project area.

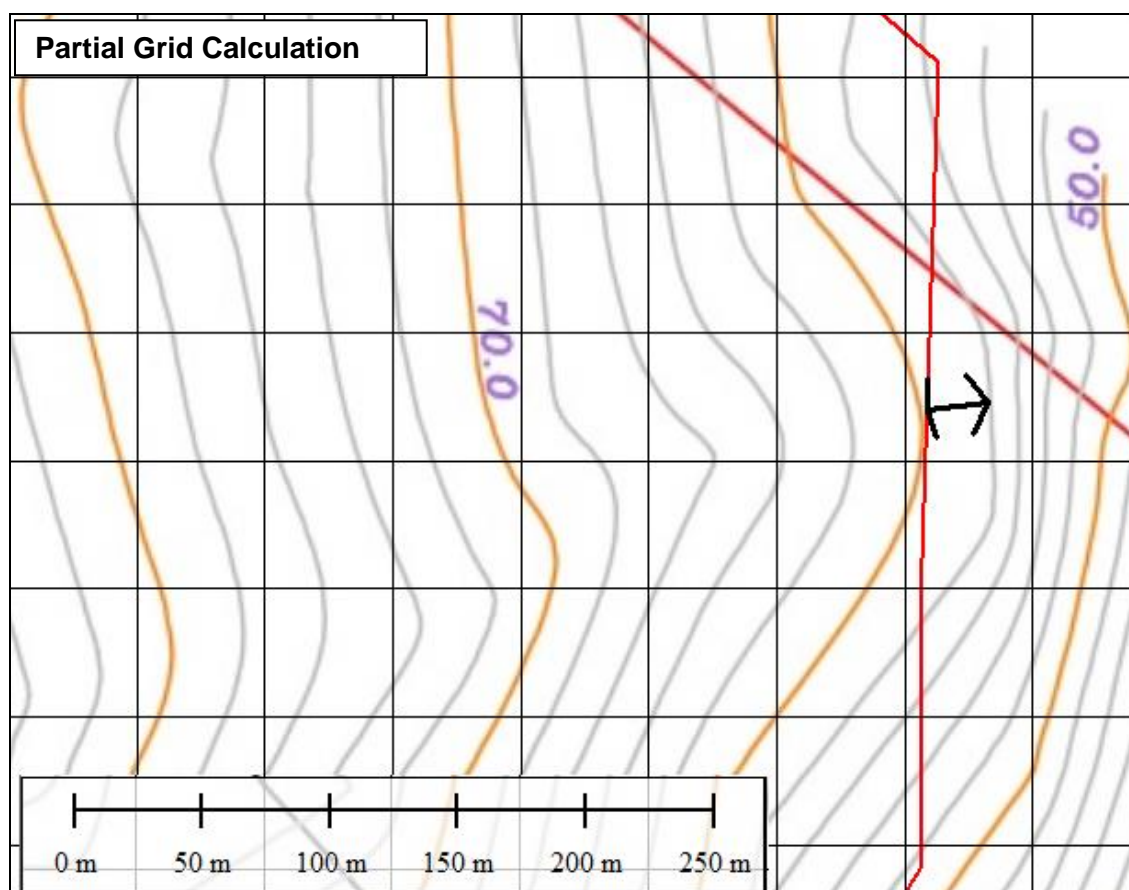


Step 2: Compute the slope for each full grid, and partial grid at the project boundary. This can be done by drawing a line perpendicular to the highest contour line in a grid to the lowest contour line within the same grid, or the next available contour line outside the grid, and taking $\tan^{-1}(m)$.

- (i) Full Grid example (**below**): there are three contour lines in the grid with lowest and highest of them lying on the top left and bottom right borders of the measured grid (4 m total vertical distance). The horizontal distance between the two points is 70.7 m. The prevailing slope angle for this grid is thus $\tan^{-1}(4/70.7) = 3.2^\circ$.



- (ii) Partial Grid example (**below**): there is only a single contour line in the grid, from which a perpendicular line is drawn to the next available lower contour line outside the grid (2 m total vertical distance). The horizontal distance between the two points is 24.3 m. Thus, the prevailing slope angle for this grid is $\tan^{-1}(2/24.3) = 4.7^\circ$.



Step 3: Sum up all the grids with prevailing slope angles and table the results by slope degree intervals, for example:

Slope, in degree (°)	Grids
<15°	175.6
≥ 15° to <25°	26.0
≥ 25° to <35°	9.2
≥ 35°	0.8
Total	211.3

Step 4: Estimate the slope distribution by area. As the grid spacing for this area is 50 m x 50 m, each grid has an effective area of 0.25 ha. The area of each slope category is derived in table below:

Slope in degree (°)	Area	
	ha	%
<15°	43.9	83.1
≥ 15° to <25°	6.5	12.3
≥ 25° to <35°	2.3	4.3
≥ 35°	0.2	0.3
Total	40	100

Step 5: the slope (in degree) will be reclassified by grouping the slopes ≥ 25° in same category, as shown below:

Slope in degree (°)	Area	
	ha	%
<15°	43.9	83.1
≥ 15° to <25°	6.5	12.3
≥ 25°	2.5	4.6
Total	40	100

Conclusion: Based on the output of the example above, 95.4% of the project area comprises the slope <25°. Hence, the project falls under Prescribed Activity 13 and subjected to a First Schedule EIA, if it were to be developed.

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APPENDIX B

POLICIES AND GUIDELINES FOR SLOPE AND HILL DEVELOPMENT



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APPENDIX B

POLICIES AND GUIDELINES FOR SLOPE AND HILL DEVELOPMENT

1.0 NATIONAL PHYSICAL PLAN 3 (NPP-3) [DEPARTMENT OF TOWN AND COUNTRY PLANNING (JPBD), 2016]

The NPP-3 provides a systematic categorisation of Environmentally Sensitive Areas (ESAs) and the level of protection and developmental controls allowed for these areas.

In terms of hills, slopes and highland areas, this is highlighted under Policy KD1.2: Management and Control of Development in ESAs.

The following ESA Framework (**Table B.1**) is to be referred to in respect to spatial planning and as a guideline for sustainable landuse development based on their specific ESA rank.

2.0 GUIDELINES FOR HILLSIDE AND HIGHLAND AREAS DEVELOPMENT PLANNING (JPBD, 2009)

The guidelines details the requirements for the planning and control of developmental activities in hilly areas, highland areas, hillslopes and hilltops and its surroundings.

The main function of the guideline is to be utilised by the various local authorities to streamline their review of development order (DO) and *Laporan Cadangan Pemajuan* (LCP) application and as a guide for implementing agencies, developers and the public to assess development in these sensitive areas.

In accordance with the guidelines, development controls is categorised based on elevation and slope degree as detailed in **Table B.2**.

The guidelines also provide the requirements for minimum setback for developments.

Table B.1: Management Criteria for ESAs – Slope and Highland Areas

ESA Rank	ESA	Management Criteria
Rank 1	Areas above 1,000 m contour.	<ul style="list-style-type: none"> • Township and agricultural development only allowed in approved highland areas under Special Management Areas (SMAs): <ul style="list-style-type: none"> (a) Cameron Highlands-Kinta-Lojing. (b) Genting Highland-Bukit Tinggi-Janda Baik. • In the above SMAs new agricultural development is only allowed outside of forest reserves and water catchment areas. • No new development in Frasers Hill SMA. Existing development to abide by the strategies and guidelines in the Frasers Hill Development Study (Realignment) [Department of Environment (DOE), 2008]. • For developed areas in highland areas, controls to be implemented through development of a Special Area Plan (SAP). • All development and agricultural activities in contour areas exceeding 1,000 m must abide by existing and future regulations and guidelines.
Rank 2	Areas between 300 – 1,000 m contour.	<ul style="list-style-type: none"> • All development and agricultural activities in these areas must abide by existing and future regulations and guidelines. • These areas are to be identified, mapped and detailed in the state structure plan and local plans.
	Areas located within the 500 m buffer zone around Rank 1 areas.	<ul style="list-style-type: none"> • The 500 m buffer zone is to be modified if there are existing or committed development and control measures put in place based on the area's features. • The landuse inventory at the Local Plan level must be updated.
Rank 3	Areas between 150 – 300 m contour.	<ul style="list-style-type: none"> • All development and agricultural activities in these areas must abide by existing and future regulations and guidelines.
	Areas located within the 500 m buffer zone around Rank 2 areas.	<ul style="list-style-type: none"> • Controlled development whereby the type and intensity of development must abide by the landuse constraints.

Source: NPP-3, JPBD, 2016.

Table B.2: Development Controls according to Class and Height

Height Class	Lowlands (<150 m)	Hilly Lands (150 – 300 m)	Highlands (300 – 1,000 m)	Mountains (>1,000 m)	EIA requirement based on Slope Class *
Class I In-situ terrain with slopes <15°	All development types can be considered, subject to local plan/ development plan	All development types can be considered, subject to local plan/ development plan	Low impact eco- tourism and recreational development can be considered	No development allowed except construction of infrastructure such as roads, tunnels, bridges, telecommunications and electricity of low intensity and of national importance	For development on Class I & II slopes, requirement of EIA will be based on prescribed activities requirements
Class II In-situ terrain with slopes ≥ 15° to <25°	<ul style="list-style-type: none"> • High density housing • Commercial rows • Offices (free standing) • Tourism • Training institute • Public amenities 	<ul style="list-style-type: none"> • High density housing • Commercial rows • Offices (free standing) • Tourism • Training institute • Public amenities 	<ul style="list-style-type: none"> • Low impact eco-tourism and recreational developments. • Low impact public amenities 	No development allowed except construction of infrastructure such as roads, tunnels, bridges, telecommunications and electricity of low intensity and of national importance	For development on Class I & II slopes, requirement of EIA will be based on prescribed activities requirements

Height Class	Lowlands (<150 m)	Hilly Lands (150 – 300 m)	Highlands (300 – 1,000 m)	Mountains (>1,000 m)	EIA requirement based on Slope Class *
Class III In-situ terrain with slopes $\geq 25^\circ$ to $<35^\circ$	<ul style="list-style-type: none"> • Medium density housing • Commercial rows • Offices (free standing) • Tourism • Training institute • Public amenities 	<ul style="list-style-type: none"> • Medium density housing • Commercial rows • Offices (free standing) • Tourism • Training institute • Public amenities 	Can be considered for low impact recreation without need for construction of structures e.g. camp sites and other conservation activities	No development allowed except construction of infrastructure such as roads, tunnels, bridges, telecommunications and electricity of low intensity and of national importance	<ul style="list-style-type: none"> • For development on Class I & II slopes, requirement of EIA will be based on prescribed activities requirements • EIA required for development on Class III slopes
Class IV In-situ terrain with slopes $\geq 35^\circ$	No development allowed except construction of infrastructure such as roads, tunnels, bridges, telecommunications and electricity of low intensity and of national importance	No development allowed except construction of infrastructure such as roads, tunnels, bridges, telecommunications and electricity of low intensity and of national importance	No development allowed except construction of infrastructure such as roads, tunnels, bridges, telecommunications and electricity of low intensity and of national importance	No development allowed except construction of infrastructure such as roads, tunnels, bridges, telecommunications and electricity of low intensity and of national importance	Detailed EIA required for developments on areas $>1,000$ m and Class IV slopes

Source: JPBD, 2009.

Note: * EIA requirements should now be based on the latest 2015 Regulations for prescribed activities for First and Second Schedules.

3.0 GUIDELINES FOR AGRICULTURAL DEVELOPMENT IN SLOPE AREAS (DEPARTMENT OF AGRICULTURE, 2013)

The guideline is targeted at agricultural development in hill areas focusing on aspects of landuse management in accordance with Good Agricultural Practices (GAP) and environmental management.

It describes the different terrain classes (**Table B.3**), crop suitability, erosion control measures for agricultural activities, and good agronomical practices in land rehabilitation. Based on the guideline, agricultural activities are limited to slopes of $<25^\circ$ (refer **Table B.4**).

Table B.3: Terrain Class in Malaysia (Agriculture Development)

Terrain Class	Slope		Type of Terrain
	Degree ($^\circ$)	Percentage (%)	
C1	0 – 2	0 – 4	Flat
C2	2 – 6	4 – 11	Undulating
C3	6 – 12	11 – 21	Wavy
C4	12 – 20	21 – 36	Hilly
C5	20 – 25	36 – 47	Very Hilly
C6	25 – 30	47 – 58	Steep
C7	>30	>58	Very Steep

Source: DOA, 2013.

4.0 GUIDELINES FOR DEVELOPMENT IN HIGHLAND AREAS (NRE, 2005)

The guideline covers land development involving infrastructure, agricultural and any other development in highland areas with elevation exceeding 300 m from mean sea level (MSL).

For forest areas within permanent reserved forest (PRF) above 1,000 m above MSL, is to be maintained as land conservation forests and water catchment forests.

Table B.5 details the development suitability classification based on the slope Classes for physical development and agricultural development.

Table B.4: Guidelines for Crop Suitability based on Slope Classification, Texture and Soil Depth

Texture Class	Soil Depth	Slope Classification					
		C1 (0 – 2°)	C2 (2 – 6°)	C3 (6 – 12°)	C4 (12 – 20°)	C5 (20 – 25°)	C6/STP (>25°)
Rough Loam and Sand (<18% Clay)	Very shallow (0 – 25 cm)	(A)*					
	Shallow (25 – 50 cm)	(A, B)	(A, B)				
	Moderately medium depth (50 – 75 cm)	A, B (C)	A, B (C)				
	Moderate depth (75 – 100 cm)	A, B (C)	A, B (C)				
	Deep (>100 cm)	A, B (C)	A, B (C)				
Fine Loam (18 – 35% Clay)	Very shallow (0 – 25 cm)	(A)*					
	Shallow (25 – 50 cm)	A (B, G, H)	A (B)				
	Moderately medium depth (50 – 75 cm)	A, B, G, H (C, D, E, F)	A, B, G, H (C, D, E, F)	(A, B, C, D, E, F, G, H)	(C, D, E, F)		
	Moderate depth (75 – 100 cm)	A, B, C, D, E, F, G, H	A, B, C, D, E, F, G, H	C, D, E, F (A, B, G, H)	D, E, F, (C)		
Clay and Heavy Clay (>35% Clay)	Deep (>100 cm)	A, B, C, D, E, F, G, H	A, B, C, D, E, F, G, H	C, D, E, F (A, B, G, H)	D, E, F, (C)	(D, E, F)	
	Very shallow (0 – 25 cm)	(A)*					
	Shallow (25 – 50 cm)	A (B, G, H)	A, B, G, H (C, D, E, F)				
	Moderately medium depth (50 – 75 cm)	A, B, G, H (C, D, E, F)	A, B, G, H (C, D, E, F)	(A, B, C, D, E, F, G, H)	(C, D, E, F)		
	Moderate depth (75 – 100 cm)	A, B, C, D, E, F, G, H	A, B, C, D, E, F, G, H	C, D, E, F (A, B, G, H)	D, E, F, (C)	(D, E, F)	
	Deep (>100 cm)	A, B, C, D, E, F, G, H	A, B, C, D, E, F, G, H	C, D, E, F (A, B, G, H)	D, E, F, (C)	D, (E, F)	

Source: DOA, 2013.

Legend:

Crop Type

A - Vegetables/ Creepers B - Short-term crops (except vegetables and paddy)
 C - Medium term crops D - Long-term crops (except palms and black pepper)
 E - Palms F - Black pepper G - Paddy H - Pasture
 () * Soil improvement needs to be carried out to improve the organic matter content in the soil, e.g. Effective Microorganism (EM) or compost.

Crop Suitability

Suitable - All letters without bracket
 Moderately Suitable - All letters within bracket ()
 Not suitable for all crops -

Table B.5: Development Suitability Classification

Class	Geotechnical Constraints	Restrictions/Requirements
Physical Development		
Class I	<ul style="list-style-type: none"> Low : <ul style="list-style-type: none"> (a) In-situ terrain with slopes $<15^\circ$ (b) Cut slopes of $<15^\circ$ 	<ul style="list-style-type: none"> Development allowed if adhering to the guidelines by the authorities^{*1}. Required site assessments^{*2}: <ul style="list-style-type: none"> (a) Detailed geological investigations and topographical surveys of the Project site and surroundings. (b) Plane discontinuity strength parameter for base structures and cut slopes. (c) Soil investigations. (d) The above to be carried out by an experienced Geotechnical Engineer and Geologist.
Class II	<ul style="list-style-type: none"> Moderate: <ul style="list-style-type: none"> (a) In-situ terrain with slopes $\geq 15^\circ$ to $<25^\circ$ without signs of erosion and slope instability. (b) In-situ terrain with slopes $<15^\circ$ with signs of erosion and slope instability. (c) Hill peaks and ridges. (d) In-situ terrain with slopes $<15^\circ$ comprising of colluvium or sensitive geological materials. (e) Flood risk areas. 	

Class	Geotechnical Constraints	Restrictions/Requirements
Class III	<ul style="list-style-type: none"> • High: <ul style="list-style-type: none"> (a) In-situ terrain with slopes $\geq 25^\circ$ to $<35^\circ$ without signs of erosion and slope instability. (b) In-situ terrain with slopes $\geq 15^\circ$ to $<25^\circ$ with signs of moderate to severe erosion and slope instability. (c) In-situ terrain with slopes $\geq 15^\circ$ to $<25^\circ$ comprising of colluvium or sensitive geological materials. (d) In-situ terrain with slopes $<15^\circ$ comprising of colluvium or sensitive geological material with signs of slope instability. (e) Areas comprising of limestone, swamp, peat soil and ex-mining land. (f) Areas at risk of mud flows. 	<ul style="list-style-type: none"> • Development can be considered based on the findings of an EIA^{*1}. • Required site assessments^{*2}: <ul style="list-style-type: none"> (a) Similar requirements as Class I & II slopes. (b) Hydrology and hydrogeological assessment at site. (c) Localised slope stability analysis for areas above and below the Project site. (d) The above to be carried out by an experienced Geotechnical Engineer and Geologist.
Class IV	<ul style="list-style-type: none"> • Extreme: <ul style="list-style-type: none"> (a) In-situ terrain with slopes $>35^\circ$ without signs of erosion and slope instability. (b) In-situ terrain with slopes of $\geq 25^\circ$ to $<35^\circ$ with signs of erosion and slope instability. (c) In-situ terrain with slopes of $\geq 15^\circ$ to $<25^\circ$ comprising of colluvium or sensitive geological materials. (d) In-situ terrain with slopes of $\geq 15^\circ$ to $<25^\circ$ comprising of colluvium or sensitive geological materials with signs of slope instability. (e) Areas at risk of debris flow. 	<ul style="list-style-type: none"> • No development allowed except for construction of roads (tunnelling, bridges and other structural measures should be in place in Class IV areas)^{*3}. • Detailed EIA required to be submitted^{*1}. • Road construction to abide by <i>Arahan Teknik JKR (Jalan)</i> 16/03 and JKR geotechnical design guidelines. • Required site assessments^{*2}: Similar to Class III slope requirements but involving slopes stability analysis over a wider area outside of the site.

Class	Geotechnical Constraints	Restrictions/Requirements
<u>Agricultural Projects</u>^{*3}		
Highland Areas with slopes $\geq 25^\circ$		
		<ul style="list-style-type: none">• No development allowed.
Highland Areas with slopes $<25^\circ$		
		<ul style="list-style-type: none">• Allowed with conditions:<ul style="list-style-type: none">(a) Heavy machinery not allowed.(b) Construct and maintain a sedimentation pond and abide by TSS discharge of <100 mg/L.(c) Abide by the Guidelines for Development of Agriculture in Slope Areas (DOA, 2013).(d) Abide by the Guidelines for Prevention and Control of Soil Erosion and Siltation in Malaysia (DOE, 2008).(e) Abide by the <i>Manual Saliran Mesra Alam Edisi-2</i> (DID, 2012).

Source: Guidelines for Development in Highland Areas, NRE, 2005.

Note:

- EIA requirements should now be based on the latest 2015 Regulations for prescribed activities for First and Second Schedules.
- Based on current requirements by the Department of Minerals and Geosciences (JMG).
- To also abide by latest policies and planning requirements such as the NPP-3 and SMAs for Kinta-Cameron Highlands-Lojing and Genting Highlands-Bukit Tinggi-Janda Baik.

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APPENDIX C
ENVIRONMENTAL SCOPING MATRIX



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APPENDIX C

ENVIRONMENTAL SCOPING MATRIX

Table C.1: EIA Matrix of Project Activities and Impacts for Development in Slope and Hill Areas

Environmental Component	Project Activity																						
	Pre-Construction						Construction										Operational					Closure/ Exit	
	Site Access	Site Surveys	Geological Terrain Mapping	Soil Investigation and Geotechnical Studies	Environmental Assessment	Land Acquisition	Access Road and Stream Crossings	Base Camp and Site Facilities Establishment	Worker Recruitment, Mobilisation of Equipment and Materials	Site Clearing and Biomass Removal	Earthworks (Cut and Fill)	Blasting	Drainage Works	Structural Works and Facilities Establishment	Waste Disposal	Establishment of Permanent Access	Final Finishing and Landscaping	Occupation and Operation of Project	Slope Maintenance	Infrastructure, Utility and Amenities Maintenance	Agricultural Development	Site Decommissioning	Rehabilitation Works
Land																							
Landforms																							
Soil Profiles																							
Soil Composition																							
Slope Stability																							
Subsidence and Compaction																							
Seismicity																							
Flood Plains/Swamp																							
Landuse																							
Engineering and Mineral Resources																							
Buffer Zones																							
Surface Water																							
Shoreline																							
Bottom Interface																							
Flow Variation																							
Water Quality																							
Drainage Pattern																							
Water Balance																							
Flooding																							
Existing Use																							
Groundwater																							
Water Table																							
Flow Regime																							

[illegible]

Environmental Component	Project Activity																							
	Pre-Construction						Construction										Operational		Closure/Exit					
	Site Access	Site Surveys	Geological Terrain Mapping	Soil Investigation and Geotechnical Studies	Environmental Assessment	Land Acquisition	Access Road and Stream Crossings	Base Camp and Site Facilities Establishment	Worker Recruitment, Mobilisation of Equipment and Materials	Site Clearing and Biomass Removal	Earthworks (Cut and Fill)	Blasting	Drainage Works	Structural Works and Facilities Establishment	Waste Disposal	Establishment of Permanent Access	Final Finishing and Landscaping	Occupation and Operation of Project	Slope Maintenance	Infrastructure, Utility and Amenities	Agricultural Development	Site Decommissioning	Rehabilitation Works	
Communicable Disease																								
Physiological Disease																								
Social and Economic																								
Employment																								
Housing																								
Utilities																								
Amenities																								
Property and Settlement																								
Aesthetic and Cultural																								
Landforms																								
Biota																								
Wilderness																								
Water Quality																								
Atmospheric Quality																								
Climate																								
Tranquillity																								
Sense of Community																								
Community Structure																								
Man-made Object																								
Historic Places or Structure																								
Religious Places or Structure																								
Landscape																								
Note: (S) – Short-term (L) – Long-term (+) – Beneficial (-) – Negative (✓) – Mitigation measure required (1) – Little significance (2) – Significant (3) – Very significant (N) – No Impact																								

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APPENDIX D

ENVIRONMENTAL STANDARDS



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APPENDIX D

ENVIRONMENTAL STANDARDS

1.0 RIVER WATER QUALITY

Table D.1: National Water Quality Standards (NWQS) for Malaysia

Parameter	Unit	Class					
		I	IIA	IIB	III	IV	V
AN	mg/L	0.1	0.3	0.3	0.9	2.7	>2.7
BOD	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	1,000	1,000	-	-	6,000	-
Floatables	-	N	N	N	-	-	-
Odour	-	N	N	N	-	-	-
Salinity	%	0.5	1	-	-	2	-
Taste	-	N	N	N	-	-	-
Total Dissolved Solids	mg/L	500	1,000	-	-	4,000	-
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/100 mL	10	100	400	5,000 (20,000) ^a	5,000 (20,000) ^a	-
Total Coliform	count/100 mL	100	5,000	5,000	50,000	50,000	>50,000

Source: Malaysia Environmental Quality Report (EQR) 2015, 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.

Table D.1: National Water Quality Standards (NWQS) for Malaysia (Continued)

Parameter	Unit	Class				
		I	IIA/IIB	III	IV	V
Aluminium, Al	mg/L	NATURAL	-	(0.06)	0.5	LEVELS
Arsenic, As	mg/L		0.05	0.4 (0.05)	0.1	
Barium, Ba	mg/L		1	-	-	
Cadmium, Cd	mg/L		0.01	0.01* (0.001)	0.01	
Chromium, Cr(IV)	mg/L		0.05	1.4 (0.05)	0.1	
Chromium, Cr(III)	mg/L		-	2.5	-	
Copper, Cu	mg/L		0.02	-	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	LEVELS	0.05	0.02* (0.01)	5	ABOVE
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, 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 EQR 2015, DOE, 2015.

Notes: * = At hardness 50 mg/L CaCO₃.

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

N = Free from visible film sheen, discolouration and deposits.

Table D.1: National Water Quality Standards (NWQS) for Malaysia (Continued)

Parameter	Unit	Class				
		I	IIA/IIB	III	IV	V
Nitrite, NO ₂	mg/L		0.4	0.4 (0.03)	-	
Nitrate, NO ₃	mg/L		7	-	5	
Phosphorus, P	mg/L		0.2	0.1	-	
Silica	mg/L		50	-	-	
Sulphide, SO ₄	mg/L		250	-	-	
Sulfur, S	mg/L		0.05	(0.001)	-	
Carbon dioxide, CO ₂	mg/L		-	-	-	
Gross – alfa	Bq/L		0.1	-	-	
Gross – beta	Bq/L		1	-	-	
Ra – 226	Bq/L		<0.1	-	-	
Sr – 90	Bq/L		<1	-	-	
CCE	µg/L		500	-	-	
MBAS/ BAS	µg/L		500	5,000 (200)	-	
O&G (Mineral)	µg/L		40; N	N	-	
O&G (Emulsified edible)	µg/L		7,000; N	N	-	
PCB	µg/L	NATURAL	0.1	6 (0.05)	-	LEVELS ABOVE IV
Phenol	µg/L	LEVELS	10	-	-	
Aldrin/Dieldrin	µg/L		0.02	0.2 (0.01)	-	
BHC	µg/L	OR	2	9 (0.1)	-	
Chlordane	µg/L		0.08	2 (0.02)	-	
t – DDT	µg/L	ABSENT	0.1	(1)	-	
Endosulfan	µg/L		10	-	-	
Heptachlor/ Epoxide	µg/L		0.05	0.9 (0.06)	-	
Lindane	µg/L		2	3 (0.4)	-	
2,4 – D	µg/L		70	450	-	
2,4,5 – T	µg/L		10	160	-	
2,4,5 – TP	µg/L		4	850	-	
Paraquat	µg/L		10	1,800	-	

Source: Malaysia EQR 2015, DOE, 2015.

Notes: * = At hardness 50 mg/L CaCO₃.

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

N = Free from visible film sheen, discolouration and deposits.

Table D.2: DOE Water Quality Classification by WQI

Water Quality Index	Index Range		
	Clean	Slightly Polluted	Polluted
WQI	81 – 100	60 – 80	0 – 59

Source: Malaysia EQR 2015, DOE, 2015.

Table D.3: DOE WQI Classification

Parameter	Unit	Class				
		I	II	III	IV	V
AN	mg/L	<0.1	0.1 – 0.3	0.3 – 0.9	0.9 – 2.7	>2.7
BOD	mg/L	<1	1 – 3	3 – 6	6 – 12	>12
COD	mg/L	<10	10 – 25	25 – 50	50 – 100	>100
DO	mg/L	>7	5 – 7	3 – 5	1 – 3	<1
pH	-	>7.0	6.0 – 7.0	5.0 – 6.0	< 5	>5.0
TSS	mg/L	<25	25 – 50	50 – 150	150 – 300	>300
WQI		>92.7	76.5 – 92.7	51.9 – 76.5	31.0 – 51.9	<31.0

Source: Malaysia EQR 2015, DOE, 2015.

2.0 MARINE WATER QUALITY

Table D.4: Marine Water Quality Criteria and Standards for Malaysia (MWQCS)

Parameter	Unit	Class 1	Class 2	Class 3	Class E
		Preservation, Marine Protected Areas, Marine Parks	Marine life, Fisheries, Coral reefs, Recreational and Mariculture	Ports, Oil and Gas Fields	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 (25 mg/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 and 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 (unionised)	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
Phosphate	µg/L	5	75	670	75
Phenol	µg/L	1	10	100	10

Parameter	Unit	Class 1	Class 2	Class 3	Class E
		Preservation, Marine Protected Areas, Marine Parks	Marine life, Fisheries, Coral reefs, Recreational and Mariculture	Ports, Oil and Gas Fields	Mangroves, Estuarine and Rivermouth Water
Tributyltin (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/100 mL)	200 faecal coliform count/100 mL	100 faecal coliform count/100 mL & (70 faecal coliform count/100 mL)
Polycyclic Aromatic Hydrocarbons (PAHs)	µg/L	100	200	1,000	1,000

Source: Malaysia EQR 2015, DOE, 2015

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

Table D.5: Malaysia: Marine Water Quality Index Classification

Marine Water Quality Index	Index Range			
	Excellent	Good	Moderate	Poor
MWQI	90 – 100	80 – <90	50 – <80	0 – <50

Source: Malaysia EQR 2015, DOE, 2015

3.0 SEWAGE DISCHARGE STANDARDS

Table D.6: Acceptable Conditions of Sewage Discharge of Standards A and B of the Second Schedule (Regulation 7), Environmental Quality (Sewage) Regulations, 2009

Parameters	Unit	Standard A	Standard B
Temperature	°C	40	40
pH	–	6.0 – 9.0	5.5 – 9.0
Biochemical Oxygen Demand (BOD ₅) at 20°C	mg/L	20	50
Chemical Oxygen Demand	mg/L	120	200
Suspended Solids	mg/L	50	100
Oil and Grease	mg/L	5.0	10.0
Ammoniacal Nitrogen (enclosed water body)	mg/L	5.0	5.0
Ammoniacal Nitrogen (river)	mg/L	10.0	20.0
Nitrate Nitrogen (river)	mg/L	20.0	50.0
Nitrate Nitrogen (enclosed water body)	mg/L	10.0	10.0
Phosphorus (enclosed water body)	mg/L	5.0	10.0

Source: Environmental Quality (Sewage) Regulations 2009.

Table D.7: Existing Sewage Treatment System (Approved before January 1999)

Parameter	Unit	Communal Septic Tank		Imhoff Tank		Aerated Lagoon		Oxidation Pond		Mechanical System	
		Standard		Standard		Standard		Standard		Standard	
		A	B	A	B	A	B	A	B	A	B
(a) BOD ₅ at 20° C	mg/L	200	200	175	175	100	100	120	120	60	60
(b) COD	mg/L	-	-	-	-	300	300	360	360	180	240
(c) Suspended Solids	mg/L	180	180	150	150	120	120	150	150	100	120
(d) Oil and Grease	mg/L	-	-	-	-	-	-	-	-	20	20
(e) Ammoniacal Nitrogen	mg/L	-	-	100	100	80	80	70	70	60	60

Source: Environmental Quality (Sewage) Regulations 2009.

Table D.8: Existing Sewage Treatment System (Approved after January 1999)

Parameter	Unit	Standard	
		A	B
(a) BOD ₅ at 20° C	mg/L	20	50
(b) COD	mg/L	120	200
(c) Suspended Solids	mg/L	50	100
(d) Oil and Grease	mg/L	20	20
(e) Ammoniacal Nitrogen	mg/L	50	50

Source: Environmental Quality (Sewage) Regulations 2009.

4.0 RAW DRINKING WATER QUALITY

Table D.9: National Guidelines for Raw Drinking Water Quality

No.	Parameter	Unit	Benchmark
1.	Sulphate, SO ₄	mg/L	250
2.	Hardness, CaCO ₃	mg/L	500
3.	Nitrate, NO ₃	mg/L	10
4.	Coliform	-	Must not be detected in any 100 mL sample
5.	Manganese, Mn	mg/L	0.1
6.	Chromium, Cr	mg/L	0.05
7.	Zinc, Zn	mg/L	3
8.	Arsenic, As	mg/L	0.01
9.	Selenium, Se	mg/L	0.01
10.	Chloride, Cl	mg/L	250
11.	Phenolics	mg/L	0.002
12.	Total Dissolved Solids	mg/L	1000
13.	Iron, Fe	mg/L	0.3
14.	Copper, Cu	mg/L	1.0
15.	Lead, Pb	mg/L	0.01
16.	Cadmium, Cd	mg/L	0.003
17.	Mercury, Hg	mg/L	0.001

Source: National Guidelines for Raw Drinking Water Quality, Ministry of Health, 2000.

5.0 AIR QUALITY

Table D.10: Malaysian Ambient Air Quality Standards (MAAQS)

Pollutant	Unit	Averaging Time	IT-1 (2015)	IT-2 (2018)	Standard (2020)
PM ₁₀	µg/m ³	1 year 24 hours	50 150	45 120	40 100
PM _{2.5}	µg/m ³	1 year 24 hours	35 75	25 50	15 35
SO ₂	µg/m ³	1 hour 24 hours	350 105	300 90	250 80
CO	mg/m ³	1 hour 8 hours	35 10	35 10	30 10
NO ₂	µg/m ³	1 hour 24 hours	320 75	300 75	280 70
O ₃	µg/m ³	1 hour 8 hours	200 120	200 120	180 100

Source: DOE Notice 1/2015, DOE, 2015.

Note: IT = Interim

6.0 NOISE AND VIBRATION

Table D.11: Schedule 1 – Maximum Permissible Sound Level (L_{Aeq}) by Receiving Landuse for Planning and New Development

Receiving Landuse Category	Maximum Permissible Sound Level (L _{Aeq}) [dB(A)]	
	Day Time 7.00 am – 10.00 pm	Night Time 10.00 pm – 7.00 am
Noise Sensitive Areas, Low Density Residential, Institutional (School, Hospital), Worship Areas.	50	40
Suburban Residential (Medium Density) Areas, Public Spaces, Parks, Recreational Areas.	55	45

Receiving Landuse Category	Maximum Permissible Sound Level (L_{Aeq}) [dB(A)]	
	Day Time 7.00 am – 10.00 pm	Night Time 10.00 pm – 7.00 am
Urban Residential (High Density) Areas, Designated Mixed Development Areas (Residential – Commercial).	60	50
Commercial Business Zones.	65	55
Designated Industrial Zones	70	60

Source: The Planning Guidelines for Environmental Noise Limits and Control, 2nd Edition, DOE, 2007.

Table D.12: Schedule 3 – Maximum Permissible Sound Level (L_{Aeq}) to be Maintained at the Existing Noise Climate

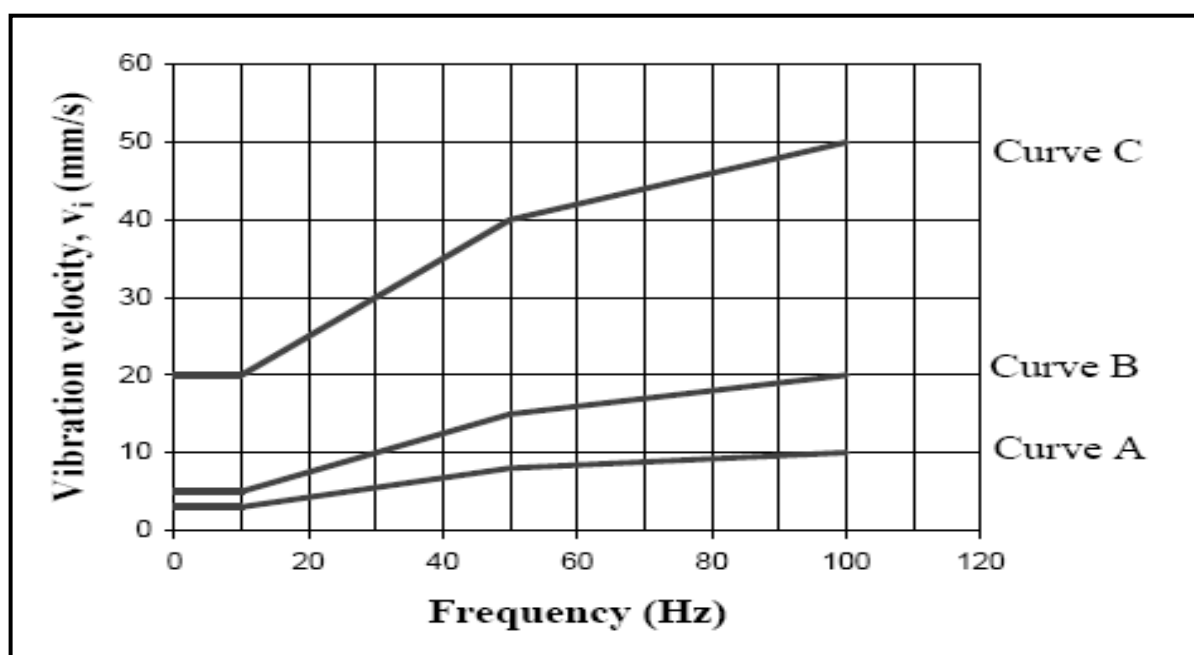
Existing Level	New Desirable Level	Maximum Permissible Level
L_{Aeq}	L_{Aeq}	$L_{Aeq} + 3 \text{ dB(A)}$

Source: The Planning Guidelines for Environmental Noise Limits and Control, 2nd Edition, DOE, 2007.

Table D.13: Recommended Limits 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 D.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

Source: The Planning Guidelines for Vibration Limits and Control in the Environment, 2nd Edition, DOE, 2007.



Source: The Planning Guidelines for Vibration Limits and Control in the Environment, 2nd Edition, DOE, 2007.

Figure D.1: Foundation Vibration Velocity Limiting Values for Vectoral Sum of Vibration Levels in Three Orthogonal Axes

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APPENDIX E

EIA CHECKLIST



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APPENDIX E

EIA CHECKLIST

E.1 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 an EIA previously prepared for the existing development?			
	(b) Does the addition involve new area development? If so how much and where?			
3.0	Does the project involve slope and hill areas:			
	(a) ≥ 300 m above mean sea level, covering an area ≥ 20 ha.			
	(b) Involve development or land clearing $< 50\%$ of an area with slopes ≥ 25 but < 35 .			
	(c) Involve development or land clearing of $\geq 50\%$ of an area with slope ≥ 25 but < 35 .			
	(d) For construction of road, tunnel or bridge traversing an area with slope ≥ 35 ?			
4.0	Has policies compliance been met by the Project Proponent?			
	(a) National and state approvals			
	(b) Land status/application			
	(c) Environmentally Sensitive Areas			
	(d) Slope hazards and terrain			
	(e) Forestry and wildlife management			
	(f) Hydrological assessment			
	(g) Orang Asli community issues			
	(h) Others (SIA, TIA, HIA, etc.)			
5.0	Who were involved in the scoping tasks?			
	(a) Project Proponent			
	(b) Town planner/Architect			

Item		Adequacy Check		Remarks
		Yes	No	
	(c) Engineering consultants			
	(d) Environmental consultant			
	(e) Affected public/stakeholders			
	(f) Government agencies (GAs)			
	(g) Others			
6.0	Does the project involve the following activities:			
	(a) Site access			
	(b) Land clearing			
	(c) New borrow area/quarry			
	(d) Cut-and-fill/earthworks			
	(e) Buildings which require foundations			
	(f) Infrastructures and amenities			
	(g) Pollution treatment systems			
7.0	Geographic scope			
	(a) Are the following features intersected by the Project?			
	(i) Rivers and/or lakes			
	(ii) Coastal areas			
	(iii) Wetlands/mangroves			
	(iv) Forest reserves			
	(v) Built-up areas			
	(vi) Tourism/recreational areas			
	(b) Are the environmental issues with each feature identified?			
8.0	Timeline			
	(a) Project implementation schedule (by phases in chronological order of occurrence)			
9.0	Project information provided:			
	(a) Project concept and layout			
	(b) Project activities			
	(c) Material sources and storage			
	(d) Infrastructure, utilities and amenities requirement			
	(e) Surrounding landuse compatibility			
10.0	Site Suitability Assessment (SSA)			
	(a) Site constraints/suitability addressed?			

Item		Adequacy Check		Remarks
		Yes	No	
	(b) Have the affected public be informed/consulted?			
	(c) Alternative project layout provided?			
	(d) Best available technology (BAT) considered?			
	(e) No Project Option?			
11.0	Significant impacts scoped and prioritised?			
	(a) Identified Impacts			
	(i) Ecology			
	(ii) Erosion and sedimentation			
	(iii) Geotechnical hazards			
	(iv) Hydrology			
	(v) Water quality			
	(vi) Wastes			
	(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?			

E.2 CHECKLIST FOR ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT

Item		Adequacy Check		Remarks
		Yes	No	
1.0	Executive Summary (Brief and Concise)			
	(a) In Bahasa Malaysia			
	(b) In English			
2.0	Introduction			
2.1	(a) Title of the project			
	(b) Project Proponent details			
	(c) EIA Consultant details			
	(d) Project location (boundary coordinates)			
	(e) Relevant maps showing project location and ESAs			
2.2	Legal requirements			

Item		Adequacy Check		Remarks
		Yes	No	
3.0	Terms of Reference			
4.0	Statement of Need			
	(a) Principle reasons for proposed project (include relevant supporting documents)			
	(b) Aim of project			
5.0	Project Options			
	(a) Alternatives considered?			
	(b) Project optimisation done?			
6.0	Project Description			
6.1	Project concept:			
	(a) Layout plan (Map)			
	(b) Landuse zoning and compatibility			
	(c) Size and land requirement			
	(d) Project component			
	(e) Method statement			
	(f) Labour requirement			
	(g) Raw material requirement			
	(h) Marine/Land transport			
	(i) Infrastructure/Utilities/Amenities			
6.2	Project activities: Construction			
6.3	Project activities: Operational			
6.4	Project Implementation Schedule (Chart)			
7.0	Description of Existing Environment			
7.1	Baseline			
	(a) Physico-chemical			
	(i) Topography			
	(ii) Soil investigations			
	(iii) Geological terrain mapping			
	(iv) Geotechnical report			
	(v) Seismic study			
	(vi) Landuse (5-km radius)			
	(vii) Hydrology/drainage			
	(viii) Climate			
	(ix) Water quality			
	(x) Ambient air quality			
	(xi) Ambient noise and vibration levels			

Item		Adequacy Check		Remarks
		Yes	No	
	(b) Biological			
	(i) Terrestrial (Flora and fauna)			
	(ii) Aquatic/Marine (Flora and fauna)			
	(c) Socio-economy			
	(i) Demography			
	(ii) Historical, cultural and archaeological aspects			
7.2	Others:			
	(a) Traffic Impact Assessment			
	(b) Health Impact Assessment			
	(c) Social Impact Assessment			
8.0	Evaluation of Impacts			
8.1	Detailed examination of impacts during:			
	(a) Pre-construction Phase			
	(i) Site access			
	(ii) Site surveys, soil and geotechnical studies			
	(iii) Environmental assessment			
	(iv) Land acquisition			
	(b) Construction Phase			
	(i) Access road and stream crossings			
	(ii) Base camp and site facilities establishment			
	(iii) Worker recruitment, mobilisation of equipment and materials			
	(iv) Site clearing and biomass removal			
	(v) Earthworks			
	(vi) Blasting			
	(vii) Drainage works			
	(viii) Structural works and facilities establishment			
	(ix) Waste disposal			
	(x) Establishment of permanent access			
	(xi) Final finishing and landscaping			
	(c) Operational Phase			
	(i) Occupation and operation of project			

Item		Adequacy Check		Remarks
		Yes	No	
	(ii) Slope maintenance			
	(iii) Infrastructure, utility and amenities maintenance			
	(d) Decommissioning Phase			
	(i) Site decommissioning			
	(ii) Rehabilitation works			
9.0	Pollution Prevention and Mitigation Measure (P2M2)			
9.1	Environmental Aspects			
	(a) Erosion and sedimentation			
	(b) Landslides and slope failure			
	(c) Drainage and flooding			
	(d) Water pollution			
	(e) Air quality and dust control			
	(f) Noise and vibration control			
	(g) Waste management			
	(h) Ecological management			
	(i) Public health and safety			
	(j) Land traffic			
	(k) Infrastructure and utility			
10.0	Environmental Management Plan (EMP)			
10.1	Guided Self-Regulation detailed out?			
10.2	Pollution Control Systems provided?			
10.3	LD-P2M2 included?			
10.4	Proposed Monitoring Programme:			
	(a) Location of monitoring points			
	(b) Frequency of monitoring			
	(c) Parameters to be measured			
	(d) Procedures for reporting and enforcement			
10.5	Environmental Audit Programme			
11.0	Study Findings/Conclusion			
12.0	Reference			
13.0	Appendices			



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