# ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES FOR AGRICULTURE

Department of Environment
Ministry of Environment and Water, Malaysia

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**e ISBN 978-967-2845-29-4**

Published by:
**DEPARTMENT OF ENVIRONMENT**
Ministry of Environment and Water
Level1-4, Podium 2&3, Wisma Sumber Asli,
No. 25, Persiaran Perdana, Presint 4,
62574 Putrajaya.

Front Cover Photo Credit:
Leonardo Losoviz, www.mesym.com

Other Photos:
Datuk Abd Kadir bin Abd Hadi,
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# ACKNOWLEDGEMENT

The Department of Environment (DOE) wishes to express its gratitude to all stakeholders who have provided valuable input in the development of this guideline. They include representatives from Federal and State government agencies, the private sector and non-government agencies (NGOs). Contributions from all individuals who have shared their knowledge and experience are much appreciated.

The Department is also grateful to all DOE staff for their efforts and passion in steering the Guidelines into reality for the benefits of streamlining and improving EIA report preparation in the country.

Finally, DOE also hopes that the Guidelines will be used in the context of EQA 1974 for the betterment of Environmental Management in the country.

# PREFACE

The **Environmental Impact Assessment Guidelines for Agriculture** have been prepared to account for the latest amendments in the ***Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015***, a subsidiary legislation of the ***Environmental Quality Act (EQA) 1974 (Act 127).***

Projects that are deemed prescribed activities are listed in the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015 and will require an Environmental Impact Assessment (EIA) to be undertaken by qualified persons, i.e. EIA Consultants, and approved by the Department of Environment (DOE).

The DOE has been streamlining the EIA process to align with the scope, functions, and vision of its Environmental Management Strategic Plan. As part of this plan, the DOE issued the ***Environmental Impact Assessment Guidelines in Malaysia (EGIM)*** in 2016, to guide industries, project developers and EIA consultants on the general requirements of the EIA. EGIM also stresses the early adoption of Environmental Mainstreaming and Guided Self-Regulation principles in project planning. Similarly, this guideline, to be read in conjunction with the complementary EGIM, shall aid in the undertaking of EIA studies pertaining to Agricultural projects.

Land-based projects such as Agricultural activities could have devastating environmental impacts including, but not limited to, indiscriminate primary and secondary forest removal that could lead to loss of livelihoods of people dependent on forest-based economies and increase in human-wildlife conflict. Apart from these, there could be impacts due to erosion, additional pollutant loads on rivers and other water bodies, soil contamination, improper waste disposal, and dust and noise due to vehicular movement. Therefore, identifying and quantifying the relevant impacts must be an integral part of the assessment process and proposing the mitigation measures. This will establish the basis for the commitment of the Project Proponent to ensure that mitigating measures are adhered to during the implementation of the project and

not to adversely affect the ecology or the surrounding human environment. The objectives of this guideline are:

- Defining environmental requirements for managing the project.
- Providing relevant 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 Guideline shall provide guidance to various stakeholders such as Government Agencies, approving authorities, Project Proponents, Qualified Persons including DOE-registered EIA Consultants, Subject Specialists, and other EIA-related practitioners in the preparation and submission of EIA reports for Fisheries activities.

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

**NORLIN BINTI JAAFAR**

Director General

Department of Environment, Malaysia.

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| | |
|---|---|
| **APCS** | Air pollution control system |
| **AN** | Ammoniacal Nitrogen |
| **BOD** | Biochemical Oxygen Demand |
| **CFS** | Central Forest Spine |
| **CAO** | Conditions of Approval (EIA) |
| **Cd** | Cadmium |
| **$Cl_2$** | Chlorine |
| **CN** | Cyanide |
| **COD** | Chemical Oxygen Demand |
| **CO** | Carbon monoxide |
| **CO2** | Carbon dioxide |
| **$Cr^{3+}$** | Chromium Trivalent |
| **Cu** | Copper |
| **dB** | Decibel |
| **dB(A)** | A-weighted decibel |
| **DID** | Drainage & Irrigation Department (JPS) |
| **DO** | Dissolved Oxygen |
| **DOA** | Department of Agriculture |
| **DOE** | Department of Environment |
| **DOSM** | Department of Standards Malaysia |
| **DTCP** | Department of Town & Country Planning |
| **DVS** | Department Of Veterinary Services Malaysia |
| **EIA** | Environmental Impact Assessment |
| **EIATRC** | EIA Technical Review Committee |
| **EGIM** | Environmental Impact Assessment Guideline In Malaysia |
| **EM** | Environmental Mainstreaming |
| **EMP** | Environmental Management Plan |
| **EQA 1974** | Environmental Quality Act 1974 |
| **ERA** | Environmental Risk Assessment |
| **ESA** | Environmentally Sensitive Area |
| **ESCP** | Erosion and Sedimentation Control Plan |
| **ESI** | Environmental scoping information |
| **FAO** | Food & Agricultural Organisation of the United Nations |
| **Fe** | Iron |
| **FRIM** | Forest Research Institute of Malaysia |
| **GAHP** | Good Animal Husbandary Practice |
| **GAs** | Government Agencies |
| **GIS** | Geographical Information System |
| **GTM** | Geological terrain mapping |

| | |
|---|---|
| **Hg** | Mercury |
| **HRA** | Health Risk Assessment |
| **HWC** | Human Wildlife Conflict |
| **IETS** | Industrial Effluent Treatment System |
| **IUCN** | International Union for Conservation of Nature |
| **JAKOA** | Jabatan Kemajuan Orang Asli |
| **JKR** | Jabatan Kerja Raya (Public Works Department) |
| **JPBD** | Jabatan Perancang Bandar & Desa / PLANMalaysia |
| **JPS** | Jabatan Pengairan dan Saliran (DID) |
| **JPSM** | Jabatan Perhutanan Semenajung Malaysia / Forestry Department of Peninsular Malaysia |
| **kg** | kilogram |
| **km** | kilometer |
| **KSAS** | Kawasan Sensitif Alam Sekitar / Environmentally Sensitive Areas |
| **KPTG** | Ketua Pengarah Tanah dan Galian |
| **kW** | kilowatt |
| **Kwh** | Kilowatt per hour |
| **$LC_{50}$** | Concentration of toxic substance (gaseous or liquid) at which 50% of the test population usually (mice) die within a certain period of time |
| **Ldn** | Day-night Sound Level (for assessing 24-hour exposure) |
| **Leq** | Equivalent Sound Level (used to describe 8-hour exposure) |
| **LO** | Land Office |
| **m** | meters |
| **$m^3$** | cubic meters |
| **MAAQS** | Malaysian Ambient Air Quality Standard |
| **mg/l** | milligram per liter |
| **min** | Minimum |
| **Mn** | Manganese |
| **MOA** | Ministry of Agriculture |
| **MOH** | Ministry of Health |
| **MOSTI** | Ministry of Science, Technology and Innovation |
| **MPF** | Modern pig farming |
| **MPFN** | National Physical Planning Council of Malaysia |
| **MPI** | Ministry of Primary Industries |
| **MPIC** | Ministry of Plantation and Commodities |
| **MPOB** | Malaysian Palm Oil Board |
| **MSL** | Mean Sea Level |
| **MSMA-2** | Manual Saliran Mesra Alam Edisi-2 |
| **MSPO** | Malaysia Sustainable Palm Oil |
| **NGO** | Non-Government Organization |
| **$NO_2$** | Nitrogen Dioxide |
| **NPP-3** | National Physical Plan 3 |

| | |
|---|---|
| **NRE** | Ministry of Natural Resources |
| **NWQS** | National Water Quality Standard |
| **O&G** | Oil and grease |
| **PERHILITAN** | Department of Wildlife and National Parks Peninsular Malaysia |
| **PM** | Performance monitoring |
| **ppm** | parts per million |
| **PBT** | Pihat Berkuasa Tempatan / Local Authority |
| **PTD** | District and Land Office |
| **PRF** | Permanent reserved forest |
| **PSF** | Peat swamp forest |
| **PTG** | Pejabat Tanah Dan Galian |
| **ROW** | Right of Way |
| **RSPO** | Roundtable on Sustainable Palm Oil |
| **$S^{2-}$** | Sulphide |
| **SIA** | Social Impact Assessment |
| **SIDRA** | Signalised and Unsignalized Intersection Design and Research Aid |
| **SMA** | Special Management Area |
| **Sn** | Tin |
| **$SO_2$** | Sulphur Dioxide |
| **SPC** | State Planning Committee |
| **SPE** | Sistem Pengolahan Effluent |
| **STS** | Sewage Treatment System |
| **SS** | Suspended Solids |
| **SSA** | Site suitability assessment |
| **TOR** | Terms of Reference |
| **TSS** | Total Suspended Solids |
| **UNEP** | United Nations Environmental Protection |
| **USEPA** | United States Environmental Protection Agency |
| **USLE** | Universal Soil Loss Equation |
| **VOC** | Volatile Organic Compounds |
| **°C** | degree Celcius |
| **µg/l** | microgram per liter |
| **ZOI** | Zone of Impact |
| **ZOS** | Zone of Study |

Guidelines Overview

# Agriculture

CHAPTER 1

## Purpose of the Guideline

To provide clear and concise guidance on the preparation of Environmental Impact Assessments (EIA) for agriculture projects and activities defined as ***prescribed activity*** in the EIA Order 2015.

## Applicability

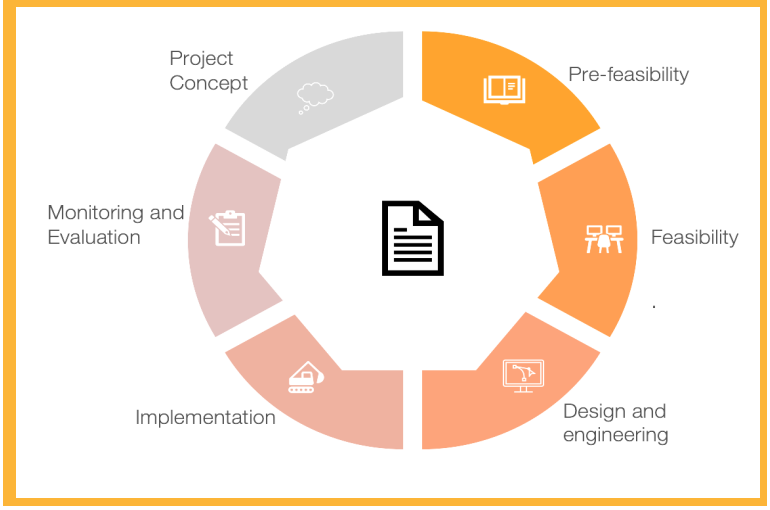
- Applicable to agriculture projects that qualify as a ***prescribed activity*** in Peninsular Malaysia.
- Use this document as a guide for non-prescribed activities.
- Guidelines to be read with EGIM 2016

## Objectives

- Provide clear and concise guidance on EIA project planning.
- Facilitate integration of the EIA into the overall project planning and development cycle.
- Provide a clear understanding on the interpretation of various terms and definition.
- Provide a detailed step-by-step guidance with explanation of the various EIA procedures and submission.
- Provide a clear framework for DOE to assess and approve the EIA report.
- Clearly define the scope of the EIA with a focus on the significant environmental issues relevant to the DOE's three functional area.

## Project Phases in EIA Study

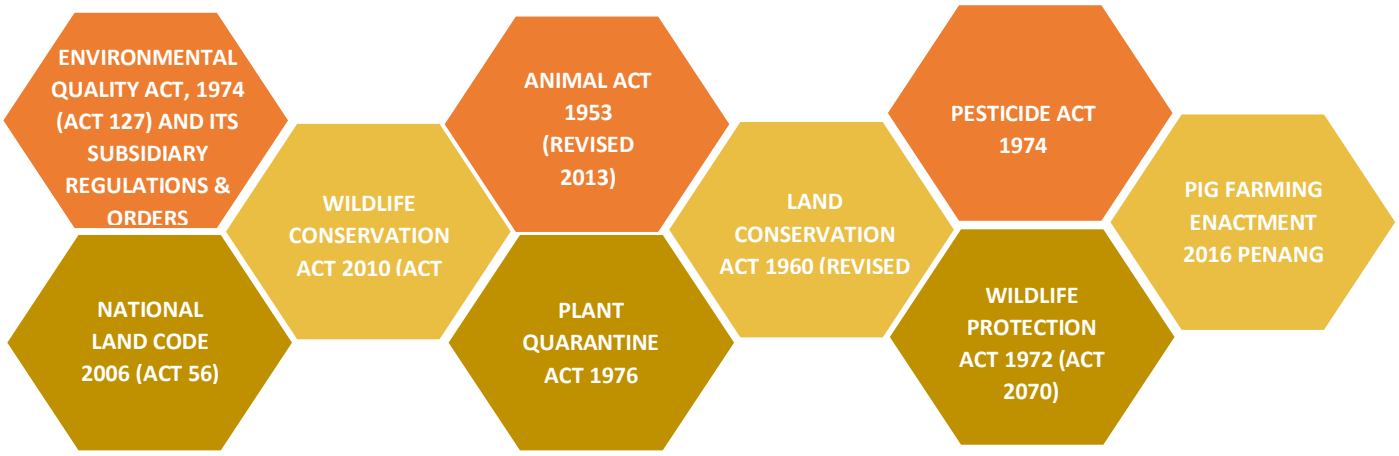
Incorporation of EIA study at an early of project planning at the Project Concept and Pre-feasibility stages provides significant benefits.




## Overview of the EIA Process

1. Provide Project Brief
2. Identify Legal Requirements
3. Review current Policies & Guidelines
4. Engagement with Stakeholders
5. Prepare TOR and ESI for Second Schedule EIA, and scoping for First Schedule EIA
6. Submit TOR to DOE and TORAC meeting for Second Schedule EIA
7. Baseline Data Collection for EIA
8. Undertake assessments conclude findings & mitigation measures
9. Stakeholders engagement (affected and finalise findings
10. Prepare EIA Report
11. EIA Submission & Public Display for Second Schedule EIA
12. EIATRC meeting
13. Decision by DOE and Approval

## Legislations for Agriculture in Malaysia




| Relevant Guidelines related to Agriculture Activities |
|---|
| Garis Panduan Perancangan Kawasan Sensitif Alam Sekitar |
| Environmental Impact Assessment Guidelines for Development in Slope and Hill Areas |
| Guidance Document for Addressing Soil Erosion and Sediment Control (ESC: Aspects in the EIA Report as per Appendix 3 of the EGIM |
| Guidance Document for the Preparation and Submission of EMP as per Chapter 6 of the EGIM |
| Guidelines for Agricultural Development in Slope Areas. Department of Agriculture, Ministry of Agriculture and Agro- Based Industry |
| Guidelines for Durian Development in Sloping Land |
| Safety Guideline for Hill Site Development in Penang |
| Planning Guidelines for Development in Hill Areas and Highlands for Selangor |
| Guidelines for Hillside and Slope Areas Development Planning for the Federal Territory of Kuala Lumpur Guidelines for Erosion and Sediment Control in Malaysia |
| Guidelines for Hillside and Highland Areas Development Planning |
| DID Manual Volume 2 - River Management |
| Garis Panduan Pembangunan Melibatkan Sungai & Rezab Sungai |
| Guidelines for Prevention and Control of Soil Erosion and Siltation in Malaysia |
| Guidelines for the Development in Highland Areas |
| Stream Crossing Guidelines: An Ecological Approach |
| Garis Panduan Ternakan Unggas Reban Tertutup |
| RSPO Guidelines for Sustainable Oil Palm Management |
| Malaysian Sustainable Palm Oil (MSPO) |
| 'Guidelines for the development of Peat land for Agriculture' in Plan Induk Rangkaian Ekologi CFS |
| Sustainable Development of Agriculture Surrounding Wetlands' in Pelan Induk Rangkaian Ekologi CFS Garis Panduan Sistem Pengolahan Efluen (SPE) Bagi Penternak Babi |
| Guidelines for the Development of a Standard Operating Procedure for Oil Palm Cultivation on Peat Malaysian Oil Palm: Sustainability Manual |

## ENVIRONMENTAL QUALITY (PRESCRIBED ACTIVITIES) (ENVIRONMENTAL IMPACT ASSESSMENT) ORDER 2015

| FIRST SCHEDULE PRESCRIBED ACTIVITY | SECOND SCHEDULE PRESCRIBED ACTIVITY |
|---|---|
| **ACTIVITY 1** | **ACTIVITY 1** |
| (a) Land development schemes covering an area of 20 hectares or more but less than 500 hectares to bring forest into agricultural production. | (a) Land development schemes covering an area of 500 hectares or more to bring forest into agricultural production. |
| (b) Development of agricultural estates covering an area of 500 hectares or more involving changes in types of agricultural use. | (b) New pig farming area of 2,000 or more standing pig population. |

## ENVIRONMENTAL SCOPING

**Rapid desktop assessment conducted to gain a preliminary understanding of the key attributes and environmental impacts of a proposed project**

- Site Suitability Analysis
- Determination of Study Boundary
- Baseline Data Review
- Determination of Key Project Activities
- Identification of Significant Impacts and Priority Setting
- Establishment of Study Requirements for EIA
- Selection of Mitigation Measures

**Second Schedule EIA**
Terms of Reference and Environmental Scoping Information

**First Schedule EIA**
Scoping exercise for internal use

## DETERMINING ENVIRONMENTAL BASELINE CONDITIONS

**To document the existing environment within Project site and its Zone of Study (ZOS) prior to Project development, and to determine suitable approaches & methodologies for impact assessments.**

Primary Data :
Ground truthing, field sampling and monitoring, site survey & investigations

⟷

Secondary Data :
Published plans, maps, data, reports, research and statistics from reliable sources, data from DOE monitoring stations.

## Baseline Data Collection

| Physico-chemical | Human | Biological |
|---|---|---|
| Topography | Land Uses, Zoning | Habitat Mapping |
| Geology | Land Tenure & Classifications | Species Inventory |
| Soil types & classes | Demographic profile | Abundance & Diversity Assessment |
| River Network & Hydrology | Displacement of People | Terrestrial Fauna |
| Water Availability & Quality | Awareness & Perceptions | Terrestrial Flora |
| Waste | Settlements | Aquatic Flora |
| Air Quality | Public health | Aquatic Fauna |
| Noise & Vibration | Traffic | Reserves & Sanctuaries |
| Climate | Heritage, Culture, and Archaeology | |

☑ *Collecting existing data is first step in the collection of baseline information.*

☑ *Must review for its relevance to the proposed site, its accuracy, and used as a basis for determining what primary field investigations may be required to 'fill the gaps'.*

☑ *Baseline data collection should be carried out at appropriate time of year.*

## PREDICTING AND EVALUATING IMPACTS

To predict and evaluate how the project will affect the physio-chemical, ecological and human components within the landscape

### Typical Impacts of Agriculture Projects

***Physical Environment***

- *Topography*
- *Slope Features*
- *Soil Features and Suitability*
- *Geology*
- *Hydrology*
- *Climate*
- *Surface Water Quality*
- *Air Quality and Noise Level*

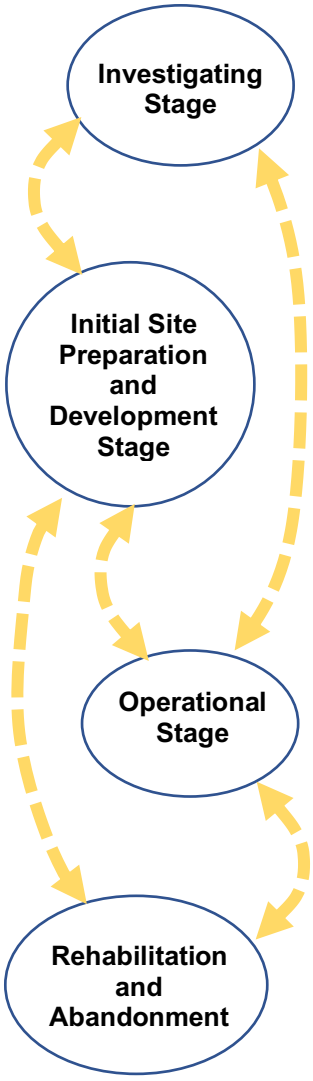
***Biological Environment***

- *Wildlife*
- *Forest Cover*
- *Rare, protected or endangered and area, fisheries*
- *Aquatic Biology*
- *Wilderness or protected areas, key conservation value habitats or species*

***Human Environment***

- *Population and communities*
- *Infrastructural facilities*
- *Water Catchment Areas*
- *Transportation)*
- *Archaeological, historical and cultural values and aesthetic values*

### Typical Breakdown of Project stages



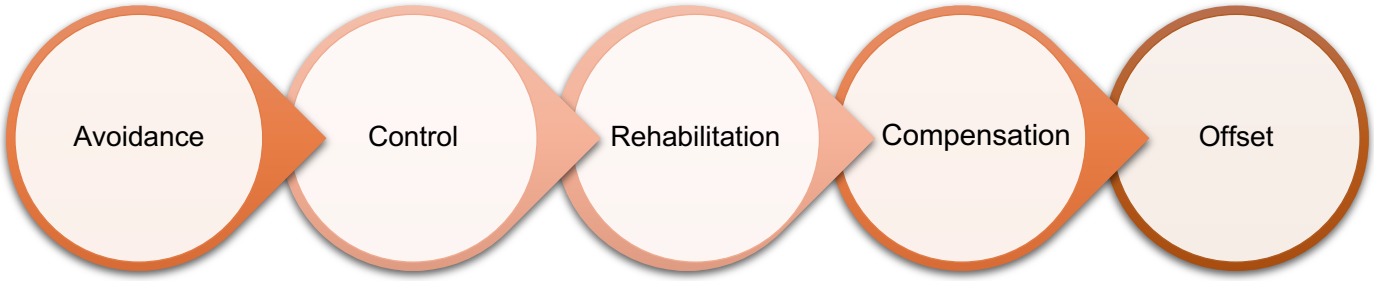

### Predictive Methods

- Checklist
- Matrices
- Spatial Analysis
- Expert Opinion
- Carrying Capacity Analysis
- Mathematical and Computer Modelling
- Network and System Analysis
- Consultations and Questionnaires
- Case Studies

### Criteria and Standards

- *Relevant laws or regulations*
- *Accepted national or international standards and limits*
- *Relevant Policies and Plans*
- *Consultation with subject experts and acceptability with the relevant decision makers.*
- *Consultation with stakeholders – impact receptors.*

## ADDRESSING IMPACTS




- *Modifications to the project design or layout to avoid the impact*
- *Implementation of BMPs or technology to reduce the impact*
- *Remedial measures such as reforestation, replanting of mangroves, development of vegetated buffers or forest rehabilitation*
- *Such as resettlement, payment for loss of income*
- *Such as replanting forest elsewhere to ensure no net loss of forest*

## KEY MITIGATION MEASURES

| Objectives | Mitigation Considerations |
|---|---|
| **Avoidance of negative impacts through selection of best options/alternatives** | **Ecological Impacts**<br>•Matching of Project Boundary with Water Catchment Boundary<br>•Buffer Zones for Protected Areas |
| **When an impact cannot be avoided, to adopt appropriate preventive measures and best management practices (BMPs) to reduce and minimise the impacts** | **Soil Erosion**<br>•Zoning of High Soil Erosion Areas<br>•Zoning of River Reserves<br>•Soil Erosion Management |
| **Ensure residual impacts are kept within acceptable levels** | **Flood Mitigation**<br>•Zoning of Flood Prone Areas<br>•Maintenance of Waterways |

**Biomass Management** | **Socio-economics Enhancement** | **Handling and Usage of Agro-Chemicals** | **Pest Control**

**Management of Hazardous Materials** | **Waste Management of Workforce Camp** | **Emission/ Sequestration of Greenhouse Gas** | **Any Others (Drainage systems etc.)**

## DEVELOPING OUTLINE OF ENVIRONMENTAL MANAGEMENT PLAN

**EMP** is a legal document prepared by the Project Proponent incorporating pollution prevention and mitigation measures and best management practices stipulated in the Conditions of Approval by the Department of Environment

### Standard Conditions of Approval

- Monthly monitoring of water quality of receiving water body by Accredited Laboratory or any other frequency as determined by DOE
- Monthly monitoring of TSS and Turbidity at inlets and outlets of sediment structures or any other frequency as determined by DOE
- In-situ monitoring of TSS and Turbidity after rain event
- Monthly or Quarterly monitoring of air, noise and vibration qualities depending on sensitivity of receptor
- Planning, construction and maintenance of LD-P2M2 on site
- P2M2 notification and implementation
- Identification of need of competent person to undertake specific task on site
- Description and implementation details of EMT
- Clear documentation on any transfer of ownership or proponent of Approved EIA
- Allocation and reporting of sufficient resources to undertake the project activities onsite
- Temporary/permanent abandonment/project closure plan details for all phases
- Implementation of 5S concept in good housekeeping practices
- Any other green initiatives undertaken for site development activities

**Refer to EGIM 2016 for EMP Format**

**Must be comprehensive documenting programs for implementing environmental management and controls, , clearly stating roles and responsibilities of all involved.**

## Mitigation Considerations

- **Performance Monitoring**
- **Compliance Monitoring**
- **Impact Monitoring**

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

- **Pre-Audit**
- **On-Site Audit**
- **Post Audit**

**EIA REPORT CONTENTS**

- Declaration
- Executive Summary
- Introduction
- Terms of Reference of EIA Study
- Existing Environment
- Project Description
- Project Options
- Statement of Need
- Evaluation of Impacts
- Mitigation Measures
- Environmental Management Plan
- Study Findings
- Appendices
- References

*Data Deliverables*

- ☑ *All relevant data collected during the EIA should be made available*
- ☑ *Sampling results, modelling databases, baseline data, metadata*

*Conclusion to EIA Report*

- ☑ *When concluding the report, Qualified Person should provide fair and unbiased conclusion of the EIA study based on the expert opinion of the impact assessment for the purpose of informed decision-making*

## Stakeholder Engagement & Public Display

Engagements should be ongoing from planning stage until Project development

| Second Schedule EIA | |
|---|---|
| ❖ Public Briefing | ❖ Online Display |
| ❖ Public Display & Review of the EIA report | ❖ Additional Engagements |
| ❖ Display Locations | ❖ Documentations |

***Good Practices in Stakeholder Engagements***

- Stakeholder Identification
- Transparency
- Information Database
- Communication Tools
- Notifications
- Selection of Venue
- Documentation
- Accountability & Continuity


*Cameron Highland, Malaysia*
*Photo By: Jules Rahman Ong (www.channelnewsasia.com)*

# 1

# INTRODUCTION

# CHAPTER 1 INTRODUCTION

## 1.1 PURPOSE OF THE EIA GUIDELINE FOR AGRICULTURE PROJECTS

The purpose of the EIA Guideline for Agriculture is to provide clear and concise guidance on the preparation of Environmental Impact Assessments (EIA) for agriculture projects. The guideline is a subset of the ***Environmental Impact Assessment Guideline in Malaysia (EGIM) (DOE, 2016).***

The main target audience of this guideline are Project Proponents, Department of Environment (DOE) - registered EIA consultants (hereinafter referred to as 'Qualified Person') and other EIA-related practitioners.

## 1.2 APPLICABILITY OF THE EIA GUIDELINE FOR AGRICULTURE PROJECTS

The guidelines titled **'Environmental Impact Assessment (EIA) Guidelines for Agriculture** (hereinafter referred to as the 'Guidelines') are prepared to take into account the latest requirements in the ***Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015***, of the ***Environmental Quality Act (EQA) 1974 (Act 127)***. Agriculture projects are prescribed under ***Activity 1 (Agriculture***) for both First Schedule and Second Schedule, as shown below:

**FIRST SCHEDULE**
**Activity 1 AGRICULTURE**

**(a)** **Land development schemes covering an area of 20 hectares or more, but less than 500 hectares, to bring forest into agricultural production.**

**(b)** **Development of agricultural estates covering an area of 500 hectares or more involving changes in types of agricultural use.**

**SECOND SCHEDULE**
**Activity 1 AGRICULTURE**

**(a)** **Land development schemes covering an area of 20 hectares or more, but less than 500 hectares, to bring forest into agricultural production.**

**(b)** **Development of agricultural estates covering an area of 500 hectares or more involving changes in types of agricultural use..**

**If a project falls under more than one prescribed activity and if one of the prescribed activities falls under the Second Schedule, then the project is deemed to fall under the ambit of the Second Schedule.**

The legal adherence to the EQA 1974 is based on the following sub-sections:

| | |
|---|---|
| **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 |
| **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. |

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 Environment Strategic Plan, with a focus on **Environmental Mainstreaming Tools (EMT) to achieve Self-Regulation (SR).**

## APPLICABILITY AND COVERAGE OF GUIDELINES

- Activity 1: Agriculture under the EIA Order 2015 only applies to agriculture projects in Peninsular Malaysia.
- The prescribed activities mentioned above does not apply to the States of Sabah and Sarawak where the management of natural resources are subject to separate state legislation and requirements and are as listed below:

**Sabah**

- ***Environment Protection Enactment, 2002*** (Enact. 12/2002).
- Applicable in the State of Sabah and is administered by the Environmental Protection Department (EPD);

**Sarawak**

- ***Natural Resources and Environment Ordinance, 1993*** (Chap. 84).
- Applicable in the State of Sarawak and is administered by the Natural Resources and Environment Board (NREB).

## TERMS AND DEFINITIONS

- The proposed terms and definitions that will be adopted in the guideline are based on interpretation and relevant documents published or to be published by DOE and other related government agencies, registered bodies, and institutions. The legal definitions and interpretations are based on the *Interpretation Acts 1948 and 1967 (Act 388).*

Also, refer to **Chapter 3** for definition, description and applicability for Agriculture project.

## 1.3 USING THIS GUIDELINE

This guideline **should be read together with the Environmental Impact Assessment Guideline in Malaysia (EGIM)** (DOE, 2016). The EGIM sets out in greater detail the procedures and requirements to be complied with at each stage of the EIA process, for all prescribed activities, whereas this guideline provides specific additional guidance on prescribed activities pertaining to agriculture projects. This Guideline is to assist the Project Proponent when **planning and developing new or expanding existing projects**.

According to EGIM, there are 10 main steps involved in the EIA process (**Table 1-1**). This guideline expands on the 10-step process, providing further details pertaining to agriculture projects.

**Table 1-1 Quick Reference of the Main Steps in the EIA Process**

| No. | Step | Refer to: | |
|---|---|---|---|
| | | Chapter in EGIM | Chapter in the EIA Guideline for Agriculture |
| 1 | Screening | Chapter 3,4 | Chapter 3 |
| 2 | Scoping Towards Formulation of Terms of Reference | Chapter 3,4 | Chapter 3 |
| 3 | Baseline Study | Chapter 3,4 | Chapter 4 |
| 4 | Impact Assessment and Evaluation of Significance | Chapter 3,4 | Chapter 5 |
| 5 | Identification of Mitigation Measures | Chapter 3,4 | Chapter 6 |
| 6 | Preparation of the EIA Report | Chapter 3,4 | Chapter 8 |
| 7 | Review of the EIA report | Chapter 5 | - |
| 8 | Decision Making | Chapter 5 | - |
| 9 | Project Implementation and Environmental Monitoring | Chapter 6 | Chapter 7 |
| 10 | Environmental Audit | Chapter 6 | Chapter 7 |

## 1.4 OVERVIEW THE ENVIRONMENTAL ASSESSMENT PROCESS

The step-by-step guide to the environmental assessment process is as follows.



**STEP 1: PROVIDE THE PROJECT BRIEF**

(a) Project Proponent must provide sufficient information about the Project to enable the Qualified Person to understand and carry out screening and initial assessment.

(b) This is to assist in determining which prescribed activity the project falls under (First or Second Schedule) based on the ***Environmental Quality (Prescribed Activity) (Environmental Impact Assessment) Order 2015***.

**STEP 2: IDENTIFY THE LEGAL REQUIREMENTS**

(a) During the Environmental Screening Process, the Qualified Person shall identify the legal requirements of the project based on the information provided by the Project Proponent

(b) Qualified Person to advise the Project Proponent on the standards and limits for compliance for the pollution generation by the project.

**STEP 3: EXISTING POLICIES AND GUIDELINES**

(a) Project Proponent is required to clear all policy matters related to the project prior to submitting the EIA report has been adhered to.

(b) Qualified Person can advise Project Proponent on the current policy matters related to project development and requirements for EIA study.

**STEP 4: ENGAGEMENT WITH STAKEHOLDER**

(a) Early in the EIA process, the Project Proponent and the Qualified Person should engage with the DOE (via the designated officer in charge) and the relevant Government Agencies (GAs) to determine the requirements to be included in the TOR and EIA.

(b) The Qualified Person can also engage with other relevant stakeholders to obtain site information and data for the scoping.

**STEP 5: PREPARATION OF THE TOR AND ESI**

(a) When it is determined that the project requires a Second Schedule EIA, the Environmental Scoping Information (ESI) and Terms of Reference (TOR) must be prepared.

(b) Qualified Person shall obtain secondary data to assist in the Environmental Scoping. At this point of the study, qualitative data is sufficient for scoping of significant impacts for the TOR.

(c) Relevant information required for the TOR and ESI that the Qualified Person is required to furnish includes:

- ✓ Site Suitability Assessment (SSA).
- ✓ Determination of the study boundary (Zone of Study) and anticipated Zone of Impact (ZOI).
- ✓ Overview of baseline data required.
- ✓ Identification of key project activities.
- ✓ Identification of significant impacts and priority setting.
- ✓ Selection of mitigation measures.

### STEP 6: SUBMISSION AND REVIEW OF THE TOR

(a) Qualified Person shall review all data obtained during the scoping to prepare the TOR report for Second Schedule EIA based on the DOE requirements in the EGIM (DOE, 2016).

(b) The TOR and ESI for Second Schedule EIA shall be submitted to the DOE State / Headquarters for review and endorsement.

(c) A TOR Adequacy Check (TORAC) meeting will be carried out (based on needs) for further clarification and endorsement of TOR.

(d) Once approved, the TOR has a validity of 1 year from the date of endorsement for the EIA report to be submitted.

### STEP 7: BASELINE DATA COLLECTION FOR EIA

(a) After TOR endorsement, baseline data collection, primary or secondary data, shall be carried out to obtain detailed information about the existing environment of the project site and its surroundings.

### STEP 8: COMPLETION OF THE EIA STUDY

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

(a) Identify and predict significant environmental issues and impacts.

(b) Perform a detailed environmental assessment on only the most significant issues.

(c) Identify the suitable pollution prevention and mitigation measures (P2M2s) to minimise any negative impacts arising from the development of the projects.

(d) Provide the Environmental Management Plan (EMP) framework in line with the Self-Regulation concept.

### STEP 9: PREPARING EIA REPORT

(a) All assessments and findings must be included in the EIA report. Take note that the results of studies required by other GAs must be incorporated into the EIA report but not to append the individual reports. These reports must, however, be reviewed and approved by the respective GAs.

(b) The EIA report must be thoroughly reviewed by the Project Proponent and with agreement to undertake the proposed P2M2 and EMP. By signing the Declaration in the EIA report, the Project Proponent shall undertake the responsibility in implementation of the P2M2 and adhere to EQA 1974.

### STEP 10: STAKEHOLDER ENGAGEMENT

(a) During preparation of the EIA report, the Project Proponent and Qualified Person shall undertake an engagement with the relevant stakeholders (those who will be affected by the project, e.g., communities or institutions, businesses, etc.).

(b) The objective is to brief these stakeholders about the project, what it entails, the potential environmental issues, and the proposed P2M2s, with the aim of seeking their thoughts and feedback. All findings of stakeholder engagement shall be incorporated into the EIA report.

**STEP 11: EIA SUBMISSION AND PUBLIC DISPLAY**

(a) The EIA report shall be submitted to the DOE State/HQ for review.

(b) Qualified Person shall note the difference in requirements for a First Schedule and Second Schedule EIA and follow the required procedures.

(c) The major difference to note is that the Second Schedule EIA shall require a public display of the EIA for the public to provide comments and feedback within the review period to DOE HQ.

**STEP 12: PRESENTATION EIA TO DOE**

(a) The EIA report must be presented to DOE State/HQ by the EIA Team Leader with attendance of Project Proponent.

(b) In the meeting, concerns arising will be discussed and decided on the need for additional information or assessment, or improvements of the overall EIA Report. Resubmission of the EIA may be required within the time frame provided, normally within the Client Charter.

**STEP 13: DECISION BY DOE AND EIA APPROVAL**

(a) Decision will be made by the DOE on the EIA Report once the information, assessment, and concerns are satisfactorily met and in line with the EQA 1974.

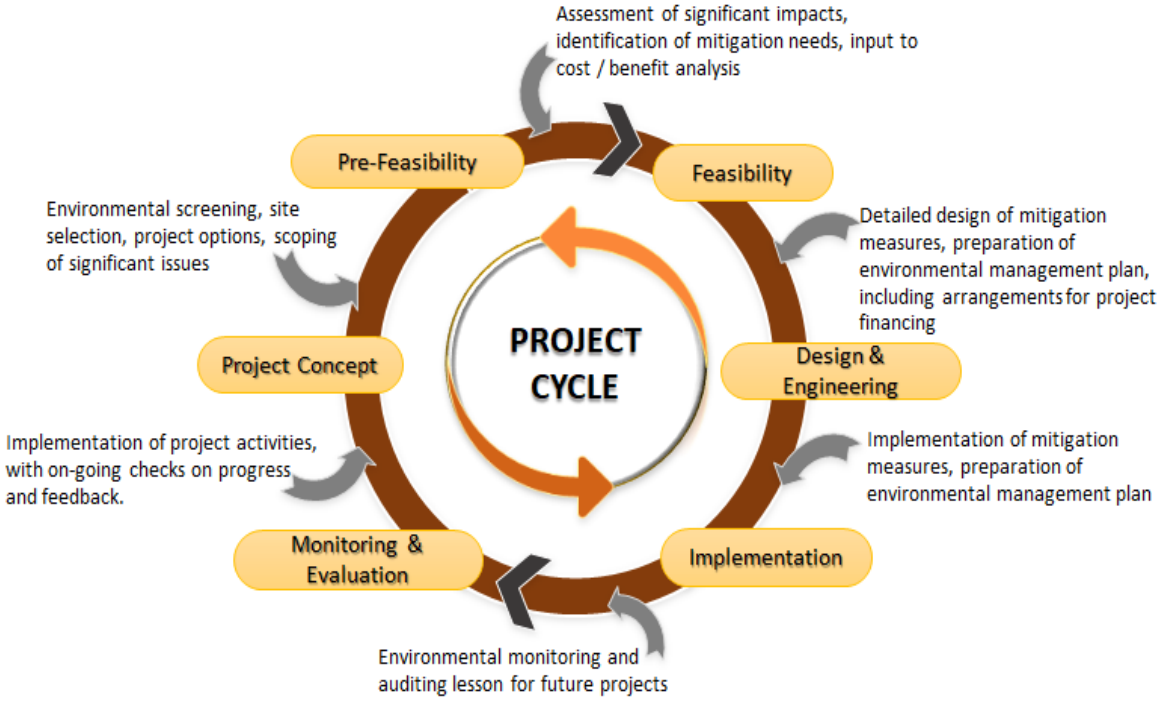
(b) The EIA approval letter will be issued by the DOE in conjunction with the EIA approval conditions, which is mandatory compliance for the Project.

(c) Project Proponent must proceed with implementation of the EIA Approval Conditions in all Project stages prescribed.

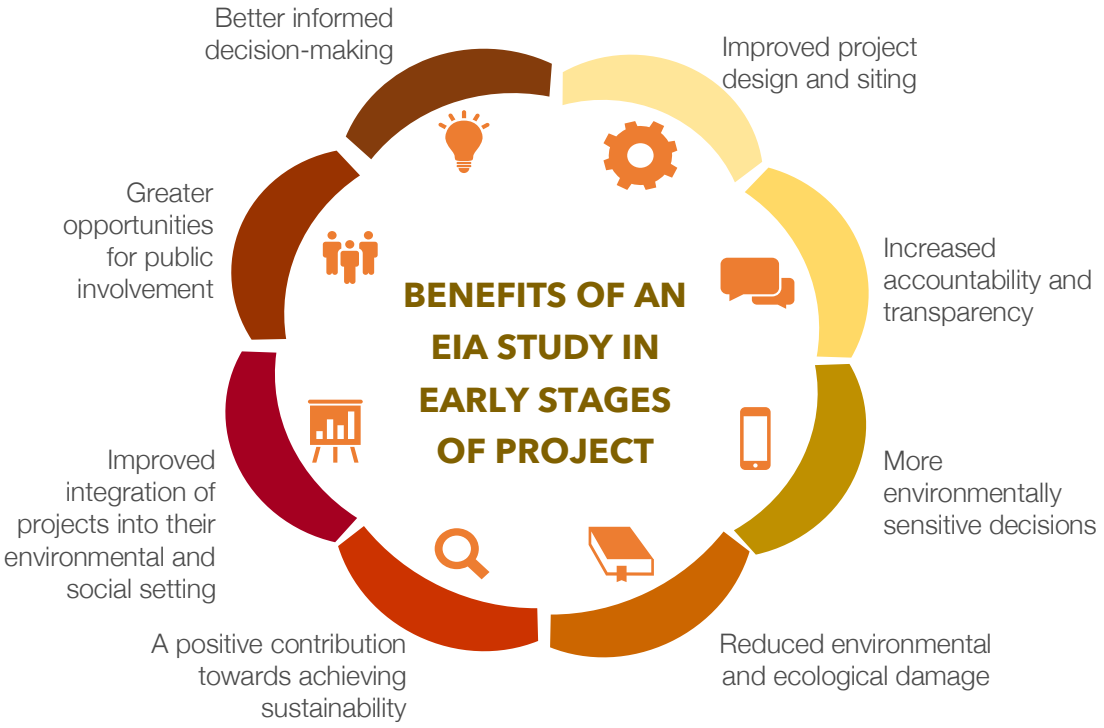
## 1.5 INCORPORATING EIA INTO THE PROJECT PLANNING FRAMEWORK

A project cycle generally has six major phases, i.e. project concept, pre-feasibility, feasibility, design and engineering, implementation, monitoring, and evaluation. The EIA should be considered an integral part of the project planning and development process, with the appropriate steps of the EIA undertaken in each phase (**Figure 1-1**).

**Figure 1-1 Project Phases And Integration Of Environmental Activities**




The incorporation of an EIA study at an early of project planning at the Project Concept and Pre-feasibility stages will have significant benefits and value add to the project and is as illustrated below.



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:

**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 need to request for land alienation (if state or federal land) or through acquisition of private land for development of the project. The Project Proponent must 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 of the project 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 land clearing and development, water resource & pollution, flooding, etc. These findings, termed the Environmental Scoping Information (ESI) forms the basis to develop the Terms of Reference (TOR) for the Department of Environment (DOE) endorsement.

**Step 2:**
**Feasibility and Detailed Project Design Phase**

The technical engineering designs of the Project would need to 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) (EIA) 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 would need to carry out the EIA based on the endorsed TOR. The EIA must incorporate major findings from the relevant sectoral studies, such as project feasibility and sustainable study for project development, land use and siting suitability, ecology assessment, water profile and hydrology study,; Social Impact Assessment (SIA), etc., as required by the other GAs.

The recommendations to manage the significant environmental impacts espoused in the EIA would need to be incorporated in the project design. For example, clearing of forests will cause erosion and would need mitigation to reduce the impacts in denuded areas.

**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 would contain 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 (if any).

**Post-EIA**: Environmental controls and management would 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 and/or avoidance of detrimental impact especially on slope failures, land slides, erosions, etc. during work activities.

Specifically, the monitoring section of the EMP will set out the following.

(a) specific monitoring measures, including the parameters to be measured and methods to be used, sampling locations, frequency of measurements, detection limits (where appropriate), and definition of thresholds that will signal the need for corrective actions;

(b) monitoring and reporting procedures to ensure earl detection of conditions tha necessitate mitigation and furnish information on the progress and results of th mitigation.

## 1.6 KEY NOTES

**Reclassification of Projects**

The classification of a project may need to be changed as circumstances dictate. For example, if there is a major modification to the project design or a new activity is added, then a change in category (either upward or downwards) may be warranted. It is also possible that new information arrives after initial project identification work. For example, a First Schedule project may be reclassified as Second Schedule if new information reveals that the project involves a bigger area and an activity may have significant adverse environmental impacts.

Furthermore, the original project implementation schedule may be delayed, especially if assessment activities must be undertaken after project implementation has started.

**Participatory Consultations**

As early as possible in the project formulation process, all efforts must be made to engage project stakeholders and beneficiaries, including indigenous people and vulnerable groups, in analysis and decision making with respect to potential environmental and social impacts of the project. Stakeholders' participation including indigenous people and vulnerable groups will be ensured in designing, implementing, and monitoring avoidance and mitigation measures and compensation & benefits including establishing appropriate and accessible grievance mechanisms.

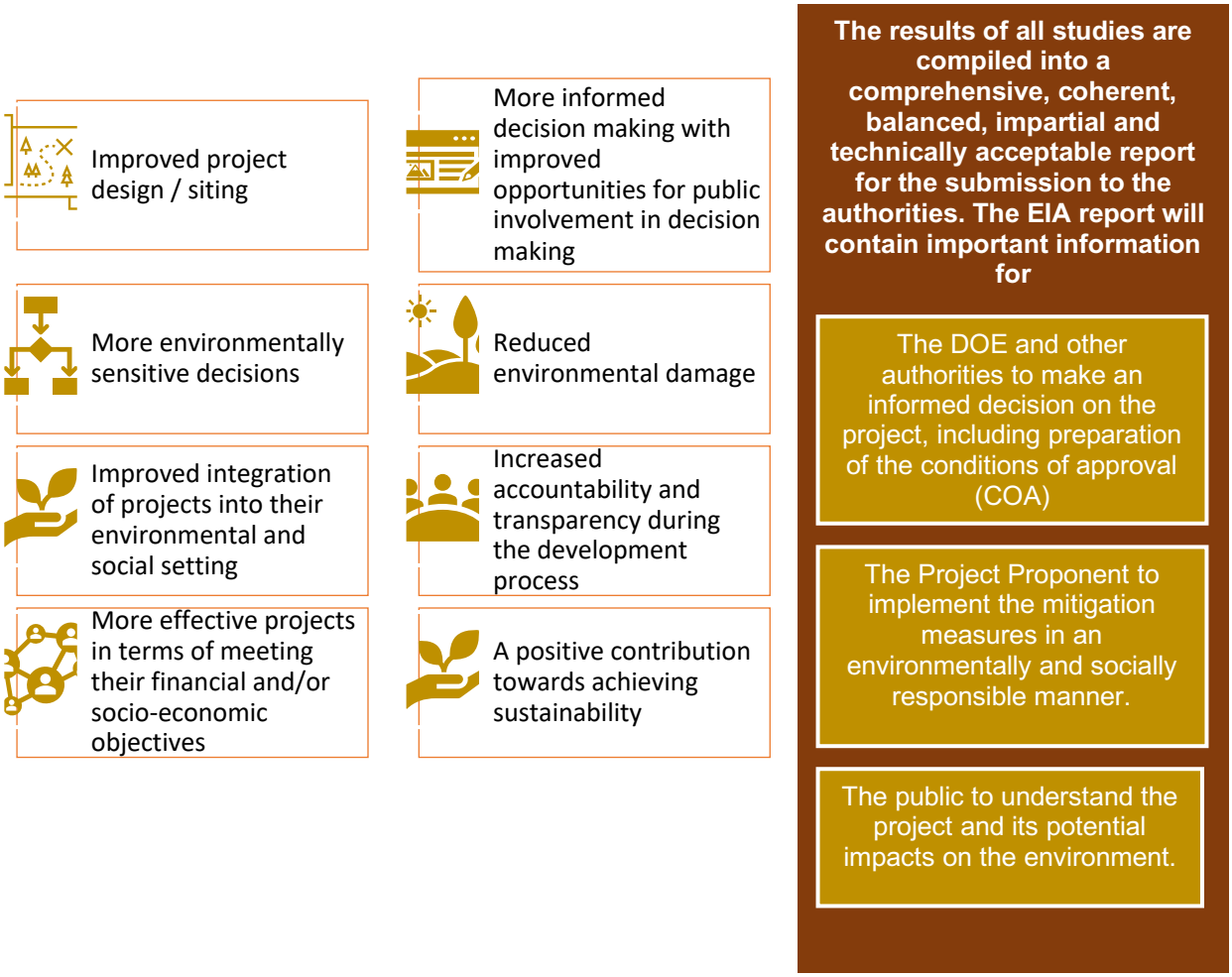
**Requirements for Public Disclosure**

Second Schedule projects require public disclosure. During the formulation process, the Project Proponent will arrange for timely provision of information on potential environmental and social impacts as well as of draft EA/EIA (including EMP and IPP) to stakeholders and beneficiaries – with particular attention to indigenous peoples and vulnerable groups – in a language and format to be accessible and understandable.

This consultation will be governed by the "free, prior and informed consent principle". Once the pertinent documentation has been completed (i.e. the environmental analysis for **Second Schedule** projects, the Project Proponent will ensure that it is made available to the public, The Project Proponent will ensure stakeholders involvement and public disclosure of relevant documentation during all the phases of the project and EIA Cycle.

### 1.6.1 Benefits of the EIA Process

The EIA process entails studies to identify, predict, evaluate, and quantify the impacts (both beneficial and adverse) on the environment of a proposed project or development and to communicate the said information to those concerned. The EIA study process is designed to facilitate decision-making for both the DOE and the Project Proponent from an environmental perspective. The EIA report shall assist stakeholders in identifying the significant environmental impacts; appropriate abatement and mitigating measures; programmes for monitoring environmental compliance; within the development plan prior to and/or during project implementation. The main benefits of conducting the process of an EIA study include:



***It is also important to highlight that there were weaknesses in some EIA studies that both the Project Proponents and the EIA consultants must be aware of. Some of the failings include:***

- Difficulties in ensuring adequate and useful public involvement or stakeholder participation;
- Insufficient integration of EIA work at key decision points in relation to feasibility and similar studies in the project cycle; with some major decisions being made even before EIAs are completed;
- Lack of consistency in selection of developments requiring specific environmental impact assessment studies;
- Inadequate understanding of the relative roles of baseline description and impact prediction;
- Poor integration of biophysical environmental impacts with social, economic and health effects also added to the problems in Environmental Impact Assessment;
- Production of EIA reports that are not easily understood by decision makers and the public because of their length and technical complexity;
- Lack of mechanisms to ensure that EIA reports are considered in decision making;
- Weak linkages between environmental impact assessment report recommendations on mitigation and monitoring and project implementation and operation; and
- Limited technical and managerial capacities to implement EIAs result in problems in carrying out Environmental Impact Assessment.

***Both the Project Proponent and EIA consultant can overcome these failings if they conduct the EIA study early in the project cycle, incorporating all the requirements of the EGIM, EESIM, and this Guideline.***

## 1.7 OBJECTIVES OF THE EIA GUIDELINES

**OBJECTIVES**

- ☑ Provide clear and concise guidance on EIA project planning and preparation to the stakeholders, Project Proponents, Qualified Person, Government Agencies (GAs), Enforcement Officers, and other EIA-related practitioners.
- ☑ Facilitate integration of the EIA into the overall project planning and development cycle to ensure compliance with and adherence to the legal environmental requirements and the framework on environmental sustainability.
- ☑ Provide a detailed step-by-step guidance with explanation of the various EIA procedures and submissions, comprising of: (a) Environmental Scoping Information (ESI), (b) Terms of Reference (TOR), and (c) EIA Report.
- ☑ Clearly 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 the environmental requirements by other authorities or agencies, to facilitate overall decision making and project approval.
- ☑ Provide a clear framework for DOE to assess and approve EIA reports..
- ☑ Provide a clear understanding on the interpretation of various terms and definitions as contained in the prescribed activities pertaining to Agriculture and to determine whether the Project falls under any prescribed activity based on the ***Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015.***

## 1.8 STRUCTURE OF THE GUIDELINES

| | | | |
|---|---|---|---|
| CHAPTER | 1 | *Introduction* | • Introduction to the Guidelines covering the objectives, scope, and structure. |
| | 2 | *Policies, Legislations, And Other Instruments* | • Provides a concise review of legislations, policies, and guidelines relevant to development of sustainable agriculture, and how they relate to the EIA process. |
| | 3 | *Screening, Scoping & Preparation of TOR* | • Provides the terms and definitions associated with agricultural area development and their interpretations Provides the procedures to conduct the screening and scoping the significant issues. ..<br>• Outlines the necessary requirements for the project to undergo initial screening and assessment. |
| | 4 | *Determining Baseline Conditions* | • Provides an outline of the relevant baseline information required for incorporation into the EIA report. |
| | 5 | *Predicting and Evaluating Environmental Impacts* | • Provides the methodology and tools to identify, predict, evaluate, and assess the significant environmental impacts. |
| | 6 | *Proposing Measures to Mitigate Impacts* | • Identifies the appropriate P2M2s to minimise any negative impacts arising from the development of the project; and the types of measures to manage any residual impacts. |
| | 7 | *Developing an Outline for the Environmental Management Plan* | • Provides an EMP framework for post-EIA.<br>• Detail of the GSR process for a project.<br>• Provides environmental monitoring and audit programmes for post-EIA. |
| | 8 | *Preparing the EIA Report and Review Process* | • Presents the structure and content for EIA reporting, including an overview of the review and approval process. |

*Oil Palm Plantation*
*Photo Source: https://ms.wikipedia.org/*

# 2

# POLICIES, LEGISLATIONS, AND OTHER INSTRUMENTS

# CHAPTER 2 POLICIES, LEGISLATIONS, AND OTHER INSTRUMENTS

## 2.1 LEGAL, POLICY AND GUIDELINES COMPLIANCE

### 2.2.1 Legal Compliance

All proposed agricultural development in the First and Second Schedule must comply with and adhere to the requirements enabled in the national and state legislations and enactments. 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.

The agriculture industry in Malaysia is highly regulated according to the law of the land. These include laws that include both federal and state legislation. There are specific laws currently being enforced to control the development and operation of agricultural activities in Malaysia as shown below and summary of these legislation and their functions is given in **Table 2-1**.


**Table 2-1 Legislation and Their Functions**

| | Legislation | Functions/ Objectives | Agencies |
|---|---|---|---|
| 1 | **Environmental Quality Act, 1974 (Act 127) and its subsidiary Regulations & Orders** | • To prevent, abate, and control pollution and to enhance the environmental quality in Malaysia.<br>• Regulations and Orders have been made under the EQA to control and manage various environmental aspects. | **DOE** |

| | Legislation | Functions/ Objectives | Agencies |
|---|---|---|---|
| | | • EIA for prescribed activities. These prescribed activities have been categorised under the new Order into the **First** and **Second Schedules**. | |
| 2 | **National Land Code 2006 (Act 56)** | • Consolidate the laws relating to land and land tenure, the registration of title to land and of dealings therewith.<br>• Classification and Use of Land.<br>• Declaration of rivers. | • **KPTG (Federal Land)**<br>• **PTG State** |
| 3 | **Wildlife Conservation Act 2010 (Act 716)** | • To protect wildlife.<br>• First Schedule is a list of protected wildlife species, and the Second Schedule is a list of wildlife species that are totally protected. | **Department of Wildlife and National Parks Peninsular Malaysia (PERHILITAN)** |
| 4 | **Wildlife Protection Act 1972 (ACT 2070)** | • Protection, management, and preservation of biodiversity for optimum benefit.<br>• Protection and development of protected areas for research, education, economic, aesthetic, recreation, and ecological purposes. | |
| 5 | **Pesticide Act 1974** | • Regulate all matters regarding pesticides.<br>• List of approved pesticides.<br>• Pesticides Registration) Rules 1988.<br>• Pesticides (Licencing for sale & storage) Rules 1988 | **Department of Agriculture** |
| 6 | **Plant Quarantine Act 1976** | • An act to amend and consolidate laws relating to the control, prevention and eradication of agricultural pests, noxious plants, and plant diseases.<br>• to extend cooperation in the control of the movement of pests in international trade.<br>• The act involves the prohibition of importation or possession of noxious plants and pests. | |
| 7 | **Land Conservation Act 1960 (Revised 1989)** | • Regulates the development of hill land i.e. land declared to be hill land in accordance with Section 3 of the Act.<br>• Control of silt and erosion.<br>• Control on use of hill land e.g.,<br>i. prohibition of planting of short-term crops except under permit,<br>ii. restrictions on clearing and cultivation of hill land,<br>iii. prohibition of agricultural activities at the High land areas which are situated at an area with more than 25 degrees slope. | **Ministry of Water, Land and Natural Resources** |

| | Legislation | Functions/ Objectives | Agencies |
|---|---|---|---|
| 8 | **Animal Act 1953 (Revised 2013)** | • The aim of the Act is to prevent, control, and eradicate animal diseases and zoonoses.<br>• Among others, the Act regulates the Importation and Exportation of Animals and Birds. | **Department of Veterinary Services** |
| 9 | **Pig Farming Enactment 2016 Penang** | To ensure that all pig farms are compliant with the new regulation by 1 January 2020. Under the Enactment, Modern Pig Farming (MPF) will be based on 4 criteria, i.e.,<br>• Closed House<br>• Zero Discharge (Pig Farming Enactment to enforce a modern rearing method with either zero or treated discharge into rivers)<br>• Good Animal Husbandry Practice (GAHP)<br>• Buffer Zone 200 metres (Currently, the buffer zone set by the Pig Enactment according to states are different from each other.) | **State Govt of Penang** |

*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.*

### 2.1.1 General Policy Adherence

The agricultural project shall also be in line with and not contradict current national and state development policies and plans, local regulations, & procedures published by national and state governments, agencies, and local authorities. The lists of general policy adherence for agriculture projects in the EIA assessment are shown in **Table 2-2**.

### 2.1.2 National and State Policies and Plans

The relevant policies and plans for development in agriculture are listed in **Table 2-3**. They serve as references for the Project Proponent and the Qualified Person when undertaking the EIA study. 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.

### 2.1.3 Guidelines on Sustainable Agriculture

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. **Table 2-4** provide a list of guidelines and guidance documents for EIA reporting on Agriculture.

**Table 2-2 General Policy Adherence for Agriculture Projects in the EIA**

| Policy Adherence | Required Outputs | Legal Requirements | Agencies/ Department |
|---|---|---|---|
| • **Project Approvals and/or Supporting Documents** | To ensure that the project complies with the national and state policies and requirements for agriculture development. | Town and Country Planning Act 1976 (Act 172) | • **National Physical Planning Council of Malaysia (MPFN)**<br>• **Regional Development Authority**<br>• **State Planning Committee (SPC)**<br>• ***Jawatankuasa Teknikal Pembangunan Kawasan Sensitif Alam Sekitar* (KSAS)**<br>• **Local Authority (PBT)** |
| • **Adherence to land use compatibility (structure/ local/ special area plan).**<br>• **Development requirements in/near ESAs.**<br>• **Social Impact Assessment (SIA) requirements.** | • To ensure that the project is in line with the structure/local plans and compatible with the surrounding landuse.<br>• To determine need for SIA for the project. | Town and Country Planning Act 1976 (Act 172) | **PLANMalaysia (JPBD)** |
| • **Land status compliance.**<br>• **Land acquisition.**<br>• **Minerals release.** | • To ensure that the Project Proponent owns the land and that status is correct with its intended development type.<br>• To ensure that there are no constraints on the land that may prohibit it from being developed. | National Land Code 1965 (Act 56) | • **Department of Director General of Land and Mines (JKPTG)**<br>• **Land and Mines Office (PTG)**<br>• **District and Land Office (PTD)** |
| • **Status of forest land** | To determine the status of the forest, ensure that it can be developed and is not within | Forestry Act 1984 | • **Forestry Department of Peninsular Malaysia (JPSM)** |

| Policy Adherence | Required Outputs | Legal Requirements | Agencies/ Department |
|---|---|---|---|
| | PRF, water catchment, etc. | (and amendments thereof) (Act 313) | • **State Forest Department** |
| • **Development requirements in ecological linkages (primary and secondary)** | To create ecological corridors for wildlife | • RFN 3<br>• Central Forest Spine (CFS) I & II: Master Plan for Ecological Linkages (JPBD, 2009) | • **Forestry Department of Peninsular Malaysia (JPSM)**<br>• **State Forest Department** |
| • **Development requirements in/near wildlife sanctuaries and other protected areas.**<br>• **Protection of flora and fauna.**<br>• **Requirement for animal relocation plan, viaduct crossings, etc.** | To determine the sensitivity of the site in terms of flora and fauna species and constraints for development. | Wildlife Conservation Act 2010 (Act 716) | **Department of Wildlife and National Parks Peninsular Malaysia (PERHILITAN)** |
| • **Permission for river diversion.**<br>• **Requirement for river reserves & buffer zones.**<br>• **Stormwater management requirements (MSMA-2).**<br>• **Erosion and Sediment Control Plan (ESCP).** | • Determine the hydrological condition of the site<br>• Requirements pertaining to changes in river system and runoff management requirements. | • Street, Drainage and Building Act 1974 (Act 133)<br>• State enactments on water resources, river basins, and coastal areas<br>• MS 2526-12: 2014. Urban stormwater management - Part 12: ESC | • **Department of Irrigation and Drainage (DID)**<br>• **State Water Authority**<br>• **Department of Standards Malaysia** |
| • **Development requirements within Orang Asli settlements and their roaming areas, agriculture plots, cultural, heritage, religious, and archaeological sites.** | • To ensure that the area is not occupied by the Orang Asli community and, if so, how to manage impacts. | • National Land Code1965 (Act 56)<br>• Aboriginal Peoples Act 1954 (Revision 1974) (Act 134) | • **District and Land Office (PTD)**<br>• **Jabatan Kemajuan Orang Asli (JAKOA)** |

***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 2-3 List of Policies and Plans Relevant to Development of Agriculture**

| | Policies and Plans | Function and Scope | Agency |
|---|---|---|---|
| 1. | **National Physical Plan-3 (NPP-3) (2016)** | National spatial planning guidelines cover agricultural areas. | **JPBD** |
| 2. | **State Structure and Local Plans (Various local authorities and publishing dates)** | State and local level planning guidelines for agriculture including agriculture zones. | **JPBD** |
| 3 | **National Policy on Biological Diversity 2016– 2025** | • To transform Malaysia into a Centre of Excellence in Biodiversity conservation and utilisation.<br>• To conserve Malaysia's biological diversity and to ensure that its components are utilised in a sustainable manner for the continued progress and socio-economic development of the nations.<br>• Covers specifically 17 national biodiversity targets with corresponding goals and action plans to achieve within 2016 – 2025. | **NRE** |
| 4 | **Pelan Pengurusan Khusus (Pemuliharaan) Tanah Tinggi*:***<br>**i. Kinta-Cameron Highlands-Lojing (JPBD, 2014).**<br>**ii. Genting Highlands-Bukit Tinggi-Janda Baik.** | Provide Guidelines for landuse and agricultural development in the two Special Management Areas (SMAs). | **JPBD** |
| 5 | **Central Forest Spine (CFS) I & II: Master Plan for Ecological Linkages (JPBD, 2009)** | • Planning requirements for development of the Central Forest Spine<br>• proposed in the CFS including primary and secondary ecological linkages. | **JPBD** |
| 6 | **National Policy on the Environment Ministry of Science, Technology and Innovation (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, promote long-term economic growth and human development, and protect and enhance the environment. | **MOSTI** |

| | Policies and Plans | Function and Scope | Agency |
|---|---|---|---|
| 7 | **National AgroFood Policy 2011-2020** | The policy, surrogate of the National Agricultural Policies (NAP1, NAP2, and NAP3), aims at ensuring that agriculture, particularly the agro-food, is a competitive and sustainable industry which can increase the income of agriculture entrepreneurs. | **MOA** |
| 8 | **National Commodity Policy 2011-2020** | • Increase the contribution of the commodity industry to the national economy.<br>• Modernise and transform the commodity industry to be more efficient and sustainable. | **Ministry of Primary Industries (MPI)** |

***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 2-4 List of Relevant Guidelines and Guidance Documents Related to Development of Agriculture Activities**

| | Guidelines / Guidelines Documents | Year of Publication | Function & Scope | Source /Agency |
|---|---|---|---|---|
| 1 | **Garis Panduan Perancangan Kawasan Sensitif Alam Sekitar** | 2017 | Provides the requirements for development in ESAs. | **PLANMalaysia** |
| 2 | **Environmental Impact Assessment Guidelines for Development in Slope and Hill Area** | 2017 | The Guidelines shall provide guidance to the Project Proponents, Qualified Person (i.e. Qualified Person), 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. | **DOE** |
| 3 | **Guidance Document for Addressing Soil Erosion and Sediment Control (ESC): Aspects in the EIA Report as per Appendix 3 of the EGIM** | 2016 | EIA reporting format concerning soil erosion and sediment control. | **DOE** |

| | Guidelines / Guidelines Documents | Year of Publication | Function & Scope | Source /Agency |
|---|---|---|---|---|
| 4 | **Guidance Document for the Preparation and Submission of EMP as per Chapter 6 of the EGIM** | 2016 | Guidance for the preparation of the EMP post-EIA including translating into action, the P2M2s recommended in the EIA and the COA. | **DOE** |
| 5 | **Guidelines for Agricultural Development in Slope Areas. Department of Agriculture, Ministry of Agriculture and Agro-Based Industry.** | 2013 | Guidelines for agricultural development in slope areas. | **DOA** |
| 6 | **Guidelines for Durian development in Sloping Land** | 2018 | Provide guidelines on the cultivation of durian on hill slopes. | **DOA** |
| 7. | **Safety Guideline for Hill Site Development in Penang** | 2012 | Guidelines for development restrictions at steep slope areas for the State of Penang. | **Penang State Government,** |
| 8 | **Planning Guidelines for Development in Hill Areas and Highlands for Selangor** | 2010 | Guidelines for development restrictions at steep slope areas for the State of Selangor. | **Selangor State Government,** |
| 9 | **Guidelines for Hillside and Slope Areas Development Planning for the Federal Territory of Kuala Lumpur** | 2010 | Guidelines for development restrictions at steep slope areas for the Federal Territories. | **Ministry of Federal Territories and Urban Wellbeing** |
| 10 | **Guidelines for Erosion and Sediment Control in Malaysia** | 2010 | Guidelines for prevention and control of soil erosion and siltation for specific projects including examples of control measures and best management practices (BMPs). | **DID** |

| | Guidelines / Guidelines Documents | Year of Publication | Function & Scope | Source /Agency |
|---|---|---|---|---|
| | **MS 2526-12: 2014. Urban stormwater management - Part 12: Erosion and sediment control** | 2014 | Malaysian Standard specifies design and planning fundamentals to enable management of stormwater quality during project construction stage. | **DOSM** |
| 11 | **Guidelines for Hillside and Highland Areas Development Planning** | 2009 | Guidelines for development restrictions at steep slope areas. | **JPBD** |
| 12 | **DID Manual Volume 2 – River Management** | 2009 | Provides methods to assess, manage and mitigate measures for river conservation, rehabilitation and restoration. | **DID** |
| 13 | **Garis Panduan Pembangunan Melibatkan Sungai & Rezab Sungai** | 2000 | Menerangkan keperluan maklumat & skop penialian impak untuk pelbagai jenis pembangunan melibatkan sungai dan rezab sungai. | **DID** |
| 14 | **Guidelines for Prevention and Control of Soil Erosion and Siltation in Malaysia** | 2008 | Guidelines for prevention and control of soil erosion and siltation for specific projects including examples of control measures and BMPs. | **DOE** |
| 15 | **Guidelines for the Development in Highland Areas** | 2005 | Development controls and restrictions for development in highland areas. | **NRE** |
| 16 | **Stream Crossing Guidelines: An Ecological Approach** | 2008 | Details on stream crossing requirements. | **DID** |
| 17 | **Garis Panduan Ternakan Unggas Reban Tertutup** | 2006 | Mengambil 24nviron supaya tahap infestasi lalat di ladang berada di bawah paras indeks 10 (menggunakan *scudder fly grill*).<br>• Memastikan udara yang disedut keluar dari reban tidak mencemarkan udara, bangunan dan tumbuhan di 24nviron berhampiran. | **DVS** |

| | Guidelines / Guidelines Documents | Year of Publication | Function & Scope | Source /Agency |
|---|---|---|---|---|
| | | | • Penggunaan racun, 25nviron dan ubat-ubatan termasuk 25nvironmen mengikut peraturan sedia ada yang diluluskan oleh Jabatan Perkhidmatan Veterinar. | |
| 18 | **RSPO Guidelines for Sustainable Oil Palm Management** | | RSPO is promoting the development of a globally acceptable credible definition of sustainable palm oil production and use and the implementation of better management practises. In order to gain RSPO certification, a number of guidelines have to be met. Some of these guidelines involve *'Environmental responsibility and conservation of natural resources and biodiversity'.* | **RSPO** |
| 19 | **Malaysian Sustainable Palm Oil (MSPO)** | 2014 | The MSPO is designed to ensure that oil palm plantings and palm oil production are using best management practises to meet agreed sustainability requirements without further aggravating forest degradation and deforestation, nor harming the environment and people. | **MSPO, Plantation Industries and Commodities Ministry (MPIC)** |
| 20 | **'Guidelines for the development of Peat land for Agriculture' in Pelan Induk Rangkaian Ekologi CFS** | 2008 | • The purpose of the guidelines is to recommend appropriate agricultural practises that will maintain the hydrological balance and ecological integrity of peatlands.<br>• Development of peat lands for agriculture purposes has shown to have very adverse impacts on the peat swamps. The loss of peat swamps results in loss of water storage capacity and lowering of water tables. This changes the fragile ecosystem in peat and therefore can alter biodiversity composition. Therefore, care must be taken to minimise the | **JPBD** |

| | Guidelines / Guidelines Documents | Year of Publication | Function & Scope | Source /Agency |
|---|---|---|---|---|
| | | | impact of agricultural development on peat land through sustainable agricultural practises. | |
| 21 | **'Sustainable Development of Agriculture Surrounding Wetlands' in the Pelan Induk Rangkaian Ekologi CFS** | 2008 | To mitigate the negative impact of agriculture development on the surrounding wet land. | **JPBD** |
| 22 | **Garis Panduan Sistem Pengolahan Efluen (SPE) Bagi Penternak Babi** | 2016 | Proposal regarding guidelines of the effluent treatment system or livestock wastewater has been prepared for pig farms. The guidelines consist of the design specification, performance monitoring and the estimated costs involved in the treatment of these animals' effluent. | **DOE** |
| 23 | **Garis Panduan Sistem Pengolahan Efluen (Spe) Bagi Penternak Lembu Tenusu, Lembu Pedaging & Kerbau** | 2016 | Proposal regarding guidelines of the effluent treatment system or livestock wastewater has been prepared for cattle farms and livestock farming. The guidelines consist of the design specification, performance monitoring and the estimated costs involved in the treatment of these animals' effluent. | **DOE** |
| 24 | **Guidelines for the Development of a Standard Operating Procedure for Oil Palm Cultivation on Peat** | 2011 | To provide guidelines for the plantation companies to prepare their own SOP for sustainable oil palm cultivation on peat. | **MPOB** |
| 25 | **Malaysian Oil Palm: Sustainability Manual** | 2015 | The manual captures the general procedures, principles and criteria underlying sustainability practices in the oil palm industry in Malaysia, with a specific emphasis on the requirements for sustainability certification under the MSPO. | **MPOB** |

***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.***

*Photo source: Zawawi Ibn Abidin, Panaroama Indah Semesta Alam*

3

# SCREENING AND SCOPING

# CHAPTER 3 SCREENING AND SCOPING

## 3.1 INTRODUCTION

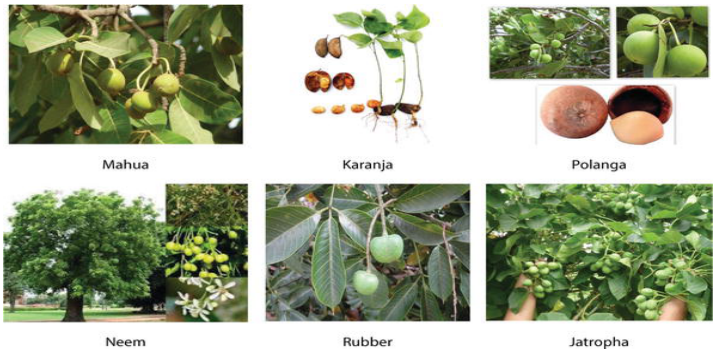
The two main activities that should be undertaken during the pre-submission stage before the EIA study proper is carried out, namely Screening and Scoping, are described in the chapter. In order to facilitate the screening and scoping, the Project Proponent should provide the Qualified Person a Project Brief that contains basic details of the proposed project, such as concept, objectives, main activities, location, layout plan, etc.

## 3.2 ENVIRONMENTAL SCREENING PROCEDURES

The first step in scoping is to carry out Environmental Screening i.e. to determine whether a proposed project is a prescribed activity under the ***Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015*** (**Table 3-1**). Screening is important because there are many projects and activities that are potentially subjected to an EIA. It is also important that any project be screened to have complied with all federal and/or state policy matters before proceeding with an EIA.

**Table 3-1 Criteria for Screening of Development of Agricultural Projects**

| FIRST SCHEDULE | Applicability |
|---|---|
| **Activity 1**<br>**(a) Land development schemes covering an area of 20 hectares or more but less than 500 hectares to bring forest into agricultural production.** | **Type of Development**<br>The scope of this prescribed activity refers to any Land development schemes which involve the utilisation or conversion of:<br>a) permanent reserved forests,<br>b) wild life reserve, or wild life sanctuary,<br>c) reserved land (under forest)<br>d) state land forest<br>e) mangrove swamp<br>f) alienated land<br>g) wetlands<br>h) Government / State owned forest<br>i) Private owned forest<br><br>Examples of development:<br>a) edible crops such as vegetables, coconuts, tea, fruits, herbs, etc.<br>b) non-edible crops such as flowers, oil palm plantation, rubber, ornamental plants, biodiesel crops such as rubber, coconut, corn, soybean, sugarcane, Jatropha (Jatropha curcas), karanja |

| FIRST SCHEDULE | Applicability |
|---|---|
| | (Pongamia pinnata), polanga (Calophyllum inophyllum), neem (Azadirachta indica) etc.<br>c) new livestock rearing / farms, poultry, cattle, pigs, etc.<br><br>  <br><br>*Examples of some biodiesel crops (Islam, A. K. M. A. , Yaakob, S. R. P. P. Z. , 2018, 'Non-Edible Vegetable Oils as Renewable Resources for Biodiesel Production: South-East Asia Perspective', in M. Nageswara-Rao, J. R. Soneji (eds.), Advances in Biofuels and Bioenergy, IntechOpen, London. 10.5772/intechopen.73304.)* |
| **<u>Activity 1</u>**<br>**(b) Development of agricultural estates covering an area of 500 hectares or more involving changes in types of agricultural use.** | **Type of Development**<br>The scope of this prescribed activity refers to any Land development schemes which involve**:**<br><br>a) change in crop type from permanent or long-term (many seasons or harvests) to seasonal or short-term (harvest after one season), (examples: conversion of oil palm estates to edible crops, etc.), or<br><br>b) change in type of agricultural activity (e.g. crops to animal husbandry or fish culture, etc.).<br><br>**Note: change in types of agriculture use includes involving change of planting methods, for example from terracing → non-terracing planting, etc.** |

| SECOND SCHEDULE | Applicability |
|---|---|
| **<u>Activity 1</u>**<br>**(a) Land development schemes covering an area of 500 hectares or more to bring forest into agricultural production.** | **Type of Development**<br>The scope of this prescribed activity refers to any Land development schemes which involve the utilisation or conversion of:<br>a) permanent reserved forests,<br>b) wild life reserve or wild life sanctuary,<br>c) reserved land (under forest) |

| SECOND SCHEDULE | Applicability |
|---|---|
| | d) state land forest<br>e) mangrove swamp<br>f) wetlands<br>g) alienated land<br>h) Government / State owned forest<br>i) Private owned forest<br><br>Examples of development:<br>a) edible crops such as vegetables, coconuts, tea, fruits, herbs, etc.<br>b) non-edible crops such as flowers, oil palm plantation, rubber, ornamental plants, planting of coconut, corn, soybean, and sugarcane for biodiesel, etc.<br>c) new livestock rearing / farms, poultry, cattle, pigs, etc. |
| **Activity 1**<br>**(b) New pig farming area of 2,000 or more standing pig population** | **Type of Development**<br>New pig farming applies to new farms or centralised farms in greenfield areas outside of designated or approved pig farming areas. |

## TERMINOLOGIES AND DEFINITIONS APPLICABLE TO THE PRESCRIBED ACTIVITY

**"Land Development Schemes"** were the government strategy for development among rural people. There were two such schemes. (1) by the Federal autonomous bodies such as Federal Land Development Authority (FELDA), Federal Land Consolidation and Rehabilitation (FELCRA), and (2) by the State Government.

Land development schemes that involve the utilisation or conversion of:

- permanent reserved forests,
- wild life reserve,
- wild life sanctuary, or
- reserved land (under forest)
- State land forest

- Forest areas are defined as "permanent reserved forest" refers to any land constituted or deemed to have been constituted a permanent reserved forest under Section 10(1) of the National Forestry Act 1984 (Act 313) and State Enactments.

- "wild life reserve" or "wild life sanctuary" as constituted under Section 47 of the Protection of Wild Life Act 1972 (Act 76).

- "reserved land" as interpreted under the National Land Code 1965 (Act 56).

- State land that is covered with forest.

"**Agriculture**" is interpreted in Section 5 of the National Land Code 1965 (Act 56), and in Section 2 of the Town and Country Planning Act 1976 (Act 172). The term 'land' is interpreted in Section 5 of the National Land Code 1965 (Act 56). Agriculture estate is also defined by large land mass or area utilise for agriculture activity, whereby it can be a single land lot or multiple land lots with single ownership.

"**Standing population"** refers to the total number of pigs kept in a pig farm at any time. Similar term / definition is adopted for livestock, where it refers to total number of livestock at any time in the farm.

**Important to Note**

If the proposed project has components falling within both First and Second Schedule prescribed activities, the Second Schedule EIA shall prevail and shall encompass all EIA requirements required of those activities. In this case, all other relevant EIA Guidelines must be referred to.

The proposed agriculture project that does not fall under Activity 1 may still require an EIA study under other prescribed activities in the EIA Order 2015. Project proponent is required to check with latest policies and legislation requirements.

Project Proponents and Qualified Person preparing the EIA report must carry out screening to ascertain the if the project intended falls under the "prescribed activity" list. The potential outcome criteria of project screening is shown in **Box 2**.

**Box 2:**
**Potential Outcomes from Project Screening**

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

ii. EIA is required: If the project will have potentially significant environmental impacts and/or falls within the prescribed activity under the First or Second Schedule.

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

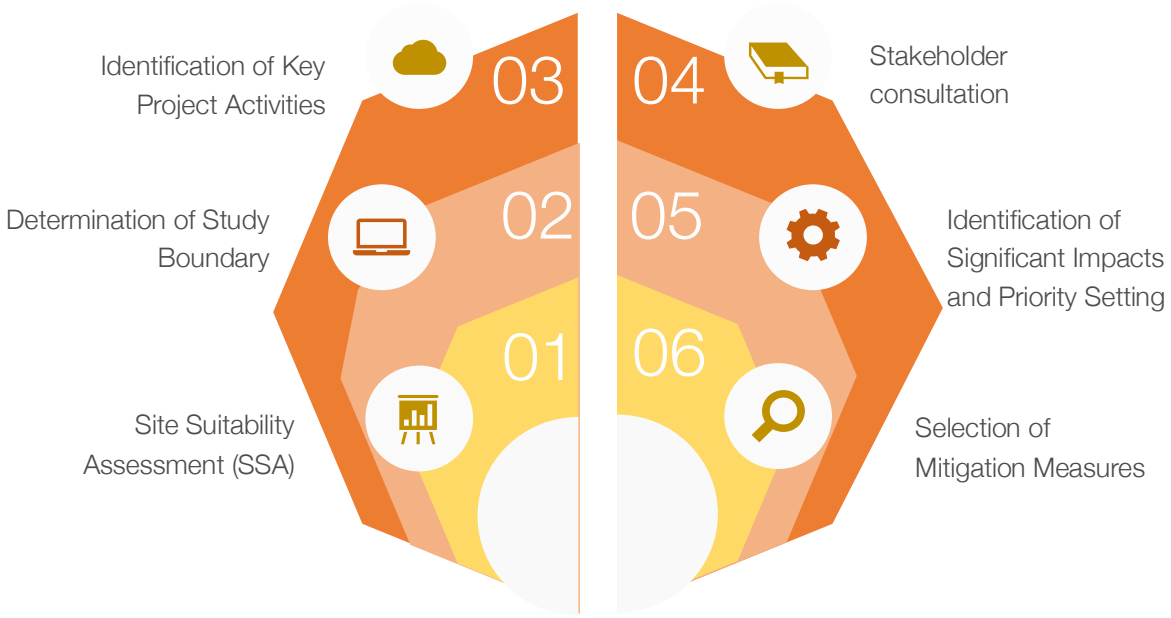
### 3.3 ENVIRONMENTAL SCOPING

Scoping is essentially a rapid desktop assessment conducted to gain a preliminary understanding of the key attributes and environmental impacts of a proposed project. The scoping process is important because it determines the focus and depth of the EIA study, which in turn influences the study's time, personnel and cost requirements. Thus, it should be carried out at an early stage of the project cycle to enable the EIA to focus on the significant issues, impacts, and sensitive receptors.

The main objective of environmental scoping is to identify environmental attributes and issues to determine the focus, depth, and spatial and temporal boundaries of the EIA that are deemed significant and require evaluation in detail as part of the EIA process. Scoping shall encompass all environmental aspects (physico-chemical, biological and socio-economic) to enable an overall evaluation of the significant impacts. At the start of the scoping exercise, no attempt should be made to exclude or prejudge any issues of concern.

The collection of secondary data, as well as the preliminary discussion with the various stakeholders, may be conducted during the scoping. Although the scoping exercise is largely dependent on secondary data, a field visit is advisable to gain a better understanding of the proposed project site.

The main components of the scoping exercise are as follows:



The scoping exercise comprises the following steps:

Site Suitability Assessment (SSA): Based on the site constraints and technical studies, the Project Proponent shall consider all alternatives or options to refine and improve upon the original concept design. The SSA shall consider all alternatives or options to refine and improve upon the original concept design.

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.

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. Quantitative assessment can be provided where necessary and available.

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).

Identification of Significant Impacts and Priority Setting: This step will involve preliminary identification of significant issues for further detailed assessment detailed assessment in the EIA. Non-Less significant issues shall also be addressed accordingly in the EIA study but through general/qualitative impact prediction and evaluation.

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.

Selection of Mitigation Measures: Based on the magnitude of the identified significant impacts, the Qualified Person shall determine the potential mitigation measures that need to be provided in detail in the EIA.Based on the identified significant impacts, the Qualified Person shall determine and select suitable mitigation measures to abate the impacts.

Preparation and Submission of ESI and TOR for Second Schedule EIA: Findings from the scoping exercise shall be compiled and collated to prepare the TOR for submission and for DOE's endorsement.

Identification of potential environmental impacts and the predicted extent of the impacts is an important early-stage evaluation as part of the environmental assessment process to ensure that the planned assessment is carried out properly and appropriately, i.e., that the report is sufficiently comprehensive, while at the same time preventing the assessment from becoming unnecessarily protracted or expensive due to inappropriate focus on issues of only minor concern.

### 3.3.1 Site Suitability Analysis

The SSA is detailed in the EGIM. 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 3-2** for alternatives and options).

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

**Table 3-2 Considerations in Project Alternatives and Options**

| Options | Considerations |
|---|---|
| **Project Siting** | • Adherence to national and state policies and guidelines.<br>• Site constraints to the project and *vice versa*.<br>• Location and proximity to sensitive receptors.<br>• Availability of adequate buffers.<br>• Any alternative sites proposed for the project. |
| **Terrain and Topography** | • Conservational value.<br>• Availability of land for buffers.<br>• Slope classification and degree.<br>• Soil types & suitability classification<br>• Site hydrology and drainage patterns.<br>• Conditions and constraints of the site (hilly, steep slopes, geohazards, flood risk, soil conditions, and soil erosion potentials).<br>• Possibility of avoidance of unsuitable terrain.<br>• Visual/aesthetic impacts. |
| **Accessibility** | • Availability of access.<br>• Proximity to construction/source materials.<br>• Strategic locational advantages.<br>• Traffic conditions. |
| **Technology Options** | • Availability of technology to minimise impacts.<br>• Best available technology (BAT) options.<br>• Benchmarking with alternative technology. |

| Options | Considerations |
|---|---|
| | • Green technology adoption |
| **Project Component and Design** | • Adaptive design to suit the terrain.<br>• Layout consideration.<br>• Choice of construction methods.<br>• Maintenance issues. |
| **Social Constraints** | • Location within or close to existing communities.<br>• Need for land acquisition and relocation. |
| **Economy and Finance** | • Potential employment and business.<br>• Cost and benefit considerations.<br>• Supply and demand scenarios.<br>• Potential loss of income. |
| **Operations** | • Type of landuse and operational components.<br>• Adoption of best practises and green development concepts.<br>• Slope management considerations. |

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

### 3.3.2 Determination of Project Study Boundary

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

i) **The study boundary**, which defines the **Zone of Study (ZOS)**. In terms of criteria, ZOS is the study area that generally encompasses a 5-km radial zone measured from the project boundary (**Figure 3-1**). In terms of criteria, the ZOS is to be defined its limits of the spatial boundary by the Qualified Person.

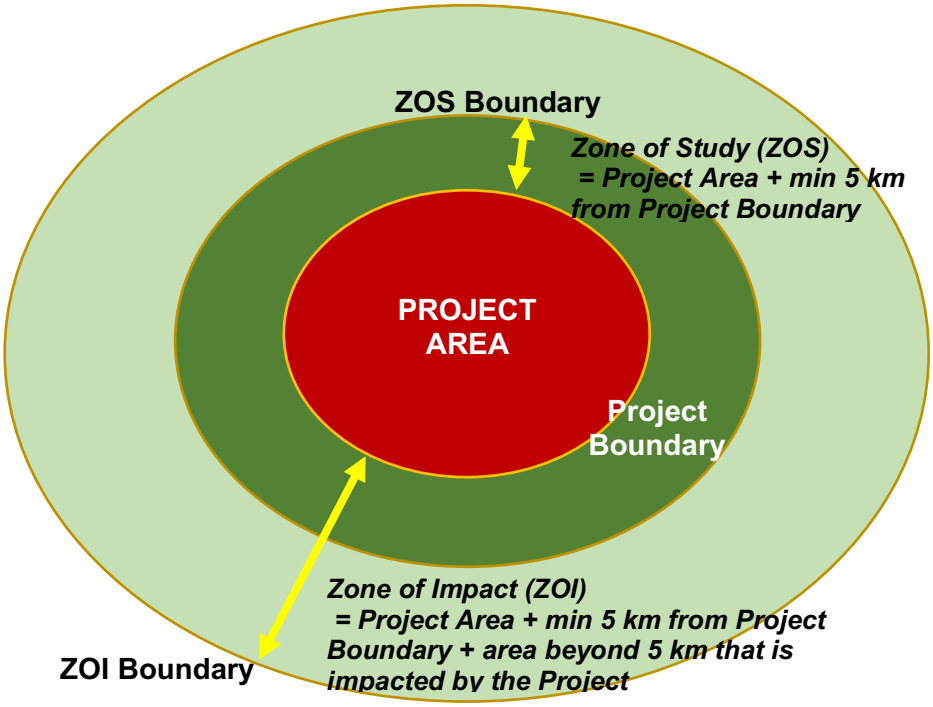
ii) **The impact boundary**, which defines the spatial area of potential impacts to extend beyond the ZOS, and hence this impact area is termed the **Zone of Impact (ZOI)** (**Figures 3-1)**. The ZOI may decrease or extend further afield, depending on the attributes of the river basin, terrain, alignment of hills, and mountain ranges amidst deep valleys, among other factors.

For large projects, the extent of the ZOI can also include the entire river basin or sub-basin in terms of the availability of water for irrigation and will be subject to the findings of the hydrology engineer and as advised by the Drainage & Irrigation Department (DID).

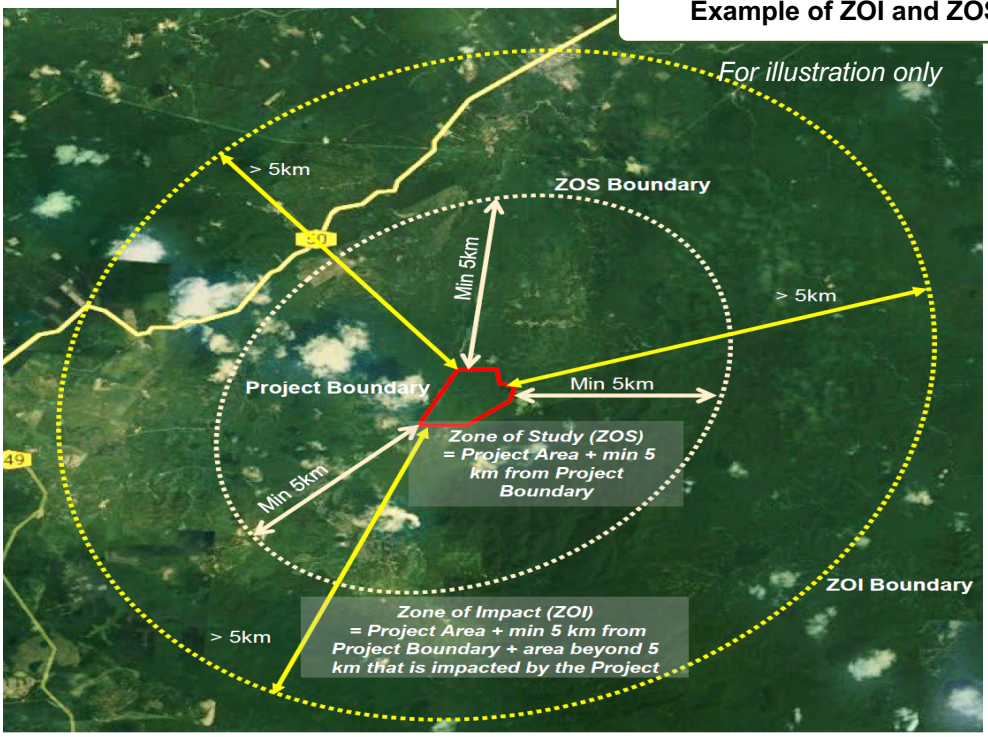
Note that ZOI is usually determined when and after an impact assessment has been performed and the extent of impacts is established. As such, baseline data collected should be reviewed at this point to ensure that they cover affected receptors within the ZOI and the

baseline database must be updated. The proposal for controls and mitigations from the Project must include in the ZOI areas.

**Figure 3-1 Project Study Boundaries – Zone of Study and Zone of Impact**




**Example of ZOI and ZOS**



The Qualified Person shall determine the project boundary and perform site suitability assessment (SSA) by comparing the proposed project (its location and type of development) with the approved development plans such as the National Physical Plan (NPP), structure plans, or any other guidelines prescribed by the Director General of Environment which are relevant to the proposed project.

Comments on SSA shall be reported in the EIA Report. There may be a situation where the proposed project site or location may not contradict approved development plans or any other guidelines prescribed by the DOE, but the site exhibits certain critical characteristics (for example, geomorphological features) that may present a particularly formidable constraint to the proposed project, due to the nature of the project. In such a situation, the consultant shall thoroughly examine the suitability of the site and report it in the EIA report.

Site selection can be carried out through a screening process. The justification for selecting the site should be explained. Some reasons cited for site selection can be as follows (apart from soil, water, and terrain factors):

a) The area is an economically inactive area
b) The area involves a change in crop land use
c) The project concept revolves around an agricultural development that enables a large number of people to participate
d) The area to be developed involves land that may be irrigated on a sustainable basis
e) There is no sensitive areas along the fringes

### 3.3.3 Baseline Data Review

**Table 3-3** lists the indicative requirements for baseline description in the environmental scoping exercise. The baseline information must be qualitative but sufficiently adequate to assess the potential impacts on sensitive receptors. Quantitative data and findings, wherever available, will be provided to support the assessment.

The level of detail 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 are 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 should be omitted during environmental scoping.

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

**Table 3-3 Baseline Requirements for Environmental Scoping**

| | Baseline | Requirements | Data Source |
|---|---|---|---|
| Physico-chemical | Land use | • Land use maps and photos.<br>• Description of existing and future land use (5-km ZOS).<br>• Identification of ESAs. | • Topography maps.<br>• Aerial or satellite imagery.<br>• Structure and local plans (PLANMalaysia).<br>• Site investigations. |
| | Geology/ Hydrogeology | • Description of local and regional geology.<br>• Locations of aquifer and groundwater abstraction wells | • Geological and hydrogeological maps by JMG.<br>• Geological Terrain Mapping (GTM) report. |
| | Soil and Terrain | • Topography and slopes.<br>• Soil investigation map<br>• Soil suitability classification map. | • Site survey.<br>• Soil map by Department of Agriculture (DOA).<br>• SI report. |
| | Climate | • Climate data (min 5 years). | • Malaysian Meteorological<br>• Department (METMalaysia) |
| | Hydrology | • River systems and catchment areas.<br>• Flood prone areas.<br>• Downstream receptors. | • JBA<br>• DID<br>• Published reports by water<br>• agencies and DOE. |
| | Air Quality | • Air quality data (if any)<br>• Locations of air polluting sources. | • DOE published data.<br>• Site observations. |
| Social | Demography | • Details of demographics.<br>• Identification of social impact stakeholders | • Population census from the Department of Statistics.<br>• Local plans from PLANMalaysia.<br>• Interviews.<br>• Local Authority (Land Office, Majlis Dearah) |
| | Public Health | • Description of public health status. | • Morbidity statistics and public health data from the Ministry of Health (MOH). |
| | Heritage, Culture and Archaeology | • Locations of historical and cultural sites<br>• Location of Orang Asli areas and settlements. | • Data from Department of Museums, National Heritage Department, Jabatan Kemajuan Orang Asli (JAKOA), etc. |
| | Traffic | • Access to project site.<br>• Transport options. | • Road maps.<br>• Site visit. |
| | Infrastructure, Utilities and Amenities | • Water, electricity, sewerage,<br>• road, telecommunication and waste. | • Information from utility providers<br>• Local plans from PLANMalaysia |

| | Baseline | Requirements | Data Source |
|---|---|---|---|
| Biological | Ecosystem | • Description of existing ecology and habitats.<br>• Identification of ESAs (forest reserve, wildlife reserves and sanctuaries, wetlands, ecological corridor mangroves, fisheries, etc.).<br>• Presence of endemic, rare, threatened, endangered and near extinct flora and fauna | • Secondary information.<br>• Data from various relevant departments such as the Department of Wildlife and National Parks Peninsular Malaysia (PERHILITAN) and Forestry Department Peninsular Malaysia (JPSM).<br>• Site observations |

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

### 3.3.4 Determination of Key Project Activities

Project activities are the basis for assessing the potential impacts of a project. The list of activities shall be provided by the Project Proponent in consultation with the Qualified Person or through discussions with the Project Proponent's team.

#### (a) Crop Development

For crop development, the major agricultural operations will include:

| | |
|---|---|
|   | • Land survey<br>• Land clearing |
|   | • Basic Infrastructure development such as utilities, farm roads, irrigation & drainage system, soil conservation structures, construction of bunds, land levelling |
|   | • Building of structures such as processing centre/ mills, store, workshop, green houses, pump house, etc |
| | • Land preparation such as ploughing, rotovating, |

| | |
|---|---|
|   | harrowing, terracing, preparation of planting holes/ planting beds<br>• Planting of cover crops<br>• Sowing or planting |
|   | • Maintenance of crops such as weeding, fertilizer application |
|  | • Harvesting |
|   | • Transportation of produce<br>• Processing of produce |

*All photos source: https://creativecommons.org/licenses/by-nd/3.0/ and https://creativecommons.org/licenses/by-nc-sa/3.0/*

**Tables 3-4** provide a summary list of activities in a typical crop farming activity. The list is not exhaustive, and the Qualified Person shall add or delete to the list, whenever and wherever necessary.

**Table 3-4 Typical Project Activities in Crop Farming And Issues of Concern**

| Activities | Issues of Concern |
|---|---|
| • **Land acquisition (if any) under Social Impact Assessment (SIA) and local authorities' scope**<br>• **Identification of affected lots and population.**<br>• **Issue notice and undertake compensation.**<br>• **Develop relocation plans through consultation.**<br>• **Acquire property.** | • Socio-economy (relocation) as part of the SIA requirement by PLANMalaysia<br>• Land use change<br>• Wastes (demolition) |

| Activities | Issues of Concern |
|---|---|
| • **Demolition of structures and buildings.** | |
| **Land survey** | • Socio-economy (relocation) as part of the SIA requirement by PLANMalaysia<br>• Landuse change<br>• Infringement of land use<br>• River buffer zone |
| **Land Clearing** | • Removal of wastes/ tree trunks<br>• Loss of vegetation/ biodiversity and wildlife disturbance e.g., the development of agriculture in and around wetlands affects ecosystem processes and may cause an impact on life cycles of both flora and fauna and therefore wildlife and biodiversity within them)<br>• Wildlife relocation<br>• Changes to Wetland hydrology<br>• Soil erosion<br>• Hydrology and drainage (Increased runoff, impacts on downstream users)<br>• Air quality (if open burning)<br>• Wastes (biomass disposal)<br>• Water pollution (silt and debris)<br>• Air (dust) and noise pollution<br>• Safety and health (respiratory effects from dust inhalation)<br>• Visual/aesthetics<br>• Human-Wildlife Conflict (HWC) |
| **Nursery Establishment** | • Same as land clearing issues |
| **Land Preparation**<br>• **Ploughing**<br>• **Harrowing**<br>• **Preparation of beds/ planting holes** | • Soil erosion<br>• Hydrology and drainage (Increased runoff, impacts on downstream users)<br>• Water pollution (silt and debris)<br>• Alignment of planting beds |
| **Infrastructure Development**<br>• **Construction of bunds**<br>• **Terracing**<br>• **Drainage system**<br>• **Irrigation system**<br>• **Farm roads** | • Soil Erosion / Slope Failure<br>• Hydrology and drainage (Increased runoff, impacts on downstream users)<br>• Alteration of ground water<br>• Water pollution (silt and debris)<br>• Air (dust) and noise pollution<br>• Wastes (spoil disposal) |

| Activities | Issues of Concern |
|---|---|
| • **Access roads**<br>• **Utilities**<br>• **Construction of farm green house, buildings, shed, collection centres** | • Air pollution (dust) |
| **Sowing/ planting** | • Safety and health (health effects due to pesticide and chemical exposure during planting) |
| **Field operations**<br>• **Fertilizer application**<br>• **Weedicide application**<br>• **Weed control**<br>• **Pest & disease control** | • Water quality (silt, pesticides, nutrients and other discharge)<br>• Hydrology (runoff)<br>• Wastes (agricultural wastes, biomass, plastics, polybags)<br>• Safety and health (health effects due to pesticide and chemical exposure)<br>• Socio-economy (employment, economic growth) |
| **Other Agricultural Operations**<br>• **Slope maintenance.**<br>• **Monitor the effectiveness of erosion and sediment control measures.**<br>• **Maintain the rainwater collection system and drainage networks.**<br>• **Management of solid waste.**<br>• **Monitor pollutants, e.g. silt, pesticides, fertilizer runoff, etc.**<br>• **Worker safety and health.** | • Soil Erosion<br>• Water quality (silt, pesticides, nutrients)<br>• Hydrology (runoff)<br>• Wastes (agricultural wastes, biomass, plastics)<br>• Safety and health (health effects due to pesticide and chemical exposure)<br>• Socio-economy (employment, economic growth) |
| **Harvesting** | • Safety and health of workers |
| **Transportation of Fruits** | • Road safety<br>• Overloading |

*Note: The list is not exhaustive and to be suited according to the project. The Qualified Person shall add or delete to the list, whenever and wherever necessary*

## (b) Livestock (Pig Farming)

For livestock development, the major agricultural operations will include:

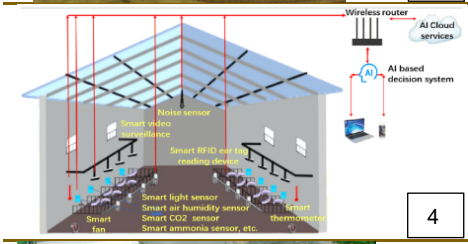
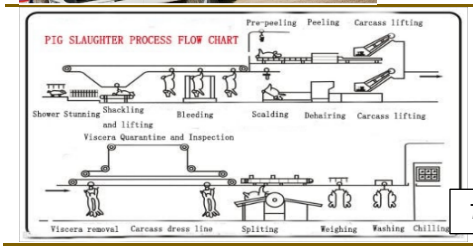
| | |
|---|---|
|  1  1 | • Land survey<br>• Land clearing |
|  1  2 | • Basic Infrastructure development such as utilities, farm roads, drainage system, soil conservation structures, land levelling |
|  3 | • Construction of Pig styles/ house |
|   4 | • Animal husbandry, performance monitoring |
|  5 | • Treatment of waste (effluent) in the farm |
|  6 | • Transportation of live animals |
|   7 | • Slaughter |

*Photo Source:*

1. *https://creativecommons.org/licenses/by-nd/3.0/ , https://creativecommons.org/licenses/by-nc-sa/3.0/*
2. *https://www.farmersjournal.ie/*
3. *https://www.spanwright.co.uk/case-study/pig-building-for-5000-finishers/*
4. *Wang, S.; Jiang, H.; Qiao, Y.; Jiang, S.; Lin, H.; Sun, Q. The Research Progress of Vision-Based Artificial Intelligence in Smart Pig Farming. Sensors 2022, 22, 6541. https://doi.org/10.3390/s22176541 https://www.mdpi.com/1803300*
5. *https://www.hcppump.co.id/*
6. *Garis Panduan Lori Mengangkut Babi, Jabatan Perkhidmatan Veterinar Negeri Pulau Pinang (2016)*
7. *https://www.modernslaughterhouse.com/pig-slaughter-line-process/*

**Tables 3-5** provide a summary list of activities in a typical crop farming activity. The list is not exhaustive, and the Qualified Person shall add or delete to the list, whenever and wherever necessary.

**Table 3-5 Typical Project Activities in Livestock Farming And Issues of Concern**

| Activities | Issues of Concern |
|---|---|
| **Land Clearing** | • Removal of wastes/ tree trunks<br>• Loss of vegetation/ biodiversity and wildlife disturbance<br>• Wildlife relocation<br>• Soil erosion<br>• Hydrology and drainage (Increased runoff, impacts on downstream users)<br>• Air quality (if open burning)<br>• Wastes (biomass disposal)<br>• Water pollution (silt and debris)<br>• Air (dust) and noise pollution<br>• Safety and health (respiratory effects from dust inhalation) |
| **Infrastructure Development**<br>• **Construction of bunds**<br>• **Terracing**<br>• **Drainage system**<br>• **Irrigation system**<br>• **Farm roads**<br>• **Access roads**<br>• **Utilities** | • Water pollution (silt and debris)<br>• Hydrology and drainage (Increased runoff, impacts to downstream users) |
| **Construction of Pig styles/ house** | • Air (dust) and noise pollution<br>• Wastes (spoil disposal)<br>• Air pollution (dust) |
| **Animal husbandry, performance monitoring** | • Index of alkalinity (pH<br>• Biological oxygen demand (BOD),<br>• Chemical oxygen demand (COD),<br>• Ammoniacal nitrogen (AN),<br>• Total suspended solids (TSS),<br>• Dissolved oxygen (DO),<br>• Sludge volume index (SVI) and<br>• Mixed liquor suspended solids (MLSS).<br>• Ammoniacal Nitrogen (AN)<br>• Faecal coliforms |
| **Treatment of waste (effluent) in the farm** | • Wastes (spoil, animal dung, scheduled wastes)<br>• Air pollution (odour)<br>• Health impact (disease, vectors, accidents)<br>• Water pollution (floatable, sewage, leachate) |

| Activities | Issues of Concern |
|---|---|
| **Transportation of live animals** | • Animal welfare<br>• Over loading |
| **Slaughter** | • Wastes (spoil, animal dung, scheduled wastes)<br>• Air pollution (odour)<br>• Health impact (disease, vectors, accidents)<br>• Water pollution (floatable, sewage, leachate) |

*Note: The list is not exhaustive and to be suited according to the project. The Qualified Person shall add or delete to the list, whenever and wherever necessary*

### 3.3.5 Identification of Significant Impacts and Priority Setting

#### (a) 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 3-6** 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 from major to minor negative and positive formats of environmental impacts (**Section 5.3.1**). 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 3**).

**Box 3:**
**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.

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

**Table 3-6 Advantages and Disadvantages of Impact Identification Methods**

| Method | Advantages | Disadvantages |
|---|---|---|
| **Checklists** | • Easy to understand and use.<br>• Good for site selection and priority setting.<br>• Simple ranking and weightages | • Do not distinguish between direct and indirect impacts.<br>• Do not link action and impact.<br>• The process of incorporation of values can be controversial. |
| **Matrices** | • Link action to impacts.<br>• Good method for displaying EIA results. | • Difficult to distinguish direct and indirect impacts.<br>• Have potential for double counting of impacts. |
| **Networks** | • Link action to impacts.<br>• Good method for displaying EIA results. | • Can be very complex if used beyond simplified version. |
| **Overlays** | • Easy to understand.<br>• Focus and display spatial impacts.<br>• Good siting tool. | • Can be cumbersome.<br>• Poorly suited to address impact duration or probability. |
| **GIS and Computer Expert Systems** | • Good for impact identification and spatial analysis.<br>• Good for experimenting. | • Heavy reliance on knowledge and data.<br>• Often complex and expensive |

*Source: EIA Training Resource Manual Second Edition (UNEP, 2002).*
*Note: The list is not exhaustive and to be suited according to the project.. It is the responsibility of the Project Proponent and Qualified Person to determine the best method to adopt for their study.*

### (b) Key Environmental Impacts of Agricultural Projects

Agriculture projects cover a variety of terrains that pose many constraints compared to development in lowland areas. The key environmental impacts associated with agriculture development concern are:

- Ecological impacts such as deforestation and fragmentation, loss of wildlife habitat or wildlife corridors, and human animal conflict
- Soil erosion and associated water pollution due to land clearing a development
- Generation and disposal of biomass from land clearing
- Waste treatment
- Local water supply issues from encroachment into catchment for water supply
- Socio-economics impacts on surrounding communities' livelihoods
- Increase in waste generation (sewage, domestic and scheduled waste) from the project & also influx of agricultural workers
- Development on river floodplain leading to loss of riparian habitat and function

- Reduced availability of water resources
- Water pollution due to usage of agro-chemicals
- Land and water pollution from hazardous materials
- Impacts due to draining of peat swamp
- Land subsidence
- Acid sulphate soils exposure
- Increased saline intrusion
- Increased coastal flooding

The list above is non-exhaustive as the Qualified Person must extend or shorten the list of issues depending on local conditions. The discovery of particular key conservation value areas or particular sensitive habitats will require the inclusion of new issues, while other issues may not be applicable for that particular project.

Some of the key environmental impacts of major concerns should be highlighted in detail in the TOR and EIA. These are as follows:

**a)** **Ecological sensitivity**: Agricultural land & forest, including river buffer zones, are home to a variety of flora and fauna. Since their habitats vary with elevations, e.g. from flat to hilly land, any development encroaching on these habitats will result in a loss of endemic, endangered, rare and threatened species. Likewise, forest fragmentation (especially from agricultural development & 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 of 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 of Peninsular Malaysia (PERHILITAN) on measures for ecological sustainability before proceeding with the EIA.

**b)** **Soil Erosion:** Removal of protective vegetation cover during land clearing and subsequent disturbance to the soil surface will inevitably increase soil erosion rates. The causes of increased soil erosion rates are tabulated below in **Table 5-5**, along with the typical effects.

Eroded soil as a result of oil palm plantation development will be carried into drains and hence to the waterways, eventually being deposited in the downstream floodplain areas. Surface runoff laden with eroded soil particles will increase the total suspended solids and turbidity of the receiving water bodies, which in turn will affect aquatic life therein. High concentrations of sediment reduce the clarity of the stream, inhibit respiration and feeding of the stream biota, decrease the light needed for plant photosynthesis, and promote infections. Deposited sediment in stream bottoms can suffocate benthic organisms.

Waterborne sediment can carry increased levels of phosphorous and nitrogen into the waterways, resulting in algal growth and feeding waterweeds (e.g. water hyacinth).

**FACTORS INFLUENCING SOIL EROSION**

**Dominant Factor**

- The dominant factor controlling soil erosion in the humid tropics are *rainfall volume and intensity*.




**Other Factors**

- The erodibility of the soil;
- The slope of the land;
- The nature of the vegetation cover;
- The location of the project and its activities;
- The area of land exposed to erosion; and
- The period of exposure.

***Assessment Methodology***

The proposed method for assessing soil erosion impacts is:

- *Erosion hazard assessment* incorporating biophysical data i.e. slope and stream drainage network, and when requested, vegetation cover, rainfall distribution and/ or intensity and soil classification;
- *Assessment of intended management procedures* i.e. area to be exposed, length of time exposed and schedule & phasing of agricultural development

Impact analysis should focus on identifying potential areas of erosion risk. A theoretical approach would be to analyse thematic data layers based on the factors that control erosion, i.e., slope, rainfall, vegetation cover, and intended sites and schedules of disturbance, i.e., location of roads and terraces. Additional layers should include all permanent streams and catchment boundaries. Subsequent overlay analysis of these factors will help identify site suitability on a reconnaissance scale of mapping based on erosion hazard.

c) **Biomass Disposal:** Site preparation and field maintenance result in the generation of large quantities of biomass. Site clearing comprises activities such as under brushing and clear felling that generates biomass in the form of re-useable/marketable timber and vegetative wastes. Field maintenance will result in the generation of manually removed weeds, as well as vegetative waste from pruning. During site preparation, the remaining biomass can be piled in windrows, simultaneously with the construction of terraces. Biomass, piled in windrows along the outer lip of terraces, and on slopes between terraces, also serves to protect these vulnerable areas from soil erosion during the early stages of plantation development. Biomass piled in this manner will decompose rapidly, especially once the cover-crop is established and covers the biomass. Improper biomass disposal, such as

pushing biomass into streams and rivers, will block/ pollute rivers and thereby impact downstream settlements. The assessment through a site survey will be used to determine the estimated amount of biomass to be disposed.



d) **Waste treatment:** Waste from agricultural processing and livestock development can be hazardous to humans if not treated properly. Therefore, it is necessary to quantify the waste generated by the agricultural project and to treat the waste in a proper way.

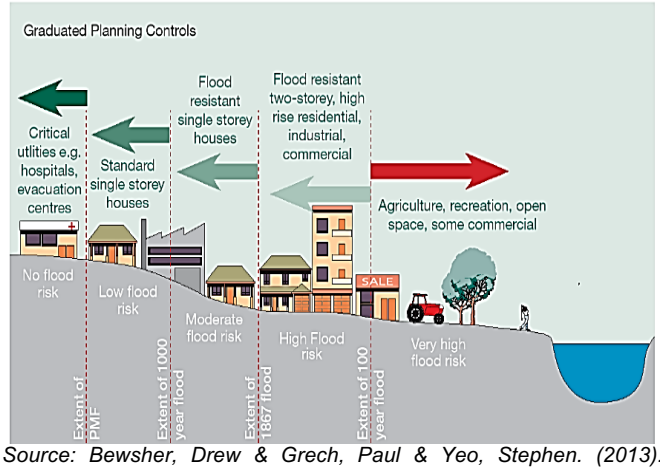
e) **Socio-Economics Impacts:** Agricultural development can result in a number of interrelated socioeconomic impacts; adverse or otherwise. These impacts touch on community structure, amenities, human settlements, and infrastructure, as discussed below. However, this list is not exhaustive and may vary based on site conditions and location of which the Qualified Person should make an assessment based on their knowledge and judgment.

- *Deterioration of drinking water quality: The quality of the water supply may be affected and the local population may face difficulties obtaining potable water for their daily use.*
- *Landscape degradation and loss of existing and potential eco-tourism opportunities.*
- *Land ownership issues, for example land ownership conflicts and disagreements, increased landlessness, loss or degradation of sacred areas i.e. areas that have cultural or religious value for the local residents*
- *Dust and noise problems related to road construction, operation, and haulage.*
- *Water resource issues i.e. reduced availability of water if it is the Project Proponents intention to abstract water for the purpose of irrigation or to meet the domestic needs of the workforce.*
- *Social/ community impacts due to influx of itinerant workers.*
- *Potential for development opportunities associated with the project. Better access to markets, infrastructure facilities, and employment in projects.*

The objective of the assessment is to identify the impact that the proposed agricultural development may have on the social aspects of the environment. Social aspects that may need special attention, and appropriate assessment methodologies, must be identified depending on the scale and significance of the project. The assessment can be made through survey or developing an effective public involvement plan, so that all affected interests will be involved. The level of public participation needed varies with the nature of the action under review.

f) **Land Development on Flood Plains:** A floodplain is a particular type of valley floor, formed through lateral and vertical accumulation of alluvial sediments and inundated in perhaps two out of three years – unless protected by a flood defence scheme. In built-up areas, lateral channel migration is usually precluded by buildings and infrastructure located close to the channel. Floodplains should be preserved, but demand for land may supersede this. Therefore, environmental assessment is vital to determine whether floodplains can be developed for agriculture.

The presence and extent of any natural corridor along the course of the river (riparian corridor) have long been known to provide important ecological habitat, but more recently it has been recognised that riparian vegetation has other significant effects.




*Source: Bewsher, Drew & Grech, Paul & Yeo, Stephen. (2013). Hawkesbury's Flood Risk Management Plan: 15 years in the making.*

The extent of a flood plain can best be determined from geomorphological data, i.e., site visits combined with aerial photograph interpretation. It is relatively simple to identify old river channels and flow paths from aerial photographs. A site survey would also help to visually determine signs of recent and historical floods, e.g., vegetation damage, vegetation trash lines, and vegetation communities. In some cases, information on the history of the area can be obtained from the Department of Irrigation and Drainage (DID) as well as by interviewing the local community.

g) **Drainage of Land (Wetlands):** Wetland environments are heavily influenced by the pattern of water movement. Once the water is drained from the peat soils, the structure of the soil is irreversibly changed. Under dry conditions, peat soils become a fire hazard. Drainage projects in wetland areas can affect a larger area than originally intended. Although drainage is usually intended to remove surface water and lower the water level of the water table to support agriculture or assist in flood mitigation, these modifications may impose physical, chemical, and biological impacts on the overall wetland environment, well beyond the project boundary.

When waterlogged sulphidic soils become exposed by drainage, oxidation of the iron sulphide produces sulphuric acid, which further reacts with other natural compounds. When these find their way into streams, they have the potential to be lethal to many wetland lifeforms.

*Source: http://www.fasterthanexpected.com*

Subsidence is another problem associated with drainage of peat soils, which have a structure not dissimilar to that of a sponge. When the peat soils dry out, the internal voids

that constitute their water holding capacity are easily compacted under mild loads. Thus, any drainage or work of these soils results in consolidation and subsidence of the surface. In low-lying areas, this can lead to increased frequency of flooding, increased salinity due to the inflow of sea water (if in coastal environments) and the destabilisation of buildings and structures. Changes in the balance of saltwater in river systems will affect the productivity of a site

***Assessment Methodology***

If it is proposed to drain a project location or part thereof, then it is a requirement that an agricultural or drainage engineer is consulted to assess and report on the following:

- Identify specific areas within the project area where, if drainage and disturbance took place, adjacent habitats would be threatened.
- Identify potential threats to the project area due to drainage and land use change in adjacent lands.
- Identify the sites (soils) that if drained would result in acid sulphate conditions

h) **Water Pollution due to Use of Agro-Chemicals:** Deterioration in water quality within plantations may occur due to infiltration of chemicals following the application of fertilisers and usage of agrochemicals such as pesticides and herbicides.

Excessive levels of chemicals can seriously affect aquatic life and the freshwater supply. The application of artificial fertilisers can lead to a marked increase in the nutrient concentrations of the water that drains from the fertilised areas. The main elements compounded in fertilisers are nitrogen (N), potassium (K), phosphorus (P), and magnesium (Mg). Fertilisers find their way into natural watercourses through a few processes.

- They are eroded together with the surface soil and washed into the watercourses.
- Leaching conveys soluble compounds into groundwater.
- Runoff carries both soluble and insoluble compounds into surface watercourses.

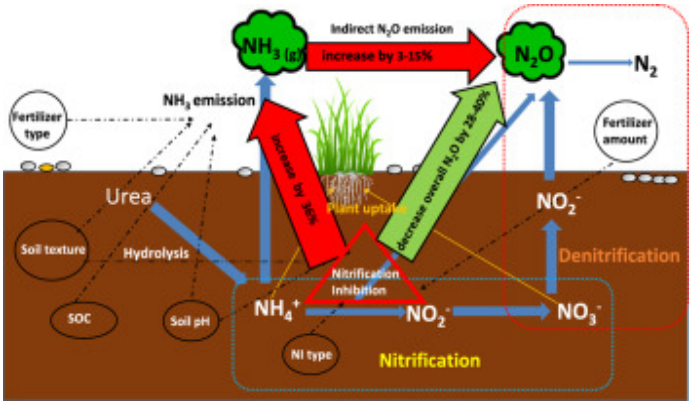



*Photo Source: Di Wu, Yuxue Zhang, Gao Dong, Zhangliu Du, Wenliang Wu, David Chadwick, Roland Bol, The importance of ammonia volatilisation in estimating the efficacy of nitrification inhibitors to reduce $N_2O$ emissions: A global meta-analysis, Environmental Pollution. (https://www.sciencedirect.com/science/article/pii/S0269749120370548)*

i) **Pests:** There are two types of pests, namely vertebrates and invertebrates. Vertebrate pests normally consist of rats, porcupines, squirrels, monkeys, pigs, elephants, and birds, whereas invertebrate pests are nematodes, ants/ termites, slugs/ snails, grasshoppers, wasps/ bees, beetles (leaf miner, weevils, cockchafers), oil palm bunch pests, sucking insects, and leaf-eating caterpillars. Invertebrate pest infestations may occur when large amounts of biomass are left on site to degrade naturally, i.e. zero burning method. Under such conditions not only will the growth and production of palm trees be severely affected, intervention by using extra amounts of pesticides will be necessary, which in turn may be a cause of water pollution. The presence of large quantities of biomass will also provide shelter for certain pests, such as rodents, which will forage on available palm fruits and thus create the necessity to provide some form of control, i.e. chemical or biological. Again, chemical control may become a source of water pollution.

j) **Land and Water Pollution from Hazardous Materials:** The use and storage of hazardous materials, such as used lubricants and agrochemicals, can be a potential source of contamination for surface water quality and land. Appropriate storage locations and disposal procedures, specific to the material being stored, must be designed and located to prevent possible spillage and inadvertent pollution.

***Assessment Methodology***

A site assessment should identify the proposed storage location and the downstream areas that will be affected if a spill or leakage occurred. It should also include an assessment of the potential amount of lubricants to be used, and agrochemicals, including storage requirements and location, should also be made.

k) **Land and Water Pollution from Workforce Housing:** Environmental impacts that can be associated with the development of workforce housing include the generation and subsequent indiscriminate disposal of waste and sewage that could lead to the spread of disease and other disease vectors, creating a potential health hazard to residents and other settlements downstream. Domestic wastewater can also cause surface water contamination that renders the water unsafe to use.

***Assessment Methodology***

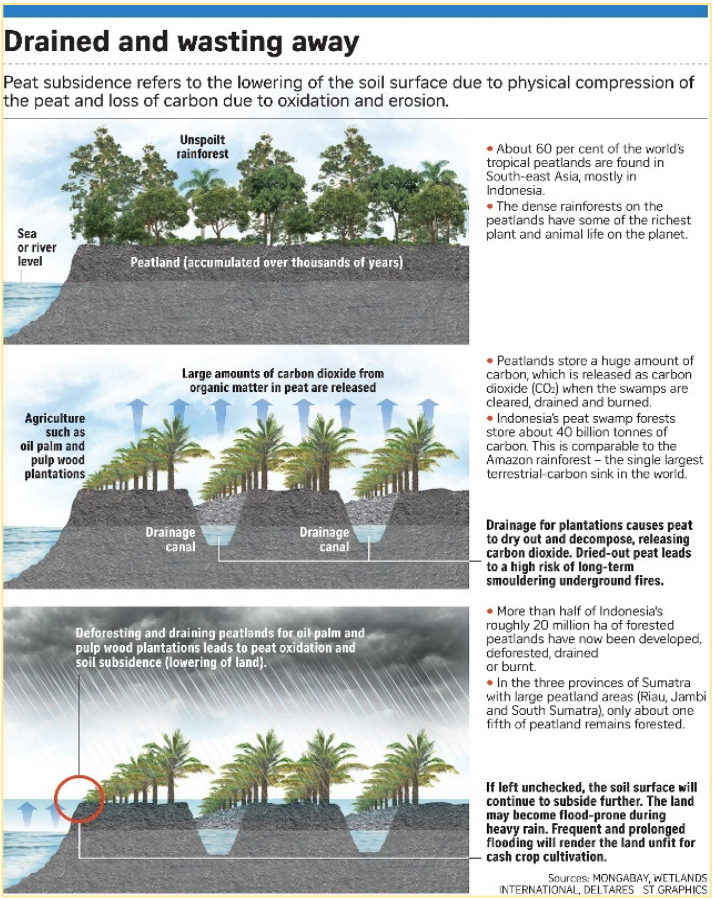
An assessment of the potential impact shall include the proposed capacity of the camp, i.e., number of families and residents to be accommodated, the proposed location of the camp, and the areas downstream that will be affected due to surface water pollution, as well as pollution loading assessment from effluent discharge based on the current condition of the receiving waterbody. Qualified Person shall first make a value judgment on the need prior to starting the pollution loading assessment.

l) **Peat Subsidence**: Certain stretches of peat swamp forest (PSF) may be utilised for agricultural cultivation. Due to its waterlogged nature, PSF is drained to make it suitable. Drainage of PSF will lead to irreversible drying of the surface peat land, and excessive

subsidence. Since peat is an environmentally sensitive area, any development in peat areas, any development must be planned carefully.

***Assessment Methodology***

Qualified Person must carry out an assessment of drainage and its sustainability (drain-ability study) has to be carried out by Qualified Person for the development of oil palm plantations in peat areas, to assess whether the drainage is sustainable or not. The subsidence rate of the peat will have to be determined by experts in the soil. Given the optimal water table for agriculture, and given the thickness of the peat layer, the subsidence rate can be used to assess the sustainability of the peat soil. For peat soils, the prime requisite for agricultural development is their long-term drain-ability on a sustainable basis.




*Source: www.aseanpeat.net/*

**m) Emission/ Sequestration of Greenhouse Gas:** As agricultural plantation development generally involves clearing large existing forest cover; it alters carbon balance through the decomposition of forest products and waste and altering the forest capacity for carbon sequestration.

***Assessment Methodology***

In view of this development, air quality is assessed based on the amount of CO2 released into the atmosphere, and the methods for calculation and reference rates of carbon contents, decomposition rates, and others are regularly published by the Intergovernmental Panel on Climate Change, national and international research centres, and NGOs.

**n) Impacts from Nursery Establishment:** The establishment of a nursery involves clearing the land to plant seedlings. Typically, the site area depends on the total size of the agricultural project. However, impacts from the nursery would be similar to plantation establishment i.e., land clearing, potential ecological impacts, and agrochemical usage impacts.

### 3.3.6 Determining EIA Study Requirements

Once the key environmental impacts have been identified and prioritised, the next step is to establish the appropriate study requirements to address these significant impacts. The scope of the EIA studies is dependent on the scale and extent of the development, its relationship to adjacent land uses and nearby sensitive receptors, the type of planning and study approvals as required by the relevant Gas, which will be generally determined in consultation and engagement with these agencies and other relevant criteria.

The Qualified Person shall provide the methodologies, assessment/modelling tools, and expected outputs derived from the assessment of the significant impacts, as part of the TOR for Second Schedule EIA. **Chapter 5** provides a list of applicable issues of environmental concerns that need to be studied. Information provided 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 suitability of the proposed studies and may recommend additional studies to be incorporated into the TOR.

## 3.4 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 and ESI prepared for Second Schedule EIA, the identified measures shall be qualitative and descriptive only, to be further detailed in the EIA stage.

## 3.5 TERMS OF REFERENCE AND ENVIRONMENTAL SCOPING INFORMATION

The scoping exercise shall define the proposed scope, boundaries, methodology, and schedule of the EIA study (among other things). For the First Schedule EIA, the scoping exercise will determine the EIA study requirements and set study boundaries that need to be assessed. Scoping for the First Schedule EIA is encouraged to be carried out as an internal exercise.

For the Second Schedule EIA, the scoping exercise shall produce two outputs, i.e., the Terms Of Reference (TOR), which defines the proposed scope, boundaries, methodology, and schedule of the EIA study (among other things) and the Environmental Scoping Information (ESI), which contains supporting information collected from the scoping exercise. The TOR (along with the ESI) is to be submitted to DOE for review and approval following the set review procedures for the Second Schedule EIA. Refer to **Chapter 4.2 of the EGIM 2016** for a description of the procedures and **Appendix 8** OF **EGIM 2016** for detailed guidance on preparing the TOR and ESI.


*Photo source: EIA Report Proposed Oil Palm Plantation Development On 8,094.43 Hectares (20,001 Acres) Land Onpt4951-Pt4955 And Pt4987-Pt4991 In Mukim Tembeling, District Of Jerantut, Pahang Darul Makmur*

# DETERMINING ENVIRONMENTAL BASELINE CONDITIONS

# CHAPTER 4 DETERMINING ENVIRONMENTAL BASELINE CONDITIONS

## 4.1 INTRODUCTION

This Chapter provides a range of baseline data for the Environmental Impact Assessment (EIA). There are two types of data that form the baseline for an agricultural project. These are secondary and primary data.

Collecting existing data is always the first step in collecting baseline information. It must however be reviewed for its relevance to the proposed site, its accuracy, and used as a basis for determining what primary field investigations may be required to 'fill the gaps'.

Primary field surveys are almost always required for most aspects of the environment, such as existing vegetation and habitats, wildlife, water quality, topography, socioeconomic and other factors. Field surveys are needed, either because published information often does not exist at a suitable scale or is not generally applicable to the project being assessed. Where primary field surveys are required, careful consideration must be given to the design of the field survey and sampling programme. Data collection must focus on the key issues needed to be examined for the environmental assessment (identified during the scoping process), and should be collected at the appropriate time(s) of the year.

## 4.2 SECONDARY DATA COLLECTION

Secondary data include 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. The data will include:

- Project description & purpose
- Infrastructure components
- Baseline environment
- Physical system e.g.
  - *Topography/ terrain*
  - *Geology*
  - *Soil types & suitability classes*
  - *Hydrology*
  - *Water availability & quality*
- Flora & fauna/ biodiversity
- Socio-Economic System e.g.
  - *Land use*
  - *Land tenure/ classification*
  - *Demographic profile*
  - *Displacement of people*
  - *Awareness & perception*
  - *Settlement*

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

## 4.3 PRIMARY DATA COLLECTION

Primary data are collected to fill in information gaps or to obtain first-hand data for detailed assessment. Common methodologies include site surveys and sampling programmes on-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 hydrology, 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, namely

| Physico-chemical Environment | Biological Environment | Human Environment |
|---|---|---|

### 4.3.1 Physico-chemical Environment

Physico-chemical Environment would include:

- *Topography*
- *Geology*
- *Soil types & classes*
- *Hydrology*
- *Water availability & quality*
- *Waste*
- *Air Quality*
- *Noise*

The EIA study shall focus on the core aspects of pollution in the physico-chemical environment, which are water, air and waste. Baseline information on these three core aspects is needed to determine the state of the environment before, during and after project implementation when compared with 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 4-1** provides a range of baseline items for sampling and studies and recommended parameters.

**Table 4-1 Baseline Items for Sampling & Studies and Recommended Parameters**

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

*Note: The list is not exhaustive and to be suited according to the project.. 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.*
** Ozone needs to be measured only for selected projects. Justification for its omission must be provided.*

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 report 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 covering flora & fauna and biodiversity. Therefore, the relevant agencies such as the Forestry Department of Peninsular Malaysia (JPSM) and the Department of Wildlife 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 are unavailable, primary data will be collected because land clearing and earthworks in forested areas will cause direct impacts on 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, sun bears, 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 (**Table 4-2**). If the biological impact of the project is not significant, secondary data would suffice.

**Table 4-2 Additional Sampling and Study Requirements**

| Recommended Parameter | Reference | Sampling Requirements | Approving Authority |
|---|---|---|---|
| **1. Geology and Soil** | | | |
| • Site topography based on land surveys<br>• Seismicity<br>• Soil profile analysis including K-value for erosion analysis.<br>• Hazard mapping | • JMG and JKR Requirements<br>• DOA | • Soil Investigation (SI).<br>• Hand auger (determine K-value)<br>• Field survey of slope areas and hazards (as part of Geological Terrain Mapping). | • Minerals and Geoscience Department (JMG)<br>• Public Works Department (JKR)<br>• DOA |

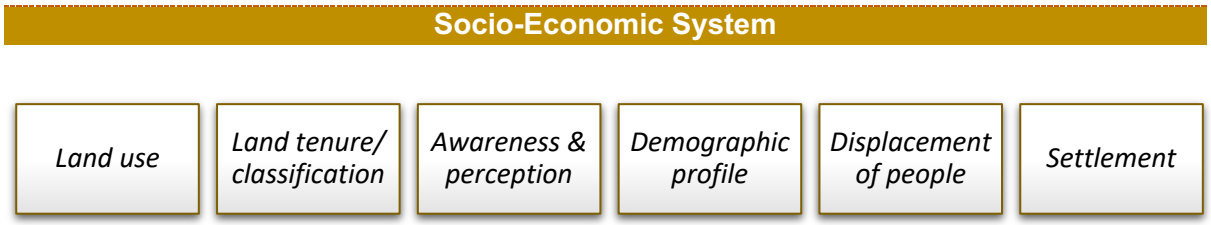
| Recommended Parameter | Reference | Sampling Requirements | Approving Authority |
|---|---|---|---|
| **2. Hydrology** | | | |
| • Stream flow<br>• Riverbed cross section | • DID requirements | • Site survey to verify river system and drainage.<br>• Stream gauging to ascertain flow and riverbed cross-section.<br>• Identification of downstream sensitive receptors. | Department of Irrigation and Drainage (DID) |
| **3.Ecological Assessment** | | | |
| • Habitat mapping<br>• Species inventory (including photographs)<br>• Abundance and diversity assessment<br>**Terrestrial Flora**<br>• Flora inventory<br>**Terrestrial Fauna**<br>• Mammals<br>• Avian<br>• Herpetofauna<br>**Aquatic Flora and Fauna**<br>• Fishery resources<br>• Phytoplankton and zooplankton<br>• Benthic Organisms | • International Union on the Conservation of Nature (IUCN)<br>• Red List Wildlife Conservation Act 2010 (Act 317) | • Terrestrial: Surveys within project site and adjacent.<br>• Aquatic: Within project site and nearby ESAs (fishery resources, aquaculture sites, etc.).<br>• ESAs (within ZOI).<br>• Identify any endemic, rare, endangered, threatened and near extinct species within the project site and surrounding ZOI.<br>• Level of sampling and data collection shall depend on the sensitivity of the site. | • JPSM<br>• PERHILITAN<br>• Department of Fisheries (DOF) |
| **4. Land use** | | | |
| • Current landuse<br>• Future and committed landuse<br>• Sensitive receptors<br>• Zoning and compatibility | • Structure and local plans | • Site surveys.<br>• Mapping to update information within the ZOS and ZOI. | • PLANMalaysia<br>• Forestry Department<br>• State government<br>• Local government |

| Recommended Parameter | Reference | Sampling Requirements | Approving Authority |
|---|---|---|---|
| **5. Social Impact Assessment (SIA)** | | | |
| • Population profile<br>• Identification of stakeholders<br>• Perception survey | • Manual for SIA of Project Development | • Carried out as part of the SIA.<br>• Surveys on target groups potentially affected by the project<br>• Surveys shall represent the stakeholders in the ZOI.<br>• Stakeholder engagement conducted | • PLANMalaysia |
| **6. Wastes** | | | |
| • Estimation of Biomass from site clearing.<br>• Potential waste (biomass, domestic, construction & demolition, scheduled wastes) generation<br>• Animal waste | • DOE and local<br>• Authorities (PBT) Requirements<br>• DVS | • Site surveys to ascertain existing site conditions. | • DOE<br>• PBT<br>• DVS |
| **7. Heritage, Culture and Archaeology** | | | |
| • Identify and determine significance of value of such sites within or near to project site. | • National Heritage Register | • Site surveys and interviews with authorities and locals. | • National Heritage Department.<br>• Department of Museum.<br>• Jabatan Kemajuan Orang Asli (JAKOA). |

*Note: The list is not exhaustive and to be suited according 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.*

### 4.3.3 Human Environment

Relevant data collection will be required for the section on socio-economic environment in the EIA. Secondary data include:




Socioeconomic data, such as population will have to be obtained from focus 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 of the SIA shall be incorporated.

Other aspects that may affect communities within the vicinity of the project site must be considered if they are deemed significant issues. The requirements may include, but not be limited to, public health, heritage and culture, archaeology, and traffic (**Table 4-2**). The findings of these studies must be incorporated into the EIA.

Photo source: https://www.science.org/

# 5

# PREDICTING AND EVALUATING IMPACTS

# CHAPTER 5 PREDICTING AND EVALUATING IMPACTS

## 5.1 IMPACT ASSESSMENT AND EVALUATION OF SIGNIFICANCE

At this stage of the study, the physical and ecological characteristics of the study site, as well as the sensitive receptors present, will be known following the collection and analysis of the baseline data. At the same time, details of key project activities would also be confirmed from discussions with the Project Proponent.

The next step is to predict and evaluate the environmental impacts that are likely to occur due to the implementation of the particular forestry project in that particular landscape. An accurate and balanced evaluation will enable appropriate measures to be prescribed to mitigate impacts to acceptable levels, as well as compensation mechanisms for permanent significant impacts that cannot be mitigated.

The spatial and temporal attributes of each impact must be described. This includes the location, spatial extent, duration, permanence, and magnitude. As far as possible, the cumulative impacts that factor in adjacent developments as well as secondary / derivative impacts should also be evaluated. There are many methods for assessing environmental impacts. Generally, all methods of impact assessment seek to compare the existing environment with a future environment predicted by various project activities during different phases of project implementation.

Predictions and assessments are made through qualitative or quantitative approaches and methods that form the basis of the evaluation. While there is no one method that fits all requirements, the predictive and assessment method chosen must have at least the following attributes:

- **Established and proven methods and models**
- **Adequate, accurate, and up-to-date data for assessment.**
- **The results can be replicated and are reproducible by independent evaluators**
- **Cost-effective and for any software, it can be purchased (propriety software and tools can also be used). If possible, widely accepted freeware is encouraged.**

The magnitude of impacts related to agriculture activities depends on the combination of existing conditions and the selected agricultural technologies and methodologies, while the zone of impact depends on existing environmental conditions such as topography, soil, vegetation, wildlife presence or nearby settlements. The Qualified Person must select the best method to conduct the assessments and/or generate practical scenarios from reliable datasets

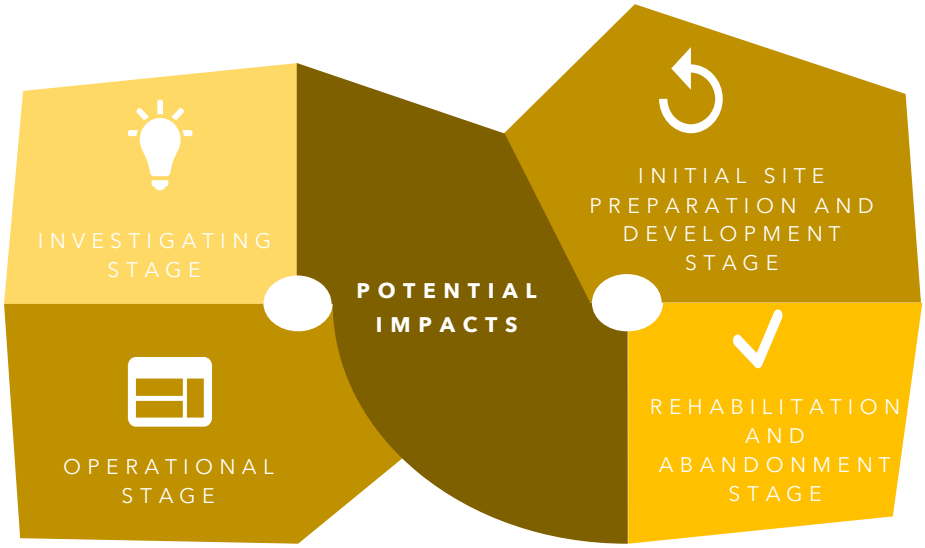
to ascertain the magnitude, extent and significance of impacts from the project. Only significant issues shall be assessed in detail in the EIA. Issues that are not significant shall only be addressed qualitatively.

Adverse environmental impacts affect production capacity, as well as habitats and livelihoods outside the project area, and hence, the Project Proponent is responsible to minimise such impacts by adopting mitigation measures. As a general principle, mitigation measures should preferentially focus on addressing the impacts to eliminate or minimise the residual impacts. The assessment must consider the site characteristics, the proposed project activities, as well as the cumulative effects with other existing or proposed projects within a close vicinity. The Qualified Person's approach to assessing these interrelated factors should be clearly described based on the TOR as approved by DOE.

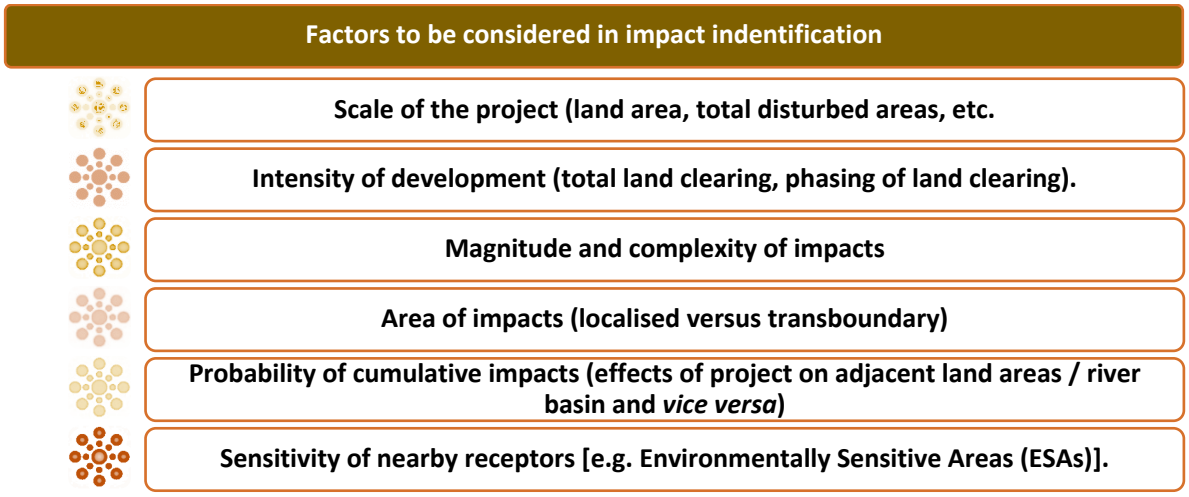
## 5.2 IMPACT PREDICTION AND EVALUATION

### 5.2.1 Assess the Project Details

Breaking down a project into its basic components or activities is a systematic means of identifying the primary sources of environmental impacts. The impacts that typically occur during the various stages of agriculture projects are detailed below.




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




The Qualified Person must, based on the information received from the Project Proponent, describe the activities that are likely to pose a risk of negative impacts on the environment or which are seen as an opportunity for environmental improvement. The description shall include technologies and methodologies chosen by the Project Proponent after consultation with the Qualified Person. If there are areas where the project description from the Project Proponent lacks detail, it must be clearly stated by the Qualified Person, and he must then later make appropriate proposals for technology selection and mitigation.

The Qualified Person can recommend changes in the project plan to better suit the site should the initial assessment indicate so. It should be highlighted in the Environmental Assessment report as “Project Options”.

### 5.2.2 Assess the Existing Environment

It is necessary to provide sufficient information to provide a brief but clear illustration of the existing environmental components. These components include, to the extent applicable (but are not necessarily limited to) the following:

| | |
|---|---|
| **Physical Environment** | topography,<br>slope features,<br>soil features and suitability,<br>geology (rock features, stability),<br>hydrology (drainage and seasonal flow pattern, flood plains, swamps),<br>climate (temperature, wind regime, rainfall),<br>surface water quality (particularly for total suspended solids, dissolved oxygen, pH, temperature, phosphorus, nitrogen, coliform count and harmful pesticides),<br>air quality<br>noise level |

| | |
|---|---|
| **Biological Environment** | wildlife,<br>forest cover,<br>rare, protected or endangered species (terrestrial and aquatic flora and fauna, elephant and rhinoceros home range) and area (mangroves, national parks, wildlife sanctuaries/ corridors, salt licks, peat swamp, freshwater swamp),<br>fisheries,<br>aquatic biology,<br>wilderness or protected areas,<br>key conservation value habitats or species |
| **Human Environment** | Population and communities (including numbers, locations, compositions, employment and others),<br>land use,<br>location of important economic resources/ upstream and downstream activities (including plantations, river sand extraction, fish rearing, *Tagal* areas),<br>infrastructural facilities (including water supply, electricity, sewerage, flood control),<br>institutions (such as schools, clinics, and places of worship),<br>water catchment areas,<br>transportation (roads, navigation and others),<br>archaeological, historical, and cultural values and aesthetic values. |

*Note: The list is not exhaustive and to be suited according to the project. It is the responsibility of the Project Proponent and the Qualified Person to determine the relevant information required for environmental assessment.*

The baseline study for the environmental assessment should focus on identifying those environmental components that may be significantly impacted by the proposed project. These may be identified through ground observation, literature review, and stakeholder consultation. The description can be presented in the form of mapping, listing, or reports in the Environmental Assessment Report.

### 5.2.3 Study Area and Zone of Impact

Generally, a study area for the preparation of an environmental assessment report covers a radius of 5 km from the project site boundaries. However, the study area should focus on what the Qualified Person deems to be the **zone of impact** as described in **Section 3.5**. A clear delineation of the study area based on the actual ground survey conducted is important to define the area within which impacts should be considered.

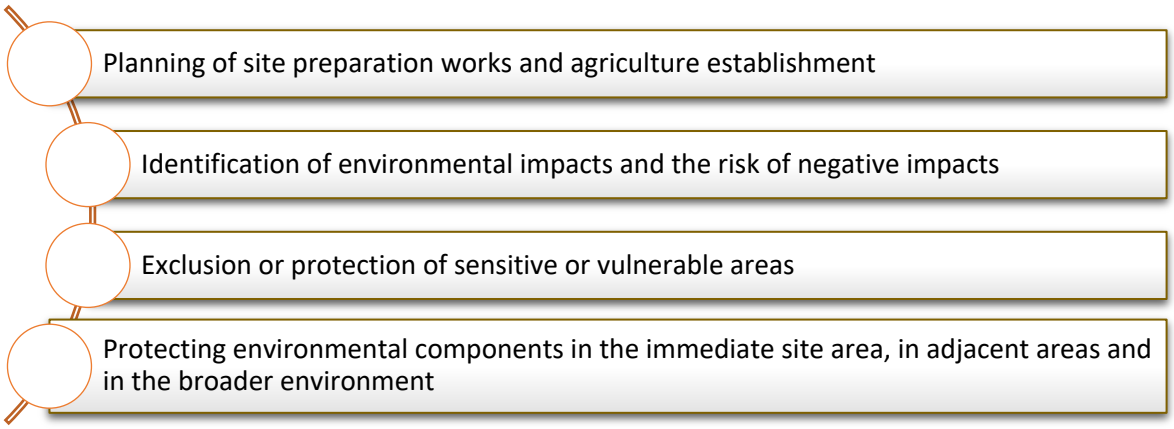
There may be different zones of impact for physical (such as water quality, terrain features and hydrology), biological (such as wildlife species, habitat and diversity) and human (such as social issues affecting communities, cultural and aesthetic aspect and land use) environment. The Qualified Person should overlap these impact zones and decide which zone is particularly sensitive and where impacts are likely to be of some significance. Such zones may reach far

downstream from the sites, particularly if there are sensitive areas downstream or locality concerns. The zone of impact can be determined after understanding the concept of the proposed development and conducting ground observations to identify these sensitive areas.

The extent of the study area/ zone of impact must be mapped out, clearly defined and justified in the TOR document and agreed upon with DOE. This will particularly include human settlements that are to be included in the assessment surveys for the preparation of the EIA report.

### 5.3 IMPACT ASSESSMENT: METHODS AND TOOLS

Undertaking the environmental impact assessment will assist in the following:



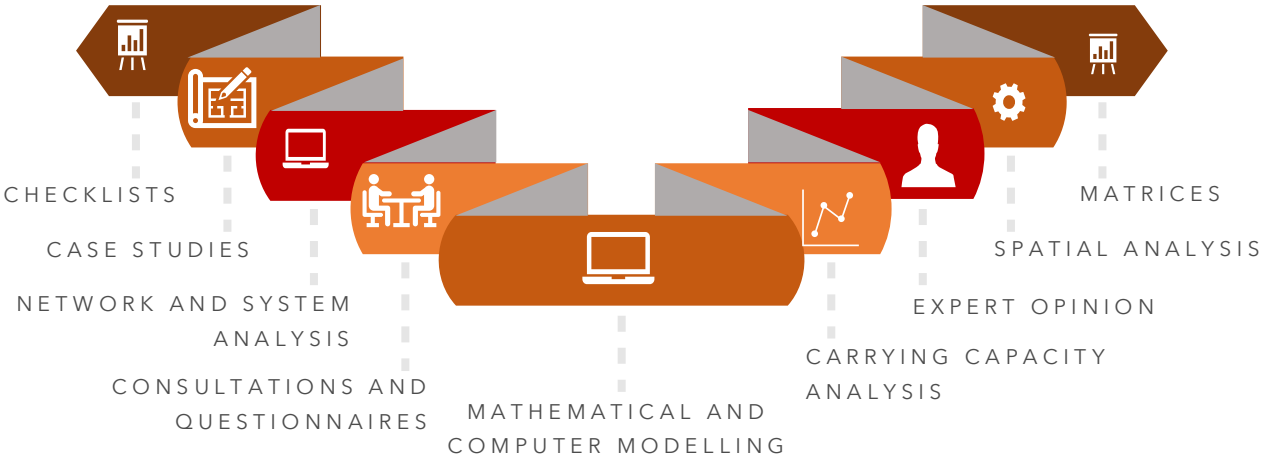

Integrating environment protection at the project planning stage will ensure that measures to avoid and minimise pollution can be built into the project design and work schedule. The assessment should not only consider the environmental impact within project site, but also whether or not significant off-site effects are likely.

An initial assessment of the site should be conducted to identify sensitive environmental areas or land uses that require protection. These may include:

| | | |
|---|---|---|
| Sensitive or endangered flora and fauna | Aquatic plants and animals, if a natural waterway is affected | Historical/ cultural areas that are considered sensitive |

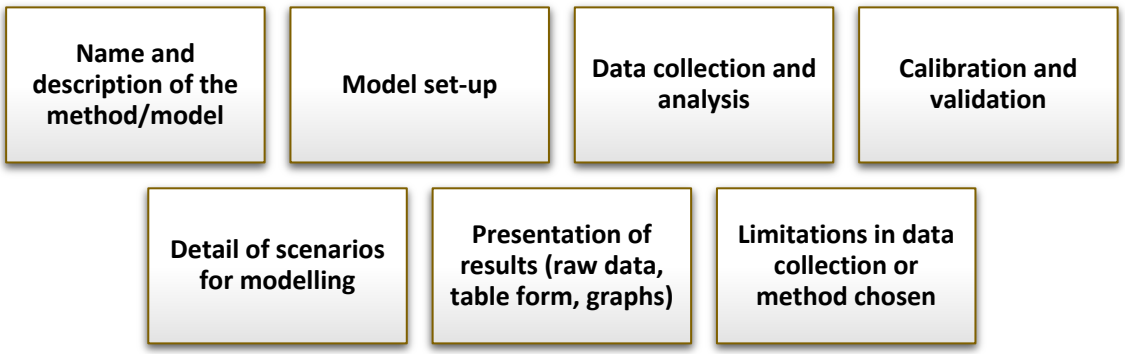
The first activity to be performed as part of the Environmental Assessment process is to predict & identify environmental issues which are important and which will need to be studied in detail and to identify and eliminate issues which are of little or no importance and, therefore, can be excluded from the Environmental Assessment study.

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




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 most 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:




All modelling exercises carried out should capture the impacts under various scenarios, either for short-, mid- to long-term for the worst-case scenario. The modelling studies shall undergo verification, calibration, and validation. The outputs of the modelling studies shall be presented in a concise manner and all uncertainties shall be discussed. Technical reports, data analysis, tables, and raw data, where necessary, shall be included as an 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 the studies, which must 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.

Whatever methodology used should be stated in the EIA report, and the results of the impact assessment should be presented in a manner that can be understood by the layman, but with

sufficient supporting technical details (e.g. technical reports, data analyses and raw data) included in the report appendix.

**Table 5-1** 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 5-1 Examples of Prediction Methods for Environmental Impacts**

| Impacts | Prediction Methods | Output |
|---|---|---|
| **Erosion and Sedimentation** | • Revised Universal Soil Loss Equation (RUSLE).<br>• Modified Universal Soil Loss Equation (MUSLE).<br>• Computer models. | • Soil loss rates and sediment yield.<br>• Erosion risk and potential soil loss maps |
| **Landslide and Slope Failure** | • Soil investigations.<br>• Geological Terrain Mapping (GTM).<br>• Site assessment by qualified geotechnical engineer and/or geologist.<br>• Risk analysis.<br>• Engineering design and estimation of Factor of Safety (FOS). | • Identification and mapping of high-risk areas to avoid or to apply mitigation measures. |
| **Hydrology** | • Hydrological procedures (DID).<br>• 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).<br>• Hydrological analysis in accordance with *Manual Saliran Mesra Alam Edisi-2* (MSMA-2) and approved by DID. | • Estimation of preconstruction and postconstruction runoff.<br>• Flood risk map. |
| **Water Quality** | • Mathematical models (one, two or three-dimensional) analysis of pollution loads and dispersion in the waterways, such as QUAL2K, MIKE11, etc.<br>• Simple mass balance models, e.g. the Streeter-Phelps model.<br>• Operational sewage discharge modelled using Qual2K or Delft3D or MIKE11. | • Estimation of TSS (erosion) and BOD and AN (sewage) concentration affecting a stretch of river and downstream sensitive areas.<br>• Estimation of the pollution load and |

| Impacts | Prediction Methods | Output |
|---|---|---|
| | | extent of effect on sensitive receptors. |
| **Air Quality** | • Gaussian plume dispersion model to assess dust generation and gas dispersion over an area in the worst-case scenario. | • Dispersion contour map indicating levels at sensitive receptors.<br>• Comparison of the computed values with the Malaysian Ambient Air Quality Standards (MAAQS).<br>• Determination of location of maximum air pollution concentration. |
| **Ecology** | • Comparative assessment of conservation status and sensitivity of habitat, flora and fauna.<br>• Ecological models for species diversity and population change.<br>• Limit of Acceptable Change (LAC).<br>• Spatial models, such as GLOBIO3. | • Habitat map.<br>• Species inventory, especially of rare, endangered, threatened and near extinct species that may require protection. |
| **Social Impacts** | • Social and economic surveys on affected population.<br>• Perception survey to ascertain acceptance of project.<br>• Social Impact Assessment (SIA). | • Socio-economic profiling.<br>• Public opinion survey results.<br>• Stakeholder feedback for EIA including possible mitigation measures. |
| **Land use** | • Compatibility assessment based on structure plan, local plan and other guidelines.<br>• Adherence to required setback based on national and state guidelines. | • Land use compatibility and buffer requirements |
| **Public Health** | • Qualitative/quantitative health risk assessment (HRA) encompassing hazard identification, exposure assessment and risk characterisation | • Potential health impacts to nearby population |
| **Biomass** | • Estimation on total biomass based on vegetation types and published studies values. | • Predicted biomass waste generation. |

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

*Note: The list is not exhaustive and to be suited according 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.*

### 5.3.1 EIA Matrix

Impact assessment is not an exact science. The assessment of impacts therefore requires a deep knowledge and understanding of the local environment and of agricultural development project. Therefore, different assessments are likely to come to similar but still somewhat different, conclusions.

Qualified Person should combine their personal experience with recent international and local research results, monitoring reports from neighbouring areas of agricultural project development, from new survey data and, in some cases, from the results of modelling.

Literature on the impacts of agricultural development already exists, and in the first instance this should be consulted. A review of known impacts documented for similar environments is likely to provide a good foundation for the basis of the impact assessment.

Results obtained from computerised mathematical models need to be verified against field data. It should be recognised that for the results to be representative, the data requirements are high and limited by the quality of the input data. To enable verification by DOE, actual

procedures must be made available. Before using computer models, prior consultation and approval with DOE is advisable.

It cannot be stressed enough that the Qualified Person must take a realistic and site-specific view of the project. They shall neither promote nor counter the proposed activities, but realistically present what, in their professional opinion, is realistic to expect as a result of the plans. To have an impact on planning, the Qualified Person should focus on a limited number of key significant issues supported by a review of the literature and project-specific information. In addition to an assessment of the probability (risk) of the impact to occur, each issue shall be described with a view of:

- The magnitude of the projected impact
- The permanence of the projected impact
- The reversibility of the projected impact
- Cumulative impacts over time of the projected impact

This means that these four points must be represented as subheadings for each description of each impact.

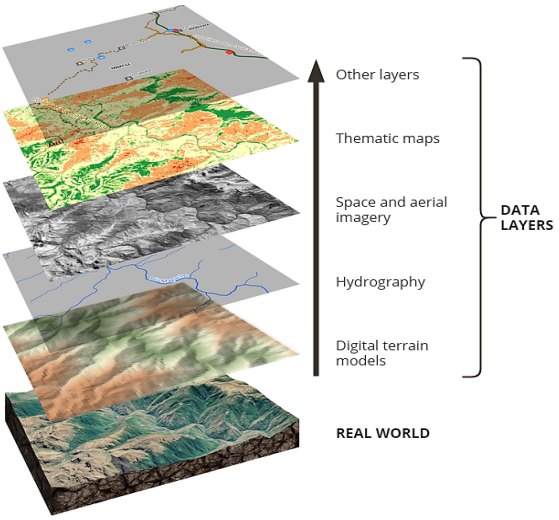
The summary of results shall be presented in an EIA matrix, an example of which is shown in the appendix. To guide the reader of the Environmental Assessment report, this summary table is best placed before the descriptions of each environmental impact.

### 5.3.2 Use of Geographical Information System (GIS)

The representation of spatial data by means of a GIS provides an appropriate tool for representing and analysing spatial data sets, particularly for larger, more complex, and sensitive projects. GIS therefore offers good opportunities to examine the environmental sensitivity of different environments.

It is a requirement to submit data sets directly to DOE. The GIS used by the Qualified Person should be able to export the data sets in a format readable by the DOE system. Therefore, the Qualified Person should consult the DOE before the analytic work begins to ensure such compatibility.

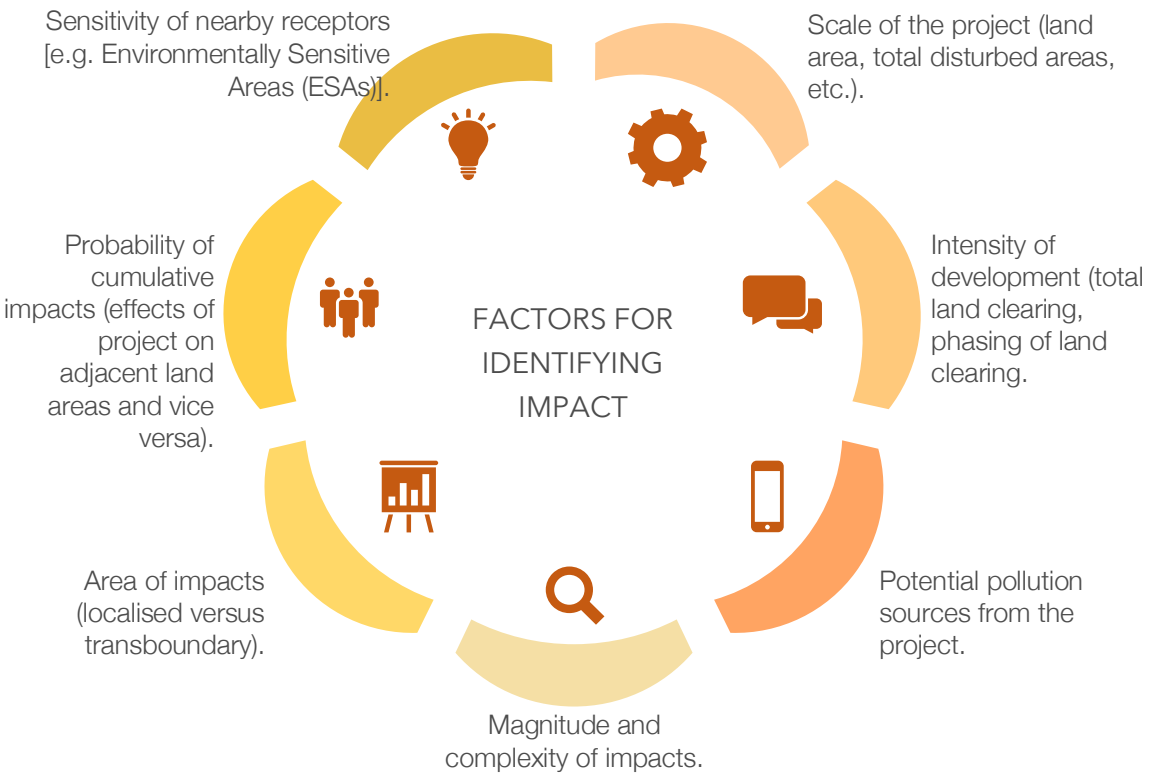
DOE may from time to time issue a list of map formats including standardised map symbols or spatial data requirement, which must be used in maps submitted as part of an environmental assessment.



## 5.4 TYPICAL IMPACTS OF AGRICULTURE PROJECTS

### 5.4.1 Determining the Impacts due to the Prescribed Activity

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




The key environmental impacts generally associated with agriculture activities will include:

- Ecological impacts such as deforestation and fragmentation, loss of wildlife habitat and wildlife corridors, and human animal conflict
- Soil erosion and associated water pollution due to land clearing and development
- Generation and disposal of biomass from land clearing
- Local water supply issues from encroachment into water catchment areas
- Socio-economics impacts on surrounding communities' livelihoods
- Increase in waste generation (sewage, domestic and scheduled waste) due to influx of agricultural workers
- Untreated waste from pig farming & processing activities
- Development on river floodplain leading to loss of riparian habitat and function
- Reduced availability of water resources
- Water pollution due to usage of agro-chemicals
- Land and water pollution from hazardous materials
- Impacts due to draining of peat swamp

- Land subsidence
- Acid sulphate soils exposure
- Increased saline intrusion
- Increased coastal flooding
- Air quality and odour

The list of key potential impacts above is non-exhaustive as the Qualified Person must extend or shorten the list of issues depending on local conditions. The discovery of particular key conservation value areas or particular sensitive habitats will require the inclusion of new issues while other issues may not be applicable for that particular project.

Following are further elaboration on key environmental impacts.

### 5.4.2 Ecological Impacts

Establishing agricultural projects in new areas will result in permanent loss of almost all species of flora and fauna in the developed area. If adjacent undisturbed forest exists and it is assumed that it is in ecological equilibrium, opportunities for the absorption of displaced neighbouring populations will be limited, if they exist at all. It can be assumed that displaced individuals will compete with resident individuals in the intact forest, resulting in their displacement or the eventual loss of residents.

Site selection and site preparation activities are the two main aspects that result in ecological impacts of agricultural projects. Location within areas classified as ecologically sensitive and site clearing for access road, nursery, and plantation will directly damage the habitats for a broad range of terrestrial and aquatic flora and fauna species.

***Assessment Methodology***

An assessment of the impacts on flora and fauna to be addressed in the impact assessment depends on a number of factors, some of which would have been determined in the initial assessment of the project.

- Assessment of existing land use on the project site, that is, whether it is an existing plantation, pristine forest, secondary forest, and others;
- Assessment of the geographical location and size of the project area;
- Assessment of the status and land development trends in the area and within the State;
- Discussion with existing regulatory bodies that govern the project;
- Assessment of the main project activities; and
- Assessment of the project site and the presence of key conservation value elements.

The overall objective of an assessment of flora and fauna would be to identify areas that may need special attention and treatment or protection due to identified significance. Appropriate assessment methodologies should be identified depending on the scale and significance of the project. On the basis of the above, the Qualified Person can determine whether a detailed

flora and fauna study is required or not. A related proposal of mitigation measures and monitoring programmes might suffice in some cases. For example, a small to medium-scale project in an area already developed; there would generally be no need or little purpose to study the flora and fauna impacts. Reasons to include or exclude a more detailed assessment of impact on flora and fauna should be clearly outlined, presented and supported with relevant land use maps.

### 5.4.3 Soil Erosion

Removal of protective vegetation cover during land clearing and subsequent disturbance to the soil surface will inevitably increase soil erosion rates. The causes of the increased soil erosion rates along with typical effects as shown below:

**Soil Erosion Impacts for Oil Palm Plantation Development:**
**Key Impacts Possible Cause Typical Effects**

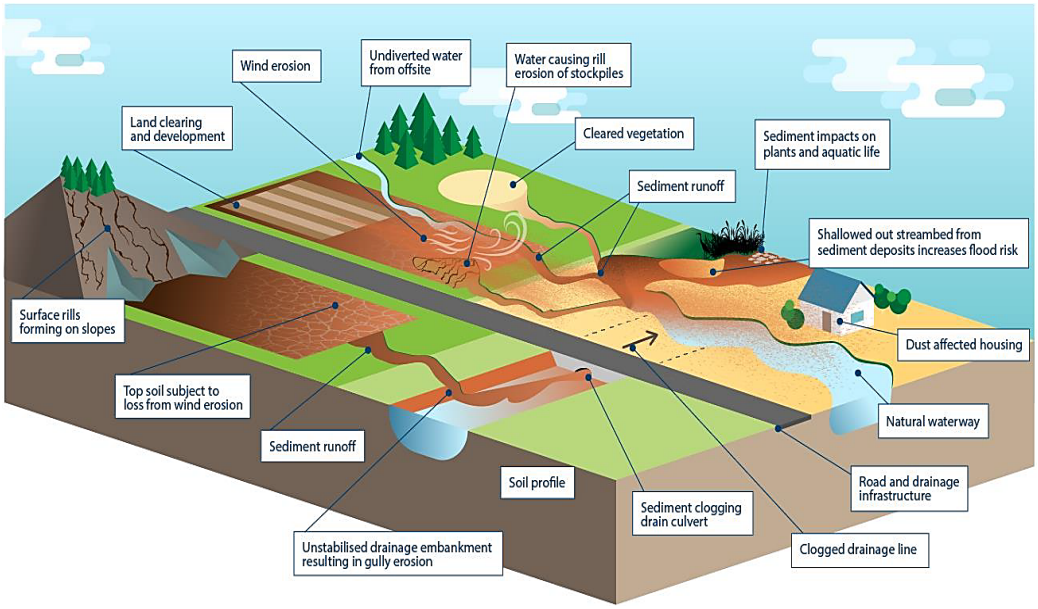
| Possible Cause | Typical Effects |
|---|---|
| Site clearing and earthwork for:<br>• Construction of access roads<br>• Establishment of base camp<br>• Establishment of nursery<br>• Terracing, drainage and infrastructure | • Reduction in arable soil from plantation area.<br>• Elevated Total Suspended Solids content and turbidity in waterways downstream.<br>• Reduction in the channel capacity of waterways due to sedimentation leading to potential localised flooding and impeded navigation. |

Eroded soil resulting from oil palm plantation development will be carried into the drains and hence the waterways, eventually being deposited in downstream floodplain areas. Surface runoff laden with eroded soil particles will increase the total suspended solids and turbidity of the receiving water bodies, which in turn will affect the aquatic life therein. High concentrations of sediment reduce stream clarity, inhibit respiration and feeding of stream biota, diminish light needed for plant photosynthesis, and promote infections. Deposited sediment in stream bottoms can suffocate benthic organisms. Waterborne sediment can carry increased levels of phosphorus and nitrogen into the waterways, resulting in algal growth and feeding waterweeds (e.g. water hyacinth).

Socially and economically, high sediment concentrations can add considerably to the cost of water treatment for human use and can also significantly decrease the storage capacity of reservoirs. As more and more eroded soil being deposited in the waterways bed, downstream channel capacity will be reduced, leading to flooding and restricted river transport, as the channel becomes difficult to navigate. Soil loss to streams or rivers is expected to reduce as time progresses when tree crops mature and ground vegetation establishes and covers the site.

***Factors Influencing Soil Erosion***

| Dominant factor | Other factors |
|---|---|
| *rainfall volume and intensity* | Soil type<br>Erodibility of the soil (K value);<br>Slope and steepness of the land;<br>Cultural practices (e.g., terracing, use of machinery)<br>Nature of vegetation cover;<br>Location of project and its activities;<br>Area of land exposed to erosion; and<br>Period of exposure, |




*Source: "Erosion and Sediment Control Approach" by Dato' Ir. Mohd Azmi Bin Ismail. National Conference on Stormwater Management 2019*

## *Assessment Methodology*

The proposed method to assess soil erosion impacts is the following:

- ***Erosion hazard assessment*** incorporating biophysical data i.e., slope and stream drainage network, and when requested, vegetation cover, rainfall distribution, and/or intensity, and soil classification; and
- ***Assessment of intended management procedures*** i.e., area to be exposed, length of time exposed, and schedule of agricultural development.

Impact analysis should focus on identifying potential areas of erosion risk. A theoretical approach would be to analyse thematic data layers based on the factors that control erosion, i.e., slope, rainfall, vegetation cover, and intended sites and schedules of disturbance, i.e., location of roads and terraces. Additional layers should include all permanent streams and catchment boundaries. Subsequent overlay analysis of these factors will help identify site suitability on a reconnaissance scale of mapping based on erosion hazard. The Geographic Information System (GIS) is well suited for overlay analysis.

### 5.4.4 Biomass Disposal

Site preparation and field maintenance result in the generation of large quantities of biomass. Site clearing comprises activities such as under brushing and clear felling that generates biomass in the form of re-useable/ marketable timber and vegetative wastes. Field maintenance will result in the generation of manually removed weeds, as well as vegetative waste from pruning.

During site preparation, the remaining biomass can be piled in windrows, simultaneously with the construction of terraces. Biomass, piled in windrows along the outer lip of the terraces and on slopes between the terraces, also serves to protect these vulnerable areas from soil erosion during the early stages of plantation development. Biomass piled in this manner will decompose rapidly, especially once the cover crop is established and covers the biomass. Improper biomass disposal, such as pushing biomass into streams and rivers, will block/ pollute rivers and thereby impact downstream settlements.


The assessment through a site survey will be used to determine the estimated amount of biomass to be disposed. The determining factors would be the size of the area and the extent of vegetation cover and the species therein. The findings of the biomass estimation shall be used to assess the possible reduction in the amount of biomass to be disposed of by sorting/ recovery of useable biomass (segregate useable timber from vegetative wastes). After undergoing sorting and recovery of useable biomass, the residual biomass from clearing activities, which is mainly vegetative wastes, must be disposed of by adopting the zero burning techniques.

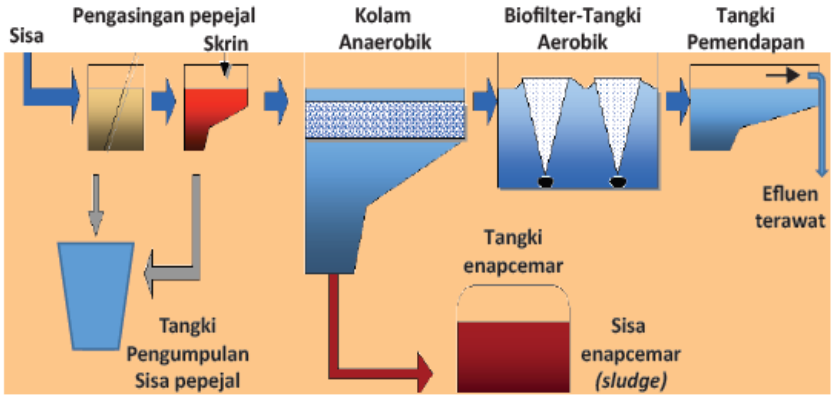
### 5.4.5 Animal Waste Impact

Livestock farming can result in the generation of large quantities of waste or effluent. Treatment process of these effluent has become mandatory for each scale farms. The characterisation of effluents should be monitored for each location. Characterisation of effluent is important for monitoring the performance of the proposed effluent treatment system.

Characterisation is composed of parameters such as biological oxygen demand (BOD), chemical oxygen demand (COD), ammoniacal nitrogen (AN), total suspended solids (TSS), the index of alkalinity (pH), dissolved oxygen (DO), sludge volume index (SVI), and mixed liquor suspended solids (MLSS). The frequency of monitoring differs according to the scale of farms on a daily, weekly, and monthly basis.

***Assessment Methodology***

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




*Source: Garis Panduan Pengurusan Sisa Buangan Ternakan Babi, 2019. Department of Veterinary Services.*

### 5.4.6 Socio-Economics Impacts

Agriculture development can result in a number of interrelated socioeconomic impacts; adverse or otherwise. These impacts touch on community structure, amenities, human settlements, and infrastructure, as discussed below. However, this list is not exhaustive and may vary depending on site conditions and location, for which the Qualified Person should make an assessment based on their knowledge and judgment.

| | |
|---|---|
| *Deterioration of Drinking Water Quality* | Increased sediment loads and improper waste handling may degrade the quality of drinking water obtained from gravity feed systems or water intake points, and thereby increase health hazard issues. In remote areas, especially areas where piped potable water supply is not available, there is a possibility that the agricultural project areas encroach into the local water supply catchment (normally in the form of a weir and gravity feed distribution line). The quality of the water supply may be affected, and the local population may face difficulties obtaining potable water for their daily use. |
| *Landscape degradation and loss of existing and potential ecotourism opportunities.* | Excessive damage to the natural vegetation cover may degrade the landscape and affect the aesthetic values. Sediment-polluted rivers may lead to the degradation or loss of water recreation sites |
| *Land ownership issues* | For example, land ownership conflicts and disagreements, increased landlessness, loss or degradation of sacred areas |

| | |
|---|---|
| | i.e., areas that have cultural or religious value for the local residents |
| *Dust and Noise Problems* | relating to road construction, operation, and haulage. |
| *Water resource issues,* | i.e., reduced availability of water if it is the Project Proponents intention to abstract water for the purpose of irrigation or to meet the domestic need of the work force, |
| *Social / community impacts* | due to the influx of itinerant workers; |
| *Potential for development opportunities* | associated with the project. Better access to markets, infrastructure facilities, and employment in projects |
| *Development needs that may be provided as part of the project.* | Health facilities, education, recreation, transportation, communication, power supply, improved water supply |

The objective of the assessment is to identify the impact that the proposed agricultural development may have on the social aspects of the environment. Social aspects that may need special attention, and appropriate assessment methodologies, must be identified depending on the scale and significance of the project. Examples of the aspects include:

- The ways in which people cope with life through their economy, social systems, and cultural values.
- The ways people use the natural environment, for subsistence, recreation, spiritual activities, cultural activities, and so forth.
- The ways people use the built environment, for shelter, making livelihoods, industry, worship, recreation, gathering together, and others.
- The ways in which communities are organised and held together by their social and cultural institutions and beliefs.
- Ways of life that communities value as expressions of their identity.

***Assessment Methodology***

The assessment would involve characterising the existing state of such aspects of the environment, forecasting how they may change if a given action or alternative is implemented, and developing means of mitigating changes that are likely to be adverse from the point of view of an affected population. In most cases, there is a series of standard steps through which the analysis must proceed in order to achieve good results.

**PROCESS 1**

- *Initial assessment of potential adverse impacts. An initial assessment based on available data, information, interviews and maps should be undertaken*

| **PROCESS 2** | **PROCESS 3** |
|---|---|
| • *Develop an effective public involvement plan, so that all affected interests will be involved. The level of public participation* | • *Survey of potential affected settlements and define baseline. Based on the initial assessment, a semi-structured* |

| | |
|---|---|
| *needed varies with the nature of the action under review. On a complicated project, a social assessment may be useful at the outset to establish the general character of the community, define the potentially affected groups, and determine enough about them to know how to involve them. In a simpler case, merely consulting with local leaders and experts may be sufficient to obtain the critical data on which to build a public involvement plan* | *questionnaire should be developed. The questionnaire should include;*<br>*(i) a number of closed ended questions, for example; 'What is the population size of the village?' 'Do you use the forest for income-generation purposes?' and,*<br>(ii) *a number of open-ended questions, including for example; 'What do you think are the main environmental concerns associated with the project? How do you think the project will affect your family?'* |

Brief social survey notes describing the agricultural development and outlining the social consultation method (list of questionnaires) must be prepared by the Qualified Person and documented in the Environmental Assessment report. The number of respondents to be consulted within the zone of impact must be determined and justified by the Qualified Person with the locations of those interviewed.

### 5.4.7 Land Development in Flood Plains

A floodplain is a particular type of valley floor, formed through lateral and vertical accumulation of alluvial sediments and inundated in perhaps two years out of three – unless protected by a flood defence scheme. In built-up areas, lateral channel migration is usually precluded by buildings and infrastructure located close to the channel. Floodplains should be preserved, but demand for land may supersede this. Hence, environmental assessment is vital to determine whether floodplains can be developed for agricultural plantation.

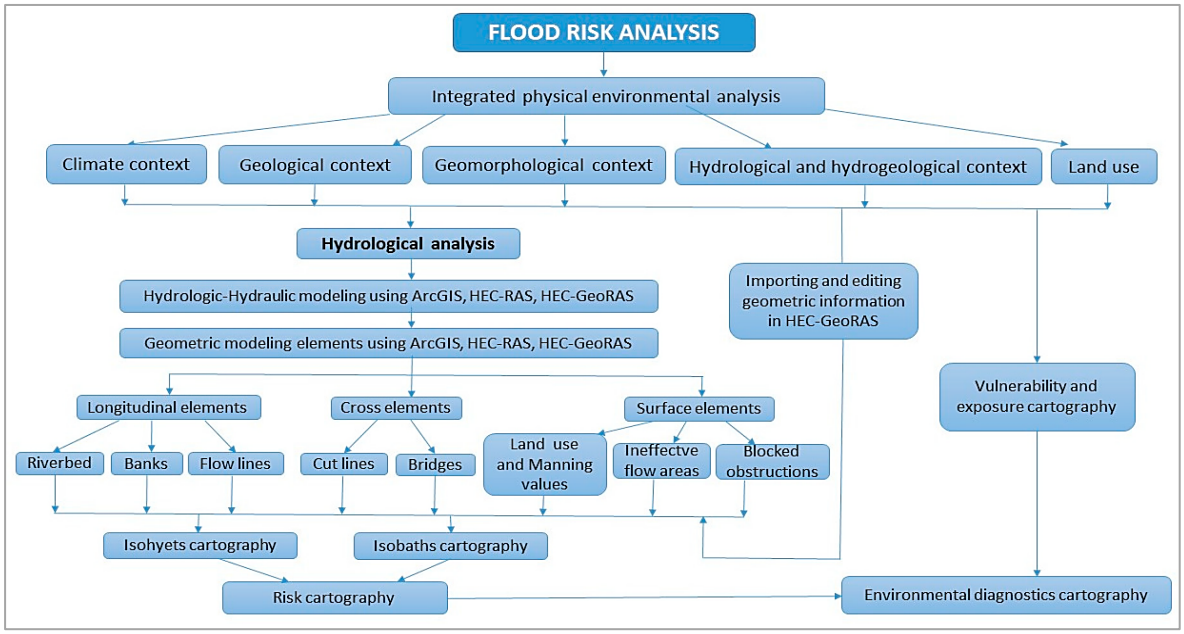
The presence and extent of any natural corridor along the course of the river (riparian corridor) has long been known to provide important ecological habitat, but more recently it has been recognised that riparian vegetation has other significant effects. First, a buffer strip creates space within which the form and process of the river can be adjusted freely, reducing the need for engineering stabilisation and heavy maintenance. Second, it reduces near-bank flow velocities. Experience has shown that bank instability often occurs when the buffering effect of riparian vegetation is lost because the cultivation extends right up to the bank edge. Third, it intercepts and reduces surface runoff, reducing the potential for erosion by drainage over and through the bank. Fourth, riparian vegetation and the presence of a natural vegetation corridor around the channel are important scenic elements that add significant aesthetic value to any landscape.

***Assessment Methodology***

An assessment of the river channel form may provide useful information for planning. The extent of a flood plain can best be determined from geomorphological data, i.e., site visits combined with aerial photograph interpretation. It is relatively simple to identify old river channels and flow paths from aerial photographs. A site survey would also help to visually determine signs of recent and historical floods, e.g., vegetation damage, vegetation trash lines, and vegetation communities. In some instances, information on the flood history of the area may be obtained from the Department of Irrigation and Drainage (DID) as well as by interviewing local peoples.

***Demarcation of flood plains***

An estimate of the extent of the flood plain should be demarcated for the proposed plantation and the flood risk areas for specified return periods should be marked, e.g., 1 to 5, 10, 50-year floods. The flood plain area should be mapped on the topographic or river catchment base map.




*Source: Veleda, S.; Martínez-Graña, A.; Santos-Francés, F.; Sánchez-SanRoman, J.; Criado, M. Analysis of the Hazard, Vulnerability, and Exposure to the Risk of Flooding (Alba de Yeltes, Salamanca, Spain). Appl. Sci. 2017, 7, 157*

### 5.4.8 Drainage of Land (Wetlands)

Wetland environments are heavily influenced by the pattern of water movement. Once the water is drained from the peat soils, the structure of the soil is irreversibly changed. Under dry conditions, peat soils become a fire hazard.

Drainage projects in wetland areas can affect a larger area than originally intended. Although drainage is usually intended to remove surface water and lower the water level of the water table to support agriculture or assist in flood mitigation, these modifications may impose physical, chemical, and biological impacts on the overall wetland environment, well beyond the project boundary.

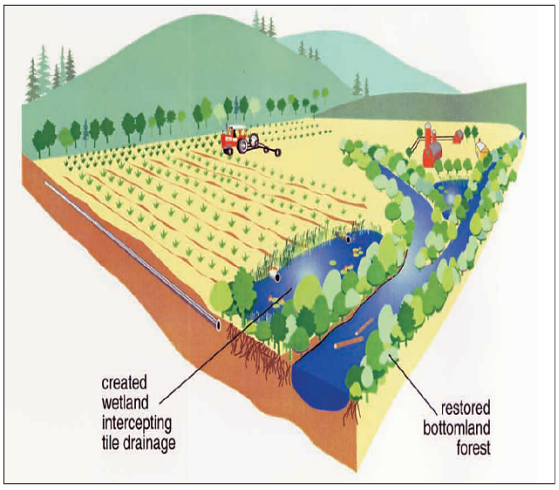
When waterlogged sulphidic soils become exposed by drainage, oxidation of the iron sulphide produces sulphuric acid, which further reacts with other natural compounds. When these find their way into streams, they have the potential to be lethal to many wetland life forms.

Subsidence is another problem associated with drainage of peat soils, which have a structure not dissimilar to that of a sponge. When the peat soils dry out, the internal voids that constitute their water holding capacity are easily compacted under mild loads. Thus, any drainage or work of these soils results in consolidation and subsidence of the surface. In low-lying areas, this can lead to increased frequency of flooding, increased salinity due to the inflow of sea water (if in coastal environments) and the destabilisation of buildings and structures. Changes in the balance of saltwater and freshwater in river systems will affect the productivity of a site.

***Assessment Methodology***

If it is proposed to drain a project location or part thereof, it is a requirement that an agricultural or drainage engineer be consulted to assess and report the following.

- Identify specific areas within the project area where, if drainage and disturbance took place, adjacent habitats would be threatened.
- Identify potential threats to the project area due to drainage and land use change in adjacent lands.
- Identify the sites (soils) that if drained would result in acid sulphate conditions.




*Mitsch, William & Day, John & Gilliam, Wendell & Groffman, Peter & Hey, Donald & RANDALL, GYLES & Wang, Naiming. (2001). Reducing Nitrogen Loading to the Gulf of Mexico from the Mississippi River Basin: Strategies to Counter a Persistent Ecological Problem. Bioscience. 51. 10.1641/0006-3568(2001)051[0373:RNLTTG]2.0.CO;2.*

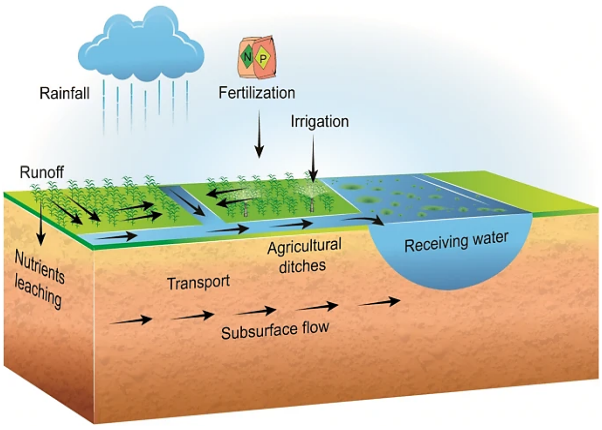
### 5.4.9 Water Pollution due to Use of Agro-Chemicals

Deterioration in water quality within plantations may occur due to infiltration of chemicals following the application of fertilisers and usage of agrochemicals such as pesticides and herbicides. Excessive levels of chemicals can seriously affect aquatic life and the freshwater supply. The application of artificial fertilisers can lead to a marked increase in the nutrient concentrations of the water that drains from the fertilised areas. The main elements compounded in fertilisers are nitrogen (N), potassium (K), phosphorus (P), and magnesium (Mg).

**Fertilisers pathway into natural watercourses**

- Eroded together with the surface soil and washed into the watercourses.
- Leaching conveys soluble compounds into groundwater.
- Runoff carries both soluble and insoluble compounds into surface watercourses.

Nitrogen and phosphorus will have a significant impact on water quality. Nitrogen is mainly supplied bound in the forms of ammonium and/ or nitrate compounds and urea. Both ammonium compounds and urea eventually convert to nitrate in the soil under well-drained conditions. Nitrate, which is soluble in water, will easily enter the river system if no precautions are taken. Excess nitrate promotes undesirable growth of aquatic microflora in waterways (eutrophication). Eutrophication in turn depletes dissolved oxygen, imparts undesirable tastes and odours in the water, and clogs water supply intakes. High nitrate concentrations in drinking water can result in methemoglobinemia, a potentially fatal disease in infants.

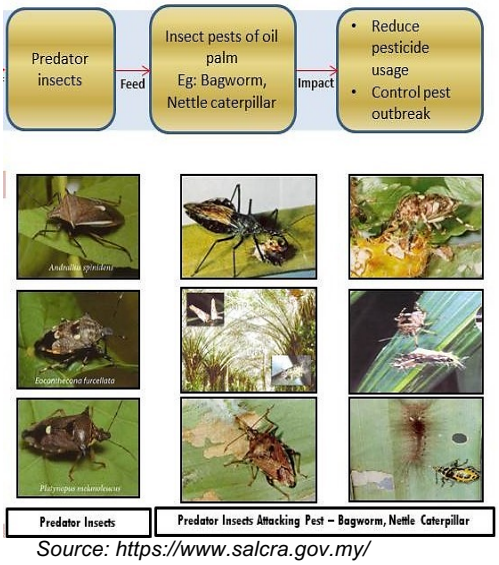



Source: Xia, Y., Zhang, M., Tsang, D.C.W. et al. Recent advances in control technologies for non-point source pollution with nitrogen and phosphorous from agricultural runoff: current practices and future prospects. Appl Biol Chem 63, 8 (2020)

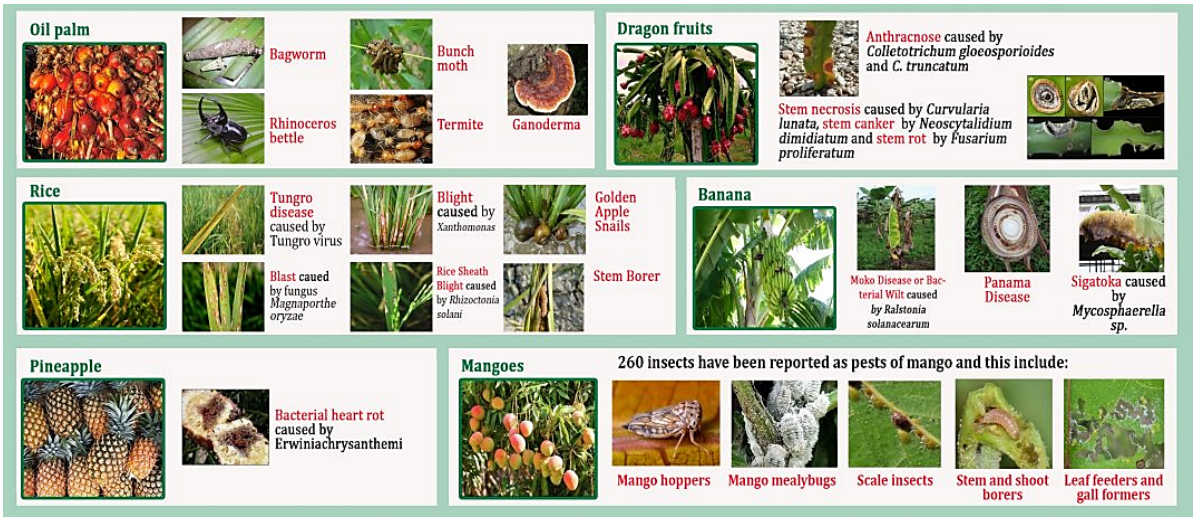
Phosphorus in the form of phosphate has the same eutrophication effect in surface water as nitrate, causing excessive wanton growth of algae, stopping sunlight from reaching aquatic life in deeper water. However, phosphate is less mobile than nitrate. Therefore, leaching loss of phosphate is small. Loss is mainly due to runoff and soil erosion.

### 5.4.10 Pests

There are two types of pests, namely vertebrates and invertebrates. Vertebrate pests normally consist of rats, porcupines, squirrels, monkeys, pigs, elephants, and birds, whereas invertebrate pests are nematodes, ants/ termites, slugs/ snails, grasshoppers, wasps/ bees, beetles (leaf miner, weevils, cockchafers), oil palm bunch pests, sucking insects, and leaf-eating caterpillars. Invertebrate pest infestations may occur when large amounts of biomass are left on site to degrade naturally, i.e. zero burning method. Under such conditions not only will the growth and production of agricultural crops & trees be severely affected, intervention by using extra amounts of pesticides will be necessary, which in turn may be a cause of water pollution.




*Source: https://www.salcra.gov.my/*




*Source: www.thepetridish.my/2019/08/27/is-malaysia-ready-to-face-agri-challenges-through-gene-technologies/*

The presence of large quantities of biomass will also provide shelter for certain pests such as rodents, which will forage on available fruits and thus create the necessity to provide some form of control i.e., chemical or biological. Again, chemical control may become a source of water pollution.

### 5.4.11 Land and Water Pollution from Hazardous Materials

The use and storage of hazardous materials such as used lubricants and agrochemicals may be a potential pollution source to surface water quality and land. Appropriate storage locations and disposal procedures, specific to the material being stored, must be designed and located to prevent possible spillage and inadvertent pollution.

***Assessment Methodology***

A site assessment should identify the proposed storage location and the areas downstream that will be affected if spillage or leakage were to take place. It should also include assessment of the potential quantities of lubricants to be used and agrochemicals, including storage requirements and location, should also be made

### 5.4.12 Land and Water Pollution from Workforce Housing

Environmental impacts that can be associated with the development of workforce housing include the generation and subsequent indiscriminate disposal of waste and sewage that could lead to the spread of disease and other disease vectors, creating a potential health hazard to residents and other settlements downstream. Domestic wastewater may also cause contamination of surface water rendering the water unsafe to use.

***Assessment Methodology***

- An assessment of the potential impact shall include the proposed capacity of the camp, i.e., number of families and residents to be accommodated, the proposed location of the camp, and the areas downstream that will be affected due to surface water pollution.
- An assessment of pollution loading from effluent discharge should be undertaken, but it should be based on the current condition of the receiving waterbody. Qualified Person shall make value judgment first on the need prior to commencement of pollution loading assessment.

### 5.4.13 Peat Subsidence

Peat is generally considered to be environmentally sensitive areas. Certain stretches of peat swamp forest (PSF) especially shallow peat may, however, be utilised for agricultural cultivation. Due to its waterlogged nature, PSF is drained to make it suitable.

Drainage of PSF will lead to irreversible drying of surface peat and excessive subsidence. Therefore, judging by its uniqueness and its function, any development on peat must be planned carefully. An assessment of the drainage and its sustainability (drainability study) has to be carried out by Qualified Person for oil palm plantation development in peat areas, to assess whether the drainage is sustainable or otherwise. The subsidence rate of peat will have to be determined by soil experts. Given the optimal water table for oil palm and given the thickness of the peat layer, the subsidence rate can be used to assess the sustainability of the peat soil.

***Assessment Methodology***

For peat soils, the prime requisite for agricultural development is their long-term drain-ability on a sustainable basis. A peat soil area can only be economically drained if the mineral subsoil level is above the mean water level (MWL) in the nearby stream, river or sea into which the drained water will be discharged. This is because of the unique properties of peat, which will decompose and subside once the drainage is improved. If the mineral subsoil level is below the MWL, continued drainage will eventually cause the ground surface to subside to a level that approaches the river level, thus making further drainage by gravity impossible.

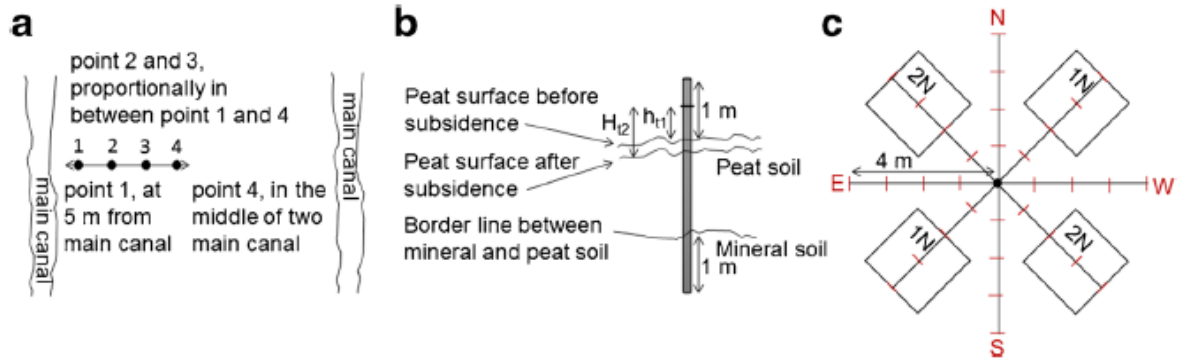
In view of this, it is imperative that peat depth and level surveys are undertaken before the agricultural suitability of a peat soil area can be reasonably determined:

- Soil auguring will be done with a special extension peat auger at an interval of 100-150 m right down to the underlying mineral substratum. Attention will particularly be paid to peat depth, nature of the mineral substratum, depth of groundwater table, presence or absence of sulphidic materials.
- Along the same transects where the peat depth has been determined, a ground and water level survey will also be undertaken. Spot heights will be measured at an interval of 25 m. A temporary benchmark will be established at the start point of each transect along the riverbank. The elevation of the reference will be related to the ‘high-water’ and ‘low-water’ levels of the river.

- In the field, other relevant information like land use, vegetation, drainage conditions, and micro-relief will also be recorded.

The highest and lowest daily river level (usually the river where the main drains flow to) will be monitored. The water level will be measured during the survey period in the transect lines. High water level will be identified through flood marks on tree trunks or other indicators. The ground level shall be related to the DID datum if it is found within a reasonable distance from the transect concerned. Otherwise, the transect level shall be based only on an arbitrary datum.

*Example: Design of peat subsidence measurement. Four positions of metal rods in transects perpendicular to the main drainage canal to measure peat subsidence.*




*Source: Khasanah, Ni'matul & Van Noordwijk, Meine. (2019). Subsidence and carbon dioxide emissions in a smallholder peatland mosaic in Sumatra, Indonesia. Mitigation and Adaptation Strategies for Global Change. 24. 10.1007/s11027-018-9803-2*

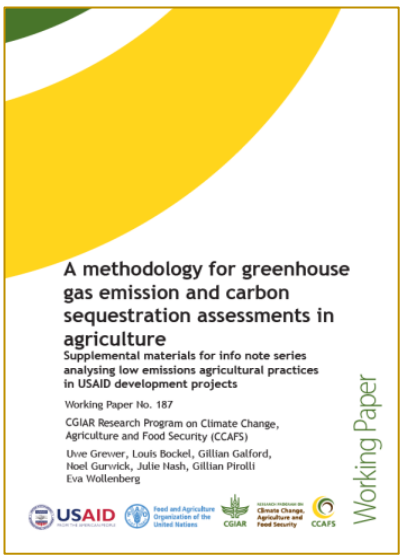
Once the above is complete, an assessment on the drainability of the study area and an appraisal of the potential of the proposed site for agriculture development will be carried out. Subsequently, the optimal water management system can be determined to ensure the timely removal of excess water.

### 5.4.14 Emission/ Sequestration of Greenhouse Gas

As agriculture development generally involves the clearing of large existing forest cover, it alters the carbon balance through decomposition of forest products and waste and altering the forest's capacity for carbon sequestration.

***Assessment Methodology***

In view of this development, air quality is assessed based on the amount of $CO_2$ released into the atmosphere, and the methods for calculation and reference rates of carbon contents, decomposition rates, and others are regularly published by the Intergovernmental Panel on Climate Change, national and international research centres, and NGOs.




*Source: https://www.climatelinks.org/*

### 5.4.15 Impacts from Nursery Establishment

The establishment of a nursery involves clearing the land to plant seedlings. Typically, the area of the site depends on the total size of the plantation. However, impacts from the nursery would be similar to plantation establishment i.e., land clearing, potential ecological impacts, and agrochemical usage impacts.

## 5.5 CRITERIA AND STANDARDS

The significance of an environmental impact can be gauged by benchmarking the assessment findings and predictions against relevant standards and criteria, including:

| | | | | |
|---|---|---|---|---|
| **Relevant laws or regulations** | **Accepted national or international standards and limits** | **Relevant policies and plans** | **Consultation with subject experts and acceptability with the relevant decision makers** | **Consultation with local communities, especially on the impacts that affect them** |

The method to determine the level of significant impact is to benchmark the results against the stipulated current criteria and standard limits imposed under the EQA 1974 and other governing policies, standards and limits. **Table 5-2** provide a list of the evaluation criteria for various environmental components to be used as a guide. On the basis of the prediction methods and tools, the outcomes shall be derived. 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.

## 5.6 OUTCOMES FROM IMPACT ASSESSMENT

**NO IMPACT**

This scenario occurs when there are very low to no sensitive receptors in the vicinity of the project to receive the impacts. Examples are communities that live very far away and are only indirectly affected, such as by increases in traffic on the main roads. Another example is when there are terrain constraints such as steep slopes, but the Project Proponent has decided to redesign the layout without affecting these areas.

**SIGNIFICANT IMPACT**

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

## NON-SIGNIFICANT IMPACT

Impacts will inevitably occur in project development, but they may not result in a significant exceedance of the accepted criteria or standards. An example is TSS from erosion and sedimentation. If the TSS emanating from land clearance that abides by standards stipulated for Class II waters of the NWQS, the impact is classified as nonsignificant, with the level of impact abiding by the stipulated criteria and standards.

**Table 5-2 Criteria and Standards for Environmental Parameters**

| Impacts | Evaluation Criteria |
|---|---|
| **Erosion and Sedimentation** | Guidance Documents<br>• Guidance Document for Addressing Soil Erosion and Sediment Control Aspects in the EIA Report (DOE, 2016).<br>• Guidance Document for the Preparation of the Document on LDP2M2 (DOE, 2017).<br>• Guidelines for Erosion and Sediment Control in Malaysia (DID, 2010).<br>• Manual Saliran Mesra Alam Edisi-2 (MSMA-2) (DID, 2012).<br><br>Sediment basin/silt trap discharge<br>• TSS: 50 mg/L or 100 mg/L, depending on locality.<br>• Turbidity: 250 NTU.<br><br>Silt curtain<br>• TSS: 50 mg/L.<br>• Turbidity: 250 NTU. |
| **Water Quality and Pollution Control** | • Groundwater Standards For Agricultural Use (DOE)<br>• Ambient water quality: National Water Quality Standards (NWQS).<br>• Ambient marine water quality: Malaysia Marine Water Quality Criteria and Standards (MMWQCS).<br>• Sewage discharge: Environmental Quality (Sewage) Regulations 2009.<br>• Toilets and septic tanks: SPAN approved design and requirements. |
| **Flood/Runoff Management** | • MSMA-2 (DID, 2012) requirements. |
| **Air Quality** | • Environmental Quality (Clean Air) Regulations 2015.<br>• Malaysian Ambient Air Quality Standards (MAAQS). |
| **Noise Level** | • The Planning Guidelines for Environmental Noise Limits and, Control 3rd Edition (DOE).<br>• Factories and Machinery (Noise Exposure) Regulations 1989. |
| **Vibration** | • The Planning Guidelines for Environmental Vibration Limits and Control 2nd Edition (DOE). |
| **Ecology** | • International Union on the Conservation of Nature (IUCN) and Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) listing. |

| Impacts | Evaluation Criteria |
|---|---|
| | • Fisheries Act 1985.<br>• Wildlife Conservation Act 2010.<br>• Forestry Act, 1972<br>• Feedback from Departments of Fisheries (DOF), Wildlife (PERHILITAN) and Forestry (JPSM). |
| **Land use** | • Structure Plans and Local Plans.<br>• Environmental Sensitive Area (ESA) Listing under the National Physical Plan-3 (NPP-3) (JPBD, 2016).<br>• Requirements in the National Physical Coastal Zone Plan (NPCZP) (JPBD, 2012).<br>• Local authority requirements. |
| **Land Traffic** | • Acceptable level of service (LOS) for traffic flows.<br>• Local authority requirement. |
| **Safety and Health** | • Occupational Safety and Health Act 1994.<br>• Factory and Machinery Act 1967.<br>• Department of Occupational Safety and Health (DOSH) requirements.<br>• International Labour Organisation (ILO) and other guidelines.<br>• Guidance Document on HIA in EIA (DOE, 2004).<br>• EIA Guidelines for Risk Assessment (DOE, 2004). |
| **Treatment Systems** | • Technical Guidance Document on the Design and Operation of Industrial Effluent Treatment Systems (DOE, 2015).<br>• Technical Guidance Document on Performance Monitoring of Industrial Effluent Treatment Systems (DOE, 2015).<br>• Technical Guidance Document on Performance Monitoring of Air Pollution Control Systems (DOE, 2006). |
| **Social Impacts** | • Public perception on acceptability.<br>• Social Impact Assessment (SIA) requirements in the context of the Town and Country Planning Act (Amendment) 2017 (Act A1522) |
| **Waste** | • Scheduled wastes<br>• Environmental Quality (Scheduled Wastes) Regulations 2005.<br><br>• Other wastes<br>• Solid Waste and Public Cleansing Management Act 2007.<br>• Local authority requirements. |
| **Visual Aesthetics** | • Public perception on acceptability. |

*Notes: The list above is not exhaustive and to be expanded where required for the specific project and areas of concern. The selection of relevant environmental parameters must be determined to ensure it covers the impacts identified and to be studied. The Project Proponent and Qualified Person shall make reference to the latest standards and requirements by the authorities.*

*Tea plantation in Cameron Highland, Malaysia*
*Photo source: amirulsyaidi, iStock*

# 6

# IDENTIFICATION OF MITIGATION MEASURES

# CHAPTER 6 PROPOSING MEASURES TO MITIGATE IMPACTS

## 6.1 ADDRESSING IMPACTS

In general, there are five ways in which an impact can be mitigated:


In any case, the Project Proponent should agree and commit to undertake the mitigation measures proposed in the EIA. When cumulative impacts caused by neighbouring developments arise, it may be beneficial to design and coordinate shared mitigation measures amongst the different projects.

## 6.2 KEY MITIGATION MEASURES

While the most appropriate Pollution Prevention and Mitigating Measures (P2M2) to adopt may vary depending on the nature of the impact and project site, some of the most important P2M2s are outline below. It should be noted that this list is not comprehensive, and other innovative measures should be considered as well.

The implementation of P2M2 is intended to achieve the following:

| | | | |
|---|---|---|---|
| **Avoidance of negative impacts through selection of best options/alternatives** | **When an impact cannot be avoided, to adopt appropriate preventive measures and best management practices (BMPs) to reduce and minimise the impacts** | **Enhance and amplify beneficial impacts.** | **Ensure that residual impacts are kept within acceptable levels** |

The Project Proponent and Qualified Person shall recommend alternative measures and/or introduce newer technology whenever these are proven more effective. At the EIA stage, the P2M2 shall be detailed out as best as possible and reported in the EIA Report. The Qualified Person shall identify and incorporate into the EIA, any additional P2M2 and BMPs required to mitigate significant impacts from the project site.

The key P2M2 that are applicable include Land Disturbing, Ecological Management, Erosion and Sediment Management, Socio-Economic, Water Pollution Control, Biomass, Flood Management and Pest Control . Other minor mitigation measures that may be required include Air pollution Control, Noise and Vibration Control, Waste Management, Safety and Health, Land Traffic and Visual Aesthetics.

**Underpinning principles of P2M2 are to reduce environmental degradation and pollution through management measures best suited to the site conditions & locations to preserve the integrity of the site and to ensure public safety.**
**Key Approaches:**

- Extent of P2M2s shall correspond to the degree of significance of impact. Once an impact is identified as significant, P2M2s shall be recommended in the EIA (e.g. as part of the engineering designs for slope reinforcement works, sediment control, etc.). For minor issues, simple management actions will suffice, e.g. water browsing for dust control at site, etc.
- 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).
- Mitigation must be site- and project-specific. The P2M2s need not be complex and costly, but instead should be practical, easy to implement, and effective.
- 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.
- The use of new technology is encouraged if it can be proven to be effective in mitigating impacts. The Project Proponent or the Qualified Person is responsible to provide proof and supporting evidence that the proposed technology is tried and tested and capable of addressing the impacts.
- P2M2s require regular inspection, maintenance, and rehabilitation. These must be incorporated as part of the environmental management requirements of the project, including the allocation of sufficient budget for such a purpose.
- The effectiveness of P2M2s shall be recorded and documented as part of the monitoring and audit programmes (**Chapter 7**).
- The Qualified Person shall propose best management practices (BMPs), if deemed necessary.
- P2M2 and BMP shall be incorporated early into the overall design of the project and as part of the LD-P2M2 document.

The submission of the EIA and the pledge given by the Project Proponent reflect a commitment to ensure 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.

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

The LD-P2M2 is a mandatory requirement under the 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. LD-P2M2 is the most important section of an EIA report when involving 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 EGIM 2016), and the Guidelines On Land Disturbing Pollution Prevention And Mitigation Measures (LD-P2M2) by DOE (2017).

The information to be included is as per the LD-P2M2 Submission Checklist in **Table 6-1** adapted from the EGIM 2016. All submissions must be accompanied by relevant technical drawings and maps.

**Table 6-1 Standard Requirements for the LD-P2M2 Submission**

| Requirement | Information to be Included |
|---|---|
| Project Activity And Implementation | Phasing plan.<br>Project implementation schedule.<br>Description of construction & agricultural activities.<br>Construction & agricultural schedule complete with timeline or charts for P2M2s installation.<br>Construction method statements. |
| Information and Analysis on Project Development | Selected weather and rainfall data.<br>Site runoff velocity and flow rates (pre- and post-development).<br>Description of soil and geological characteristics (type,<br>erodibility, hydrologic group, percentage dispersible material, excavation depth, etc.).<br>Description of adjacent areas that may be affected by land disturbance & agricultural development.<br>List of drainage, streams and river onsite as well as receiving streams and rivers.<br>List of P2M2s proposed.<br>Access roads and project components located outside of project boundary.<br>Earthworks cut and fill volume. |

| Requirement | Information to be Included |
|---|---|
| | Biomass management.<br>Solid waste (construction waste) and domestic waste management.<br>Spill prevention and control plan.<br>Hazardous waste management.<br>Soil loss prediction (pre, during and post-development) for with and without LD-P2M2 implementation scenarios.<br>Calculation of sediment traps/basins and projected runoff flows. |
| Map of Site Plan with Existing Conditions | Topographic survey map.<br>Geological Terrain Map.<br>Erosion risk map.<br>Land use map.<br>Site development plan map. |

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

## 6.4 POLLUTION CONTROL SYSTEMS

One of the main features of 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 clearing the land and starting construction.

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 along with specifications of control equipment and technical engineering maintenance works. The most common is for Sewage Treatment Systems (STS). Other systems, whenever necessary, may include Industrial Effluent Treatment Systems (IETS), Air Pollution Control Systems (APCS), and Wastewater Treatment Systems (WWTS), 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.

## 6.5 P2M2 FOR AGRICULTURAL PROJECTS

### 6.5.1 Ecological Impacts

The mitigation measures that can be considered include, but are not limited to:

**(a) Matching of Project Boundary with Water Catchment Boundary**

Project boundary demarcation and alignment frequently does not follow the local topography and water catchment boundaries. This condition will make it difficult in terms of controlling environmental impacts since pollution sources may be external to the project location.

Boundary demarcation can facilitate control of potential environmental impacts such as fragmentation, severance, and the like. This can be achieved when topography is considered when assigning the boundary of the plantation. Thereafter, the identification of environmental impacts and their related control/ mitigation measures can focus on the Project Proponent's operations residing in a given catchment. This will also facilitate enforcement as well as clearly defining the spatial responsibility of the Project Proponent.

Assessment and proposals for mitigation measures for demarcation of water catchment as boundaries must be made.

| Guide For Demarcation Of Water Catchment Boundaries | |
|---|---|
| ***Step 1: Mapping*** | From the assessment exercise, overlay the proposed plantation boundary onto the topography map. |
| ***Step 2: Adjust Boundary*** | If necessary, adjust the project boundary to follow the catchment boundaries. Initiate administrative procedures to adjust the boundary of the proposed project location. Ideally, this should be done during land alienation or land use planning at the very early stage. |

**(b) Buffer Zones for Protected Areas**

The impacts of oil palm plantation development on the biodiversity of nearby protected areas can be minimised by provision of clearly demarcated buffer zones between the plantation site and the protected area. The width of the buffer must be determined based on the values to be protected and the level of threat from the plantation.

Mitigation measures must include permissible land use practises within the buffer zone. This will depend on type of protected area, vegetation, and topography of the buffer or occurrence of wildlife.

### 6.5.2 Soil Erosion

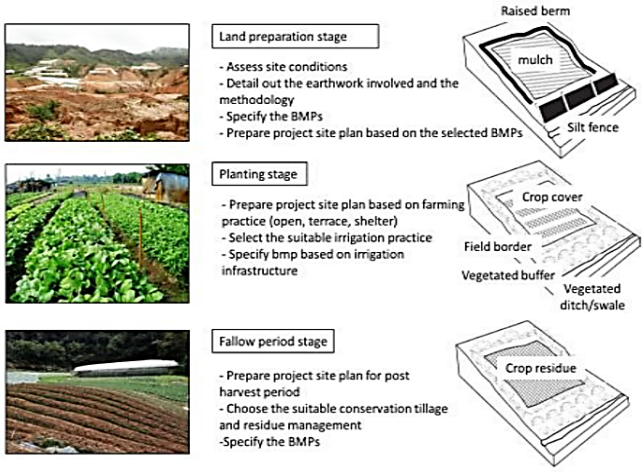
The mitigation measures that can be considered include, but are not limited to:

**(a) Zoning of High Soil Erosion Areas**

Exclusion of high-risk soil erosion areas or very steep slopes from plantation development will substantially reduce soil erosion rates and therefore maintain water quality. Excluded or reserved areas will furthermore provide natural, bio-diverse habitat for flora and fauna within the plantation area.

Although zoning of high-risk areas and areas of steep slopes such as slopes exceeding 25 degrees may be made based on existing 1:50,000 topographic maps, it will be the conditions in the field that in the end counts. Topographic maps are only indicative concerning topographic contours, and there can be several metres of inaccuracies. High-risk areas may be subdivided based on gradient, soil, vegetation, or other features and areas including significant regions of high risk should be excised from the project plan. If the steep areas are few and isolated, then a decision may be taken to progress with the development. Intensive conversion should be restricted to low-risk, more gentle terrain, generally in the lower parts of catchments.

Within the high-risk or increased-risk areas, the Qualified Person must establish whether these areas shall be totally excluded from plantation development or whether there shall be imposed restrictions on technologies, methodologies, or plantation density.




*Source: Noh, N & Mohd Sidek, Lariyah & Wayayok, Aimrun & Abdullah, A & Basri, Hidayah & Farhan, S & Sulaiman, T & Ariffin, A. (2019). Erosion and Sediment Control Best Management Practices in Agricultural Farms for Effective Reservoir Sedimentation Management at Cameron Highlands.*

The risk areas shall be clearly mapped and described in the EIA report. Once work is being planned in the area, the high-risk areas must be identified on the ground, surveyed (Class II survey or GPS) and visibly demarcated. Geographical coordinates may be extracted from maps or obtained by other means, such as by GPS and listed in the Environmental Assessment report or in the associated working plans.

Replanting on slopes of more than 25 degrees has to be assessed on a case-by-case basis. Most established plantations practise terracing to mitigate slope instability and soil erosion. Hence, if replanting in steep areas cannot be avoided, then soil conservation measures such as terracing and cover cropping should be considered.

### (b) Zoning of River Reserves

The impact of agricultural development on ecology, soil erosion, and water pollution can be minimised by the provision of river reserves for waterways affected by or related to the plantation. The purpose of maintaining river reserves is to minimise the amount of sediments entering the river system, to minimise erosion of riverbanks, and to minimise destruction of riparian habitat. Densely vegetated river reserves can serve as natural filters for surface runoff from plantation areas. Reserves also play an important role in protecting the banks of the waterways from channel erosion.

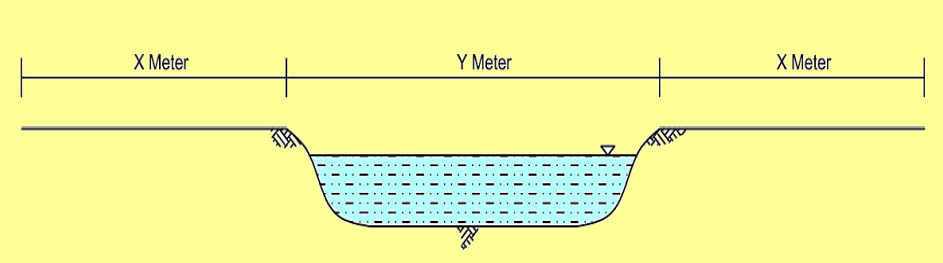
River reserves within the agricultural/ plantation area will also provide evacuation corridors and sanctuaries for wildlife. These excluded areas will in the long run, and if they are wide enough, provide habitats for most of the original natural forest species that occupied the site prior to the plantation development, thus preventing their local extinction. In addition, the reserves maintain an aesthetic value. The implementation of river reserves will also help protect the hydrological environment.The river reserves and other corridors will also provide a breeding ground for predators useful to control pests, such as rats, in the plantations.

The border of the river reserves can be determined by a simple Class III survey (compass and tape) measuring along the surface of the terrain. Detailed correction for slope during measurement is not necessary. The Qualified Person must make precise recommendations for the appropriate width of river reserves. This will depend on the river conditions, topography, vegetation, wildlife populations, and connectivity to other corridors. Some general guidelines have been issued by the Department of Irrigation and Drainage. These guidelines are generally supported by DOE as minimum requirements. The law requires a 20 m reserve on both banks of rivers that exceed 3 metres width.

**River Reserves**

- Forestry Department requires 2 x 30 m reserves for rivers exceeding 5 metres in width and 2 x 5 metres for rivers less than 5 metres in forest reserves.
- For ***alienated land and state land*** operations, the Department of Irrigation and Drainage requires:

| Width of river Between Both River Bank, (Y) | Width of River between Both River Bank, (X) |
|---|---|
| More than 40m (2 chains) | 45 meter (50 yards) |
| Between 20m & 40m (1 & 2 chains) | 40 meter (2 chains) |
| Between 10m & 20m (1/2 & 1 chains) | 20 meter (1 chains) |
| Between 5m & 10m (1/4 & 1/2 chains) | 10 meter (1/2 chains) |
| Less than 5m (1/4 chains) | 5 meter (1/4 chains) |




- Additional Notes:
  - Qualified Person must refer to Declaration of River under the National Land Code (Act 56), 1965 in order to check the gazatted river and its required buffer zone.
  - Project layout must clearly indicate the buffer zone to be developed so that Project Proponent will clearly know actual land area can be developed.
  - This buffer zone area shall be officially declared as “unusable” or “non-development” area. Project Proponent can revert to State Governmetn to request premium paid for unusable” or “non-development” area only.

The identification of river reserves must be done based on conditions in the field rather than based on maps only. The identified reserves must be included on the operational maps to be submitted to the DOE.

### (c) Soil Erosion Management

Soil conservation practises will minimise or eliminate the impact of soil erosion within the plantation, which, in turn, will prevent related impacts such as deterioration of water quality and aquatic habitat and sedimentation of rivers due to high suspended solid content in stream and river water.

A major step is recognising the potential soil erosion risk sites and the subsequent zoning of areas. Areas comprising significant regions of high soil erosion risk – steep areas – shall be excised from the project. The provision of river reserves also contributes to reducing soil erosion. Subsequently, the key mitigation measure is to minimise ground disturbance during clearing and site development operations. Mitigation measures should focus on reducing the disturbed land area and reducing the time of soil exposure after disturbance.

| Guide For Reducing Soil Erosion. |
|---|
| **Reducing time of soil exposure after disturbance** |
| ➢ The forest conversion schedule should minimise the time between harvesting, conversion, and planting, thus minimising the period of exposure and increased erosion risk. Large, exposed areas may be revegetated with fast growing ground cover species such as *Mucuna bractiada*, *Centrosema pubescens*, *Calopogonium caeruleum*, *Calopogonium muconoides*, *Pueraria phaseoloides,* and *Pueraria javanica* or indigenous species of the same attributes. Ground cover not only protects against soil erosion, but if leguminous plants are used, they also enrich the soil through their |

nitrogen fixing abilities. Exposed areas where planting of cover crops is not favourable (e.g. road sides) may be compacted as soil in large particles are more resistant to transport by erosive agents because of the greater force required to mobilise them. Compaction or other soil management practises can be implemented to reduce as much as possible the detachment of soil particles. Practises intended for use should be clearly stated in the Environmental Assessment Report.

**Use existing access roads and construction along contour lines**

- Reducing the area of disturbed land may be achieved by minimising fresh clearing for access roads through improvement and use of existing timber tracks within the area. Access roads constructed during the nursery establishment and site preparation stages can be based on existing logging tracks in order to minimise or prevent fresh clearing of vegetation and disturbance to soil. Existing and new roads should be clearly marked in the Environmental Assessment Report.

**Provision of surface runoff control measures**

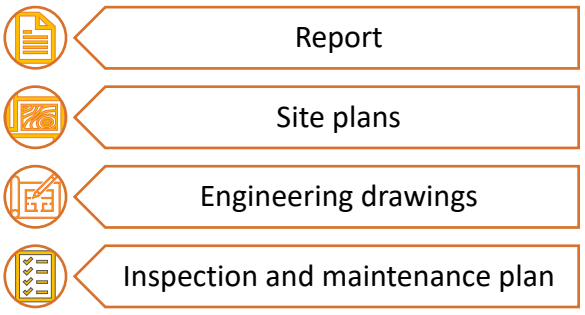
- Providing a drainage system for effective conveyance of surface runoff away from disturbed areas will minimise the extent of erosion. For plantation nurseries, roadside drains and culvert berms may reduce soil erosion. River reserves can further retain direct discharge of eroded soil particles into waterways. However, for areas that have been cleared for large blocks of oil palm plantation, a sedimentation pond that corresponds to at least 5 to 15% of the total cleared area may be constructed to retain surface runoff and allow the deposit of sediments from eroded soils, prior to discharge of surface water into the waterways. Any intended application of surface runoff control systems should be clearly indicated in the Environmental Assessment report.

**Contour planting and terracing**

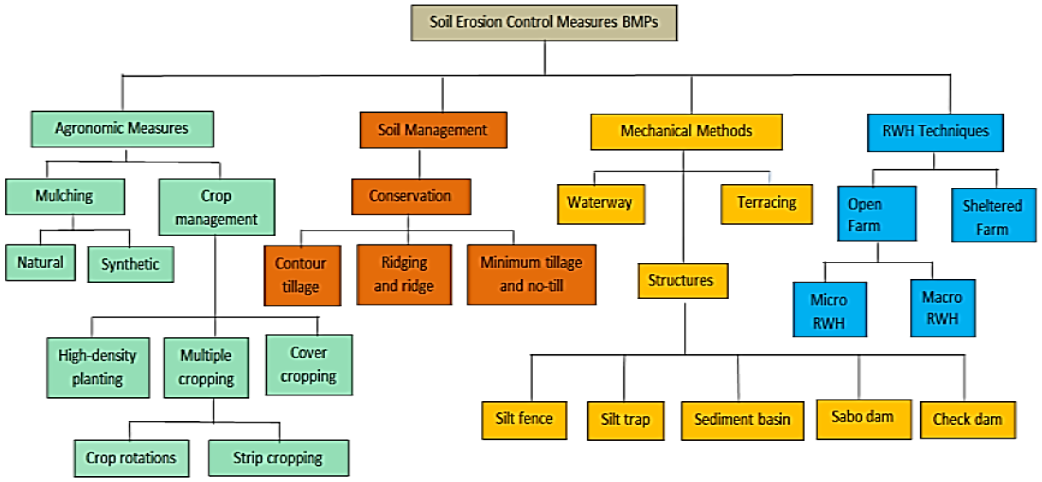
- Contour planting and terracing may contribute to minimising soil erosion, as these measures improve slope stability. A soil erosion management plan that details temporary measures should be incorporated during the plantation establishment stage and may subsequently lead to permanent measures once plantation development is complete.

The soil erosion management plan should contain the following:

- Narrative and mapping on project location and site description;
- Narrative and mapping on proposed project development; and
- Narrative and mapping of erosion and sediment control including calculation of soil loss, sediment yield, and BMP design.



## Examples of Soil Erosion Management




**Recommended BMPs Component for Open Farm Condition**

| Item | Descriptions | Erosion Risk Level |
|---|---|---|
| Terrace | • At $35^0$ slopes, the terrace bed should be constructed with a length of about 1.2m.<br>• During the construction of the terrace, the erosion control measures should be applied such as silt fence and sediment trap<br>• Avoid any earthworks during monsoon season | L, M, H |
| Drain | • Ridged drain on the terrace bed is important to increase infiltration rate and collect the run off to the side drain. It also serves as a micro rainwater harvesting system.<br>• The side drain is necessary to allow the stormwater to flow into an engineered waterway. If the slope of the side drain is too high, it is suggested to construct several steps to reduce the runoff velocity and water energy.<br>• Drain collector and diversion drain are important to allow the stormwater to the nearest river. A proper size of these waterways should be rational to the size of the planting area. The bank of earthen waterways should be protected by vegetative measures. Setting up of a group that shares the same drainage system should be encouraged for better management. | M, H |
| Mulching | • Synthetic mulching on the terrace platform should be applied all the time during planting season. This synthetic mulch has several benefits to soil erosion and sediment control and it also provides advantages to the plant such as weed control, moisture conservation and temperature control.<br>• Natural mulching on the side slope of the terrace is encouraged such as the planting of crop cover or synthetic mulching for temporary protection of soil erosion and sedimentation. | M, H |

| | | |
|---|---|---|
| Cropping | • In a sustainable manner, strip cropping or conservative cropping at every 5 terrace interval should be practiced to use as a sediment trap zone. Moreover, vertiver grass or other similar characteristic crops should be used as a slope control measure. | L, M, H |
| Waste Management | • Waste management center should be comprised of a burial pit for organic waste and inorganic waste center. Burial pit is a dumping site for organic waste such as rotten vegetables and the size of this burial pit depends on the amount of organic waste produced by a farm. An inorganic waste center should be constructed at every farm to collect plastic bottles after 3 times rinsed. This center at the farm is just a temporary collection before sending to the main collection center.<br>• Composting center should be constructed by farmers to return the organic waste into compost and it can be used for their farming to replenish the nutrients. The use of compost gives many benefits to farmers such as reduction in the use of nutrient inputs, reduction in chemical fertilizers, provides many micronutrients, etc. The main purpose of stormwater management is that organic waste should be properly managed in order for it does not flow into a stream or river, which eventually will block the river flow. | VL, L, M, H |
| Basin and Pond | • Sediment basin and irrigation pond should be placed at the right location within a farm. More benefits could be gained if both can serve to reduce sedimentation and runoff. | M, H |
| Others | • Workers house should be located at a good place within the farm boundary where its drain should be proper sizing and diverted the drain water into the adjacent river.<br>• Some other aspect of open farm BMPs can be referred to a guideline for Erosion and Sediment Control Plan (ESCP) preparation stage.<br>• Incorporate with other farms as Water User Group (WUG) to work together in maintaining the pipes for irrigation water supply that run from a long distance of the upstream water source.<br>• Do not allow to have any bare soil areas in the farm especially during monsoon season. Mulching by natural or synthetic means should be applied to protect soil erosion and sedimentation. | VL, L, M, H |

*Note: VL = very low (loss of less than 1 t ha$^{-1}$ year$^{-1}$), L = low (1 to 5 t ha-1 year$^{-1}$), M = medium (5-15 t ha-1 year-1), H = high (more than 15 t ha-1 year-1).*

**Recommended BMPs Component for Open Farm Condition**

| Item | Descriptions | Erosion Risk Level |
|---|---|---|
| Terrace | • At 35$^0$ slopes, the terrace bed should be constructed with a length of about 1.2m.<br>• During the construction of the terrace, the erosion control measures should be applied such as silt fence and sediment trap<br>• Avoid any earthworks during monsoon season | L, M, H |

| | | |
|---|---|---|
| Drain | • Ridged drain on the terrace bed is important to increase infiltration rate and collect the run off to the side drain. It also serves as a micro rainwater harvesting system.<br>• The side drain is necessary to allow the stormwater to flow into an engineered waterway. If the slope of the side drain is too high, it is suggested to construct several steps to reduce the runoff velocity and water energy.<br>• Drain collector and diversion drain are important to allow the stormwater to the nearest river. A proper size of these waterways should be rational to the size of the planting area. The bank of earthen waterways should be protected by vegetative measures. Setting up of a group that shares the same drainage system should be encouraged for better management. | M, H |
| Mulching | • Synthetic mulching on the terrace platform should be applied all the time during planting season. This synthetic mulch has several benefits to soil erosion and sediment control and it also provides advantages to the plant such as weed control, moisture conservation and temperature control.<br>• Natural mulching on the side slope of the terrace is encouraged such as the planting of crop cover or synthetic mulching for temporary protection of soil erosion and sedimentation. | M, H |
| Cropping | • In a sustainable manner, strip cropping or conservative cropping at every 5 terrace interval should be practiced to use as a sediment trap zone. Moreover, vertiver grass or other similar characteristic crops should be used as a slope control measure. | L, M, H |
| Waste Management | • Waste management center should be comprised of a burial pit for organic waste and inorganic waste center. Burial pit is a dumping site for organic waste such as rotten vegetables and the size of this burial pit depends on the amount of organic waste produced by a farm. An inorganic waste center should be constructed at every farm to collect plastic bottles after 3 times rinsed. This center at the farm is just a temporary collection before sending to the main collection center.<br>• Composting center should be constructed by farmers to return the organic waste into compost and it can be used for their farming to replenish the nutrients. The use of compost gives many benefits to farmers such as reduction in the use of nutrient inputs, reduction in chemical fertilizers, provides many micronutrients, etc. The main purpose of stormwater management is that organic waste should be properly managed in order for it does not flow into a stream or river, which eventually will block the river flow. | VL, L, M, H |
| Basin and Pond | • Sediment basin and irrigation pond should be placed at the right location within a farm. More benefits could be gained if both can serve to reduce sedimentation and runoff. | M, H |

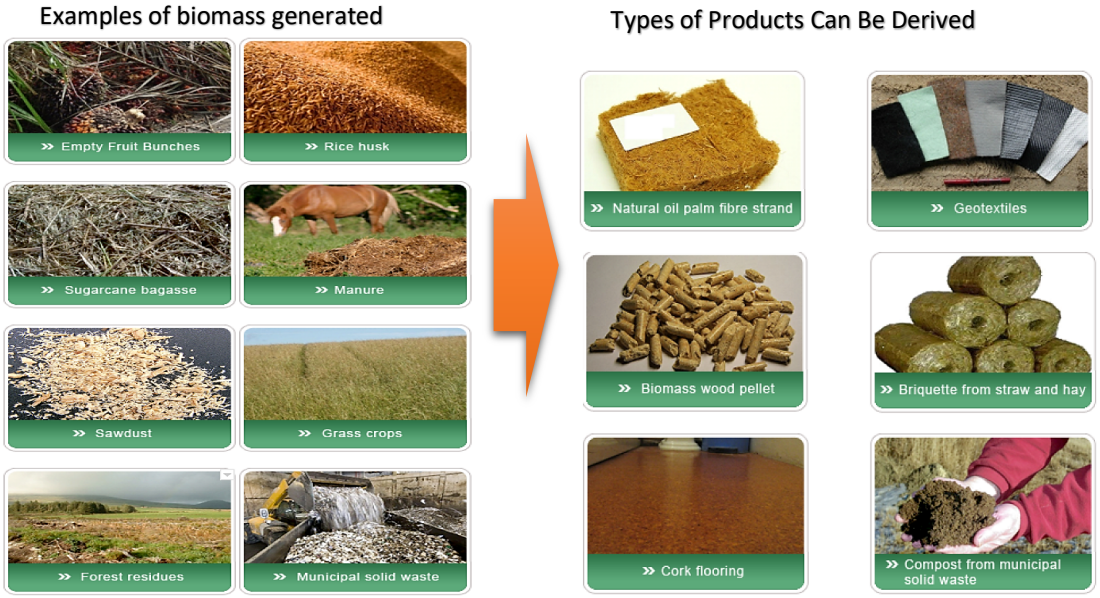
| | | |
|---|---|---|
| Others | • Workers house should be located at a good place within the farm boundary where its drain should be proper sizing and diverted the drain water into the adjacent river.<br>• Some other aspect of open farm BMPs can be referred to a guideline for Erosion and Sediment Control Plan (ESCP) preparation stage.<br>• Incorporate with other farms as Water User Group (WUG) to work together in maintaining the pipes for irrigation water supply that run from a long distance of the upstream water source.<br>• Do not allow to have any bare soil areas in the farm especially during monsoon season. Mulching by natural or synthetic means should be applied to protect soil erosion and sedimentation. | VL, L, M, H |

*Note: VL = very low (loss of less than 1 t ha$^{-1}$ year$^{-1}$), L = low (1 to 5 t ha-1 year$^{-1}$), M = medium (5-15 t ha-1 year-1), H = high (more than 15 t ha-1 year-1).*

*Source: Noh, N & Mohd Sidek, Lariyah & Wayayok, Aimrun & Abdullah, A & Basri, Hidayah & Farhan, S & Sulaiman, T & Ariffin, A. (2019). Erosion and Sediment Control Best Management Practices in Agricultural Farms for Effective Reservoir Sedimentation Management at Cameron Highlands.*

### 6.5.3 Biomass Management

Burning of debris and clearing waste during the development stage of an agriculture plantation is prohibited in Malaysia. Zero burning will eliminate the impacts of air pollution (smoke), reduce forest fire risks, and result in better soil conditions and more productive growing sites. Assessment and proposals for mitigation measures for the management of biomass generated must be made. These include consideration on temporary stockpile location, amount, and disposal method which may also include onsite natural decomposition. Alternate use or recycling options for biomass should be considered if there are potential.




*Source: www.biomass.org.my/*

### 6.5.4 Socio-economics Enhancement

The mitigation measures that can be considered include, but are not limited to:

**(a) Form Joint-Venture with Local Community**

When native / *orang asal* rights have been established, recognising those rights is the main measure to mitigate potential social impacts relating to land ownership issues. Recognition of rights may be further enhanced by the formation of a joint venture between the Project Proponent and interested landowners to develop their lands in tandem with the plantation development. This approach will reduce potential conflicts due to land issues and helps provide an additional source of income for the affected people that can be translated into an improved standard and quality of life.

Formation of joint ventures between the smallholders and Project Proponent may be implemented by:

| | |
|---|---|
| ***Identifying agricultural/ plantation area that comprises native land.*** | The areas shall be properly surveyed and marked on the ground. The extent of the area shall then be determined, and the coverage incorporated into the overall plantation plan. |
| ***Exclusion of native land area from land title*** | Based on the information from above, the Project Proponent may now appeal to the Lands Office for exclusion of such areas from the land title and thus reduction in land premiums as well as other payments related to holding the land. On the landowners' side, this information will confirm their land tenure security and define their role in the joint venture. |
| ***Development arrangements.*** | Prior to execution of the joint venture, the following aspects shall be clarified between the Project Proponent and the smallholders: distribution of development costs, distribution of profits and possible employment of smallholders as workers and/ or service providers on the plantation. |

**(b) Securing Water Supply**

Exclusion of water supply catchment areas from agricultural development is one of the best approaches to eliminate or minimise the social impacts arising from agricultural development. However, if exclusion cannot be implemented or water quality is eventually impacted, the Project Proponent shall be responsible for providing alternative water supply for the affected community. Assessment and proposals for mitigation measures for local water supply need to be made.

**Guide For Water Supply.**

**Option A: Exclusion of Water Catchment Areas**

The water supply areas must be clearly identified on a map and GPS waypoints must be supplied. The boundaries of the local water supply catchment areas must be agreed upon by the Project Proponent and the claimants. The Lands Office should be involved in these negotiations. The area should be clearly demarcated in the field, e.g. with rentice and/ or stakes as determined by the Qualified Person.

**Option B: Look for Alternative Water Supply**

If nearby government piped water mains are available, the Project Proponent may help affected local communities to be included in the water supply scheme by making the necessary arrangements with the relevant agencies. If there are no piped water mains nearby, but there is a reservoir accessible to the affected communities, the Project Proponent can assist in providing the necessary resources (e.g.. funds, cost, labour, and materials) for the water supply to be extended to the affected community. However, before decisions are made to implement this alternative, the following shall be investigated:

a) ***Catchment capacity*** – The catchment capacity shall be determined in terms of water quantity and sustainability. Water quantity needs to be ascertained as the size of the catchment will determine the number of communities it can support.

b) ***Water quality*** – The quality of water from the reservoir for the supply scheme shall be determined to ensure that it is potable and fit for human consumption as well as other domestic uses. Water quality analysis can be performed and the results shall be compared to the WHO (World Health Organisation) drinking water standards. Any variations from the potable water quality will result in the need for treatment prior to use. At this stage, the Project Proponent may initiate assistance and support from the relevant Government agencies including State Water Department for further implementation.

If piped water mains and water reservoirs are not available, a remaining option would be to improve the rainwater collection capacity. This can be implemented by providing rainwater collection drums and tanks.

Taking into account the difficulties in implementing alternative approaches, it is logistically more feasible to exclude existing water catchment areas from agricultural/plantation development.

### 6.5.5 Flood Mitigation

The flood mitigation measures that can be considered include, but are not limited to:

**Zoning of Flood Prone Areas**

In addition to zoning river reserves, floodplain assessment may identify areas that are frequently inundated. The consequences of planting in such zones should be brought to the Project Proponents attention. Frequently inundated areas should be excised and demarcated in the field as with other zoning exercises.

**Maintenance of Waterways**

The waterways on site should be maintained and kept clear of any blockages in the form of vegetative wastes. The removal and disposal of blocking materials should be incorporated into the plantation work schedule to ensure smooth flow of surface water and to prevent flash floods on site. Stream crossings (bridges and culverts) should be provided where natural waterways within the oil palm plantation are affected. This approach will prevent the occurrence of flash flooding and reduce erosion in the waterway. The use of available logs on site (during site preparation stage) to construct temporary crossings can further justify the need to sort and recover useable biomass generated by plantation land clearing operations.

### 6.5.6 Handling and Use of Agro-Chemicals

Excessive usage and untimely application of agrochemicals not only results in higher operating costs, but also in the pollution of surface water systems. Manure/ fertiliser application should be based on the palms' requirements (i.e. through foliar sampling and analysis). The use of pesticides, herbicides, and others should be minimised, restricted to oil palm stands only, and limited to serious cases of infestation. Priority should be given to biological control and manual weeding.

In summary, for pest control, as far as possible, the use of agrochemicals should be taken as the last resort and biological control should be given priority. If use of agrochemicals is inevitable, controlled usage should be implemented based on 'Integrated Pest Management (IPMI) with emphasis on judicious use of pesticides base on pest threshold level, the amount and timing of application, and proper training programmes for those handling and applying these substances.

### 6.5.7 Pest Control

When carrying out zero burning method for biomass disposal, pests such as rats and termites may become a concern. The mitigation measures include, but are not limited to:

Provide breaks within the alignment of the biomass windrows to prevent any potential for extensive infestation

*(Image: Mike Kahn / Alamy)*

Controlled use of pesticides, particularly when infestation is extensive

### 6.5.8 Management of Hazardous Materials

In the operation of an agricultural project, there are two types of materials that are of environmental concern, namely the agrochemicals (pesticides, herbicides, and fertilisers) and oil/ grease wastes. Both materials can be a source of significant water pollution. Oil and grease wastes and mishandling of used lubricants or other petrochemical products, such as fuel and fuel enhancers, may result in episodic pollution. The mitigation measures that can be considered to minimise pollution from these materials include (but are not limited to):

| | |
|---|---|
| ***Agrochemicals*** | Used containers to be returned to suppliers or collected for approved disposal – the disposal procedure should be described |
| ***Used lubricants*** | These should be collected for recycling (if suitable) and/ or disposed of as scheduled waste. |
| ***Fuel dispensing*** | This should be carried out in a designated area or sealed area to prevent spillage and contain spills and handled by trained and experienced personnel. |
| ***Containers for fuel and fuel enhancers*** | These should be collected and disposed of using approved procedures. |

### 6.5.9 Waste Management of Workforce Camp

Improper sanitation facilities may lead to disease outbreak (either airborne, waterborne, or vector-borne). Adequate sanitation facilities that can be provided as shown below, but not limited to these. It is important that the Project Proponent allocates sufficient funds for providing adequate facilities for the plantation population and ensuring good housekeeping practice is implemented at all times.

Toilets with septic tanks that are maintained regularly to ensure their effectiveness.

*(Image: www.minkyuan.com.my)*

Domestic waste disposal system that is capable of ensuring proper disposal, prevention of scavenging by rodents and other scavengers. Waste segregation facilities should also be provided to encourage recycling practises.

*(Image: www.facebook.com/swcorp)*

### 6.5.10 Emission/ Sequestration of Greenhouse Gas

Greenhouse gases are emitted from energy production and from vegetation removal. The mitigation measures that can be considered for greenhouse gas emissions include (but are not limited to):

*Limit New Areas Opening*

- Clearing land for agricultural development should be done in phases

*Electricity Supply*

- Make preference for electricity to be procured from the grid rather than from independent diesel generators

*Renewable Energy*

- Use of renewable energy sources such as solar or hydro power

*Strict Control*

- Implement strict control on equipment with combustion engines, from chainsaws to large earth and vegetation moving equipment

*Drainage*

- Drainage of all areas of impounded water to avoid formation of methane

### 6.5.11 Peat Area

Assessment and proposals for mitigation measures for peat area management should be consider suitable drainage system for the development in peat areas.

*(Image: https://malaysia.wetlands.org)*

## 6.6 RESIDUAL IMPACT

There will be some adverse impacts from agricultural activities, even if these are carried out with every intention of avoiding or minimising such impacts. There will be soil erosion with subsequent siltation of waterways as a result of clearing, harvesting, quarters construction, or road construction. Cleared areas will lead to the loss of natural habitat for wildlife and subsequently reduce the wildlife population in that particular area. Such impacts, the risk, and the magnitude must be assessed as part of the assessment procedure.

### 6.6.1 Off-set of Residual Impacts

Residual impacts relating to the emission of greenhouse gases or loss of biodiversity/ habitat may be countered by offset activities elsewhere. Particular key conservation value habitats or carbon sinks may be protected or restored elsewhere. Such off-set activities may balance the impact in full or partially but should in all cases be considered.

### 6.6.2 Mitigation of Residual Impacts

Residual impacts are already minimised through the choice of technologies or methodologies. Mitigation is therefore only possible through compensation or substitution. Compensatory measures in terms of replacement of habitat loss, re-vegetation, alternative access to livelihoods, and others are among Tre-vegetation, alternative access to livelihoods, and others are among the available options for mitigation of residual impacts.

*Biogas plant at Pig Farm Area in Samarahan*
*Photo source: https://juruterajasa.com/2021/05/06/biogas-plant-at-pfa-samarahan/*

7

# DEVELOPING OUTLINE OF ENVIRONMENTAL MANAGEMENT PLAN

# CHAPTER 7 PREPARING THE ENVIRONMENTAL MANAGEMENT PLAN (EMP)

## 7.1 INTRODUCTION

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

The key contents of the EMP are formatted as the scope of work in the Bill of Quantities (BQ) for the contractors to bid for the implementation of the project. 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 on 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 standard COAs to be included are:

| | |
|---|---|
| (a) | Monthly monitoring of the water quality of the receiving water body by an Accredited Laboratory or any other frequency determined by the DOE. |
| (b) | Monthly monitoring of TSS and turbidity at the inlets and outlets of sediment structures or any other frequency as determined by DOE. |
| (c) | In-situ monitoring of TSS and Turbidity after rain event. |
| (d) | Monthly or quarterly monitoring of air, noise, and vibration qualities, depending on sensitivity of receptor. |
| (e) | Planning, construction, and maintenance of LD-P2M2 on site |
| (f) | P2M2 notification and implementation. |
| (g) | Identification of need of competent person to undertake specific task on site. |

| | |
|---|---|
| (h) | Description and implementation details of EMT. |
| (i) | Clear documentation on any transfer of ownership or proponent of approved EIA. |
| (j) | Allocation and reporting of sufficient resources to carry out project activities on site. |
| (k) | Details of the temporary/permanent abandonment/project closure plan for all phases. |
| (l) | Implementation of the 5S concept in good housekeeping practises. |
| (m) | Any other green initiatives undertaken for site development activities |

The format for the EMP shall be based on the requirements stated within the Environmental Impact Assessment Guideline in Malaysia (EGIM 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 SELF-REGULATION (SR)

Environmental Mainstreaming (EM) is a strategic tool that allows the cultural evolution of embracing the environmental agenda at all levels of the organisational structure of the Project Proponent. With the understanding of EM, all key personnel in an Organisation can play a role in safeguarding our environment in an effective manner. As such, the elements as espoused in the EMT provide a guide in achieving the ultimate Goal of Environmental Excellence in an Organisation.

Details on the SR for the project shall be incorporated into the EMP framework as required by the Environmental Mainstreaming Directive issued by the DOE. This shall cover the seven environmental mainstreaming tools:

### 7.3.1 Environmental Policy

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

| | |
|---|---|
| **ENVIRONMENTAL POLICY** | This refers to the Project Proponent's Environmental Policy and the conveyance of such policies throughout the organisation. |
| **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 must also be part of the BQ for the contractors in the contractual stage. |

| | |
|---|---|
| **ENVIRONMENTAL MONITORING COMMITTEE** | The Project Proponent is required to identify and establish 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.<br><br>For 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).<br><br>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. |
| **ENVIRONMENTAL FACILITY** | The EMP shall provide the range of environmental facilities in the project, such as wastewater treatment system (WWTS), sewage treatment systems (STS), air pollution control system (APCS), BMP, P2M2 structures and associated supporting utilities and facilities that need operational and maintenance support. |
| **ENVIRONMENTAL COMPETENCY** | Training requirements are needed to ensure the competency of environmental management for all relevant site personnel. The proposed training programme and requirements shall be included in the EMP framework. |
| **ENVIRONMENTAL REPORTING AND COMMUNICATIONS** | The EMP framework shall contain a reporting time schedule for various submissions during the post-EIA phase, which shall include:<br>• Environmental Management Plan.<br>• Monitoring Reporting.<br>• Audit Reporting.<br><br>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.<br><br>**(i) Record Keeping**<br>A documented procedure on record keeping for the activities, operations, and maintenance of the P2M2 must be established to ensure all aspects of the compliance and performance of the |

| | |
|---|---|
| | Organisation in EM are properly and easily referred to. Records must be made available to the DOE the Regulator whenever asked for.<br><br>**(ii) Data Analysis & Interpretation**<br>The Competent Person has to analyse and interpret the data from the IM, CM and PM in a suitable format for presentation the ERCMC and EPMC for any decision-making purpose. Data for any upset conditions must also be analysed so that records can be kept for continuous improvement purposes. |
| **ENVIRONMENTAL TRANSPARENCY** | The status of the company, environmental policy, compliance, and achievement can be displayed on the company website or on the ad located on the project site boundary or at the entrance to the company premises to improve public confidence.<br><br>An annual environmental sustainability report has to be prepared and submitted to DOE. |

## 7.4 MONITORING AND AUDIT PROGRAMMES

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:

**Performance Monitoring (PM)**

- Relates to monitoring of the performance treatment systems such as IETS, STS and APCS.
- This shall be undertaken by a Competent Person with expertise in the related treatment system.

**Compliance Monitoring (CM)**

- 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).
- This shall be carried out by a Qualified Person such as the EO and/or the Qualified Person.

**Impact Monitoring (IM)**

- 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.
- This task must be carried out by a Qualified Person (Environmental Consultant)

### 7.4.2 Monitoring Methodology

The extent of monitoring is 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 impacts are perceived to affect sensitive receptors.

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

The monitoring programme shall be tailored for all types of agricultural projects involving slope and hill areas as well as other environmentally sensitive areas, based on site conditions and types of development.

### 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 of the DOE. The audit must be carried out by an independent third party as a DOE-registered auditor.

The typical audit process involves:

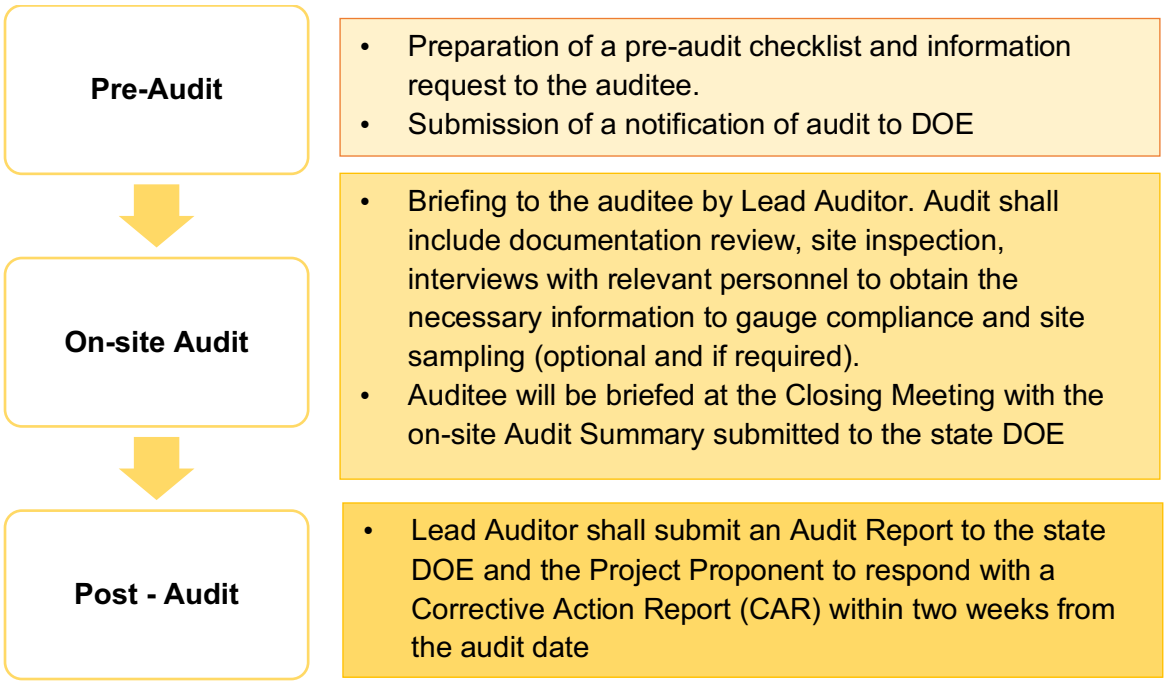


*Photo source: Madzhir Hasan Det, Kedah Tourism Facebook*

# 8

# PREPARING THE EIA REPORT, SUBMISSION & REVIEW PROCESS

# CHAPTER 8 PREPARING THE EIA REPORT AND REVIEW PROCESS

## 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 2016) provides the specifications and format for the reporting of EIA 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 on the respective company letterhead and attached to the EIA.

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

(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 (**Chapter 2**).

(e) Terms of Reference (TOR) for the Second Schedule EIA as endorsed by the DOE (**Chapter 3**). 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 are included as part of the report. The key points to include can include the examples in **Box 6**.

(g) Deliberation on the alternatives and project options (**Section 3**).

**Box 6**
**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.

(h) Detailed description of the project that includes site information, concept and breakdown of major components, material and manpower requirements, project activities, and time schedule (**Table 8-1)**

**Table 8-1 Recommended Project Description in EIA Report**

**Project Details**

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.

**Location**

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.).
iv. Relevant map showing project location and accessibility.

**Project Component and Design Details**

i. Project details (land area, buffer requirements, lots and land status).Project concept.
ii. Project components.
iii. Technology use.
iv. 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 preconstruction, 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 Abandonment Plan and Rehabilitation**

i. Wastes.
ii. Structure.
iii. Site Stability.
iv. Closing and Maintenance.

**Project Implementation Schedule**

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

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

(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 (**Chapter 4**).

(j) Assessment of significant impacts (positive and negative), prediction of the extent and effects on nearby sensitive receptors, and proposal of pollution prevention and mitigation measures (P2M2) to minimise or enhance these impacts and any potential residual impacts (**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 (**Chapter 7**).

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

(n) Executive Summary

The Executive Summary provides a concise summary of the findings and recommendations of the EIA. It shall be written in nontechnical language, both in Bahasa Malaysia and English, presenting the following information.

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

A soft copy of the Executive Summary (PDF format) is submitted to DOE along with a soft copy of the full EIA report.

(o) 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.

(p) Conclusion to the EIA Report

## 8.3 STAKEHOLDER ENGAGEMENT AND PUBLIC DISPLAY

The stakeholder engagement process is ongoing from the project planning stage (**Section 2.6**). 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 the EIA Team will 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*** | Similarly, after the EIA is submitted, there is a public review period of 30 days, by which 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 3 days). |
| ***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*** | The EIA report will be uploaded to the DOE website for the duration of the review period. |
| ***Additional Engagements*** | Although 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:<br>• Details of the programme (dates, venue, itinerary).<br>• Attendance list of participants.<br>• Copies of survey forms.<br>• Brief summary of findings from the event, e.g. reports, minutes of meeting, list of questions and responses, photograph of event.<br>• 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 7** provides some examples of good practises when engaging with the stakeholder.

**Box 7**
**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

Requirements for submission of EIA Report and the review process for the First and Second Schedule EIA is presented in **Table 8-2**.

**Table 8-2 Comparison of the Submission and Review Process for the First and Second Schedule EIA**

| Components | First-Schedule Activity | Second Schedule Activity |
|---|---|---|
| **Report Submission** | Submission to DOE State Office | Submit to DOE HQ |
| **No. of Reports** | Minimum 3 hardcopies + 1 softcopy to State DOE<br>1 hard copy + 1 soft copy to DOE HQ | Minimum 3 copies + 1 soft copy |
| **No. of corrected EIA (if needed)** | 3 hard copies + 1 soft copy | 3 hardcopies + 1 softcopies |
| **Review Timeline** | 25 working days (5 weeks) | 60 working days (12 weeks) |
| **Public Participation** | Required | Required |
| **Public Display** | Not required | Required |
| **Web Display** | Required<br>Submit a soft copy of the EIA report to the DOE State Office. | Required<br>Submit a soft copy of the EIA report to the DOE State Office. |
| **Advertisement** | Not required | Advertise in two major newspapers or main media streams. |

*Source: Adapted from EGIM, DOE, 2016, and DOE Notice JAS.600-1/1/7Jilid 2(22) dated 7 December 2020, JAS.100-1/4/1 Jilid 3(22) dated 3 August 2020, Notis Kepada Jururunding EIA 2/2020 dated 25 August 2020.*

The submission of the EIA report shall be in accordance 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 a self-check of the quality of the EIA before submission to the DOE, to avoid rejection. An EIA checklist is attached 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, the 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 8**. This marks the end of the EIA process.

**Box 8:**
**Outcomes from EIA Review Process**

The outcomes of the EIATRC meetings are:

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

ii. Rejection of the EIA Report, where the report does not meet the requirements of Section 34A (2C) of the EQA 1974.

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Photo source: www.thecounter.org/vertical-farms-scale-profit/

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# GLOSSARY

Photo source: www.thecounter.org/vertical-farms-scale-profit/

# Glossary

| | | |
|---|---|---|
| Acute/Subacute Toxicity | - | Immediate or short-term response of an organism to a single dose of a chemical substance through various routes of exposure. Refers to generalised toxic response with lethality usually being the observer endpoint. Includes $LD_{50}$, $LC_{50}$, $LD_{10}$ and other quantitative endpoints. |
| Analysis | - | An examination in order to understand. *See Assessment*. |
| Aquatic | - | Living, growing, or taking place in or on water. |
| Assessment | - | Examination in order to decide. *See Analysis.* |
| Assessor | - | Person who conducts or coordinates an environmental impact assessment. This person may be the leader of a team of experts and responsible to the Project Initiator. |
| Bacteria | - | Class of microscopic unicellular organisms that cause many diseases. |
| Baseline Data | - | Site-specific data pertaining to existing environment (physical, chemical, biological and human) in the vicinity of the project site; establishes the current ambient status of the environment. |
| Baseline Studies | - | Baseline studies are fundamental survey of the physico-chemical, biological and human environment. They may be specific to a particular project or they may be to provide a database for future Environmental Assessment or Environmental Impact Assessment at other localities. |
| Benthos | - | Flora and fauna at the bottom of a water body. |
| Bioconcentration/ Biomagnification | - | The uptake and retention of a chemical substance in an organism or in organs or tissues of an organism (bioconcentration). An increase in the tissue concentration of organisms higher in the food chain (biomagnification). |
| Carcinogen | - | A substance that increases the risk of cancer. |
| Carrying Capacity | - | Number of individuals that an environment can support. |
| Checklist | - | A list for verification purposes, a comprehensive list; an inventory. |
| Chronic Toxicity | - | Response of an organism to repeated/long-term exposure to a chemical substance. |

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| Community | - | Any group of natural-occurring organisms sharing a particular habitat. |
| Cost-Benefit | - | A term that represents the relationship between the benefits accrued for the cost incurred. |
| Data | - | A general term used to denote any or all facts in the form of numbers, letters, text, or symbols. (Raw facts or statistics, which alone have little or no meaning, but as a group allow some meaningful relationships to be drawn). |
| Decision Makers | - | Those persons or organisations whose prerogative and responsibility is to make project planning and implementation decisions are the decision makers. They are the Project Initiators, the Approving Authority for the project, and higher authorities. |
| Decontaminate | - | Removal of or cleaning up chemicals or residue to avoid or reduce danger or damage to desirable plants, insects, animals, people, or the natural environment. |
| Design Solution | - | Any design measure incorporated into a project plan that will avoid a potentially significant environmental impact. |
| Desludging | - | Removal of accumulated solid materials by pumping from a septic tank or leaching pit. |
| Drawdown | - | The magnitude of the change in water level in a well, reservoir, or natural body of water resulting from the withdrawal of water. |
| Ecology | - | The study of relationship between communities of organisms and their environment. |
| Ecosystem | - | A community and its environment (living and non-living considered collectively) (may range in extent from very small to very large units). |
| Effluent | - | Liquid industrial and agricultural waste; outflowing sewage during purification. |
| Endemic | - | Of a disease or organism; indigenous to a geographic area or population. |
| Environment | - | The surrounding zone (the specific zone to be affected by the project), all natural resources (physical and biological) and human resources (people, economic development, and quality of life values). |
| Environmental Data Collection | - | The collection of environmental information from existing sources, e.g. libraries, universities and environment-related agencies, or through base-line studies. |

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| Environmental Risk Assessment (ERA) | - | The description, analysis, and communication of information about risks to human health and welfare and to ecosystems; the risks arising from or being transmitted through the natural environment. |
| Environmental Components | - | The detailed environmental categories listed on the Preliminary Assessment Matrix. |
| Environmental Monitoring | - | Observation of the effects of development projects on environmental resources and values, including sampling, analysis, including temporary during the project construction stage and continuing periodic monitoring after commencement of project operations. Environmental monitoring allows the actual impact of the project to be measured and improves the data base for future impact prediction. |
| Environmental Impact Assessment (EIA) | - | Assessment of changes in environmental resources or values resulting from a proposed project (called an environmental impact statement (EIS) in the US and the Philippines). |
| Environmental Effect or Impact | - | An effect on an environmental resource or value resulting from natural or man-made actions, including project development (measured by physical, chemical, biological, and social parameters). |
| Environmental Resource or Value | - | An aspect of the environment that is of benefit to man, including all ecological resources and values. |
| Exposure | - | To be accessible to the influence of a chemical or chemical action. |
| Feasibility | - | A measure to prove that the technical options are sustainable and are also the best in that situation. |
| Feasibility Study | - | For the purposes of the environmental impact assessment procedure and guidelines, a feasibility study is a project planning exercise that results in a final project plant and immediately proceeds the design phase of the project. For most projects, it is followed by a period project (reappraisal during which the final implementation decision is made). |
| Flotables (or Floatables) | - | Materials which float on the water surface, including oils, greases, rubber bits, etc. |
| Frequency | - | Rate of occurrence per unit of time. |
| Geographic Information System | - | Any information system that can input, manipulate System and analyse geographically referenced data in order to support the decision-making processes of any |

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| | | organisation. (The term ”GIS” Is used not only to describe the concept underlying the system but also the facility based on it). |
| Groundwater | - | Water that occurs naturally beneath the ground surface and may include the fraction of precipitation that infiltrates the land surface. |
| Habitat | - | The normal abode or locality of an animal or plant; the physical environment of a community; the place where a person or thing can usually be found. |
| Hazard | - | Anything that jeopardises safety or health. |
| Hazardous Wastes | - | All wastes that pose significant hazards to people and ecology, including toxics, inflammables, explosives, and incendiary materials. |
| Hazardous Chemical | - | An element or compound that may cause damage to human health and welfare because of its properties, such as toxicity, flammability, explosivity, corrosivity, or extreme reactivity. |
| Health Hazard | - | Potential for causing harm to people. |
| Health Risk | - | The likelihood that a health hazard will cause harm to a human community. Measure of the probability that a hazard will cause harm. As there are great uncertainties, only a simple ranking procedure can be used. |
| Host | - | An organism on or in which a parasite lives and feeds. |
| Infiltration | - | Inflow of groundwater into the sewer through leaky joints. |
| Insecticide | - | Any substance or mixture of substances intended for preventing, killing, repelling, or controlling an insect pest. |
| Integrated Project Planning | - | Integrated project planning is a process in which, through various procedures available, all technical, economic, and environmental factors in project planning are assessed and evaluated together and through the course of project development. |
| Integrated Pest Management | - | A pest management system that, in the context of the associated environment and the population dynamics of the pest species, utilises all suitable techniques and methods in the most compatible manner possible to maintain the pest populations at levels below those causing economically unacceptable damage or loss. |
| $LD_{50}$ | - | Doses of a chemical that kills half of a population of test animals if taken by mouth or absorbed through the skin. |

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| | | Expressed in milligrammes of toxicant per kilogramme of body weight of the test animal (mg/kg). |
| Leaching | - | The removal of readily soluble components, such as chlorides, sulphates, and carbonates, from soil by percolating water. |
| Matrix | - | A matrix is a two-dimensional checklist of environmental components and project activities used to identify and communicate the potential environmental impacts of a proposed project. |
| Migration | - | Permanent movement of a population from one habitat or location to another. |
| Mitigating and Abatement Measures | - | Measures adopted into the final project plan which either moderate or completely forestall potential environmental impact. |
| Natural Hazard | - | Processes or events that damage human health and welfare, such as storms, volcanic eruptions, tsunamis, lightning, or fires. |
| Pathogen | - | An organism that causes disease. Most pathogens are microscopic in size. |
| Pest | - | Any animal, plant, or pathogen that causes damage or annoyance to humans, their animals, crops, or possessions. |
| Pesticide | - | Any substance or mixture of substances intended to prevent, destroy or control any pest, including vectors of human or animal disease, unwanted species of plants, or animals that cause harm during or otherwise interfere with the production, processing, storage, transport, or marketing of food, agricultural commodities, wood, and wood products or animal feedstuffs, or substances administered to animals for the control of insects, arachnids, or other pests in or on their bodies. The term includes substances intended for use as a plant growth regulator, defoliant, desiccant, or agent to thinning fruit or preventing premature fall of fruit, and substances applied to crops before or after harvest to protect the commodity from deterioration during storage and transport. |
| Pesticide Residue | - | Pesticide remaining on or in a plant or treated area after a time lapse after application. |
| pH | - | Value that represents the acidity of alkalinity of a solution. It is defined as the logarithm of the reciprocal of the hydrogen ion concentration. |
| Plume | - | A narrow column of smoke or noxious gases. |

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| Potable Water | - | Water that is palatable and safe for human consumption; in which any toxic substances, pathogenic organisms, and factors have been reduced to safe or acceptable levels. |
| ppm (parts per million) | - | A means to express the concentration of chemicals in a solution or in food, plants, and animals. One part per million equals 1 milligramme in 1 kilogramme. |
| Project Identification | - | The inception of project planning. It is usually documented in a very brief report, internal minute, or file note. At that stage of planning, only the broad project concept and some general ideas on the site are known. |
| Project Activity | - | An operation or procedure conducted during the planning, development, or subsequent operation of the project. The various project activities during each phase of the project adequately describe the work carried out. |
| Public Participation | - | Public participation in project planning is a means of:<br>1. identifying the material or psychological impact of a proposal.<br>2. measuring and prompting the social acceptance of a project.<br>3. monitoring community needs and ensuring that development continues to meet those needs.<br>4. monitoring the change in environmental values in the community. |
| Remote Sensing | - | Recording images of the Earth's surface from aircraft and satellites and processing and analysing these images to obtain information needed for inventories of natural resources, assessments of natural disasters, preparation of maps, etc. |
| Residual Environmental Impact | - | The potential impact remaining after mitigating measures has been adopted into a project plan. |
| Risk | - | The likelihood (probability) of an adverse effect, direct or indirect, on human health and welfare. |
| Runoff | - | Precipitation that flows over the surface of the land, as opposed to that that penetrates beneath the surface. |
| Sanitary Landfill | - | Method of disposing of municipal waste by deposited on land with periodic covering of deposited material with layers of earth to prevent nuisance odours and vector diseases hazards. |
| Scenario | - | A sequence of actions and events that involve the project technology, facilities, the environment, and affected persons. |

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| Scope | - | A field of activity |
| Scoping | - | Setting the boundaries or scope of works for EIA in terms of issues, time, cost, alternatives, and other variables. |
| Septic Tank/Leaching System | - | Septic tank plus subsurface leaching system for effluent disposal. The term “septic tank” generally means both the tank and the leaching system. |
| Sewage | - | Human excreta and waste water flushed along a sewer pipe. |
| Significant Environmental Impact | - | A significant environmental impact is one that will have an appreciable effect on the quality of life of people in the community or an appreciable effect on the ecosystem on which the community depends. |
| Species | - | A group of plants or animals, with similar characteristics and common name, that reproduce true to type. |
| Storm Sewer | - | Sewer or conduit to receive storm surface water runoff (storm water). |
| Terms of Reference | - | The terms of reference issued in a detailed assessment brief list the significant environmental impacts and the impacts of unknown significance that must be assessed during a detailed assessment. |
| Topographic Map | - | Map that represents the horizontal and vertical positions of the features represented. |
| Toxicity | - | A physiological or biological property which determines the capacity of a chemical to do harm or produce injury to a living organism by means other than mechanical means. |
| Weeds | - | Unwanted plants. |
| Wetlands | - | Areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish, or salt, including areas of marine waters, the depth of which at low tide does not exceed six metres. In addition, the Ramsar Convention (1971) provides that wetlands 'may incorporate riparian and coastal zones adjacent to wetlands and island or bodies of marine water deeper than six metres at low tide lying within the wetlands'. |

# APPENDICES

Photo source: www.thecounter.org/vertical-farms-scale-profit/

# Appendix 1 Generalised Pathway for Planning Sustainable Harvesting Projects

| STAGE | ACTION | BY WHOM |
|---|---|---|
| Project Identification | Reconnaissance Survey | Project Proponent (PP) |
| | Consultation with DOE / Forest Dept. (FD) | PP |
| Pre-Feasibility & Feasibility | Identification of site(s) areas | Project Proponent |
| | Screening for site selection | PP & EIA Consultant |
| | Scoping of EIA | PP, EIA Consultant & DOE |
| | Preparation of TOR & Approval by DOE | PP, EIA Consultant & DOE |
| | Harvesting / Operations Plan | Project Consultant appointed by PP |
| | Selection of site / area | PP |
| | EIA Study | EIA Consultant |
| | Submission of EIA to DOE for approval | PP |
| | Application to Approval Authority for project approval (State Forest Dept.) | PP |
| | DOE & State Forest Dept. sends EIA and harvesting plan submission, respectively, to various public sector agencies for comments | DOE (for EIA) |
| | Comments compiled, and recommendations made. | DOE & FD |
| | Decision on EIA | DOE |
| | PP informed of EIA approval / conditions | DOE |
| | Key EIA Issues (if necessary) | EIA Consultant |
| | Recommendation made to Approval Authority | FD |
| | Decision of project | Approval Authority |
| | PP informed of project approval | Approval Authority |
| Implementation | Detailed layout plan and trees marked for harvesting including direction of felling | PP |
| | Type of harvesting machines / vehicles | PP |
| | Harvesting camp and landings for timber | PP |
| | Construction of roads, drainage, bridge | PP |
| | Operations and Safety Measures | PP |
| | Environmentally Monitoring Auditing (EM&A) / Reporting | PP/DOE/Consultant |
| Post-Harvesting | Decommissioning and removal of all machines, vehicles, logs, waste and debris | PP |
| | Ongoing EM&A (as necessary) | PP/DOE/Consultant |

# Appendix 2 Generalised Pathway for Planning Land Conversion Projects

| STAGE | ACTION | BY WHOM |
|---|---|---|
| Project Identification | Reconnaissance Survey | Project Proponent (PP) |
| | Consultation with DOE / Forest Dept. (FD) / Land Office (LO) | PP |
| Pre-Feasibility & Feasibility | Identification of site(s) areas | Project Proponent |
| | Screening for site selection | PP & EIA Consultant |
| | Scoping of EIA | PP, EIA Consultant & DOE |
| | Land Conversion Plan(s) | Project Consultant appointed by PP |
| | Selection of site / area | PP |
| | EIA Study | EIA Consultant |
| | Submission of EIA to DOE for approval | PP |
| | Application to Approval Authority for project approval (State Forest Dept.) | PP |
| | DOE, FD / Land Office sends EIA and harvesting plan submission, respectively, to various public sector agencies for comments. | DOE (for EIA)<br>LO(for land conversion)/FD |
| | Comments compiled, and recommendations made. | DOE & LO |
| | Decision on EIA | DOE |
| | PP informed of EIA approval / conditions | DOE |
| | Key EIA Issues (if necessary) | EIA Consultant |
| | Recommendation made to Approval Authority | FD |
| | Decision of project | Approval Authority |
| | PP informed of project approval | Approval Authority |
| Detailed design / planning | Detailed layout plan / engineering design | PP |
| | Submission to LO, FD and various agencies (e.g. JKR, JPS, DOE, Fisheries, Agriculture, etc.) for approval. | PP |
| | Approval of detailed layout by referred agencies | Individual agencies referred to |
| Implementation | Land clearing, land preparation / construction | PP |
| | Operation | PP |
| | Environmentally Monitoring and Auditing (EM&A) / Reporting | PP/DOE/Consultant |
| Post-Harvesting | Decommissioning | PP |
| | Ongoing EM&A (as necessary) | PP/DOE/Consultant |
| | Post-closure Landuse Plan | PP |

# Appendix 3 Impact Assessment Matrix For Agriculture Land / Site Preparation

**KEY**

1. Environmental impact that is potentially significant but on a temporary basis, and will assume equilibrium after a certain period of time.

2. Environmental impact that is potentially significant but about which there is insufficient data to make a reliable prediction. Close monitoring and control is recommended.

3. Potentially significant adverse environmental impacts for which a design solution has been identified.

4. Residual and significant adverse environmental impact.

5. Significant environmental enhancement.

| | | | SITE PREPARATION | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Access roads & tracks | Stream crossing | Base camp | Site clearing | Biomass disposal | Earthworkds | Terracing & benching | Drainage & culvert installation | Irrigation works & wells | Erosion control | Cover crops | Preparation of panting holes/ploughing/rotovating/bedding | construction of rain shelter | Agrochemical application | Mulching | Transportation & machinery | Storage of materials | Surfacing and paving | Barriers & fences | Housing & installation | Labour force | Utilities | Waste disposal & recovery | Nursery | Abandonment |
| Physicochemical System | Soil | Soil Erosion | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Slope Stability | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Soil Runoff | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Surface water | Water quality | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Water resources | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Geology | Geological Hazards | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Topography | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Geomorphology | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ground water | Water resources | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Water quality | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Noise | Noise | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Vibration | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Air | Air quality | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Odour | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Biological System | Terrestrial | Terrestrial flora | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Terrestrial fauna | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Pest | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Wildlife encronchment | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Weed control | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Invasive species | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Aquatic | Aquatic flora | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Aquatic fauna | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Fishery | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Socio economic System | | Local communities | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Social | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Current landuse | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Resource conservation | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | High value crop | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Crop yield | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Economic return | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Local infrastructure & services | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Health & safety | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Waste disposal management | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Basic amenities | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Productivity | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Employment | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Labour force | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Aesthetics | | | | | | | | | | | | | | | | | | | | | | | | | | | |

# Appendix 4 Impact Assessment Matrix For Crop Planting, Replanting & Maintenance

**KEY**

**1. Environmental impact that is potentially significant but on a temporary basis, and will assume equilibrium after a certain period of time.**

**2. Environmental impact that is potentially significant but about which there is insufficient data to make a reliable prediction. Close monitoring and control is recommended.**

**3. Potentially significant adverse environmental impacts for which a design solution has been identified.**

**4. Residual and significant adverse environmental impact.**

**5. Significant environmental enhancement.**

| | | | CROP INTRODUCTION/PLANTING | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Irrigation | Drainage | Selection of farming technique | Selection of planting material | Fertiliser application | Labour force | Planting/transplanting | Harvesting | Ground water extraction | Pest disease & weed control | Waste disposal & recovery | Produce handling and storage | Transportation and traffic | Abandonment |
| Physicochemical System | Soil | Soil Erosion | | | | | | | | | | | | | | |
| | | Slope Stability | | | | | | | | | | | | | | |
| | | Soil Runoff | | | | | | | | | | | | | | |
| | Surface water | Water quality | | | | | | | | | | | | | | |
| | | Water resources | | | | | | | | | | | | | | |
| | Geology | Geological Hazards | | | | | | | | | | | | | | |
| | | Topography | | | | | | | | | | | | | | |
| | | Geomorphology | | | | | | | | | | | | | | |
| | Ground water | Water resources | | | | | | | | | | | | | | |
| | | Water quality | | | | | | | | | | | | | | |
| | Noise | Noise | | | | | | | | | | | | | | |
| | | Vibration | | | | | | | | | | | | | | |
| | Air | Air quality | | | | | | | | | | | | | | |
| | | Odour | | | | | | | | | | | | | | |
| Biological System | Terrestrial | Terrestrial flora | | | | | | | | | | | | | | |
| | | Terrestrial fauna | | | | | | | | | | | | | | |
| | | Pest | | | | | | | | | | | | | | |
| | | Wildlife encronchment | | | | | | | | | | | | | | |
| | | Weed control | | | | | | | | | | | | | | |
| | | Invasive species | | | | | | | | | | | | | | |
| | Aquatic | Aquatic flora | | | | | | | | | | | | | | |
| | | Aquatic fauna | | | | | | | | | | | | | | |
| | | Fishery | | | | | | | | | | | | | | |
| Socio economic System | | Local communities | | | | | | | | | | | | | | |
| | | Social | | | | | | | | | | | | | | |
| | | Current landuse | | | | | | | | | | | | | | |
| | | Resource conservation | | | | | | | | | | | | | | |
| | | High value crop | | | | | | | | | | | | | | |
| | | Crop yield | | | | | | | | | | | | | | |
| | | Economic return | | | | | | | | | | | | | | |
| | | Local infrastructure & services | | | | | | | | | | | | | | |
| | | Health & safety | | | | | | | | | | | | | | |
| | | Waste disposal management | | | | | | | | | | | | | | |
| | | Basic amenities | | | | | | | | | | | | | | |
| | | Productivity | | | | | | | | | | | | | | |
| | | Employment | | | | | | | | | | | | | | |
| | | Labour force | | | | | | | | | | | | | | |
| | | Aesthetics | | | | | | | | | | | | | | |

# Appendix 4 Impact Assessment Matrix For Crop Planting, Replanting & Maintenance (cont.)

**KEY**

1. Environmental impact that is potentially significant but on a temporary basis, and will assume equilibrium after a certain period of time.
2. Environmental impact that is potentially significant but about which there is insufficient data to make a reliable prediction. Close monitoring and control is recommended.
3. Potentially significant adverse environmental impacts for which a design solution has been identified.
4. Residual and significant adverse environmental impact.
5. Significant environmental enhancement.

| | | | CROP MAINTENANCE | | | | | | HARVESTING & REPLANTING | | | | | CROP PROCESSING | | | ABANDONMENT | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Weeding | Pest and disease control | Desilting and clearing of drains | Fertilisation | Structure maintenance | Pruning | Collection of produce | Transportation | Clearing/felling | Biomass management | Ploughing/rotavating/bedding | Packaging/processing | Storage/stockpiling | Transportation | Exposed land | Landscaping | Retrenchment | Removal of structures & machinery |
| Physicochemical System | Soil | Soil Erosion | | | | | | | | | | | | | | | | | | |
| | | Slope Stability | | | | | | | | | | | | | | | | | | |
| | | Soil Runoff | | | | | | | | | | | | | | | | | | |
| | Surface water | Water quality | | | | | | | | | | | | | | | | | | |
| | | Water resources | | | | | | | | | | | | | | | | | | |
| | Geology | Geological Hazards | | | | | | | | | | | | | | | | | | |
| | | Topography | | | | | | | | | | | | | | | | | | |
| | | Geomorphology | | | | | | | | | | | | | | | | | | |
| | Ground water | Water resources | | | | | | | | | | | | | | | | | | |
| | | Water quality | | | | | | | | | | | | | | | | | | |
| | Noise | Noise | | | | | | | | | | | | | | | | | | |
| | | Vibration | | | | | | | | | | | | | | | | | | |
| | Air | Air quality | | | | | | | | | | | | | | | | | | |
| | | Odour | | | | | | | | | | | | | | | | | | |
| Biological System | Terrestrial | Terrestrial flora | | | | | | | | | | | | | | | | | | |
| | | Terrestrial fauna | | | | | | | | | | | | | | | | | | |
| | | Pest | | | | | | | | | | | | | | | | | | |
| | | Wildlife encronchment | | | | | | | | | | | | | | | | | | |
| | | Weed control | | | | | | | | | | | | | | | | | | |
| | | Invasive species | | | | | | | | | | | | | | | | | | |
| | Aquatic | Aquatic flora | | | | | | | | | | | | | | | | | | |
| | | Aquatic fauna | | | | | | | | | | | | | | | | | | |
| | | Fishery | | | | | | | | | | | | | | | | | | |
| Socio economic System | | Local communities | | | | | | | | | | | | | | | | | | |
| | | Social | | | | | | | | | | | | | | | | | | |
| | | Current landuse | | | | | | | | | | | | | | | | | | |
| | | Resource conservation | | | | | | | | | | | | | | | | | | |
| | | High value crop | | | | | | | | | | | | | | | | | | |
| | | Crop yield | | | | | | | | | | | | | | | | | | |
| | | Economic return | | | | | | | | | | | | | | | | | | |
| | | Local infrastructure & services | | | | | | | | | | | | | | | | | | |
| | | Health & safety | | | | | | | | | | | | | | | | | | |
| | | Waste disposal management | | | | | | | | | | | | | | | | | | |
| | | Basic amenities | | | | | | | | | | | | | | | | | | |
| | | Productivity | | | | | | | | | | | | | | | | | | |
| | | Employment | | | | | | | | | | | | | | | | | | |
| | | Labour force | | | | | | | | | | | | | | | | | | |
| | | Aesthetics | | | | | | | | | | | | | | | | | | |

# Appendix 5 Impact Assessment Matrix For Animal Husbandry

KEY
1. Environmental impact that is potentially significant but on a temporary basis, and will assume equilibrium after a certain period of time.

2. Environmental impact that is potentially significant but about which there is insufficient data to make a reliable prediction. Close monitoring and control is recommended.

3. Potentially significant adverse environmental impacts for which a design solution has been identified.

4. Residual and significant adverse environmental impact.

5. Significant environmental enhancement

| | | Site investigation (Scoping) | | | | | | | | | Pigsty/hatchery site construction | | | | | | | | | | | | Animal/stock Maintenance | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Access Road | Site Survey | Geological Survey | Soil Survey | Hydrological Survey | Ecological Survey | Socio Economics Survey | Archeological Survey | Hydrogeological Survey | Access Road | Stream Crossing | Base Camp | Soil Survey | Site Clearing | Earth Works | Drainage | Chemicals | Waste Disposal | Storage | Barriers & Fences | Abandonment | Drainage | Pests | Diseases | Distribution | Storage |
| Physical | Climate | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Geology | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Soil | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Surface Water | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ground Water | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Land Use | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Topography | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Erosion | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Slope | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Mineral | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Air Quality | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Air Quality (Fumigation) | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Pharmaceutical & Feeding | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Biological | Terrestrial flora | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Terrestrial fauna | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Habitat | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Pest | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Wildlife encronchment | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Socio | Geological Heritage | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Cultural Heritage | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Local Communities | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Labour | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Economy | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Health & Safety | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Amenities | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Telecommunication | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Electricity | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Waste | | | | | | | | | | | | | | | | | | | | | | | | | | |

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e ISBN 978-967-2845-29-4