EIA GUIDELINES

DRAINAGE AND/OR IRRIGATION PROJECTS

Department of Environment
Ministry of Environment and Water, Malaysia

EIA GUIDELINES FOR DRAINAGE AND/OR IRRIGATION PROJECTS

2021

Department of Environment, Malaysia

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The Department of Environment (DOE) would like to express our gratitude to all Government Agencies (GAs), both at the Federal and State level, the Local Authorities, Consultants, stakeholders and Non-Governmental Organisations (NGOs) in providing their inputs and incomparable assistance in developing the content of the Guidelines.

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 reports preparation in the country.

Last but not least, 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

This document (referred as **the Guidelines**) represents the revised version of the *Environmental Impact Assessment Guidelines for Drainage and/or Irrigation Projects* developed by the Department of Environment (DOE) in 1995.

This Guideline is meant to assist various stakeholders that are involved with the development of a drainage and/or irrigation projects. This includes the Project Proponent, project team, environmental consultant, government agencies, and also non-profit organisations (NGOs).

This document provides in depth guidance on the requirements to conduct an Environmental Impact Assessment (EIA) study including step-by-step approaches to ensure it is carried out accordingly. Apart from that, this Guideline highlights the EIA pre-requisites to be considered by the Project Proponent and states the roles and responsibilities of each stakeholders involved. This takes into account the task of each government agencies within the EIA domain.

As the project spans over various aspects and legal jurisdictions, it is recommended that this document is read together with other relevant guidance documents to ensure all environmental issues and requirements are addressed appropriately.

NORLIN BINTI JAAFAR
Director General,
Department of
Environment

SUMMARY

Chapter 1 | Introduction

SCOPE OF THE EIA GUIDELINES

This Guideline:

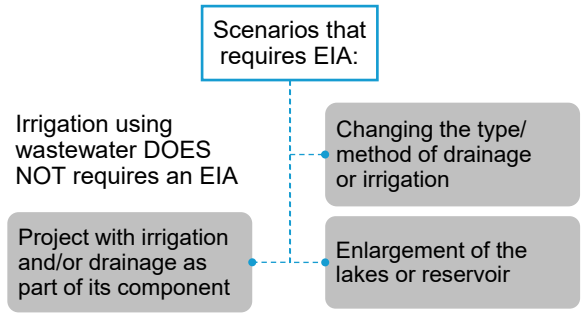
FIRST SCHEDULE No. 3 Drainage and Irrigation	SECOND SCHEDULE No. 3 Drainage and Irrigation
a) Construction of man-made lakes and enlargement of artificial lakes with surface areas of 100 hectares or more. b) Irrigation schemes covering an area of 500 hectares or more.	a) Construction of man-made lakes and artificial enlargement of lakes with surface areas of 50 hectares or more in or adjacent or near to environmentally sensitive area. b) A drainage of wetland, wild-life habitat or of dry inland forest covering an area of 20 hectares or more.

Other possible prescribed activities:

FIRST SCHEDULE	SECOND SCHEDULE
1. Agriculture 4. Fisheries 5. Forestry: 21. Water Supply	1. Agriculture 4. Fisheries 15. Construction of Dam: 21. Water Supply

Subject to nature of project, may involve other prescribed activities. Other relevant guidelines must be referred.

EIA REPORT REQUIREMENT



TERMS AND DEFINITION

Drainage works
Construction and maintenance of drains and water courses, embankments, culverts, sluices, water gates, access paths in drainage reserves and other similar works.

Irrigation
The practice of causing water to flow upon, or spread over, or under, the surface land or of retaining water on or under the surface of land for agricultural purpose and includes drainage for the removal of water which is injurious to agriculture.

Irrigation Scheme
Any land in a State within the area affected by any irrigation works wholly or in part carried out or sanctioned by the Government of that State that has been declared as irrigation area, with specific boundary that may include any headworks and main canals.

Environmentally Sensitive Area (ESA)
A particular area that is sensitive to any forms of alteration to its ecosystem due to natural processes or activities within or around it, either directly or indirectly.

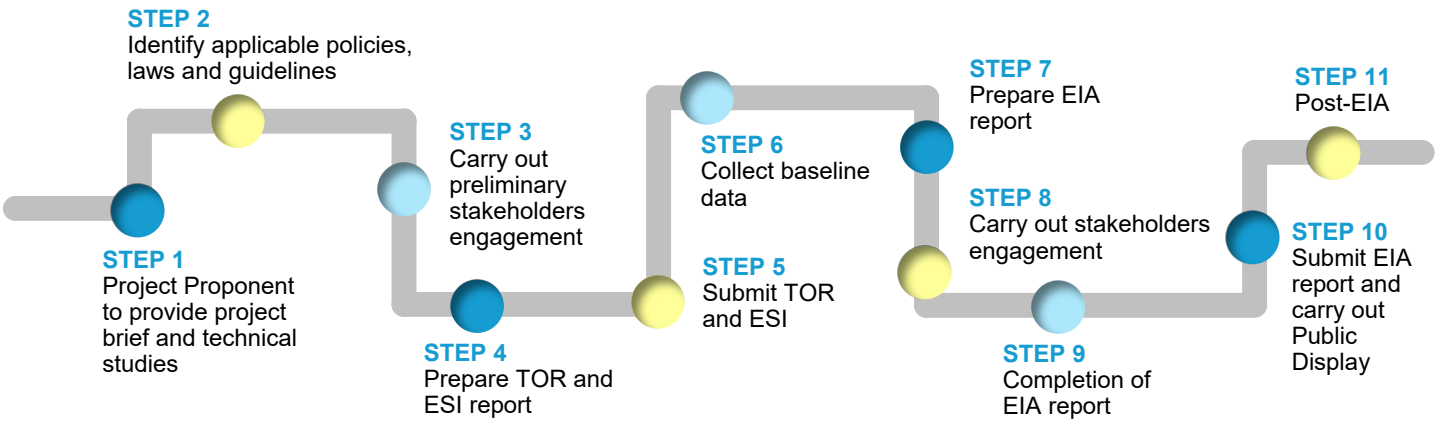
Lake
A terrestrial area that is submersed with water with an area of 1 ha or above with varying depths and generally contains nutrients that are able to support aquatic life for socio-economic as well as recreational benefits.

Wetlands
Areas of marsh, fen, peatland or water whether natural or artificial, permanent or temporary with water that is static or flowing, fresh, brackish or salty, including areas of marine waters, the depth of which at low tide does not exceed six metres.

Wildlife habitat
Areas distributed horizontally and vertically across the landscape that fulfill the needs of a specific wildlife species for the basic requirements of food, water, reproduction (nesting), and protection against predators and competitors (cover).

Dry inland forest
Dipterocarp Forest i.e. forest that is mostly dominated by trees from the Dipterocarpaceae family. This forest occurs on dry land just above sea level to an altitude of about 1,200 metres.

OVERVIEW OF THE EIA PROCESS



SUMMARY

Chapter 2 | Environmental Project Planning

RELEVANT LEGISLATIONS

- Environmental Quality Act 1974
- Drainage Works Act 1954
- Irrigation Areas Act 1953
- Geological Survey Act 1974
- National Parks Act 1980
- National Land Code 1965
- Water Services Industry Act 2006
- Waters Act 1920
- Town and Country Planning Act 1976
- Food Act 1983

RELEVANT POLICIES AND GUIDELINES

- Sustainable Development Goals (SDG) (UNDP, 2015)
- Five Year Malaysia Plan
- National Physical Plan (PLANMalaysia, 2015)
- National Policy on Biological Diversity 2016 – 2025 (NRE, 2016)
- National Policy on the Environment (Ministry of Science, Technology and the Environment, 2002)
- National Policy on Climate Change (NRE, 2010)
- Central Forest Spine (CFS) Ecological Network Master Plan (PLANMalaysia, 2010)
- National Water Resources Policy (NRE, 2012)
- Malaysia National Forestry Policy 1978 (Revised 1993) (Forestry, 1993)
- National Agro-food Policy (DAN) (MOA, 2011)
- Green Technology Master Plan Malaysia 2017 – 2030 (MESTECC, 2017)
- Garis Panduan Perancangan Pemuliharaan dan Pembangunan (GPPPP) Kawasan Sensitif Alam Sekitar (KSAS) (PLANMalaysia, 2017)
- Garis Panduan Perancangan Pembangunan (GPPP) di Kawasan Bukit dan Tanah Tinggi (PLANMalaysia, 2009)
- Guidance Document Addressing Soil Erosion and Sediment Control (ESC): Aspects in the EIA Report as per Appendix 3 of the EGIM (DOE, 2016)
- Guidelines for Erosion and Sediment Control in Malaysia (DID, 2010)
- Guidance Document for the Preparation and Submission of EMP as per Chapter 6 of the EGIM (DOE, 2016)
- Guidelines for Slope Design (PWD, 2010)
- Guidance Document for the Preparation of the Document on Land-Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2) as per Appendix 4 of the EGIM (DOE, 2016)
- Integrated Approaches under the National Water Resources Policy

RELEVANT REQUIREMENTS AT VARIOUS PROJECT IMPLEMENTATION STAGE

01. PRE-FEASIBILITY STUDY
- Site suitability assessment (SSA)
- Application to Water Regulatory Body

02. FEASIBILITY STUDY
- TELOS assessment
- Field activities
- Land acquisition

03. PLANNING AND DESIGN
- Planning and design approval
- Environmental Impact Assessment (EIA)
- Social Impact Assessment (SIA)*
- Traffic Impact Assessment (TIA)*
- Health Impact Assessment (HIA)*
- Heritage Impact Assessment*
- Wildlife Management Plan (WMP)*
- Erosion and Sediment Control Plan (ESCP)
- Geotechnical assessment report
- Geological study
- Hydrology study
- Hydrogeological study
- Geomorphology study
- Topographic survey

Note: *if required

04. PRE-CONSTRUCTION
- Written permission
- Environmental Management Plan (EMP)
- Social Impact Management Plan (SIMP)
- Emergency Response Plan (ERP)
- Environmental reporting
- Written notification

05. CONSTRUCTION
- Environmental monitoring
- Environmental reporting
- Environmental audit
- Competent person

06. OPERATION AND MAINTENANCE
- Environmental monitoring
- Environmental audit
- Competent person
- Emergency Response Plan (ERP)

07. PRE-REHABILITATION OR PRE-ABANDONMENT
- Abandonment Plan
- Rehabilitation Plan

08. REHABILITATION OR ABANDONMENT
- Environmental monitoring

STAKEHOLDERS ENGAGEMENT

Relevant Stakeholders
- DOE
- Project Proponent
- Government Agencies
- Approving Authorities
- Affected Groups
- Interested Groups

Engagement Methods
- Direct Interview
- Focus Group Discussion (FGD)
- Public Dialogue
- Workshop
- Exhibitions and Road Show
- Round Table Discussion

Documentation and Reporting
- Basic information of engagement
- Respondents' particulars
- Sample questionnaire
- Findings
- Voice or video recordings

SUMMARY

Chapter 3 | **Terms of Reference**

Environmental Scoping

- Information gathering and analysis
- Identification of significant environmental issues
- Prioritise significant issues for further studies in EIA
- Determine approach, methodology and tools for assessment
- Identify potential pollution prevention and mitigation measures (P2M2)
- Submission of TOR and ESI for DOE assessment and endorsement (*Second Schedule EIA only*)

Site Suitability Assessment (SSA)

Consideration of project alternatives and options:

- Project siting
- Project component and design options
- P2M2 technology options
- Social aspect
- Accessibility

Study Boundary

- **Zone of Study (ZOS)**: 5 km radial zone from project boundary
- **Zone of Impact (ZOI)**: Not limited to a specific distance and will be determined by the findings of the Consultant and as advised by relevant technical agencies

Baseline Data Review

Must be adequate to assess potential impacts on the ESAs which includes:

- Physical: Topography, land use, geology and hydrogeology, soil characteristics, climate, hydrology, water quality, air quality, noise and vibration level
- Biological: Ecosystem, terrestrial flora and fauna, aquatic flora and fauna
- Social: Demographic data, stakeholders, public health status, heritage, culture and archaeology, ecotourism
- Land traffic
- Environmentally sensitive areas (ESA)
- Existing site constraints

Determination of Key Project Activities

Based on stages of the project:

- **Pre-construction**: Survey, investigation and land acquisition
- **Construction**: Temporary occupation, site prepapration, earthwork, reservoir construction, canal construction, reservoir filling, permanent access road formation
- **Operation**: Reservoir presence, operation and maintenance

Identification of Significant Impacts and Priority Setting

- Various techniques to analyse and prioritise issues and impacts: network method, comparison with other similar projects, questionnaire and matrix
- Criteria for determining significance of impacts: magnitude, permanence, reversibility and cumulative effects

Selection of Mitigation Measures

- To be assessed and identified based on best available techniques (BATs), best management practices (BMPs) and options available
- To be qualitative and descriptive only and to be detailed out in the EIA stage

Key Issues Related to Drainage and/or Irrigation Projects

- Lowered water level
- Land inundation
- Location of reservoir
- Regulated flow
- In-stream barrier
- Watershed protection
- Water-related disease
- Sustainable groundwater yield

Establishment of Study Requirement

- Scope of EIA study is dependent of the scale and magnitude of the project
- Qualified Person to provide methodologies, assessment/ modeling tools, baseline data, potential impact and proposed mitigation measures

Preparation of TOR and ESI Report

Preparation of the document to follow as per EGIM and to be submitted to DOE State for endorsement

**Note: Second Schedule EIA only*

EIA Study Team Members

- Study team can be formed once issues and possible impacts are identified
- Qualified Person must be registered with DOE
- All team members are to perform the tasks required for the EIA study (studies, modeling, public engagements)
- Assess the impacts, proposed P2M2, EMP and monitoring framework

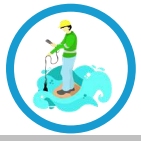
SUMMARY

Chapter 4 | Environmental Baseline Data

BASELINE DATA COLLECTION

PURPOSE

- identify existing environmental conditions which may influence project design decisions (project layout, project components)
- identify sensitive issues or areas requiring mitigation or compensation
- provide input data to numerical models for prediction of impacts
- provide baseline reference for compensation during project implementation stage



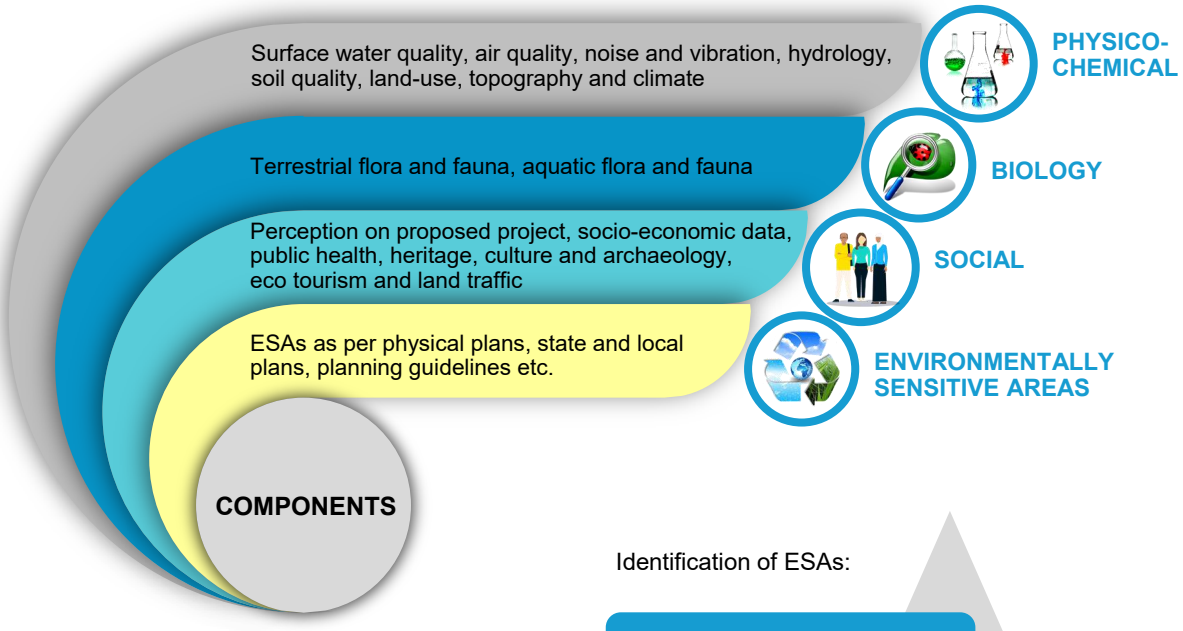
PRIMARY DATA

First-hand data collected e.g. field survey and sampling exercise

SECONDARY DATA

Information from various sources e.g. published reports and research papers

COMPONENTS OF ENVIRONMENTAL BASELINE DATA



Identification of ESAs:

01. ESA rank

02. Category

03. Location

04. The nearest distance from project boundary

05. Source

*Note: All samples must be analysed by a laboratory accredited by the Skim Akreditasi Makmal Malaysia (SAMM). All test certificates and data shall be included in the appendix of the EIA as supporting evidence.

SUMMARY

Chapter 5 | **Evaluation of Impacts**

ECOLOGY

Assessment Requirements
- Mapping of ESAs
- Inventory of flora and fauna
- Identification of critical species

Prediction Method
- Comparative assessment
- Ecological models
- Limit of Acceptable change

Evaluation of Impacts
- Level of encroachment into ESA
- Indication of possible loss of habitat
- Project activities that disturb animal behaviour

Output
- Highlight important area to be protected
- Identification of critical areas for mitigation measures
- Develop wildlife management plan

HYDROLOGY

Assessment Requirements
- Land clearing scale, alterations to hydrological and drainage of the site
- Scale of drainage system that may be altered
- Hydrological condition before and after project implementation
- Impacts downstream

Prediction Method
- Hydrological procedures (DID)
- Computer models
- Hydrological analysis

Evaluation of Impacts
- Delineate river basins affected
- Hydrological data and long-term rainfall trends
- Hydrological conditions; pre and post project implementation

Output
- Hydrological and drainage systems of the project and its impact on the surrounding

EROSION & SEDIMENTATION

Assessment Requirements
- Land clearing scale
- Conditions of the hydrological and drainage system
- Extent of erosion and sedimentation
- Suitable best management practices (BMP)

Prediction Method
- Revised Universal Soil Loss Equation (RUSLE)
- Modified Universal Soil Loss Equation (MUSLE)
- Computer models

Evaluation of Impacts
- Rate of erosion and sediment yield
- Erosion scenarios i.e. with and without mitigation measures
- Simulation to determine the BMPs that shall be adopted

Output
- Adoption of avoidance principles
- Identify suitable BMP to incorporated for mitigation measures

WATER QUALITY

Assessment Requirements
- Types and scale of impairment to water quality
- Potential sources of pollutants e.g. land clearing, biomass degradation

Prediction Method
- Mathematical models
- Simple mass balance models

Evaluation of Impacts
- Pollutant loading, magnitude and extent of impacts
- Potential water polluting sources
- Users and sensitive habitat located downstream
- Areas that need mitigation/ engineering solutions

Output
- Suitable BMP and treatment system

AIR QUALITY

Assessment Requirements
- Potential air pollution generating sources

Prediction Method
- Gaussian plume dispersion model

Evaluation of Impacts
- Level of pollutants pre and post development for major sensitive receptors

Output
- Extent of potential impacts to nearby sensitive receptors
- Critical levels for pollutant at sensitive receptors

NOISE

Assessment Requirements
- Ambient noise
- Activities that pose impairment hazards to workers and nearby sensitive receptors

Prediction Method
- Mathematical models
- Noise modeling software
- Traffic noise models

Evaluation of Impacts
- Increase in noise level,
- Noise contours

Output
- Extent of potential impacts to nearby sensitive receptors
- Critical levels for pollutant at sensitive receptors

GEOTECHNICAL HAZARDS/SLOPE STABILITY

Assessment Requirements
- Areas of the project site and its surroundings for risk
- Adequacy of buffer
- Identification of suitable engineering and geotechnical measures

Prediction Method
- Soil Investigation (SI)
- Geological Terrain Mapping (GTM)
- Site assessment
- Risk analysis
- Engineering design and estimation of Factor of Safety (FOS)

Evaluation of Impacts
- Risk map and FOS for all engineered slopes and hazard areas
- Extent of damages/losses and sensitive receptors affected
- Areas that need mitigation/ engineering solutions

Output
- Hazard map
- Avoidance of high risk
- Monitoring programme

SUMMARY

Chapter 5 | **Evaluation of Impacts** (cont'd)..

LAND USE & AESTHETICS

Assessment Requirements
- Compatibility towards surrounding land use

Prediction Method
- Structure plan, local plan and other guidelines
- Adherence to required setback
- Visual assessment
- 2-D and 3-D Viewshed Analysis

Evaluation of Impacts
- Designated land use as per the spatial plan
- Suitability of the project on surrounding development

Output
- Suitability of the project on the designated site
- Possible land use conflict that may arise

VIBRATION

Assessment Requirements
- Ambient vibration
- Activities that pose impairment hazards to workers and nearby sensitive receptors

Prediction Method
- Continuous vibration
- Ground vibration
- Human annoyance and discomfort

Evaluation of Impacts
- Comparison with Planning Guidelines for Vibration Limits and Control in the Environment 2007

Output
- Extent of potential impacts to nearby sensitive receptors
- Critical levels for pollutant at sensitive receptors

WASTE MANAGEMENT

Assessment Requirements
- Types of waste generated during construction and operations
- impacts from wastes and required management measures

Prediction Method
- Estimation on waste generated

Evaluation of Impacts
- Quantum of all waste sources
- Severity of impacts from improper management
- Locations of temporary storage within the site
- Locations for disposal site

Output
- Proper temporary disposal sites and storage facilities
- Mitigation measures against spillage and other impacts

CLIMATE

Assessment Requirements
- Loss of carbon sink due to forest clearance
- Changes of micro climate due to the presence of impounded water body

Prediction Method
- The Greenhouse Gas Protocol (GHG Protocol) of the World Resources Institute (WRI)
- The technical reports and methodology guidelines of the Intergovernmental Panel on Climate Change (IPCC)

Evaluation of Impacts
- Determine loss of carbon sink due to vegetation clearance.
- Determine potential carbon sink of aquatic vegetation (microphyte) in the water body

Output
- Estimation of pre-construction and post-construction carbon sink

SOCIO-ECONOMY

Assessment Requirements
- Land and property acquisition and relocation of communities
- Extent of impacts both negative and positive
- Views and perception of the affected stakeholders

Prediction Method
- Social and economic surveys
- Perception survey
- Social Impact Assessment (SIA)

Evaluation of Impacts
- Extent of land acquisition and affected stakeholders
- Survey catchment
- Communities within the ZOS

Output
- Land and property acquisition and relocation of communities must first be settled prior to EIA commissioning and submission

SAFETY & HEALTH

Assessment Requirements
- Safety and health towards workers and surrounding community

Prediction Method
- Qualitative/quantitative health risk assessment (HRA)

Evaluation of Impacts
- Level of risk to neighbouring receptors
- Existing health conditions of receptors
- Possible impacts on workers safety and health during construction stage

Output
- Appropriate BMPs

TRAFFIC

Assessment Requirements
- Traffic arrangement during construction
- Safety and health towards workers and surrounding community

Prediction Method
- Traffic impact assessment
- Simulation using SIDRA

Evaluation of Impacts
- Communities living along the logistic road during construction
- Level of risk to neighbouring receptors

Output
- Identification of potential issues during construction and incorporation of structural and non-structural measures
- Identification of risk factors

SUMMARY

Chapter 6 | Mitigation Measures

PURPOSE

- Avoidance of negative impacts through selection of alternatives to implement the preventive measures
- Adopt relevant mitigation measures to minimise the impacts
- Enhance and amplify the beneficial impacts
- Ensure that residual impacts are kept within acceptable levels

GENERAL APPROACHES

- Need and extend of P2M2s correspond to significance of impact
- Priority on control at source and rectifying the impacts
- Project-specific
- Practical, easy to implement and effective
- Use of new technology is encouraged
- Explanation on the design and function of P2M2s shall be supported by diagrams, illustrations, photos and maps
- P2M2s shall require regular inspection, maintenance and rehabilitation
- Enhance and amplify the beneficial impacts
- Effectiveness of the P2M2s shall be documented via monitoring programme

- The Qualified Person shall identify and propose Best Management Practices (BMPs) based on the findings of the EIA.
- The submission of the EIA and the pledge by the Project Proponent shall reflect the agreement and commitment towards ensuring implementation of the P2M2s and BMPs on-site during all stages of work.

POLLUTION PREVENTION & MITIGATION MEASURES (P2M2)

Key P2M2s based on environmental components/aspects:

- Air pollution control
- Land disturbance
- Slope stabilization
- Waste management
- Water pollution control
- Noise and vibration
- Ecological management
- Erosion and sediment management
- Land traffic

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

- BMPs comprising activities, facilities, measures, planning or procedures used to minimize accelerated erosion and sedimentation
- Site specific
- Must have Work Breakdown Structure (WBS) of project activities
- Main components of LD-P2M2: Project activity and Implementation, Information and Analysis on Project Site and Development, Map of Site Plan with Existing Condition

PROJECT ACTIVITY AND IMPLEMENTATION

- Phasing plan
- Project implementation schedule
- Description of construction activities
- Construction timeline, including BMP installation
- Construction method statement

INFORMATION AND ANALYSIS ON PROJECT SITE AND DEVELOPMENT

- Selected weather and rainfall data
- Site runoff velocity and flow rates (pre and post development)
- Description of soil and geological characteristics
- Description of adjacent areas that may be affected by land disturbance
- List of drainage, streams and river onsite, including receiving water bodies
- List of BMP proposed
- Access roads and project components located outside of project boundary
- Earthworks cut and fill volume
- Availability of materials
- Biomass management
- Construction and domestic waste management
- Spill prevention and control plan
- Soil loss prediction (pre, during and post development as well as with and without BMP scenarios)
- Projected runoff flows
- Calculation for BMP (sediment traps/basins, check dams, etc.)

MAP OF SITE PLAN WITH EXISTING CONDITION

- Topographic survey map
- Geological terrain map
- Erosion risk map
- Land use map
- Site development plan

SUMMARY

Chapter 7 | **Post-EIA**

ENVIRONMENTAL MAINSTREAMING AGENDA AND SELF-REGULATION CULTURE

- Full responsibility and accountability of the Project Proponent
- Regulatory compliance to the COA and other environmental requirements
- Embracing the environmental mainstreaming and self-regulation aspirations
- Portray positive image of good governance and corporate social responsibility to the public

ROLES AND RESPONSIBILITIES DURING POST-EIA STAGE

Implementation of EIA Conditions of Approval (COA) and P2M2 requires the involvement of several parties:

- DOE
- Project Proponent
- Environmental Officer
- Environmental Consultant
- Environmental Auditor

ENVIRONMENTAL MONITORING

- Conducted after the EMP document has been approved and the physical work of the project is about to commence.
- Can be grouped into three different aspects; Impact Monitoring (IM), Performance Monitoring (PM) and Compliance Monitoring (CM).
- Monitoring programme: Physical Environment, Biological Environment

ENVIRONMENTAL SUSTAINABILITY REPORT

- An organizational report that gives information about environmental performance, compliance and monitoring.
- Can be made up of several reports e.g. environmental reports (Compliance Report and Monitoring Report)

ENVIRONMENTAL DATABASE

- Recommended to be established to assist the Project Proponent in managing issues in an effective way.
- Benefits: Environmental Scanning, A Fact Library, Financial Viability

ENVIRONMENTAL MAINSTREAMING TOOLS

- Environmental policy (EP)
- Environmental budgeting (EB)
- Environmental monitoring committee (EMC)
- Environmental facility (EF)
- Environmental competency (EC)
- Environmental reporting and communication (ERC)
- Environmental transparency (ET)

ENVIRONMENTAL MANAGEMENT PLAN

- A living document that states explicitly on:
  - Actions to be taken
  - Measures to be instituted
  - Structures to be built
- Needs to be revised and updated
- Includes LD-P2M2 document

ENVIRONMENTAL AUDIT

Typical audit process:

- **Pre-audit**
  - Preparation of a pre-audit checklist and information request to the auditee.
  - Notification of the audit to DOE
- **On-site audit**
  - Briefing of the audit by Lead Auditor.
  - Include documentation review, site inspection and interviews with relevant personnel
  - Auditee will be briefed at the Closing Meeting with the on-site Audit Summary (to be submitted to DOE)
- **Post-audit**
  - Lead Auditor to submit Audit Report to the state DOE
  - Project Proponent to respond with a Corrective Action Report (CAR) within two weeks from the audit date

SUMMARY

Chapter 8 | TOR & EIA Checklist

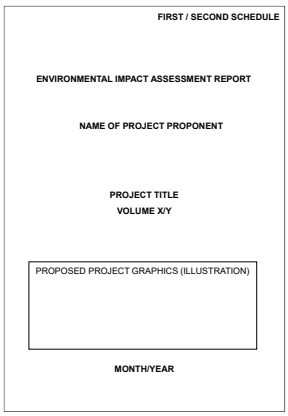
- Checklists to assist the Qualified Person in preparing:

TOR/ESI | EIA

- Both checklists must be filled in and incorporated at the front of the respective reports.
- Can also be used by the EIATRC as a reference.

Chapter 9 | EIA Report Format

- Specific format for the EIA report, as detailed in Appendix 9 of EGiM.
- Consist of cover page, preliminary pages, chapters arrangement and appendices.


FIRST / SECOND SCHEDULE

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

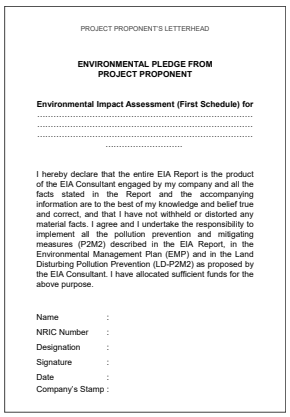
NAME OF PROJECT PROPONENT

PROJECT TITLE
VOLUME X/Y

PROPOSED PROJECT GRAPHICS (ILLUSTRATION)

MONTH/YEAR

EIA report cover


PROJECT PROPONENT'S LETTERHEAD

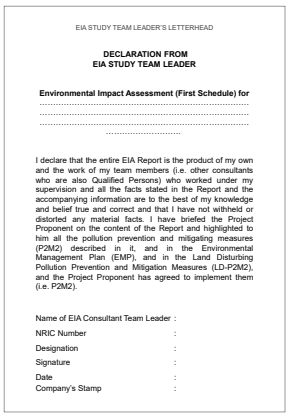
ENVIRONMENTAL PLEDGE FROM PROJECT PROPONENT

Environmental Impact Assessment (First Schedule) for

I hereby declare that the entire EIA Report is the product of the EIA Consultant engaged by my company and all the facts stated in the Report and the accompanying information are to the best of my knowledge and belief true and correct, and that I have not withheld or distorted any material facts. I agree and I undertake the responsibility to implement all the pollution prevention and mitigating measures (P2M2) described in the EIA Report, in the Environmental Management Plan (EMP) and in the Land Disturbing Pollution Prevention (LD-P2M2) as proposed by the EIA Consultant. I have allocated sufficient funds for the above purpose.

Name :
NRIC Number :
Designation :
Signature :
Date :
Company's Stamp :

Environmental Pledge by the Project Proponent


EIA STUDY TEAM LEADER'S LETTERHEAD

DECLARATION FROM EIA STUDY TEAM LEADER

Environmental Impact Assessment (First Schedule) for

I declare that the entire EIA Report is the product of my own and the work of my team members (i.e. other consultants who are also Qualified Persons) who worked under my supervision and all the facts stated in the Report and the accompanying information are to the best of my knowledge and belief true and correct and that I have not withheld or distorted any material facts. I have briefed the Project Proponent on the content of the Report and highlighted to him all the pollution prevention and mitigating measures (P2M2) described in it, and in the Environmental Management Plan (EMP), and in the Land Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2), and the Project Proponent has agreed to implement them (i.e. P2M2).

Name of EIA Consultant Team Leader :
NRIC Number :
Designation :
Signature :
Date :
Company's Stamp :

Declaration by the Qualified Person

MAIN TEXT OF THE EIA REPORT

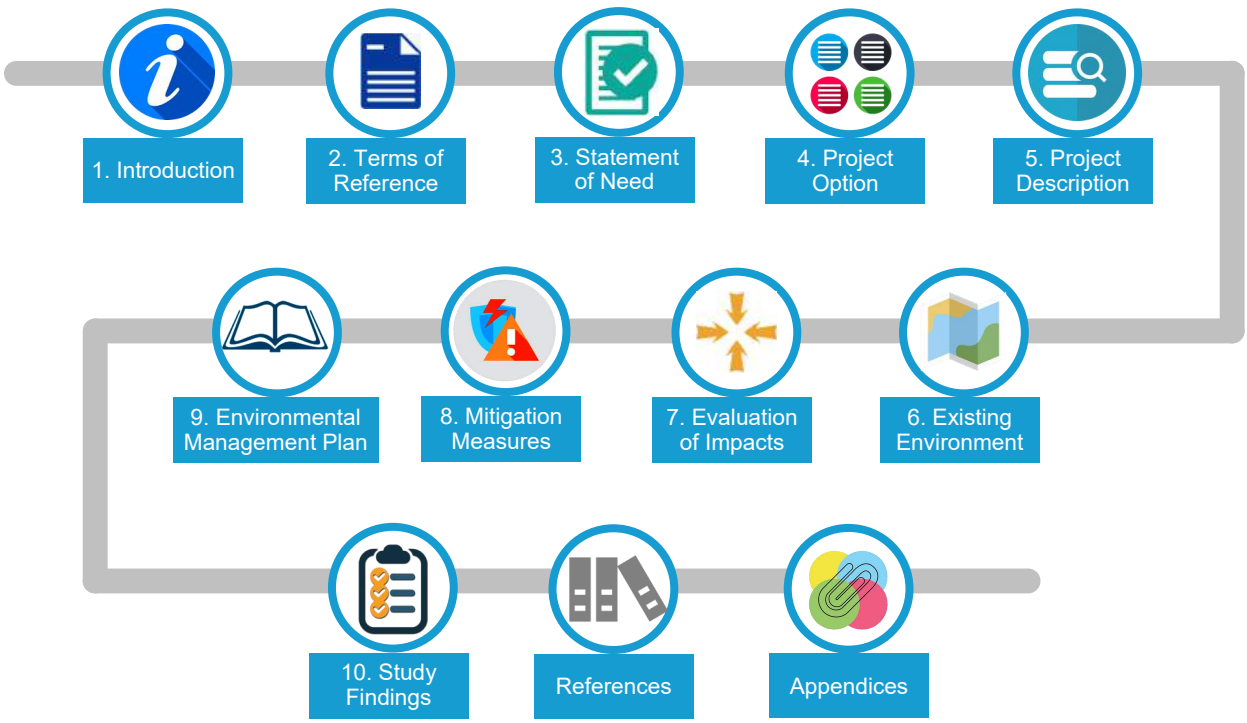


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Table of Contents

03

Terms of Reference

04

Environmental Baseline Data

05

Evaluation of Impacts

06

Mitigation Measures

07

Post-EIA

08

TOR & EIA Checklist

09

EIA Report Format

List of Figures

List of Tables

Chapter 1

Chapter 2

Chapter 3

Chapter 4

Chapter 5

Chapter 6

Chapter 7

Chapter 8

Chapter 9

List of Attachments

List of Abbreviations

AGC	Attorney General Chambers
AIs	appointed individuals
APCS	Air Pollution Control System
ARI	average recurrence interval
ATS	active treatment system
BAT	best available technology
BKSA	*Badan Kawal Selia Air*
BMP	Best Management Practice
BOD	biochemical oxygen demand
C&S	Civil And Structural
CAR	Corrective Action Report
CePSWaM	Certified Environment Professional in Scheduled Waste Management
CFS	Central Forest Spine
CIDB	Construction Industry Development Board
CITES	Convention on International Trade in Endangered Species
CM	compliance monitoring
CO	Carbon monoxide
COA	Condition of Approval
COD	chemical oxygen demand
CPESC	Certified Professional Erosion and Sediment Control
CRE	Chief Resident Engineer
DID	Department of Irrigation and Drainage
DO	Development Order
DOA	Department of Agriculture
DOE	Department of Environment
DOF	Department of Fisheries
DOSH	Department of Occupational Safety and Health
DWNP	Department of Wildlife and National Parks
e.g.	*exempli gratia*, for example
EGiM	Environmental Impact Assessment Guideline in Malaysia
EB	Environmental budgeting
EC	Environmental competency
EE	environmental excellence
EESIM	Environmental Essentials for Siting of Industries in Malaysia
EF	Environmental facility
EIA	Environmental Impact Assessment
EIATRC	EIA Technical Review Committee
EiMAS	Environment Institute of Malaysia
EM	Environmental Mainstreaming
EMC	Environmental Monitoring Committee
EMP	Environmental Management Plan
EMR	Environmental Monitoring Report
EO	Environmental Officer
EP	Environmental Policy
EPA	Environmental Protection Agency
EPMC	Environmental Performance Monitoring Committee
EPMD	Environmental Performance Monitoring Document
EMT	Environmental Mainstreaming Tools
EPU	Economic Planning Unit
EQA	Environmental Quality Act
ERC	Environmental reporting and communication
ERCMC	Environmental Regulatory Compliance Monitoring Committee
ERP	Emergency Response Plan
ESA	environmentally sensitive areas
ESC	erosion and sediment control
ESCP	Erosion and Sediment Control Plan
ESI	Environmental Scoping Information
ESR	Environmental Sustainability Report
ET	Environmental transparency
etc.	*et cetera*, and other similar things
EVEI	Economic Valuation of Environmental Impacts
FGD	focus group discussion
FIA	Fisheries Impact Assessment
FOS	Factor of Safety
FRIM	Forest Research Institute of Malaysia
GAs	government agencies
GIS	Geographic Information System
GPPPP	*Garis Panduan Perancangan Pemuliharaan dan Pembangunan*
GTM	Geological Terrain Mapping

H_2S	Hydrogen Sulfide
HIA	Health Impact Assessment
HQ	headquarters
HRA	Health Risk Assessment
HSE	Health, Safety and Environment
HWC	Human-Wildlife Conflict
ICZM	Integrated Coastal Zone Management
IETS	Industrial Effluent Treatment System
IFM	Integrated Flood Management
ILM	Integrated Lake Management
IM	impact monitoring
IRDA	Iskandar Regional Development Authority
IRBM	Integrated River Basin Management
ISMP	Integrated Shoreline Management Plan
IUCN	International Union for Conservation of Nature
IWK	Indah Water Konsortium
IWRM	Integrated Water Resources Management
JAKOA	*Jabatan Kemajuan orang Asli*
JKPTG	*Jabatan Ketua Pengarah Tanah dan Galian*
JKR	*Jabatan Kerja Raya*
JMG	*Jabatan Mineral Dan Geosains Malaysia*
JPSM	*Jabatan Perhutanan Semenanjung Malaysia*
JUPEM	*Jabatan Ukur dan Pemetaan Malaysia*
km	kilometre
KSAS	*Kawasan Sensitif Alam Sekitar*
LAC	Limit of Acceptable Change
LCP	*Laporan Cadangan Pemajuan*
LD-P2M2	Land-Disturbing Pollution Prevention and Mitigation Measures
LKIM	*Lembaga Kemajuan Ikan Malaysia*
LLM	*Lembaga Lebuhraya Malaysia*
LoS	Level of Service
m	metre
MAAQS	Malaysian Ambient Air Quality Standards
MAFI	Ministry of Agriculture and Food Industries
METMalaysia	Malaysian Meteorological Department
min	minimum
MMWQS	Malaysian Marine Water Quality Standards
MOH	Ministry of Health
MOTAC	Ministry of Tourism, Arts and Culture Malaysia
MSMA	*Manual Saliran Mesra Alam*
MUSLE	Modified Universal Soil Loss Equation
N/A	not available
NCIA	Northern Corridor Implementation Authority
NLWQS	National Lake Water Quality Criteria and Standards
No.	number
NGOs	Non-Governmental Organisations
NO_2	Nitrogen dioxide
NPP-3	Third National Physical Plan
NPPC	National Physical Planning Council
NRE	Ministry of Energy and Natural Resources
NWQS	National Water Quality Standards of Malaysia
NWRP	National Water Resources Policy
0_3	Ozone
P2M2	Pollution Prevention and Mitigation Measures
PDF	portable document format
PE	Professional Engineer
PERHILITAN	*Jabatan Perlindungan Hidupan Liar dan Taman Negara*
PM	performance monitoring
PMR	Performance Monitoring Report
PPE	personal protection equipment
PSD	pipe slope drain
PTD	*Pejabat Tanah dan Daerah*
PTG	*Pejabat Tanah dan Galian*
RFZPPN	*Rancangan Fizikal Zon Persisiran Pantai Negara*
RUSLE	Revised Universal Soil Loss Equation
SAINS	*Syarikat Air Negeri Sembilan*
SAMM	*Skim Akreditasi Makmal Malaysia*
SATU	*Syarikat Air Terengganu*
SHE	Safety, Health and Environment
SI	Soil investigation
SIA	Social Impact Assessment
SIMP	Social Impact Management Plan
SO_2	Sulphur dioxide

SPAN	*Suruhanjaya Perkhidmatan Air Negara*
STS	Sewage Treatment System
SSA	Site Suitability Assessment
SWMM	Storm Water Management Model
SZIRA	Siting and Zoning of Industry and Residential Areas
TIA	Traffic Impact Assessment
TOC	table of content
TOR	Terms of Reference
TORAC	TOR Adequacy Check
WBS	work breakdown structure
WMP	Wildlife Management Plan
WQI	water quality index
ZOI	zone of impact
ZOS	zone of study

Glossary

Active Treatment System (ATS)
Treatment of runoffs using a mechanical system with the application of coagulants and flocculants to promote the settling of suspended solids out of the aqueous phase. Only coagulants and flocculants which have been approved for use by environmental agencies such as USEPA or similar authorities are allowed to be used.

Air Pollution Control Systems (APCS)
Equipment or machinery used in the capture and treatment of emissions from fuel burning equipment, incinerators and other types of engines to ensure it meets with the standards of the Malaysian Ambient Air Quality Standards (MAAQS).

Appointed Individuals (AIs)
Persons appointed to be part of the TRC with expertise and specialist knowledge on specific fields/subjects to contribute to the technical review of a report.

Approving Authority/ Agencies
Any government ministry, agencies or department with the authority to approve a project and/or activity under their jurisdiction by law.

Auditing
Evaluation process carried out by an independent auditor to determine effectiveness and performance of P2M2 and to ensure compliance of a project with the COA from DOE and other agencies.

Baseline Data
Site specific data pertaining to the existing environment (physical, chemical, biological and human). It establishes the ambient situation, usually before some drastic change occurs, e.g. a major project.

Best Available Technology (BAT)
The most current and advanced technologies and methods available for pollution prevention and management.

Best Management Practices (BMPs)
Using the best controlling measures to prevent or mitigate pollution of other sources of environmental impact.

Biological Diversity/ Biodiversity
The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

Buffer Zone
An area designated around the boundary of a project and/or adjacent to environmentally sensitive areas where no or limited development is allowed for the purpose of mitigating against any environmental impact from the site to the surrounding areas or vice versa.

Catchment
The area determined by landform within which falling rain will contribute to runoff at a particular point such as a stream or river. Often, it is used synonymously with basin or watershed.

Central Forest Spine (CFS)
The backbone of Peninsular Malaysia's ESA network which comprises of four major forest complexes [i] Banjaran Titiwangsa-Banjaran Bintang- Banjaran Nakawan, [ii] Taman Negara-Banjaran Timur, [iii] South East Pahang, Chini and Bera Wetlands, and [iv] Endau Rompin Park-Kluang Wildlife Reserves.

Competent Person
A person with the necessary skills and knowledge to carry out the specific technical task, usually gained through certification, work experience or training.

Compliance Monitoring (CM)
Monitoring of P2M2 installed within the project site to ensure they are functional and effective in treating pollutants.

Conditions of Approval (COA)
A set of legally binding instructions and requirements prepared by DOE after the end of EIA process for the Project Proponent to abide by for all phases of the development.

Cumulative Impact
The total sum from combination of various activities or sources resulting in accumulation and aggregation of multiple impacts which would be significantly expanded as compared to a single event.

Cut and Fill
Procedure in which the elevation of a landform surface is modified by the removal or addition of surface material.

Disposal Area
A designated or gazetted area specifically for the storage of wastes or excess materials generated from construction and during operation.

Drainage
Natural or artificial removal of surface and sub-surface water from an area.

Earthworks
Excavation and relocation of large quantities of soil and earth to form slopes platforms, embankments, etc.

Ecology
The study of the habits and modes of life-living organisms (such as plants and animals), and their relationships to each other and their environment.

Ecosystem
A dynamic complex of plant, animal and microorganism communities and their non-living environment that interact as a functional unit.

EIA Adequacy Check
Initial review of the EIA by a technical committee comprising of DOE HQ/state officers to determine compliance with the TOR.

Emergency Response Plan (ERP)
A manual incorporating all measures, actions, roles and responsibilities for the project team to take action during emergencies and crisis, covers various scenarios that may occur during construction and operations.

Endemic Species
Native to, and restricted to, a particular geographical region. Highly endemic species, those with very restricted natural ranges, are especially vulnerable to extinction if their natural habitat is eliminated or significantly disturbed.

Environment
The area (specific zone to be affected by the project), and all natural resources (physical, biological and human resources), people, economic development and quality-of-life values.

Environmental Flow
The timing and amount of water to be retained in lakes, rivers, streams and estuaries to sustain seasonal patterns of high and low water levels needed for natural functions, processes and resilience to persist.

Environmental Impact Assessment (EIA)
A study to identify, predict, evaluate and communicate information about the impacts (both beneficial and adverse) on the environment of a proposed development activity and to detail out the mitigating measures prior to project approval and implementation.

Environmental Management Plan (EMP)
A legally binding document which spells out in concise details the environmental requirements and P2M2 as detailed in the EIA and LD-P2M2 as well at other information, e.g. environmental budget, monitoring and audit programmes and roles and responsibilities of the EMT.

Environmental Management Team (EMT)
Specialist team comprising of relevant personnel of a project with specific roles and responsibilities in the management of environmental matters at site.

Environmental Manager (EM)
A person mandated to oversee all aspects of managing environmental compliance for a project, usually heads the EMT.

Environmental Officer (EO)
The site personnel directly in charge of supervising a site to ensure that all P2M2 are in place, maintained and repaired and that all requirements within the COA are adhered by the contractors. Other tasks include training of staff, taking samples for reporting and attending site walkabouts and meetings.

Environmental Performance Monitoring Committee (EPMC)
Organisational setup within the Project Proponent which shall management environmental compliance at the working level during construction and operational phases of a project.

Environmental Pledge/Declaration
Statement by the Project Proponent and/or Qualified Person preparing the EIA that they have carried out the study in the proper manner and all facts and figures are to their knowledge true and correct and that they will carry out the recommendations and P2M2 for the project as described in the EIA.

Environmental Regulatory Compliance Monitoring Committee (RMCMC)
Organisational setup within the Project Proponent which shall management environmental compliance at the policy level during construction and operational phases of a project.

Environmental Quality Act 1974 (EQA)
The main legislation governing environmental management in Malaysia, contains provisions on setting up of an environmental management body; rules and regulations for specific activities within its jurisdiction; powers for enforcement and licensing; etc.

Environmental Scoping Information (ESI)
A report detailing the findings of the environmental scoping carried out for a site to allow for decision making through identification of significant impacts, proposals for mitigation measures and required studies. Forms and important part of the EIA process.

Environmental Scoping Matrix
Technique to integrated large amounts of information for a rapid assessment in identifying significant impacts based on project activities and their impacts on different aspects of the environment.

Environmentally Sensitive Areas (ESAs)
A special area that is very sensitive to any changes in the ecosystem as a result of natural processes or activities in or around the area, either directly or indirectly.

Erosion
The detachment or wearing away of the earth's surface, particularly soil or loose materials, by flowing water, wind or other geological agents.

Erosion and Sediment Control Plan (ESCP)
Document incorporating all erosion and sediment control measures as required by the Department of Irrigation and Drainage (DID) for a site. Usually prepared by a professional engineer (PE) to be endorsed by DID.

Gazette
The official publication of a government organisation institution, or protected area.

Geological Terrain Mapping (GTM)
Report prepared by a licensed Geologist required by the Minerals and Geoscience Department (JMG) to be submitted for DO approval, contains information on the terrain, geological makeup, soils and slope classification to allow for assessment of site suitability for construction.

Geology
The science which has for its object the investigation of the earth's crust, of the strata which enter into its composition with their mutual relations, and of the successive changes to which their present condition and position are due.

Government Agencies (GAs)
Personnel from government ministries, agencies and/or department with a role in specific committees, approving authorities or decision making bodies.

Guided Self- Regulation (GSR)
An initiative by DOE to cultivate environmental ownership and excellence in environmental commitment from the sectors regulated by DOE especially in regards to performance monitoring of pollution control measures, scheduled reporting, record keeping, competent persons and involvement of environmental professionals with specific roles.

Health Impact Assessment (HIA)
A report which assesses the health impacts of policies, plans and projects using quantitative, qualitative and participatory techniques for decision making. Usually required by the Ministry of Health (MOH) or Department of Health (DOH) for projects with health implications to nearby populations.

Hydrology
The study of the rainfall and runoff process and relates to the derivation of hydrographs for given floods, droughts and seasonal pattern of inundation.

Impact Monitoring (IM)
Monitoring of impacts outside of the project site to ascertain its origin and magnitude.

Land Acquisition/ Alienation
The act of obtaining, either voluntarily or by law, the necessary land from existing landowners. May involve relocation of existing population on the said piece of land.

Land-Disturbing Activities
Activities such as clearing of trees or vegetation, excavating, raising or sloping of ground, trenching, grading and blasting.

Land Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2)
A legal pledge document by the Project Proponent to prevent, mitigate and control the discharge from the development area containing the major pollutant (suspended solids) resulting from land disturbing activities through the protection of natural resources by preservation and conservation, reduction of waste generation and releases or discharges of pollutants to land, air and water and incorporation of BMPs and techniques to attain compliance with the EIA COA.

L_{10}
Level exceeded for 10% of the time and takes account of any annoying peaks in noise.

L_{50}
Level exceeded for 50% of the time and takes account of any annoying peaks in noise.

L_{90}
Level exceeded for 90% of the time and takes account of any annoying peaks in noise.

L_{Aeq}
A-weighted, equivalent continuous sound level in decibels measured over a stated period of time.

L_{max}
Highest sound level measured during a single noise event.

L_{min}
Lowest sound level measured during a single noise event.

Method Statement
A detailed scope and account of proposed construction techniques, equipment and machinery usage and structural and non-structural measures applied in carrying out construction, usually prepared by the contractors.

Modeling
To simulate a particular feature of the world using mathematical and computer aids to better understand, define, quantify and visualise the process.

Monitoring
To measure, systematically and repeatedly, the continuing conditions to track change(s).

Noise
A sound, especially one that is loud or unpleasant or that causes disturbance.
Orang Asli

Orang Asli
Collective term for ethnic groups who are widely regarded as comprising Peninsular Malaysia's original inhabitants as defined under Aboriginal Peoples Act 1954 (Act 134).

Performance Monitoring (PM)
Monitoring of performance systems, e.g. IETS, STS and APCS.

Permanent Reserved Forest (PRF)
The total area of forest land that has been legally designated for retention for forestry as defined under the Forestry Act 1985.

Personal Protective Equipment (PPE)
Equipment designed to safeguard a user against harm when working in risk and hazard areas.

$PM_{2.5}$
atmospheric particulate matter (PM) that have a diameter of less than 2.5 micrometers.

PM_{10}
atmospheric particulate matter (PM) that have a diameter of less than 10 micrometers.

Pollution Prevention and Mitigation Measures (P2M2)
The various methods (structural and non-structural) required to ensure that pollution does not occur or at least minimised as a result of a project.

Prescribed Activity
Any activity specified by the Director General of Environment under the Environmental Quality (Prescribed Activity) (Environmental Impact Assessment) Order 2015, as requiring to prepare an EIA.

Project Activities
Specific tasks undertaken throughout the course of a project (earthworks, construction or operational) which serves to meet certain objectives.

Project Brief
Information pertaining to a project or development, including the details of the project, layout, method statement, location, etc. which can assist in assessment of the project.

Project Proponent
The main person, organisation or body which is proposing to undertake a project or activity. He/she shall bear responsibility to ensure that the project meets all environmental requirements mandated by DOE and other GAs or is liable to be held accountable under the law.

Public Display
Mandatory viewing of a Second Schedule EIA for a fixed period of time whereby the public can forward recommendations and objections to the report for consideration by DOE in the EIA approval process.

Public Participation/ Engagement
The process whereby the public and related stakeholders are allowed the opportunity to participate in the planning, decision making, objection, idea sharing and/or approval of a project which may affect them. Can be mandated or voluntary.

Qualified Person
A person appointed by the Director General of Environment or is certified by/registered with DOE under Section 34A (2B) under EQA 1974 to carry out an EIA study, e.g. Environmental Consultant.

Revised TOR
Final version of the TOR after incorporation of comments from the TRC and additional information.

Risk
A combination of the likelihood of an occurrence of a hazardous event with specified period or in specified circumstances and the severity of injury or damage to the health of people, property, environment or any combination of these caused by the event.

Runoff
The portion of precipitation that runs off the surface as opposed to soaking in.

Sampling Station
Locations identified and designated for collection of environmental data (air, water, noise, vibration, ecology, etc.).

Schedule
Categorisation of Prescribed Activities divided into the First Schedule (EIA without need for public display and public comments and will be processed by DOE State) and Second Schedule (EIA requiring public display and public comments and will be processed by DOE HQ).

Scheduled Wastes
Any form of toxic and hazardous wastes listed under the First Schedule of the Environmental Quality (Scheduled Wastes) Regulations 2005 (Amendment 2007).

Scoping
Initial phase in an EIA to identify the key environmental issues and the study spatial and temporal boundaries. The scoping will identify the required investigations and assessment of significant impacts during the subsequent phases of the EIA process.

Screening
Process by which a proposed development project is identified as being subjected to a regulatory provision requiring an EIA.

Sedimentation
The deposition of sediment from suspension in water.

Seismicity
The occurrence or frequency of ground vibrations or earthquakes in a region.

Self-regulation
The adoption and implementation of measures and practices by a Project Proponent on their own initiative without requiring intervention of the authorities to safeguard the environment and meet all regulatory requirements of the country.

Setback
Distance which a building or other structure is set back from a street or road, a river, a shore or any other place which is deemed to need protection.

Sewage Treatment System (STS)/ Plant (STP)
Any facility designed and constructed for the purpose of reducing the potential of the sewage to cause pollution.

Siltation
The deposition or accumulation of silt that is suspended in a body of water.

Site Suitability Assessment (SSA)
A study on the suitability of various sites and the determination based on specific criteria on the best possible site for a project.

Social Impact Assessment (SIA)
A process to identify, predict, evaluate and communicate information about the social impacts of a proposed project, policy, programme or plan on a community and their activities, and to choose the best development option and subsequently propose mitigation measures.

Soil Investigation (SI)
Technical study on the soil and sub-surface strata of a project site to determine the sub-surface conditions and engineering requirements needed prior to a development.

Spoil
Rock and debris produced by tunneling, dredging and other excavations.

Statement of Need
A brief on the justifications for a project, including supporting arguments and evidence on the necessity of the project and benefits that will be generated.

Stormwater
Water that originates during precipitation events, e.g. rainfall.

Suspended Sediment
Sediment suspended in a fluid by its (fluid) turbulent flow.

Technical Review Committee (TRC)
A panel of decision makers comprising DOE officers, AIs and GAs that are selected to review the TOR and/or EIA to provide approval based on the reports submitted by the Project Proponent and Qualified Person(s).

Terms of Reference (TOR)
Product of the scoping process which sets the objectives, defines the scope, and establishes the strategy and schedule for EIA process to address identified significant issues. Typically, the TOR is complemented by an ESI.

Topography
The configuration of the surface of the earth, including its relief, the position of its streams, roads, cities, etc. The earth's natural and physical features collectively.

TOR Adequacy Check (TORAC)
A review by a selected panel of DOE officers, IAs and/or GAs on whether a TOR has been prepared in accordance with DOE requirements and contains all necessary information for decision making to be made.

Traffic Impact Assessment (TIA)
A study on the condition of the roads and traffic (level of service) in an area and if there is adequate capacity to meet the increasing demand from a project or to identify measures required to ensure that traffic will be smooth and uninterrupted.

Visual/Aesthetics
Pleasing scenery, vistas and view to an audience.

Wastes
Any substance which is discarded after primary us. Comprises of various types of wastes, such as municipal wastes, scheduled wastes, biomass wastes, etc.

Water Quality
A term to describe the chemical, physical and biological characteristics of water, usually with respect to its suitability for a particular purpose.

Water Quality Index (WQI)
An index integrating six water quality parameters to provide a general categorisation to determine the condition of the water source.

Wildlife Management Plan (WMP)
A technical report that outlines implementation steps to increase, preserve and manage wildlife impacted from a project, both during construction and operation project. The management plan usually contains maps, descriptive documents, and records of progress and change.

Zone of Impact (ZOI)
The maximum area which will receive the impacts from the project.

Zone of Study (ZOS)
Boundary identified for the EIA Study which would be the main spatial area to carry out baseline data gathering, determine extent of modelling and assessment and other supporting studies.

Introduction

01

Putrajaya, Malaysia
Source: Ishan on unsplash.com

Putrajaya, Malaysia
Source: Ishan on unsplash.com

01

Introduction

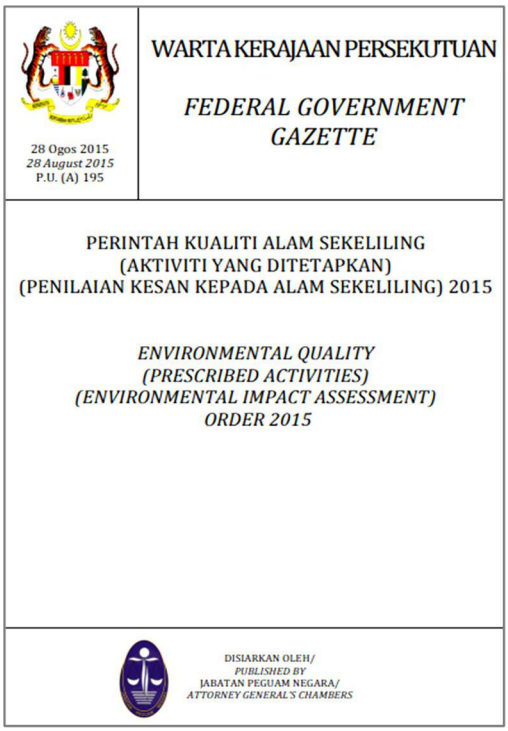
1.1 Introduction

This document is entitled:

‘Environmental Impact Assessment (EIA) Guidelines for Drainage and/or Irrigation Projects’

This document shall be referred as “**The Guideline**” hereinfater. It supersedes the ‘EIA Guidelines for Drainage and/or Irrigation Projects’ published in 1995.

The Guideline adopts the latest amendments in the Environmental Quality Act 1974 (EQA 1974) (Act 127), mainly the Environmental Quality (Prescribed Activities) (EIA) Order 2015 (hereinafter to be referred to as “the EIA Order 2015”). The EIA Order 2015 replaced EIA Order 1987 that had been referred to in the previous guideline.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28 August 2015
P.U. (A) 195

WARTA KERAJAAN PERSEKUTUAN

FEDERAL GOVERNMENT GAZETTE

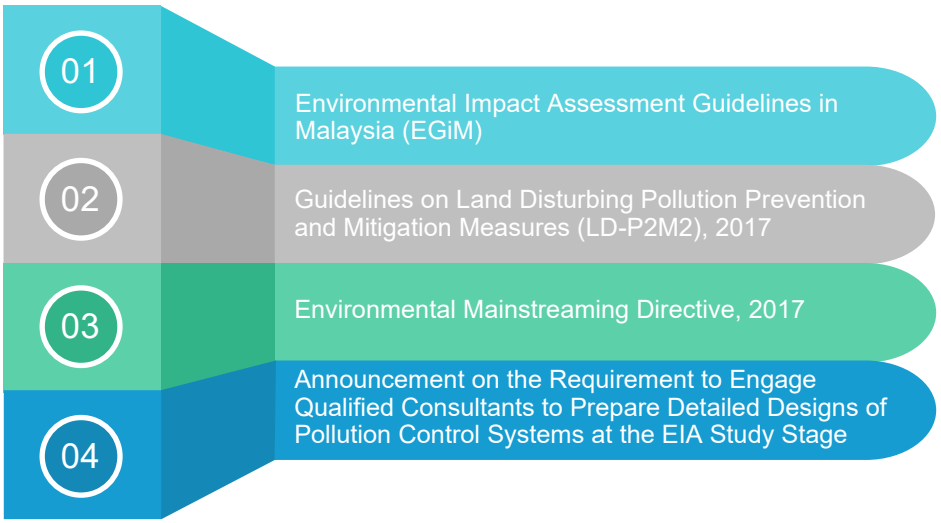
PERINTAH KUALITI ALAM SEKELILING
(AKTIVITI YANG DITETAPKAN)
(PENILAIAN KESAN KEPADA ALAM SEKELILING) 2015

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

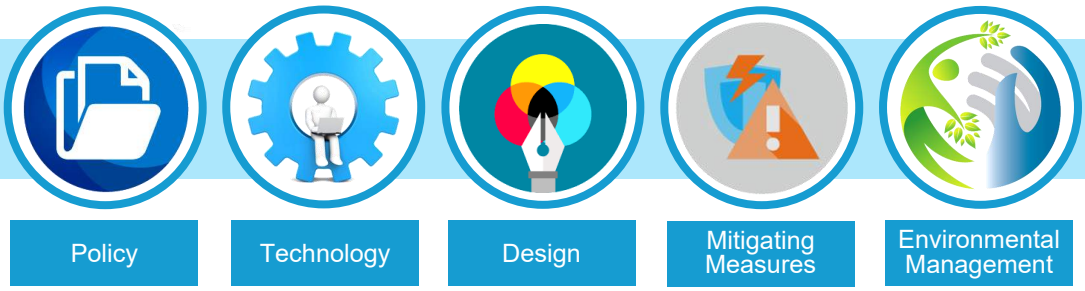
DISIARKAN OLEH/
PUBLISHED BY
JABATAN PEGUAM NEGARA/
ATTORNEY GENERAL'S CHAMBERS

EIA Order 2015

The Guideline also incorporates all new elements that have been introduced by the Department of Environment (DOE) with regards to EIA through its other recent guidelines, directives and notifications such as:



Additionally, this document also considers current practises in terms of:



This includes relevant information and description that enable the stakeholders to understand the overall concept of EIA and the possible environmental issues that may arise from the proposed project.

This Guideline complements EGiM and thus should be read together with other guidelines relevant to the prescribed activity. Compliance with the requirements as set out in this Guideline and EGiM will thereby fulfil the obligations of the Project Proponent as specified in the Section 34A (2C) of the EQA 1974, and/or any amendments thereafter.

1.2 Objectives of the Guideline

The guideline are intended to improve the effectiveness of the present EIA procedure through:

01 Providing a clear and concise guidance document on EIA preparation to the following:

- Project Proponents
- DOE Officers
- Qualified Persons
- Stakeholders
- Government Agencies (GAs)
- Appointed Individuals (AIs)
- Non-Governmental Organizations (NGOs)
- Other EIA-related Practitioners

02 Facilitate integration of the EIA into the overall project planning and development cycle; to ensure compliance with and adherence to the legal requirements within the framework of environmental preservation.

03 Providing a guidance with explanations of the EIA procedures and submissions, comprising:

- Environmental Scoping Information (ESI)
- Terms of Reference (TOR)
- EIA reporting
- Post-EIA

04 Defining the scope of the EIA with a focus on the significant environmental issues, whilst also taking into consideration other environmental requirements by other authorities or agencies.

05 Provide a succinct framework for DOE to assess the EIA reports.

1.3 Scope of the Guideline

The scope of the guideline cover four prescribed activities under Prescribed Activity No. 3 - Drainage and Irrigation of the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015. There are two prescribed activities under the First Schedule and two prescribed activities under the Second Schedule which are shown below.

PRESCRIBED ACTIVITY NO. 3
First Schedule a) Construction of man-made lakes and enlargement of artificial lakes with surface areas of 100 hectares or more. b) Irrigation schemes covering an area of 500 hectares or more. **Second Schedule** a) Construction of man-made lakes and artificial enlargement of lakes with surface areas of 50 hectares or more in or adjacent or near to environmentally sensitive area. b) A drainage of wetland, wild-life habitat or of dry inland forest covering an area of 20 hectares or more.

Putrajaya Lake
Source: www.kuala-lumpur.ws/putrajaya/

It should be noted that the drainage and/or irrigation project typically involves other prescribed activities as well. Prescribed activities that are normally related to drainage and/or irrigation project are:

FIRST SCHEDULE

Prescribed Activity No. 1 - Agriculture

b) development of agriculture estates covering an area of 500 hectares or more involving changes in type of agricultural use.

Prescribed Activity No. 4 - Fisheries

Land based aquaculture project accompanied by clearing of mangrove forest, peat swamp forest or fresh water swamp forest covering an area of 20 hectares or more but less than 50 hectares.

Prescribed Activity No. 5 - Forestry

d) Conversion of an area of:
   i) mangrove forest;
   ii) peat swamp forest;
   iii) fresh water swamp forest,

   for industrial, housing or agricultural use covering an area of 20 hectraes or more but less than 50 hectares.

Prescribed Activity No. 21 - Water Supply

Groundwater development for industrial, agricultural or urban water supply of 4,500 cubic metres or more per day.

SECOND SCHEDULE

Prescribed Activity No. 1 - Agriculture

a) Land development schemes covering an area of 500 hectares or more to bring forest into agricultural production.

Prescribed Activity No. 4 - Fisheries

Land based aquaculture project accompanied by clearing of mangrove forest, peat swamp forest or fresh water swamp forest covering an area of 50 hectares or more.

Prescribed Activity No. 15 - Construction of Dam

a) Construction of dam or impounding reservoir for the purpose of irrigation, flood mitigation, control of siltation, recreational, water supply or any other reason with a surface area of 100 hectares or more.

1.4
Terms and Definitions

Specific definition of the terms stated in the EIA Order 2015 is provided in the following sections.

1.4.1
Drainage

According to the Drainage Works Act 1954, "drainage works" has been defined to include construction and maintenance of drains and water courses, embankments, culverts, sluices, water gates, access paths in drainage reserves and other similar works.

Meanwhile, **DID Manual Volume 5 – Irrigation and Agricultural Drainage** specifies *irrigation* as "the artificial removal of excess water and dissolved salts from agricultural land in order to enhance crop growth".

It should be noted that urban drainage and stormwater management system as defined under Street, Drainage and Building Act 1974 and Urban Stormwater Management Manual for Malaysia (MSMA-2) is not covered under this definition.

Source: www.asiatravelgate.com

1.4.2
Irrigation

According to **Section 2 of Irrigation Areas Act 1953**, *irrigation* is defined as: "the practice of causing water to flow upon, or spread over, or under, the surface land or of retaining water on or under the surface of land for agricultural purpose and includes drainage for the removal of water which is injurious to agriculture."

In addition, the same section also provides definition for *irrigation works* which is: "including the construction and maintenance of headworks, main canal, subsidiary canals, distribution channels, drainage channels, banks, bunds, batas, water gates, culverts, sluices, drains and other similar works."

Meanwhile, **DID Manual Volume 5 – Irrigation and Agricultural Drainage** specifies *irrigation* as: "a process of transferring water from a conveyance system of channels or pipes into the field for the purpose of agricultural production."

1.4.3
Relevant Terms

Definitions of relevant terms for each prescribed activity are tabulated in *Tables 1.1* and *1.2*.

Table 1.1 Relevant terms for Prescribed Activity No. 3 under First Schedule

FIRST SCHEDULE

3(a) - Construction of man-made lakes and enlargement of artificial lakes with surface areas of 100 hectares or more.

i) Lake

A lake (natural or man-made) is defined as a terrestrial area that is submersed with water with an area of 1 ha or above with varying depths and generally contains nutrients that are able to support aquatic life for socio-economic as well as recreational benefits.
Source: GPPP Pemuliharaan dan Pembangunan KSAS (PLANMalaysia, 2017)

The main differentiation between man-made lakes and dam/reservoir is the purpose of the water body itself. Lakes shall not have any major purpose except for recreation, while dam/reservoir can be used for water supply, irrigation, flood mitigation, hydroelectric power generation or any other reason (as defined under Prescribed Activity No 15 of the Second Schedule). Other pertinent details on differentiating between man-made lakes and dam/reservoir are as shown below.

Differences between man-made lakes and dam/reservoir

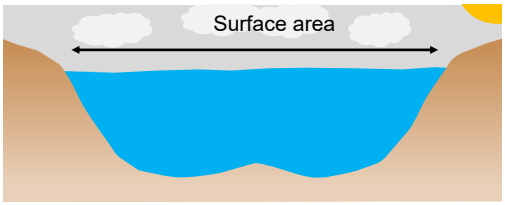
DEFINITION	MAN-MADE LAKES	DAM/RESERVOIR
Purpose	Recreation	Water supply, irrigation, hydroelectric power generation, flood mitigation, siltation control, etc.
Water impounding structure	No	Yes
Formation technique	Natural depression or basin, ground excavation	Structural barrier or impoundment across waterway
Safety requirement	No specific restriction	Restricted

ii) Enlargement

It usually entails expanding the capacity of the lake via allowing the lake's normal pool elevation to be raised, thus increasing the surface area as well as the water storing capacity.

iii) Surface area

The area of water surface (outer or uppermost part) of the lake at its maximum capacity.



3(b) - Irrigation schemes covering an area of 500 hectares or more.

i) Irrigation scheme

The area of an irrigation scheme, or "irrigation area", is defined as any land in a State within the area affected by any irrigation works wholly or in part carried out or sanctioned by the Government of that State that has been declared as irrigation area, with specific boundary that may include any headworks and main canals.
Source: Irrigation Areas Act 1953

Table 1.2 Relevant terms for Prescribed Activity No. 3 under Second Schedule

SECOND SCHEDULE
3(a) - Construction of man-made lakes and artificial enlargement of lakes with surface areas of 50 hectares or more in or adjacent or near to environmentally sensitive area.
i) Lake A lake (natural or man-made) is defined as a terrestrial area that is submersed with water with an area of 1 ha or above with varying depths and generally contains nutrients that are able to support aquatic life for socio-economic as well as recreational benefits. Source: GPPP Pemuliharaan dan Pembangunan KSAS (PLANMalaysia, 2017) **ii) Surface area** The area of water surface (outer or uppermost part) of the lake at its maximum capacity. **iii) Environmentally sensitive area (ESA)** A particular area that is sensitive to any forms of alteration to its ecosystem due to natural processes or activities within or around it, either directly or indirectly. ESA is categorized into three ranks i.e. Rank 1, Rank 2 and Rank 3. Source: NPP **iv) Within ESA** Inside of ESA Rank 1, 2 or 3 Source: NPP & EIA Guidelines for Quarry and Mining (DOE, 2018) **v) Adjacent to ESA** Within 500 m of ESA Rank 1, 2 or 3 Source: NPP & EIA Guidelines for Quarry and Mining (DOE, 2018) **vi) Near to ESA** Sharing a boundary with ESA Rank 1, 2 or 3 Source: NPP & EIA Guidelines for Quarry and Mining (DOE, 2018)
3(b) - A drainage of wetland, wild-life habitat or of dry inland forest covering an area of 20 hectares or more.
i) Wetlands refer to areas of marsh, fen, peatland or water whether natural or artificial, permanent or temporary with water that is static or flowing, fresh, brackish or salty, including areas of marine waters, the depth of which at low tide does not exceed six metres. Source: Ramsar Convention (1971) ii) Wildlife habitat are areas distributed horizontally and vertically across the landscape that fulfill the needs of a specific wildlife species for the basic requirements of food, water, reproduction (nesting), and protection against predators and competitors (cover). Source: Grebner *et. al* (2013) iii) Dry inland forest refers to Dipterocarp Forest i.e. forest that is mostly dominated by trees from the Dipterocarpaceae family. This forest occurs on dry land just above sea level to an altitude of about 1,200 metres. It is differentiated by land elevation starting at the lowland dipterocarp forest, hill dipterocarp forest and upper fill dipterocarp forest. Source: FRIM (2011)

1.5 Scope of the Prescribed Activities

1.5.1 Drainage

Drainage can be broadly defined as the artificial process of water removal from both surface and subsurface However, the Order has defined that the scope prescribed therein covers the drainage of a certain types of land only and does not cover the urban drainage in general. Drainage activity here refers to the removal of water from wetland, wild-life habitat or dry inland forest.

Drainage of an area is normally carried out to convert "idle land" into productive lands by achieving the following objectives:

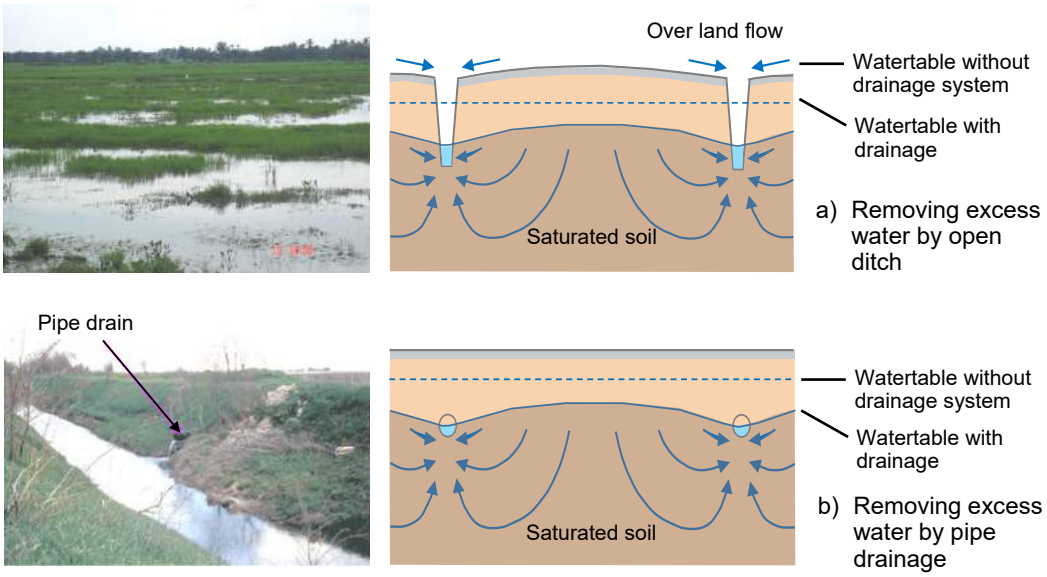
01 lowering the watertable;

02 removing excess surface and subsurface water; and

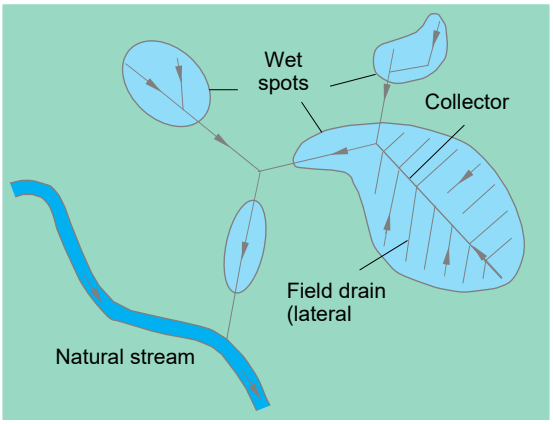
03 maintaining groundwater levels at a desired level.

Selection of the mode of drainage methods depends upon the nature of the problem and the typical characteristics of the area. The physical factors in deciding the method of drainage include topography, soil and water. However, when physical factor are equally favourable, then the deciding factor may be their relative economics, ease in operation and maintenance and long term impacts on the environment.

Usually, drainage of an area is conducted via horizontal drainage i.e. open or closed conduits. Trenches or pipes are placed below the current water level, allowing gravity to do the work of propelling water down and out of the area, as shown in *Figure 1.1*. The field drainage layout is typically set up in a herringbone system, as illustrated in *Figure 1.2*.



Source: Adapted from DID Manual Vol. 5 (2009)
Figure 1.1 Common method of drainage



Source: Adapted from DID Manual Vol. 5 (2009)

Figure 1.2
Typical field drainage pattern

In addition, the construction or enlargement of artificial lakes is also defined under this scope, whereby it is normally done by channelling water into a natural or created low spot or depression (mining or quarrying pit), letting water to accumulate there without any impounding structure. As the water flow is accumulated, the basin gets filled with water over the course of time, depending on the size of the basin, amount of incoming water, seepage rate, etc.

As for artificial lakes enlargement activity, it usually entails expanding the capacity of the lake via allowing the lake's normal pool elevation to be raised, thus increasing the water storing capacity.

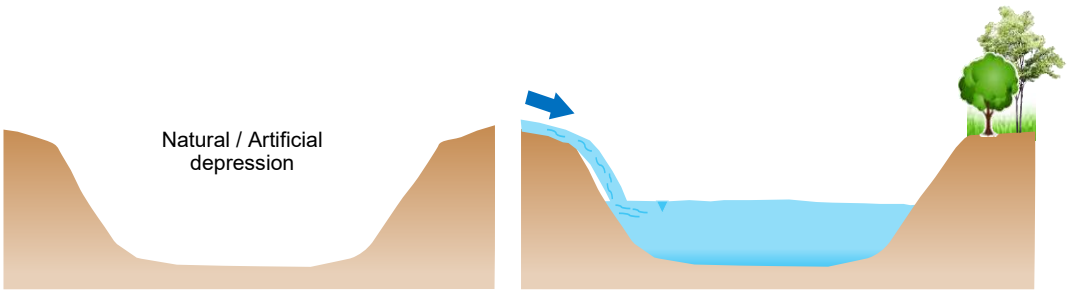


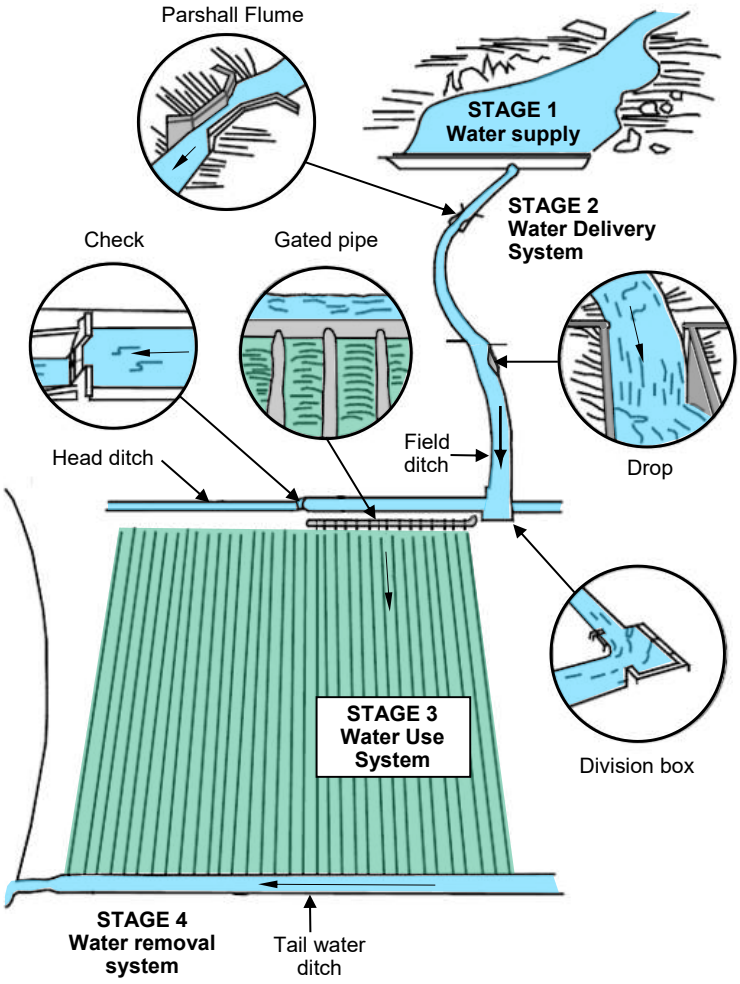
Figure 1.3 Construction of artificial lake

1.5.2 Irrigation

Meanwhile, **irrigation** is the opposite of drainage whereby it refers to the artificial application of water to land usually for the purpose of agricultural production. The primary reason for the application of water to soil is to meet the water needs of growing plants.

A typical irrigation scheme component, as defined above, is shown in *Figure 1.4.*

In general, the flow of water through the irrigation system will pass through four main stages, as detailed in *Table 1.3*.



Source: DID Manual Vol. 5 (2009)

Figure 1.4 Typical irrigation scheme components

Table 1.3 Stages of irrigation flow

STAGE	DESCRIPTION	TYPICAL COMPONENTS
1. Water Supply	The source of water for irrigation system is typically obtained from rivers, reservoirs or groundwater aquifers. An intake or pumping system will typically be built for water sourcing.	 Source: ecwc.gov.et Irrigation reservoir  Source: mapio.net Water intake from river/canal
2. Water Delivery System	Water obtained from the supply is pumped or flows by gravity through canals, ditches, pipes or even natural streams. The flow of water from through the water delivery system is usually monitored to ensure the efficient use of water. The flow of water is usually controlled by a network of flumes, head work, water gates, sluices, division box, culverts, etc.	 Source: inmtn.com Irrigation flume  Source: did.sabah.gov.my Head work

Table 1.3 (cont'd) Stages of irrigation flow

STAGE	DESCRIPTION	TYPICAL COMPONENTS
2. Water Delivery System (cont'd)..	Water obtained from the supply is pumped or flows by gravity through canals, ditches, pipes or even natural streams. The flow of water from through the water delivery system is usually monitored to ensure the efficient use of water. The flow of water is usually controlled by a network of flumes, head work, water gates, sluices, division box, culverts, etc.	 Source: thedailystar.net Sluice gate  Source: did.sabah.gov.my Division box
3. Water Use System	The channelled water from the delivery system is then applied to the crop or field using various irrigation methods. Major classification of these methods is shown in *Figure 1.5*.	 Source: ricetoday.irri.org Application of irrigation water at paddy field (basin irrigation)
4. Water Removal System	Excess water from the irrigated land will be removed via canal, ditches, etc.	 Source: blog.worldagrofrestry.org Drainage canal in an oil palm plantation

Irrigation scheme will also consist of a drainage system that are necessary to remove excess water from the irrigated land. The general objective of agricultural drainage is to enhance crop growth and to maintain soil productivity by achieving said objectives:

01 To lower the watertable for favorable crop growing conditions;

02 To remove excess surface and subsurface water;

03 To remove excess soluble salts with the excess water from the drained soil profile; and

04 To maintain groundwater levels at a desired level.

There is an expansive type of irrigation being practiced depending on the source of water, method of water storage, conveyance and distribution system and methods of delivery. The major classification of irrigation systems is shown in *Figure 1.5*.

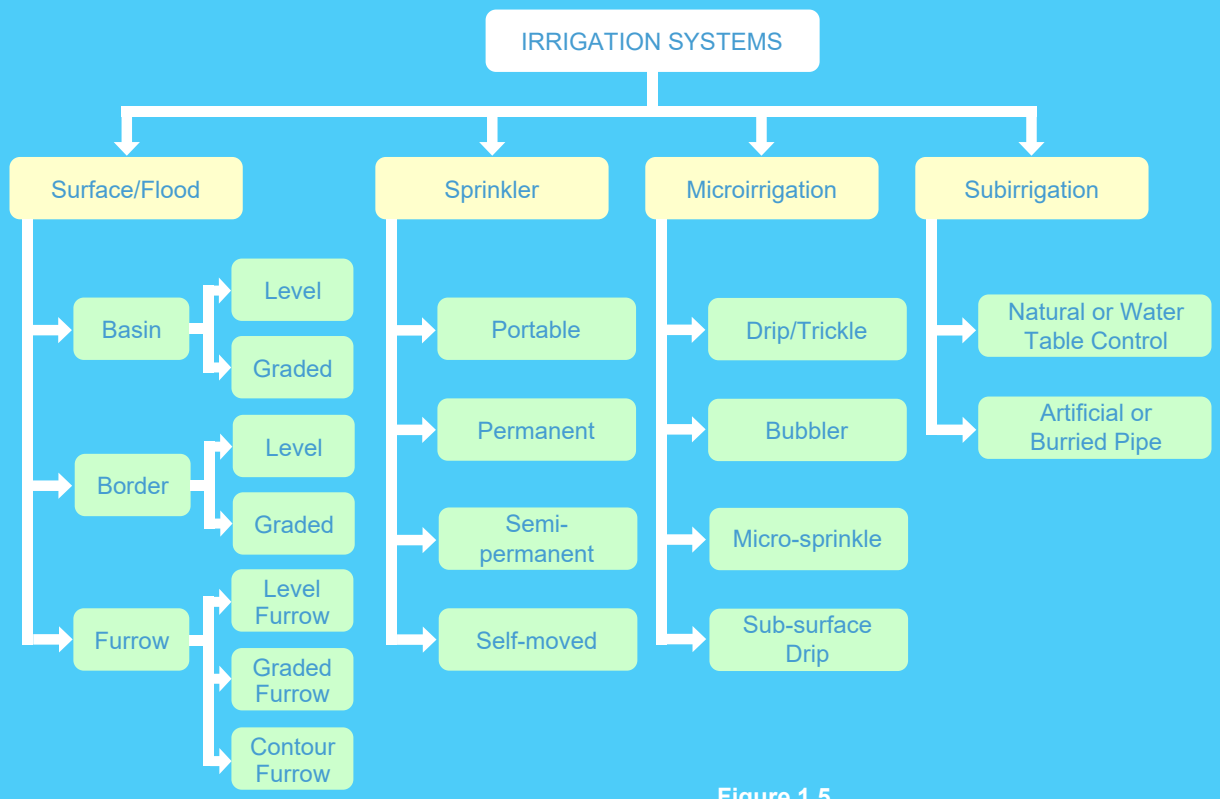
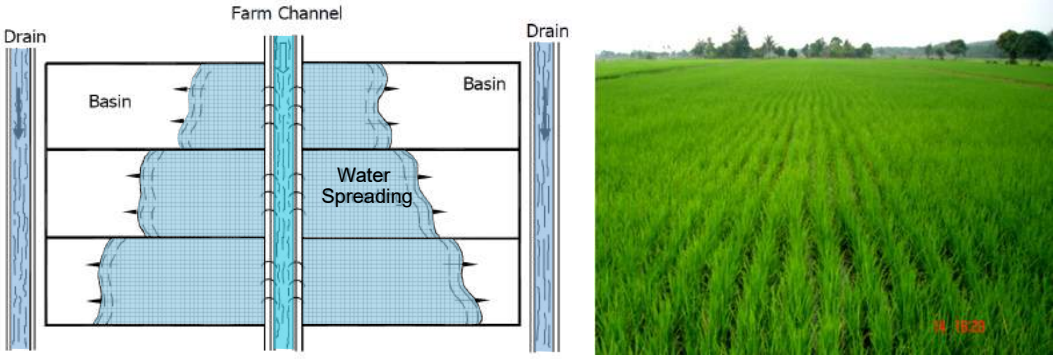


Figure 1.5
Major classifications of irrigation system

Surface Irrigation

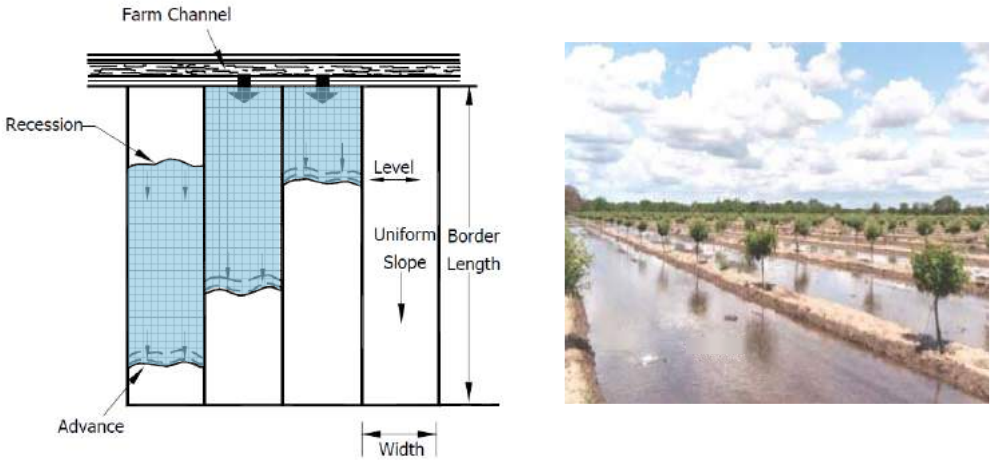
Surface irrigation is the allocation and distribution of water into fields by gravity flow of water over the soil surface. *Figure 1.6* to *1.8* show the three common surface irrigation methods, which are:

01 basin irrigation;
02 border irrigation; and
03 furrow irrigation.



a) Basin irrigation layout b) Basin irrigation at paddy field

Source: DID Manual Vol. 5 (2009)
Figure 1.6 Basin irrigation



a) Border layout b) Farm channel view

Source: DID Manual Vol. 5 (2009)
Figure 1.7 Border irrigation

a) Furrow with siphon in Florida, USA

b) Furrow with tobacco at Jelebu, Malaysia

Source: DID Manual Vol. 5 (2009)
Figure 1.8 Furrow irrigation

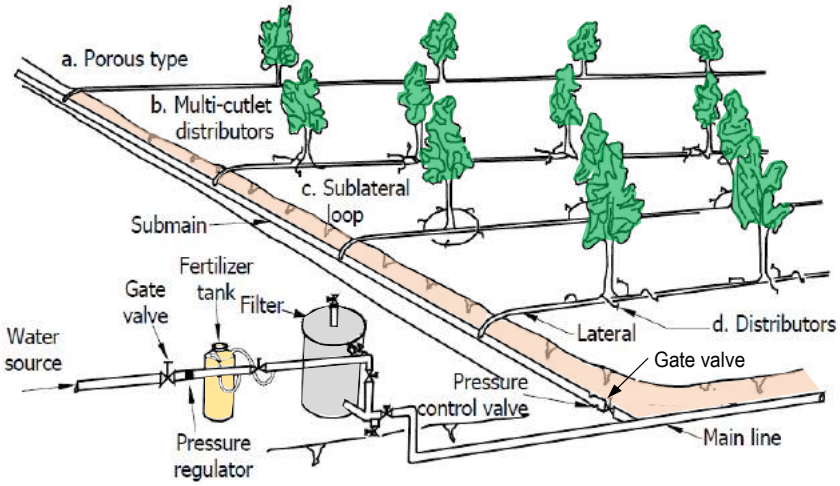
Sprinkler Irrigation

A sprinkler system consists of pipelines which carry water under pressure from a pump or elevated source to lateral lines along which sprinkler heads are spaced at appropriate intervals. *Figure 1.9* shows an example of sprinkler irrigation system.

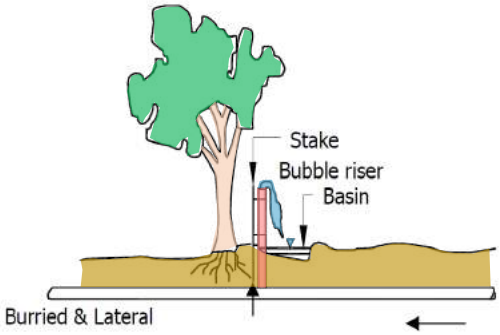
Source: DID Manual Vol. 5 (2009)
Figure 1.9 Sprinklers on lateral pipe with risers

Microirrigation

Microirrigation systems are localized irrigation methods that slowly and repetitively distribute water uniformly to the plant root zone via emitters. It operates under low pressure with small-sized wetting patterns and low discharges. The systems apply water and fertilizer directly to individual plants or trees, reducing the wetted area by wetting only a fraction of the soil surface; thus, water is applied directly into the root zone. *Figures 1.10* and *1.11* show examples of microirrigation system.



Source:
DID Manual Vol. 5 (2009)
Figure 1.10
Drip irrigation system



a) Bubbler installation

b) Bubbler emitter

Source: DID Manual Vol. 5 (2009)
Figure 1.11 Bubbler system

Sub-irrigation

For sub-irrigation, water is applied beneath the ground surface, usually 30 to 75 cm below the ground surface, either by raising the water table within or near the root zone or by using a buried perforated or porous pipe system that discharges directly into the root zone.

The system depends on the root characteristics of the crop. Irrigation then occurs by capillary movement of water into the crop root zone. *Figure 1.12* shows a typical example of sub-irrigation practiced in Malaysia.

a) Lateral ditches

b) Main ditch of sub-irrigation

Source: DID Manual Vol. 5 (2009)
Figure 1.12 Sub-irrigation system

1.6
EIA Report Requirement

Section 34A of the EQA 1974 provides powers to the Minister to prescribe, by order, any activity which may have significant environmental impacts as a prescribed activity, for which a report on an assessment of the impact(s) such an activity will have on the environment, be submitted to the Director General of Environmental for approval. The submission of an EIA report for approval by the Director General is a requirement prior to the approval by the relevant project approving authorities.

Enforcement of the provisions of Section 34A of the EQA 1974 was made possible from 1st April, 1988.

In EIA Order 2015, the Prescribed Activities are divided into the First Schedule (comprised of 21 Prescribed Activities) and Second Schedule (comprised of 17 Prescribed Activities).

Drainage and irrigation projects fall under Prescribed Activity No.3 of both First and Second Schedule which are detailed as follows:

FIRST SCHEDULE
Prescribe Activity No.3:
Drainage and Irrigation

a) Construction of man-made lakes and enlargement of artificial lakes with surface areas of 100 hectares or more.
b) Irrigation schemes covering an area of 500 hectares or more.

SECOND SCHEDULE
Prescribe Activity No.3:
Drainage and Irrigation

a) Construction of man-made lakes and artificial enlargement of lakes with surface areas of 50 hectares or more in or adjacent or near to environmentally sensitive area.
b) A drainage of wetland, wild-life habitat or of dry inland forest covering an area of 20 hectares or more.

For specific drainage and irrigation projects that fall under the First Schedule, the EIA report shall be assessed by the respective DOE State.

Meanwhile for those that fall under the Second Schedule, the EIA report requires the following:

01 Public display; and
02 Public comments.

The EIA approval process will be carried out by DOE HQ. The respective DOE State will provide local input in order to facilitate DOE HQ.

The prescribed activities mentioned shall not apply to Sabah and Sarawak where these are subjected to separate state legislations and authorities as listed in *Table 1.4.*

Table 1.4
Environmental legislation for Sabah and Sarawak

LEGISLATIONS	AUTHORITY
SABAH	
Environment Protection Enactment (Prescribed Activities) (Environmental Impact Assessment) Order 2005	Environment Protection Department (EPD)
SARAWAK	
Natural Resources and Environment (Prescribed Activities) Order 1994	Natural Resources and Environment Board (NREB) Sarawak

1.6.1
Scenarios that Requires EIA

There might be several scenarios where drainage and/or irrigation related projects do not directly fall under Prescribed Activity No. 3 (First and Second Schedule). However, these scenarios may require EIA study to be carried out for approval. Brief descriptions of these scenarios are detailed in the following subsections.

1.6.1.1
New Project Component

The EIA Order 2015 has clearly defined the quantum in terms of area for each activities defined under Prescribed Activity No. 3 (First and Second Schedule). If an existing project that previously does not meet the required quantum (thus not having an EIA) to be upgraded and resulted in a total size that meet the defined size, an EIA study must be conducted.

For example, an existing irrigation scheme with an area of 450 hectares will be upgraded whereby additional 51 hectares will be added. As the total area of the irrigation scheme is now 501 hectares, an EIA study is required.

It should be noted that some of the upgrading or additional components may be related to other prescribed activities as well. For example, an existing reservoir for an irrigation scheme is planned to be increased in capacity whereby the surface area now reaches 100 hectares or more. This activity is specified under Prescribed Activity No. 15 of the Second Schedule. As such, an EIA must be prepared.

1.6.1.2
Amendments in Project Component and Design after EIA Approval

Any amendment in the component and design which has been detailed in the approved EIA is not permitted. As such, the Project Proponent or the Qualified Person must consult with the DOE for advise whether a new EIA report is required or not. Among the amendment includes, but not limited to the followings:

01 **Changing the method of drainage and/or irrigation:**
Each type of drainage and/or irrigation method differs in their application and its impact to the environment. Thus, changing of the method of irrigation and/or drainage will require their impacts to be investigated, requiring a new EIA study.

02 **Increasing the size of drainage and/or irrigation area:**
EIA approval usually will define the specific boundary of the drainage and/or area. Any significant changes to initially approved boundary, say over 10% increase in size, may require new EIA study to be submitted.

03 **Enlargement of the lakes or reservoir:**
This is normally done to cope up with the increasing demands of water. It should be noted that enlargement of existing artificial lakes is already specified as a prescribed activity, thus necessitating an EIA study.

1.6.1.3 Wastewater for Irrigation

Typically, water is used as the source of irrigation. However, there are instances where wastewater is used in substitute of water for the irrigation supply. For example, palm oil mill effluent (POME) has been used for irrigation in oil palm plantations. In this case, EIA is **NOT** required as water is not used for the irrigation scheme.

1.6.1.4 Project with Drainage and/or Irrigation as part of its Components

Certain projects may consist of drainage and/or irrigation as part of the project's components. This is possible if said project is in similar nature to drainage and/or irrigation scheme. For example, flood mitigation project may also serve the purpose of channeling the water to supply an irrigation scheme. Even though the main objective of the project is flood mitigation, if the area of the irrigation scheme served covers an area of 500 ha or more, the project will require an EIA.

1.7 Overview of the EIA Process

This section provides an overview of the step-by-step guide to the preparation of an EIA study for drainage and/or irrigation projects. Each step is briefly described and reference made to each chapter is listed in *Table 1.5*.

Table 1.5 Step-by-step guide for the EIA process

STEP	DESCRIPTION	REFERENCE IN THE GUIDELINE
1. Project Proponent to provide project brief and technical studies	▪ The Project Proponent must provide basic information about the proposed project in order for the Qualified Person to understand the intent, objectives and scope of the proposed project. ▪ The basic information includes: i) project location with coordinates; ii) project boundary; iii) project acreage; and iv) project layout plan and components. ▪ This is to assist the Qualified Person to determine whether the proposed project falls under the Prescribed Activity No. 3 (First and Second Schedule) of the EIA Order 2015.	Chapter 1
2. Identify applicable policies, laws and guidelines	The Project Proponent is required to identify and comply with the relevant legal requirements before submitting the EIA report to DOE for approval.	Chapter 2

Table 1.5 (cont'd) Step-by-step guide for the EIA process

STEP	DESCRIPTION	REFERENCE IN THE GUIDELINE
3. Carry out preliminary stakeholders' engagement	▪ It is important for the Project Proponent to carry out stakeholders engagement prior to preparing the Terms of Reference (TOR) and Environmental Scoping Information (ESI) reports. ▪ Constant engagement with DOE is advisable (via the designated officer in charge), as well as with the relevant government agencies (GAs). This is to ensure the scoping is comprehensively covered in the EIA report.	Chapter 2
4. Prepare TOR and ESI report	▪ TOR and ESI must be submitted for endorsement before submission of EIA report. ▪ Qualitative data will suffice. However, quantitative data can also be included if available. ▪ These reports must cover the followings: i) Site Suitability Assessment (SSA); ii) determine project and study boundaries iii) overview baseline data; iv) identify current issues and constraints within the project site; v) identify existing site conditions and environmentally sensitive areas (ESA); vi) predict potential impacts; and vii) propose appropriate mitigation measures.	Chapter 3
5. Submit TOR and ESI	▪ The TOR and ESI prepared by the Qualified Person must follow the format as documented in the EGiM and this Guideline. ▪ The TOR and ESI must be submitted to DOE for review and endorsement.	Chapter 3
6. Collect baseline data	▪ After the TOR endorsement, data collection must be carried out to obtain information of the existing environment and surroundings of the project site. ▪ Two approaches will be used for the data collection which are primary data and secondary data. i) Primary data: * site survey, ground-truthing and sampling programmes. ii) Secondary data: * relevant reports and literatures from various government departments and agencies; and * studies performed for other projects within the project's vicinity.	Chapter 4
7. Prepare EIA report	▪ The EIA study must covers the following main components: i) assess impacts of the project against baseline by comparing scenarios 'before project' and 'after project'; ii) predict impacts qualitatively and measure quantitatively; iii) identify and predict the environmental issues during pre-construction, during construction and operation stages of the project; iv) propose applicable pollution prevention and mitigation measures (P2M2s) during pre-construction, during construction and operation stages of the project; and v) provide post-EIA framework including Environmental Management Plan (EMP) and Environment Mainstreaming Tools (EMTs) programmes.	Chapters 5, 6 and 7

Table 1.5 (cont'd) Step-by-step guide for the EIA process

STEP	DESCRIPTION	REFERENCE IN THE GUIDELINE
7. Prepare EIA report (cont'd)..	▪ Project description must cover the following (refer *Attachment 1* for more detail): i) project location; ii) project components; iii) project activities; iv) project detailed design; v) infrastructure, utilities and amenities requirement; and vi) project implementation schedule.	Chapters 5, 6 and 7
8. Carry out stakeholders' engagement	▪ Upon completion of the draft EIA report, a stakeholder engagement must be carried out by the Project Proponent and assisted by the Qualified Person. ▪ The potential stakeholders are local communities, business operators etc., who are likely to be directly or indirectly affected by the project. ▪ The main objectives of these engagements are: i) to brief the stakeholders about the project, the potential environmental impacts and the proposed P2M2s; and ii) to seek stakeholders concern and feedback regarding the project. ▪ All findings from the public engagements shall be incorporated into the final EIA report.	Chapter 2
9. Completion of EIA report	▪ Key findings from all the relevant technical studies must be incorporated into the EIA report. ▪ The EIA report prepared by the Qualified Person must follow the format as documented in the EGiM and this Guideline.	Chapter 8
10. Submit EIA report and carry out Public Display	▪ Hard copy and soft copy (in PDF format) of the EIA report must be submitted to DOE for approval. ▪ Concurrently, the Project Proponent must engage major newspaper companies to advertise and announce the availability of the EIA report for public review. ▪ The proposed locations for the EIA report to be displayed must obtain prior approval from the DOE. ▪ The public can vet through the EIA report and give their comments to the DOE throughout the public display period.	Chapter 8
11. Post-EIA	▪ Once the EIA is approved, the Project Proponent must appoint a Qualified Person to prepare an EMP report for submission and approval from DOE. ▪ The Project Proponent must also implement the EMTs to ensure the project is regulatory-compliant and the environmental agendas are achieved.	Chapter 9

1.8 Structure of the Guideline

The Guideline for drainage and/or irrigation project is structured according to the chapters as shown below.

01 Introduction

- Introduces the Guideline covering the objectives, scope and structure.
- Provides the terms and definitions associated with drainage and/or irrigation projects and their interpretation.

02 Environmental Project Planning

- Provides a concise review of legislations, policies and guidelines relevant to drainage and/or irrigation projects.
- Describes the integration of environmental compliance into project planning.

03 Terms of Reference (TOR)

- Provides explanation on conducting screening and scoping of significant issues.
- Discusses key issues related to the project activities and its effects.
- Describes the composition of EIA Study Team Members.
- Present the structure and content for ESI and TOR reporting.

04 Environmental Baseline Data

- Provides an outline of the relevant baseline information required for incorporation into the EIA report.

05 Prediction and Evaluation of Impacts

- Provides the methodology and tools to identify, predict, evaluate and assess the significant environmental impacts.

06 Mitigation Measures

- Identifies appropriate Pollution Prevention and Mitigation Measure (P2M2) to minimise any negative impacts arising from the development of the project.
- Provides explanation on environmental offset programmes.

07 Post-EIA

- Provides explanation on environmental mainstreaming and GSR initiatives during post-EIA stage of the project.
- Stipulates framework for the Environmental Management Plan (EMP).
- Specifies the environmental monitoring and audit programmes.

08 Checklist

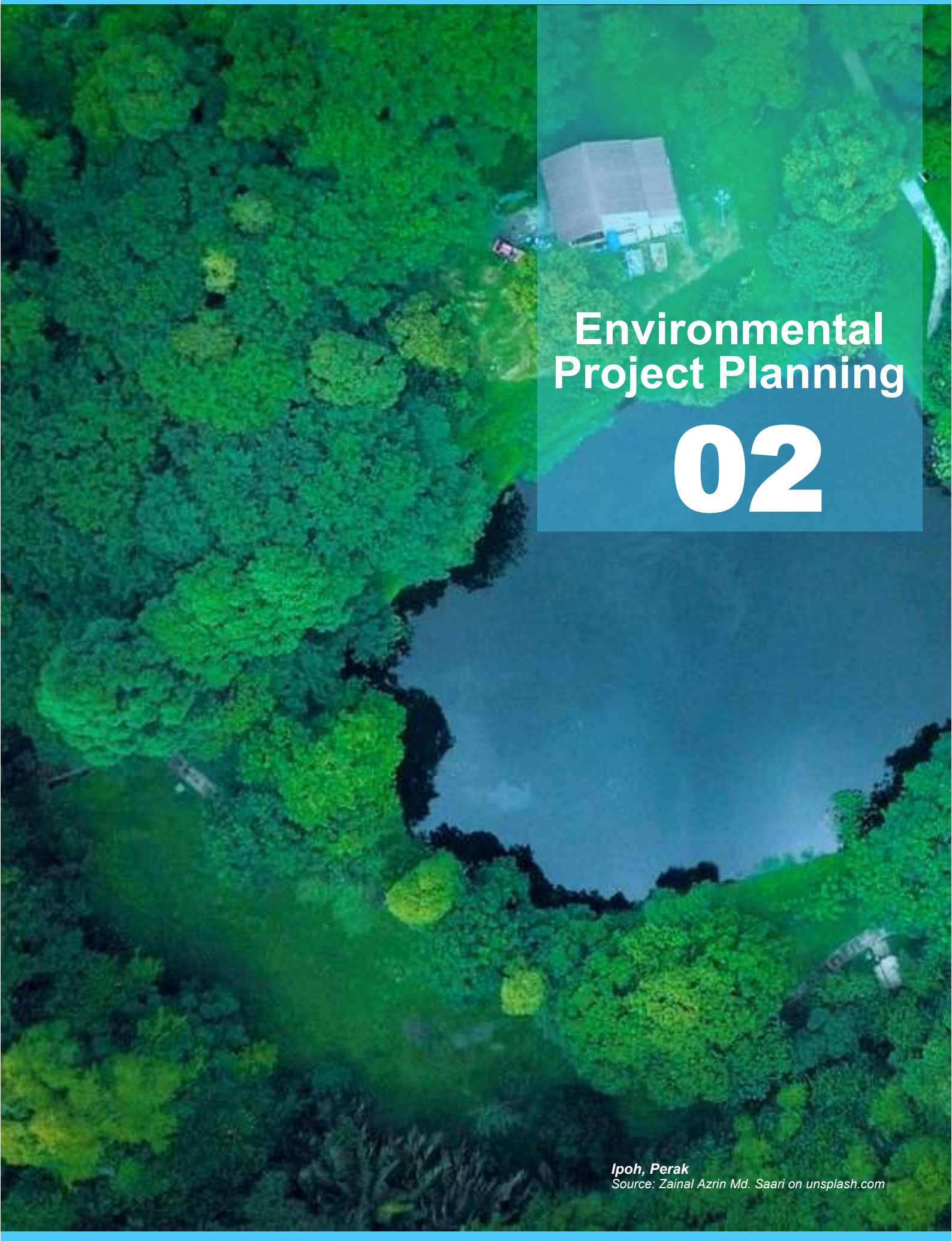
- Provides the checklist for environmental review criteria for TOR and EIA approval. The checklist is prepared to assist project proponents, consultant and DOE.

09 Report Format

- Outlines the format of an EIA report.

Environmental Project Planning

02



Ipoh, Perak
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Ipoh, Perak
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02

Environmental Project Planning

2.1 Introduction

This chapter highlights in general the concept of drainage and/or irrigation management projects in Malaysia and its relevant legislation, policies and guidelines. This includes the overall environmental project planning and the role of EIA as a tool to identify environmental constraints during the project planning stage.

2.2 Irrigation and Drainage in Malaysia

The total annual surface water resource is estimated to be 566,000 million m^3 per year and 26% of this is in Peninsular Malaysia, 54% in Sarawak and the remaining 20% in Sabah. Groundwater resource is estimated to have a safe yield of 14,700 million m^3 per year in Peninsular Malaysia, 5,500 million m^3 in Sarawak and 3,300 million m^3 per year in Sabah. Water is used for variety of purpose, largely for irrigation, industrial and domestic water supply and to a minor extent for mining and fisheries.

Irrigation is the largest consumer of water in Malaysia. The efficient use and management of water in agriculture will play a role for achieving sustainable water resources. Providing right amount of water to the crops at the right place, in the right time is the way forward. Under the National Agricultural Policy (NAP), it was formulated that agricultural growth will be pursued through moderate expansion of land and further intensification of land usage but with systematic and strategic irrigation and drainage planning, design and management approach.

2.3 Institutional and Legal Framework of Irrigation and Drainage in Malaysia

The responsibility of irrigation and drainage management, operation and maintenance is shared between Federal and State agencies. The Federal government has the responsibility of aiding the State government in socio-economic development of which irrigation and drainage development is one of them.

At the Federal level, irrigation and agricultural drainage is administered by the Bahagian Pengairan dan Saliran (BPSP) of Ministry of Agriculture and Food Industries while the implementation, operation and maintenance of the irrigation and drainage infrastructures usually are placed under the purview of respective agriculture development authority of that area.

2.3.1 Laws on Irrigation and Drainage

Drainage and irrigation development generally are covered under the Drainage Works Act 1954 and Irrigation Areas Act 1953 respectively. The enforcement of the Act shall apply to those irrigation and drainage areas that have been declared and gazetted by the State government. It should be noted that the irrigation and drainage areas that have not been declared and gazetted (e.g. irrigation areas owned and developed by private companies) are not covered under these Acts, but their agricultural activities shall be covered under other laws such as the Water Acts and the Environmental Quality Act 1974.

Every irrigation or drainage area shall be in the charge of Drainage and Irrigation Engineer or such other officer appointed by the appropriate authority.

2.3.2 Ownership of Water

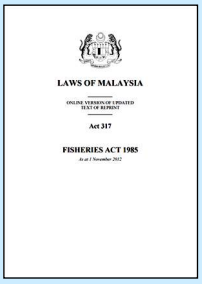
Various aspects of legislation relating to water, such as Waters Act 1920, vest ownership of water to the State government. Under this Act, “water” means any water, whether surface or underground and “watercourse” means any river including any tributary thereof, stream, reservoir, pond, lake, canal, channel, swamp, overflow area or groundwater aquifer.

For states that have their own water enactments, the usage of water requires licensing application to be made at the respective water regulating body.

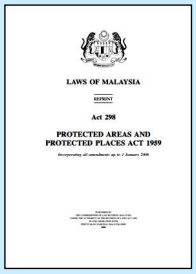
However, state licensing was not required for any Federal works. License to divert water from rivers for irrigation, may be granted under this Act.

2.4 Relevant Legislations

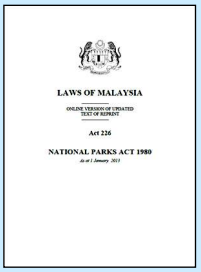
Other than the EQA 1974, other relevant federal laws shall also be referred to prior to any commencement of drainage and/or irrigation projects. The laws are as listed below (but not limited to).



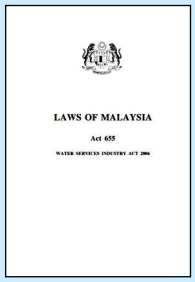
Fisheries Act 1985
This Act concerns the conserving, managing and developing any maritime and estuarine fishing and fisheries matters.



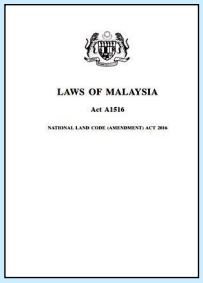
Protected Areas and Protected Places Act 1959
This Act is to provide for protected areas and places.



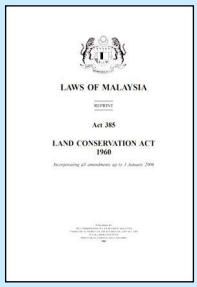
National Parks Act 1980
This Act preserves and protects flora and fauna within the National Park boundary.



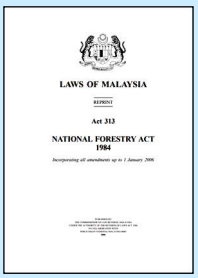
Water Services Industry Act 2006
This Act is to provide for and regulate water supply services and sewerage services and for matters incidental thereto.



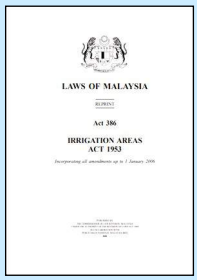
National Land Code 1965
This Act is to amend and consolidate the laws relating to land and land tenure, the registration of title to land and of dealings therewith.



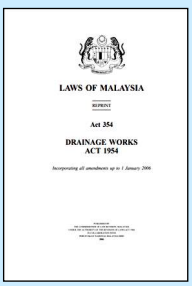
Land Conservation Act 1960
This Act relates to the conservation of hill land and the protection of soil from erosion and the inroad of silt.



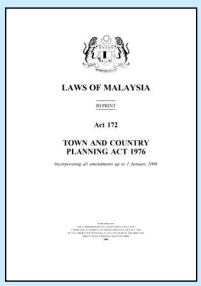
National Forestry Act 1984
This Act provides for the administration, management and conservation of forests and forestry development within the States of Malaysia.



Irrigation Areas Act 1953
This Act relates to the establishment and regulation of irrigation areas in Malaysia.



Drainage Works Act 1954
This Act relates to establishment and regulation of drainage area and drainage works in Malaysia that are not related to urban drainage.



Town and Country Planning Act 1976
All applications for planning permission for any coastal reclamation projects and construction of a major national infrastructure must seek advice from the National Physical Planning Council (NPPC). Prior to that, a Social Impact Assessment (SIA) must be submitted to PLANMalaysia for approval (if necessary).

2.4.1
Relevant State Laws

Below (but not limited to) are the relevant water acts in each state that are relevant to drainage and/or irrigation projects.

	**Johor** Water Enactment 1921
	**Kedah** ▪ Water Resources Enactment 2008 ▪ Kedah Waters Management Board Enactment 2007 ▪ Muda Agricultural Development Authority Act 1972
	**Melaka** ▪ Malacca River and Coastal Development Corporation Enactment 2005 ▪ Melaka Water Resources Enactment 2014
	**Selangor** ▪ Selangor Waters Management Authority Enactment 1999 ▪ Abstraction of Water Source (State of Selangor) Regulations 2012
	**Perak** ▪ Perak Water Act 1920 ▪ Perak Water Board Enactment 1988
	**Pulau Pinang** ▪ Water Supply Enactment 2004 ▪ Water Supply (Catchment Area) Order 2004

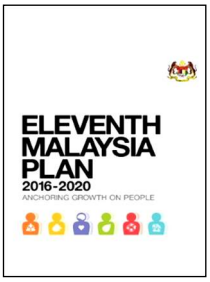
	**Terengganu** ▪ Terengganu Water Resources Enactment 2020 ▪ Water Supply Enactment 1998
	**Negeri Sembilan** Water Act 1920 (Revised - 2007) (Act 418)
	**Putrajaya** Water Act 1920 (Revised - 2007) (Act 418)
	**Kuala Lumpur** ▪ Water Act 1920 (Revised - 2007) (Act 418) ▪ Water Supply (Federal Territory Kuala Lumpur Act 1998) (Act 581)
	**Kelantan** Kelantan Water Resources Enactment 2019
	**Pahang** Pahang Water Resources Enactment 2007
	**Perlis** Water Supply Enactment 2006

2.5 Relevant Policies

National planning policies facilitate decision-making for development planning so as to control the type, location and quantum of the proposed development. Taking into account the sensitivity of an area, the planning policies also identify the locations of Environmentally Sensitive Areas (ESAs) and the types of development that are permitted in these areas.

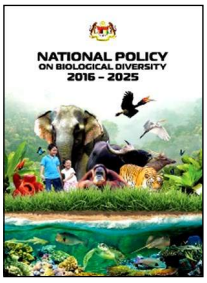
The national planning policies will be the guidance to formulate and prepare the local and regional planning policies. Below is a list (but not limited to) of the policies relevant to drainage and irrigation projects that can be referred to for EIA study purposes.

Sustainable Development Goals (SDG) (UNDP, 2015)
A blueprint under the United Nations to achieve a better and more sustainable future for all. They address the global challenges we face, including poverty, inequality, climate change, environmental degradation, peace and justice.

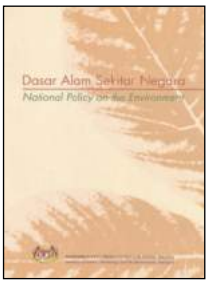


Five Year Malaysia Plan
Outlines the Malaysia's five-year development policies and strategies plan.

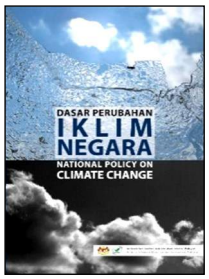
National Physical Plan (PLANMalaysia, 2015)
Provides physical planning plans for the implementation of sustainable development strategies.



National Policy on Biological Diversity 2016 – 2025 (NRE, 2016)
Provides direction and framework to conserve biodiversity.



National Policy on the Environment (Ministry of Science, Technology and the Environment, 2002)
Provides principles and strategies to ensure the environment remains productive, both ecologically and economically.

	**National Policy on Climate Change (NRE, 2010)** Provides framework to mitigate climate change in an integrated and balance manner.		**Central Forest Spine (CFS) Ecological Network Master Plan (PLANMalaysia, 2010)** Provides a general framework for development planning within and near to any identified ecological networks.
	**National Water Resources Policy (NRE, 2012)** Sets out strategies that will guide water resources stakeholders to structure actions for effective conservation and management of water resources.		**Malaysia National Forestry Policy 1978 (Revised 1993) (JPSM, 1993)** Conserve and manage the forests through sustainable management and maintain their critical roles in the national economy and preservation of environmental stability.
	**National Agro-food Policy (DAN) (MAFI, 2011)** Provide strategic direction on the development of agro-food industries in order to increase the capacity of national food production and advancing high-value agriculture.		**Green Technology Master Plan Malaysia 2017 – 2030 (MESTECC, 2017)** The master plan includes planning in the adoption and use of green technology in harnessing energy, water resources and managing wastes.

2.5.1 National Physical Plan (NPP) (PLANMalaysia)

The National Physical Plan (NPP) is the highest planning document in the national physical development plan framework. It contains physical plans that translate the strategic and sectoral policies of the nation in the context of spatial and physical dimensions.

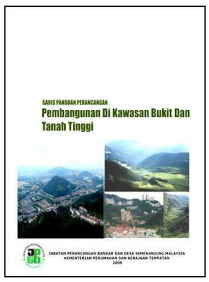
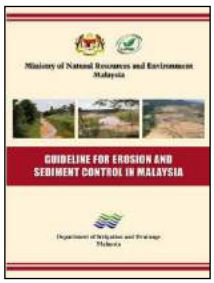
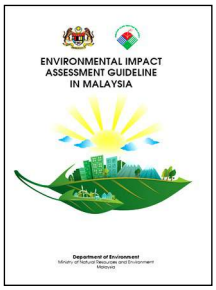
Under the Town and Country Planning Act 176 (Act 172), the National Physical Planning Council (NPPC) is established to ensure sustainable physical development. The NPPC is responsible for the formulation of related policies, coordination of physical development at national and regional levels, as well as giving advice on any applications referred to the NPPC.

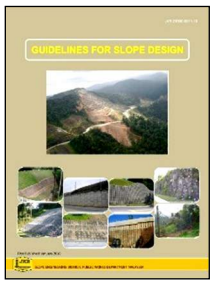
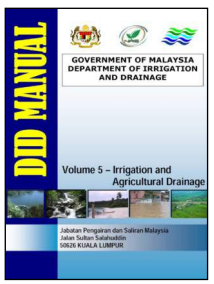
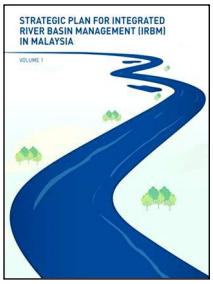
Under Section 22 (Subsections 2A) of Act 172, applications for planning permission involving development that may affect areas which have been designated as ESA in the development plan should be referred to the NPPC.

2.6 Relevant Guidelines and Guidance Documents

Guidelines pertaining to environment-related system and management must be cross-referred and incorporated in the EIA report. Any other relevant guidance documents such as notices or circulars issued by DOE or any other Government Agencies must also be incorporated in the EIA report.

Below is the list (but not limited to) of the guidelines and guidance documents relevant to drainage and/or irrigation projects that can be referred for EIA study purposes.

	**Garis Panduan Perancangan Pemuliharaan dan Pembangunan (GPPPP) Kawasan Sensitif Alam Sekitar (KSAS) (PLANMalaysia, 2017)** Provides the requirements for development in ESAs.		**Guidance Document Addressing Soil Erosion and Sediment Control (ESC): Aspects in the EIA Report as per Appendix 3 of the EGIM (DOE, 2016)** Guidance to address aspects of soil erosion and sediment control (ESC).
	**Garis Panduan Perancangan Pembangunan (GPPP) di Kawasan Bukit dan Tanah Tinggi (PLANMalaysia, 2009)** Provides the planning and management requirement for development in hilly, high lands, hill slopes and hill tops areas.		**Guidance Document for the Preparation and Submission of EMP as per Chapter 6 of the EGIM (DOE, 2016)** Guidance for the preparation of the EMP.
	**Guidelines for Erosion and Sediment Control in Malaysia (DID, 2010)** Guidelines for prevention and control of soil erosion and siltation for specific projects including examples of control measures and best management practices.		**Guidance Document for the Preparation of the Document on Land-Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2) as per Appendix 4 of the EGIM (DOE, 2016)** Guidance for the preparation of the LD-P2M2 document which is to be included as part of the EMP document for approval from DOE State.

	**Guidelines for Slope Design (JKR, 2010)** Provides geotechnical design criteria for slopes.		**Garis Panduan Jalan Hutan 2010 (Pindaan 2013) (JPSM, 2014)** Guidance for forest road management that includes phases of planning, construction, maintenance and closure of forest roads.
	**Garis Panduan Pembangunan Melibatkan Sungai dan Rizab Sungai (DID, 2000)** Provides proper planning and sustainable development involve the river and its reserve area.		**DID Manual Volume 5 – Irrigation and Agricultural Drainage (DID, 2009)** Guidance for the design of drainage for irrigation and agricultural purposes.
	Integrated Approaches under the National Water Resources Policy: ▪ Water Resources Management (IWRM) ▪ Integrated River Basin Management (IRBM) ▪ Integrated Lake Management (ILM) ▪ Integrated Coastal Zone Management (ICZM) ▪ Integrated Shoreline Management Plan (ISMP) ▪ Integrated Flood Management (IFM) Assists in structuring current practices towards better water resources governance, taking into consideration their unique application ranging from facilitating allocation to addressing hazards.		

2.7 Integration of Environmental Compliance into Project Planning

The Project Proponent is responsible of all legal requirements on environment begins from the planning stage up until the rehabilitation or abandonment stage. As such, an effective project planning requires involvement from many parties or stakeholders to ensure that it covers all relevant sectors. This includes a technical Project Team from the Project Proponent side in providing input and from various technical government agencies (GA).

A transparent and smooth integration between sectors must be established first in a Project Team in order to fulfil DOE's and GA's requirements. The EIA Consultant must be able to cross-refer various sectors in order to come up with a good environment findings that not only focusing during the EIA study but also during the post-EIA stage. A typical life cycle of a drainage and/or irrigation projects and relevant requirements in each stage is shown in *Figure 2.1* and the details are listed in *Table 2.1*.

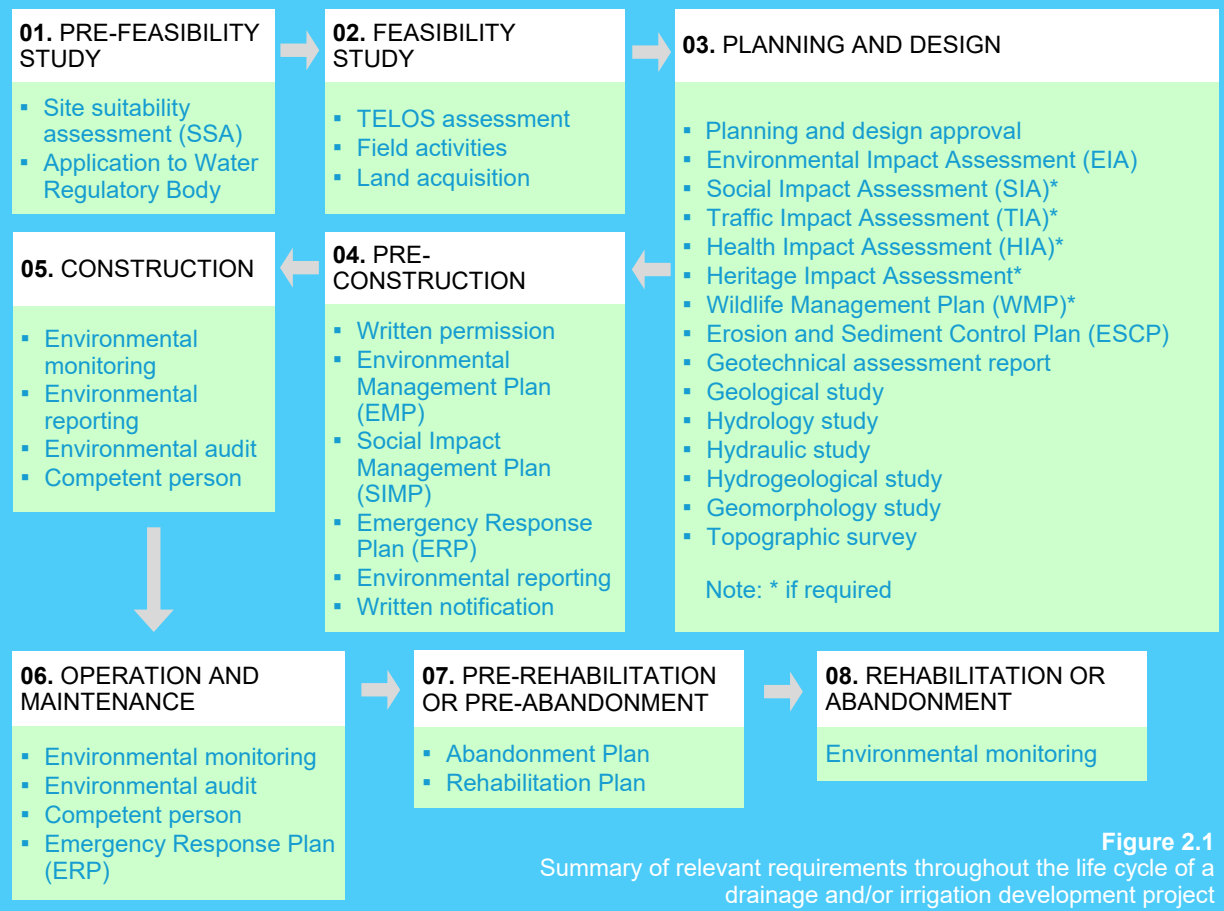


Figure 2.1
Summary of relevant requirements throughout the life cycle of a drainage and/or irrigation development project

Table 2.1 List of relevant requirements at various project implementation stage

REQUIREMENT	DETAILS	AGENCIES	LEGAL PROVISION
Pre-feasibility Study			
Site suitability assessment (SSA)	Identify a preferred site for development as detailed in Section 3.4 of the Chapter 3.	▪ Department Of Director General Of Lands And Mines (JKPTG) ▪ State Land and Mines Office (PTG) ▪ DID ▪ DOE ▪ MAFI ▪ DOA	NA
Application to Water Regulatory Body	Application for usage of water	State water regulating body	State water enactment

Note: The list is not exhaustive and not all the listed requirements are relevant to the project. It is the responsibility of the Project Proponent and the Qualified Person to determine the relevant requirements required for environmental assessment and compliance

Table 2.1 (cont'd) List of relevant requirements at various project implementation stage

REQUIREMENT	DETAILS	AGENCIES	LEGAL PROVISION
Feasibility Study			
TELOS assessment at the opted site	TELOS framework to assess five key areas: Technical, Economic, Legal, Organizational and Scheduling	NA	NA
Field activities	▪ Geological mapping ▪ Drilling ▪ Geophysical investigation	JMG	Geological Survey Act 1974 (Act 129)
Land acquisition	▪ No. of lots involved ▪ Land boundary ▪ Compensation plan	▪ Department Of Director General Of Lands And Mines (JKPTG) ▪ State Land and Mines Office (PTG)	National Land Code 1965 (Act 56)
Planning and Design			
Planning and design approval	Detailed design of each structure for the proposed project	▪ JKR ▪ DID ▪ BPSP	▪ Drainage Works Act 1954 ▪ Irrigation Areas Act 1953
Environmental Impact Assessment (EIA)	▪ TOR and ESI ▪ Statement of need ▪ Project options ▪ Project description ▪ Existing environment ▪ Evaluation of impacts ▪ Mitigation measures ▪ Post-EIA	DOE	Environmental Quality Act (EQA) 1974 (Act 127)
Social Impact Assessment (SIA)	▪ Project description ▪ Existing human environment ▪ Evaluation of social impacts ▪ Mitigation measures ▪ Post-SIA	▪ PLANMalaysia ▪ PLANMalaysia@Negeri	Town And Country Planning (Amendment) (Act 2017)
Traffic Impact Assessment (TIA)	▪ Project description ▪ Road and junction characteristics ▪ Traffic count survey ▪ Existing traffic condition evaluation ▪ Traffic forecast ▪ Evaluation of traffic impacts ▪ Mitigation measures ▪ Post-TIA	▪ JKR ▪ Local Council	▪ Road Transport Act 1987 (Act 333) ▪ Town And Country Planning Act 1976 (Act 127)
Health Impact Assessment (HIA)	▪ Project description ▪ Existing public health status ▪ Evaluation of health impacts ▪ Mitigation measures ▪ Post-HIA	Ministry of Health (MOH)	EQA 1974 (Act 127)
Heritage Impact Assessment	▪ Project description ▪ Land use assessment ▪ Existing heritage component ▪ Evaluation of heritage impacts ▪ Mitigation measures	Department of National Heritage	National Heritage Act 2005 (Act 645)

Note: The list is not exhaustive and not all the listed requirements are relevant to the project. It is the responsibility of the Project Proponent and the Qualified Person to determine the relevant requirements required for environmental assessment and compliance

Table 2.1 (cont'd) List of relevant requirements at various project implementation stage

REQUIREMENT	DETAILS	AGENCIES	LEGAL PROVISION
Planning and Design (cont'd)..			
Wildlife Management Plan (WMP)	▪ Project description ▪ Existing wildlife status ▪ Evaluation of wildlife impacts ▪ Mitigation measures ▪ Post-WMP	PERHILITAN	Wildlife Conservation Act 2010
Erosion and Sediment Control Plan (ESCP)	▪ Annual soil erosion rate ▪ Sediment yield ▪ Mitigation measures (erosion and sedimentation control measures) ▪ Inspection and maintenance	DID	Street, Drainage and Building Act 1974 (Act 133)
LD-P2M2	▪ Description of adjacent areas that may be affected by land disturbance ▪ List of BMP proposed ▪ Earthworks cut and fill volume ▪ Availability of materials ▪ Biomass management ▪ Spill prevention and control plan ▪ Soil loss prediction (pre, during and post development as well as with and without BMP scenarios) ▪ Projected runoff flows ▪ Calculation for BMP (sediment traps/ basins, check dams, etc.)	DOE	EQA 1974 (Act 127)
Geotechnical assessment report	▪ Project description ▪ Geology and terrain classification ▪ Site investigation ▪ Geotechnical design considerations ▪ Method statement ▪ ESCP plan ▪ Post-project slope and site maintenance ▪ Recommendations	▪ JMG ▪ JKR (Geotechnical Branch) ▪ IKRAM	Geological Survey Act 1974, No. 129
Geological and Hydrogeological study	▪ Project description ▪ Geological profile ▪ Permeability test ▪ Construction materials ▪ Groundwater regime ▪ Evaluation of impact ▪ Mitigation measures	JMG	Geological Survey Act 1974, No. 129
Hydrology study	▪ Project description ▪ Existing hydrology conditions ▪ Evaluation of impact ▪ Mitigation measures	DID	NA
Topographic survey	Topographical map of the project area	NA	Geological Survey Act 1974, No. 129

Note: The list is not exhaustive and not all the listed requirements are relevant to the project. It is the responsibility of the Project Proponent and the Qualified Person to determine the relevant requirements required for environmental assessment and compliance

Table 2.1 (cont'd) List of relevant requirements at various project implementation stage

REQUIREMENT	DETAILS	AGENCIES	LEGAL PROVISION
Pre-construction			
Environmental Management Plan (EMP)	▪ Project Proponent/ Contractor's Environmental Policy ▪ Organisational chart (EPMC and ERCMC) ▪ Training requirements ▪ Environmental Requirements (COAs, LD-P2M2 document) ▪ Environmental Mainstreaming Tools (EMTs)	DOE	EQA 1974 (Act 127)
Social Impact Management Plan (SIMP)	▪ Project description ▪ Existing human environment ▪ Social impact ▪ Enhancement/Mitigation measures ▪ Monitoring programme	▪ PLANMalaysia ▪ PLANMalaysia@ Negeri	Town and Country Planning Act 1976 (Act 172)
Written notification	Installation of equipment at site such as power generator	DOE	EQA 1974 (Act 127)
Environmental reporting	▪ Form EIA 1-18 – EIA Project Information status ▪ Form EIA 2-18 – EIA Approval Conditions Compliance Report		
Emergency Response Plan	▪ Emergency response overview ▪ Hazard and risk assessment ▪ Emergency response team ▪ Emergency response procedure ▪ Notification and communication ▪ Training requirement and schedule	NA	NA
Construction			
Environmental monitoring	Performance, compliance and impact monitoring: ▪ Water quality monitoring ▪ Noise monitoring ▪ Air quality monitoring ▪ Silt trap discharge monitoring ▪ LD-P2M2 structure	DOE	EQA 1974 (Act 127)
Environmental audit	▪ Audit site administrative details ▪ Regulatory compliance summary ▪ Audit findings ▪ Recommendations		
Environmental reporting	▪ Form EIA 1-18 – EIA Project Information status ▪ Form EIA 2-18 – EIA Approval Conditions Compliance Report		
Competent person	Environmental Officer (EO) ▪ Certified Erosion, Sediment and Storm Water Inspector (CESSWI) ▪ Certified Inspection of Sediment and Erosion Control (CISEC) ▪ Certified Professional Environmental Officer in EIA Project Development and Operation (CePEOEIA)		

Note: The list is not exhaustive and not all the listed requirements are relevant to the project. It is the responsibility of the Project Proponent and the Qualified Person to determine the relevant requirements required for environmental assessment and compliance

Table 2.1 (cont'd) List of relevant requirements at various project implementation stage

REQUIREMENT	DETAILS	AGENCIES	LEGAL PROVISION
Construction (cont'd)..			
Emergency Response Plan	▪ Emergency response overview ▪ Hazard and risk assessment ▪ Emergency response team ▪ Emergency response procedure ▪ Notification and communication ▪ Training requirement and schedule	NA	NA
Operation and Maintenance			
Environmental monitoring	Performance, compliance and impact monitoring: ▪ Water quality monitoring ▪ Noise monitoring ▪ Air quality monitoring	DOE	EQA 1974 (Act 127)
Environmental audit	▪ Audit site administrative details ▪ Regulatory compliance summary ▪ Audit findings ▪ Recommendations		
Environmental reporting	▪ Form EIA 1-18 – EIA Project Information status ▪ Form EIA 2-18 – EIA Approval Conditions Compliance Report		
Competent person	Environmental Officer (EO) ▪ Certified Erosion, Sediment and Storm Water Inspector (CESSWI) ▪ Certified Inspection of Sediment and Erosion Control (CISEC) ▪ Certified Professional Environmental Officer in EIA Project Development and Operation (CePEOEIA)		
Authorized person	Drainage and Irrigation Engineer	▪ BPSP ▪ Agriculture development authority ▪ DID	▪ Irrigation Areas Act 1953 ▪ Drainage Works Act 1954
Emergency Response Plan	▪ Emergency response overview ▪ Hazard and risk assessment ▪ Emergency response team ▪ Emergency response procedure ▪ Notification and communication ▪ Training requirement and schedule	NA	NA
Pre-rehabilitation and Pre-abandonment			
Abandonment plan	Overall abandonment strategy	DOE	EQA 1974 (Act 127)
Rehabilitation plan	Remedial Action Study (Interim and Long Term Measures) ▪ Alternative risk reduction options ▪ Cost of each alternative ▪ Level of risk reduction ▪ Environmental and social impacts ▪ Mitigation measures	▪ DOE ▪ DID	EQA 1974 (Act 127)
Rehabilitation and Abandonment			
Environmental monitoring	Performance, compliance and impact monitoring: ▪ Water quality monitoring ▪ Noise monitoring ▪ Air quality monitoring	DOE	EQA 1974 (Act 127)

Note: The list is not exhaustive and not all the listed requirements are relevant to the project. It is the responsibility of the Project Proponent and the Qualified Person to determine the relevant requirements required for environmental assessment and compliance

2.7.1
Project Team

In order to ensure that all relevant requirements listed in *Table 2.1* are fulfilled, the Project Proponent is advised to form a Project Team. The Project Team members comprise the EIA Study Team and other technical or engineering consultants responsible for other components of the project. This can be illustrated as per *Figure 2.2*.

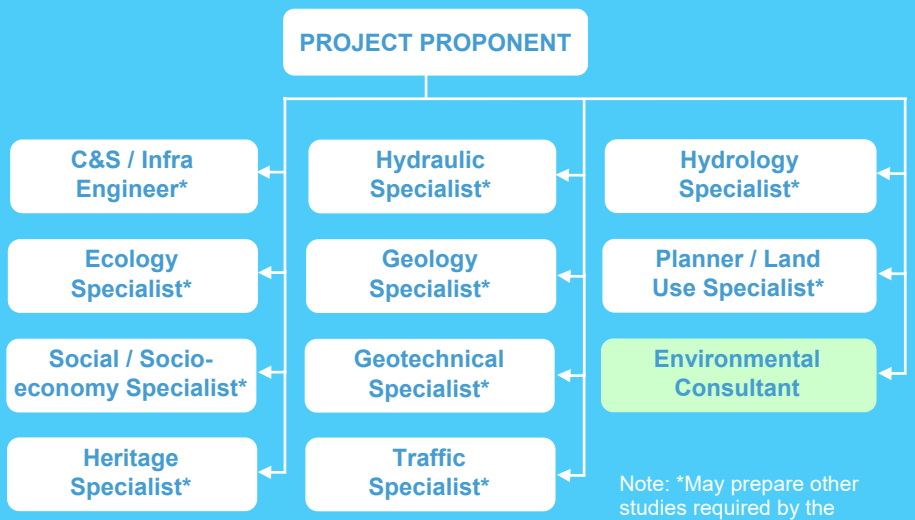


Figure 2.2
Organisation chart of project team

The **Project Team** members must:

01 provide sufficient input in ensuring that a comprehensive of the relevant technical studies are prepared; and

02 advice the Project Proponent with accurate information so that the Project Proponent can make informed holistic decisions.

Table 2.2 shows the studies typically required in a project and each Project Team member's roles.

Table 2.2 Typical project team members' roles and relevant studies

PROJECT TEAM MEMBER	STUDY / SECTOR	ROLE	ASSESSMENT AUTHORITY
Project Proponent	Fully responsible for the project starting from planning stage until rehabilitation or abandonment stages. Provide project information: ▪ Project title ▪ Project location ▪ Land title ▪ Statement of need ▪ Project options ▪ Project concept and description ▪ Project layout plan and components ▪ Method statement ▪ Sources of construction materials ▪ Spoil disposal areas ▪ Biomass disposal areas ▪ Transport route and temporary access ▪ Project implementation schedule and phasing		NA
EIA Consultant (Registered with DOE Malaysia)	 Environmental Impact Assessment (EIA)	▪ Identify ESAs ▪ Assess impacts of the project on the environment ▪ Propose P2M2 ▪ Propose EMP framework	DOE
Planner / Land Use Specialist	 Land Use Study	▪ Identify ESAs / buffer zone ▪ Prepare Development Proposal Report (LCP) ▪ Conduct viewscape assessment	PLANMalaysia
Geology Specialist (must be registered with Board of Geologist)	 Geological/ Hydrogeological Study	▪ Determine geological characteristics of the project area ▪ Identify potential groundwater locations present within or near the project area ▪ Assess impact to the geology/ hydrogeology of the surrounding area	JMG
Geotechnical Specialist	 Geotechnical / Foundation Study	▪ Conduct geotechnical assessment ▪ Design structure's foundation	▪ JMG ▪ JKR (Geotechnical Branch)
Civil and Structure / Infrastructure Engineer	 River Hydraulic and Hydrology Study	▪ Assess the river's hydraulics and hydrology ▪ Design drainage masterplan	DID

Table 2.2 (cont'd) Typical project team members' roles and relevant studies

PROJECT TEAM MEMBER	STUDY / SECTOR	ROLE	ASSESSMENT AUTHORITY
Coastal Engineer / Hydraulic Specialist	 Coastal Hydraulic	▪ Assess the coastal hydraulics ▪ Design coastal structures	DID
Ecology Specialist	 Ecology Impact Assessment	▪ Conduct impact assessment on ecology ▪ Propose mitigating measures	▪ DOF ▪ PERHILITAN ▪ JPSM
Social / Socio-economic Specialist (Registered with Malaysian Association of Social Impact Assessment)	 Social Impact Assessment (SIA)	▪ Conduct impact assessment on social ▪ Propose Social Impact Management Plan (SIMP)	▪ PLANMalaysia ▪ Local Council
Traffic Specialist	 Traffic Impact Assessment (TIA)	▪ Conduct impact assessment on present traffic conditions ▪ Predict traffic conditions in the future ▪ Propose upgrading or new roads if necessary	▪ JKR ▪ Local Council
Civil and Structure / Infrastructure Engineer	 Earthwork Plan	▪ Design the platform level ▪ Calculate cut and fill volume ▪ Determine project phasing	▪ DID ▪ Local Council
Civil and Structure Engineer	 Erosion and Sediment Control Plan (ESCP)	▪ Prepare ESCP layout ▪ Design BMPs	▪ DID ▪ Local Council
Environmental Consultant	 Environmental Management Plan (EMP)*	▪ Prepare EMP based on EIA COAs ▪ Prepare LD-P2M2 document ▪ Propose monitoring programme and audit framework	DOE
Environmental Consultant	 Environmental Monitoring Report*	▪ Conduct environmental monitoring as required in the approved EMP ▪ Prepare monitoring report	DOE

Note: *Post-EIA (described in Chapter 7 of this Guideline)

2.8 Stakeholders Engagement

The identification of stakeholders involved with the proposed project is important to ensure that the EIA study is carried out holistically whereby all relevant parties were engaged adequately. This is to ensure relevant information are obtained to assist in the decision making process for both the Project Proponent and also the approving authorities.

There are three stages of stakeholders engagement in an EIA study which are:

01 Preliminary Stakeholders Engagement

It is important for the Project Proponent to carry out stakeholders engagement prior to preparing the TOR and ESI reports. Constant engagement with DOE is advisable (via the designated officer in charge), including relevant government agencies (GAs). This is to ensure that the scoping is comprehensively covered in the EIA report.

02 Engagement during the preparation of EIA

Stakeholders' input is also an important factor in an EIA study. The stakeholders' engagements in the form of Focus Group Discussions (FGDs) or public dialogues must be conducted under the socio-economic study in the EIA. All comments both positive and negative and the responses must be compiled in the EIA report and submitted to DOE for department's record.

03 Engagement after the final EIA report is complete

During the EIA review process by the EIATRC, public display of the EIA report at public areas approved by DOE must be carried out. At this stage, the public is able voice their concerns via written comments to the DOE. Separate engagement with the Project Proponent and stakeholders can be also be done at this stage.

2.8.1
Identification of Stakeholders

The potential stakeholder engagements for drainage and/or irrigation projects can be categorized into six main categories as shown in *Figure 2.3*. It is imperative that the stakeholders engagement must cover the extent of the Zone of Impact (ZOI). If the forecasted ZOI spreads into a neighbouring state, the engagement shall also include stakeholders from the affected area.

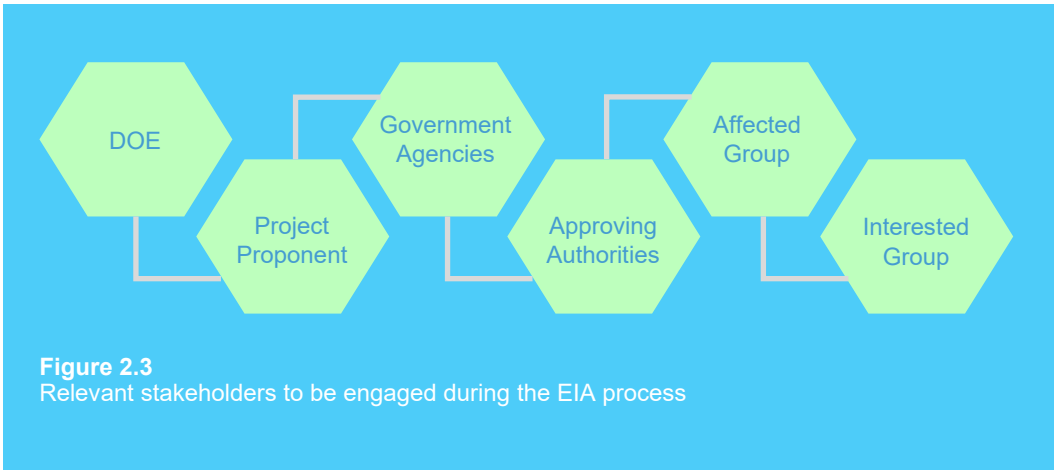


Figure 2.3
Relevant stakeholders to be engaged during the EIA process

2.8.2
Roles and Responsibilities

Table 2.3 lists the potential stakeholders to be considered for the stakeholders engagement. Representatives from government agencies (GAs) and Non-Governmental Organisations (NGOs) will also be engaged to seek for their opinion or feedback on the project. It is important for these representatives to highlight the relevant issues and give feedback of the project to be incorporated in the TOR and EIA. The representatives sent for these engagements should be the same representatives to attend the TORAC and EIATRC meetings (if not, handed over to the replacement) to guarantee continuity of the input provided.

Table 2.3 Roles and responsibilities of stakeholders

POTENTIAL STAKEHOLDERS	ISSUE/IMPACT OF INTEREST	ROLES AND RESPONSIBILTY
Department of Environment (DOE)	▪ Water quality degradation ▪ Air quality degradation ▪ Waste management	Assess and approve / reject the EIA report based on the EIA guideline
Local Council	Area management	▪ Issue Development Order approval (if required) ▪ Ensure local plan and special management area are considered ▪ Ensure EIA has addressed all relevant sectors adeptly ▪ Highlight any licensing issues related to the development
JKPTG/PTG/ PTD	▪ Land status compliance ▪ Land acquisition ▪ Minerals release	▪ Ensure that the Project Proponent owns the land and the status is correct with its intended development type ▪ Ensure there are no constraints on the land that may prohibit it from being developed
Economic Planning Unit (EPU)	Economic benefits	Ensure alignment with relevant national economic policies
Department of Irrigation and Drainage (DID)	▪ Flooding ▪ Coastal / River bank erosion and sedimentation ▪ River diversion ▪ River reserves	▪ Endorse Hydrology and Hydraulic Study ▪ Ensure DID Guidelines are adhered to (e.g.: MSMA, ISMP, ICZM, IWRM, ILM, IFM, IRBM) ▪ Ensure any flow regimes are not affected ▪ Ensure no major erosion and sedimentation ▪ Erosion and Sediment Control Plan (ESCP)
Fisheries Development Authority of Malaysia (LKIM)	Fishermen livelihood	Adhere to Fisheries Development Authority of Malaysia Act 1971 (Act 49)
Malaysian Public Works Department (JKR) / Malaysian Highway Authority (LLM)	▪ Level of Service (LoS) of nearby JKR road ▪ Building code and standard ▪ Road design specification	Ensure compliance to all JKR / LLM Guidelines and Manuals

Table 2.3 (cont'd) Roles and responsibilities of stakeholders

POTENTIAL STAKEHOLDERS	ISSUE/IMPACT OF INTEREST	ROLES AND RESPONSIBILTY
JKR (Geotechnical Branch)	▪ Slope design specification ▪ Geotechnical	Ensure compliance to all JKR Guidelines and Manuals
Department of Mineral and Geoscience Malaysia (JMG)	▪ Slope stability and protection requirements ▪ Geological conditions ▪ Soil conditions and suitability ▪ Geological Terrain Mapping (GTM) requirements	▪ Ensure topography, terrain and geological features within the site is suitable for development ▪ Ensure compliance to Mineral Development Act 1994 (Act 525) and Geological Survey Act 1974 (Act 129) ▪ Ensure adherence to all JMG Guidelines
Forestry Department of Peninsular Malaysia (JPSM)	▪ Logging / Forest clearing ▪ Logging Management Plan	▪ Ensure adherence to the National Forestry Act 1984 (Act 313) and CFS ▪ To determine the status of the forest, ensuring it can be developed and is not within PRF, water catchment, etc. ▪ Facilitate and coordinate with DOE on LD-P2M2 implementation particularly on management of *matau*, skid trails and access roads (*jalan hutan*)
Department of Wildlife and National Parks Peninsular Malaysia (PERHILITAN)	▪ Wildlife ▪ Terrestrial fauna ▪ Wildlife Management Plan (WMP)	▪ Ensure adherence to the Wildlife Conservation Act 2010 (Act 716) ▪ To determine the sensitivity of site in terms of flora and fauna species and constraints for development
Jabatan Kemajuan Orang Asli (JAKOA)	Development requirements within Orang Asli settlements and their roaming areas, agriculture plots, cultural, heritage, religious and archaeological sites	▪ Ensure adherence to the Aboriginal Peoples Act 1954 (Revision 1974 (Act 134) ▪ Ensure that the area is not occupied by Orang Asli community and if so, how to manage impacts
State Water Operators (Air Selangor, SATU, SAINS etc.)	Water supply service	▪ Ensure no impact on water supply ▪ Work together with BKSA
Water Regulatory Body	Water resources	▪ Ensure conservation of water resources, river basin, coastal waters and the surrounding environment ▪ Ensure compliance to State's BKSA laws ▪ Work together with water operators ▪ Issue license ▪ Enforcement and prosecution under the State's law
Department of Fisheries (DOF)	▪ Loss of marine / aquatic habitat ▪ Encroachment of marine parks ▪ Aquaculture production ▪ Fishermen livelihood ▪ Fisheries Management Plan	▪ Ensure compliance to Fisheries Act 1985 (Act 317) and its regulations ▪ Assess impacts on fisheries are minimised or none ▪ Ensure offset programmes or fisheries plan are undertaken and monitored to mitigate any loss of habitat

Table 2.3 (cont'd) Roles and responsibilities of stakeholders

POTENTIAL STAKEHOLDERS	ISSUE/IMPACT OF INTEREST	ROLES AND RESPONSIBILTY
PLANMalaysia	▪ ESAs within the project area ▪ Land use conflict ▪ Planning guidelines ▪ Buffer zone ▪ Social Impact Assessment (SIA) requirements	▪ Ensure that the National Physical Plan (NPP), State Structure Plan and Local Plan are complied with ▪ Ensure other planning policies are adhered to (e.g.: CFS, NWRP, National Forestry Policy, National Policy on the Environment, National Action Plan for Peatland) ▪ Ensure ESAs are not significantly impacted ▪ To determine the need of SIA
National Water Services Commission (SPAN)	▪ Water supply system ▪ Sewerage system	Ensure compliance to Suruhanjaya Perkhidmatan Air Negara Act 2006 (Act 654), Water Service Industry Act 2006 (Act 655) and their regulations
Ministry of Health (MOH)	▪ Health impact ▪ Type of diseases	Ensure adherence to all MOH Guidelines in establishing workers' camp / quarters
JUPEM Department of Survey and Mapping Malaysia (JUPEM)	▪ Topography ▪ Bathymetry	▪ Confirm the Project boundary ▪ Ensure that the latest reference map from JUPEM is referred to
Regional Development Authorities (IRDA, NCIA, etc.)	Regional matters	Ensure the EIA has addressed all relevant sectors adeptly
Attorney General Chambers (AGC)	▪ National and international laws ▪ Legal compliance	Check that all relevant laws and legislations are complied with
Affected groups: ▪ **Local community including *Orang Asli*** ▪ **Business owner** ▪ **Land owner**	▪ Give relevant inputs for protection of local interest ▪ Give feedback to the impact findings	
Interest groups: ▪ **NGOs relevant to the environment sector** ▪ **Specialists** ▪ **Environmental practitioners**	Provide inputs based on their technical knowledge and expertise	

2.8.3
Method of Engagement

The stakeholder engagements can be done via various methods e.g. by having direct interview, focus group discussion (FGD), public dialogue, workshop, exhibition and road show, and round table discussion. Details of these methods are listed below.

Direct Interview

- Useful for obtaining specific information and attitudes from wider stakeholders in the early stages as well as useful in exploring more complex issues from key stakeholders later in the project design stage.
- Typical questionnaire method to gather socio-economic data, with questions typically covering:
  - Information on head of the household
  - Information on household numbers
  - Education of household
  - House and housing condition
  - Transport and vehicle ownership
  - Land ownership (or occupation)
  - Livestock
  - Income and expenditure
  - Perceptions regarding the project
  - Perceptions regarding constraints to agricultural development
  - Attitude to resettlement (readiness to move)
  - Preferred areas for resettlement and income-producing activities

Focus Group Discussion (FGD)

- Involves small groups (recommended 6-12) of people, which are asked questions by an experienced facilitator.
- Allows facilitator to probe emerging issues.
- It is resource intensive and may be more appropriately used later in the process.

- Enable presentation of project information to the general public.
- Allow large numbers of people to be involved in some limited discussion.
- Need to be carefully managed to ensure all views are heard.

Public Dialogue

Workshop

- Structured group discussions designed to solve problems and identify ways forward.
- Useful in bringing different groups of experts together and require experienced facilitators as well as careful explanation to the attendees.

- Useful way of presenting project information and options to the public, especially local communities.
- Able to reach large numbers of people if well -advertised.
- Allows face-to-face feedback of information.

Exhibitions and Road Show

Round Table Discussion

- Facilitated debates between groups with different views with the aim of reaching consensus.
- Useful for engaging specialist interest and single-issue groups.

2.8.4
Documentation and Reporting

Details of the stakeholders engagement done throughout the EIA study must be properly recorded and presented in the EIA report. The details include:

01 Basic information of each engagement (date and venue);
02 Particulars of the respondents;
03 Sample of questionnaire (survey form);
04 Findings; and
05 Voice or video recordings (optional).

Any feedback or comments from the stakeholders shall be properly addressed and responded. The response shall also be included in the EIA report.

Terms of Reference

03

Sekinchan, Selangor
Source: Chan Weng Hang on unsplash.com

Sekinchan, Selangor
Source: Chan Weng Hang on unsplash.com

03

Terms of Reference

3.1 Introduction

Undertaking the Terms of Reference (TOR) is the first major procedure in the overall EIA process. However, for First Schedule EIA, the TOR document submission is no longer required. Nonetheless, the scoping process (main component of the TOR) is still an essential exercise that needs to be carried out at the early stage of the EIA study. The key objectives in conducting the scoping process are:

01	to assess suitability of the project site and refine the project boundary according to the environmental sensitivity of the surrounding area;
02	to determine the zone of study (ZOS) and zone of impact (ZOI);
03	to identify baseline data required to be assessed for the project;
04	to outline the key project activities during the various stages of the project implementation namely pre-construction, construction and operation;
05	to identify existing environmental issues within the EIA study boundary which cover physical, biological and social components;
06	to identify significant impacts and non-significant impacts of the project which are also to be categorized accordingly. All impacts during the various stages of the project implementation namely pre-construction, construction and operation must be identified;
07	to identify and detail out the methodologies and assessment tools to be used in the EIA for the identified significant impacts; and
08	to propose applicable P2M2s to reduce the significant impacts.

As such, the Qualified Person must carry out environmental scoping to identify the potential adverse environmental issues of concern in order to determine the focus, scope and content of the First Schedule EIA while for Second Schedule EIA, it is done to produce a comprehensive TOR document for submission to DOE.

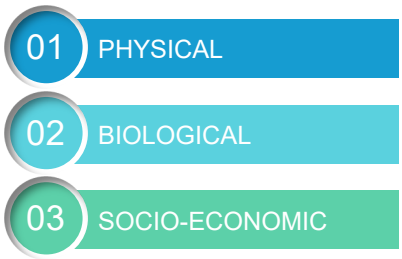
The TOR document will be complemented by an ESI which provides further elaboration and serves as evidence on how the TOR of an EIA project is formulated. An ESI must focus mainly on the important issues and significant impacts to be addressed or covered by the Project Proponent in the EIA. Resources must not be expended on matters that are trivial. Fundamentally, a TOR document can be considered as the “executive summary” of an ESI.

3.2
Environmental Screening

A preamble of the environmental scoping and TOR preparation is conducting environmental screening whereby it determines whether a proposed project is subject to a regulatory provision requiring an EIA as defined in Section 1.4 of **Chapter 1.**

3.3
Environmental Scoping

The environmental scoping is essential to identify the environmental attributes and issues associated with the project. This is to determine the focus, depth, spatial and temporal boundaries of the EIA study that are significant and require assessment. The scoping must cover all aspects of:



In overall, *Figure 3.1* illustrates the flow path for environmental scoping.

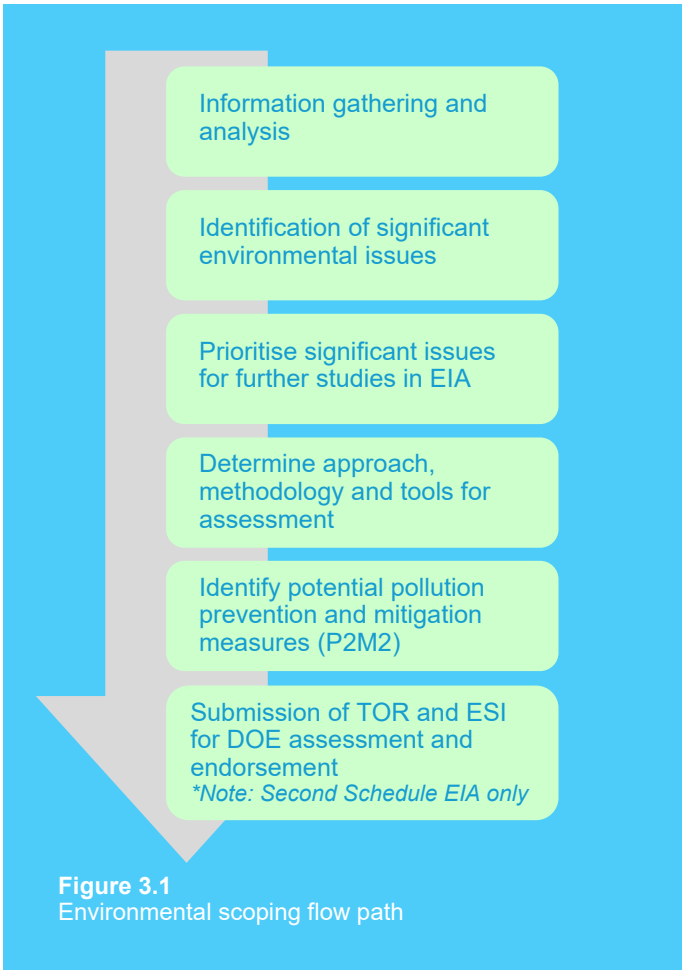


Figure 3.1
Environmental scoping flow path

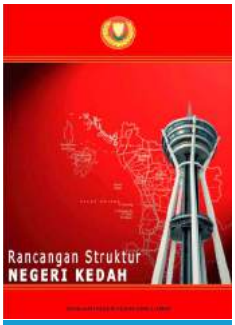
3.4
Site Suitability Assessment (SSA)

The identification of a suitable site is normally undertaken within a short time frame and based on general criteria such as technical constraints, availability of land, and costs in respect of land, utilities and infrastructure facilities required. Environmental issues and effects now form additional matters which need to be taken into account in site selection. In order to achieve this, SSA is introduced as a method for site selection.

It is imperative that the nature of the proposed project must be in line with what was gazetted in the planning policies in order to avoid land use incompatibility issues. The project must conform to all hierarchy levels of the planning policies namely:

National

- NPP, RFZPPN,
- CFS, KSAS, etc.



State

- State structure plan

Regional

- Regional Development Planning Policy

Local

- Local plan

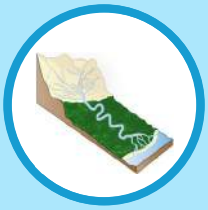
Comments on SSA shall be incorporated in the EIA report. There may be a situation where the proposed project site or location may not contradict with the approved development plans or any other guidelines but the site exhibits certain critical characteristics (e.g. geomorphological features) that may present a particularly formidable constraint to the project. In such situation, the Consultant shall thoroughly examine the suitability of the site and state its conditions in the EIA report.

The following shows some of the considerations that shall be made in assessing the suitability of the project site.

CONSIDERATIONS FOR SSA

Project Siting

- Adherence to national, state and local policies and plans such as National Physical Plan (NPP)
- Site constraints to the project and vice versa
- Location and proximity to sensitive receptors
- Buffer/setback availability and requirements (project buffer zone)



Hydrology

- Site hydrology and drainage patterns
- Water-holding capability
- Evaporation rates
- Storage zones
- Seismicity
- Sedimentation (avoid downstream area)

Accessibility

- Availability of access
- Proximity to construction/ source materials
- Strategic locational advantages
- Traffic conditions

Terrain and Topography

- Availability of land for buffers
- Slope classification and degree
- Conditions of the site (hilly, steep slopes, flood risk, geohazards, etc.)
- Soil conditions
- Visual/aesthetic impacts

Project Component and Design

- Layout consideration
- Choice of method statement

Pollution Prevention and Mitigation Measures (P2M2) Technology Options

- Availability of technology to minimise impacts
- Best available control technology (BACT) options
- Benchmarking with alternative technology
- Green technology adoption

Social

- Need for land acquisition or relocation
- Location for workers camp
- Location within or close to sensitive area and historical sites, cemeteries, places of worship, Orang Asli settlements and their roaming areas
- Location within or close to populated areas and scenic areas

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

The site selection criteria for drainage and/or irrigation projects are listed below:

Land use

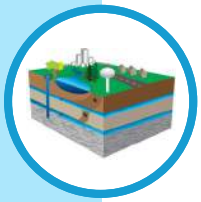
- Must be within the area declared as drainage or irrigation area as per their respective Act
- Location must consider the viability of the project and the are it is supposed to serve

Terrain and Topography

- Must be suitable for drainage and/or irrigation purposes
- Appropriate elevation for water flow
- Suitable terrain for agricultural operation

Hydrology

- Good hydrological conditions with suitable ground water table
- Sufficient hydrological flow to agricultural and environmental flow demand
- Low percolation losses in reservoir or canal
- Avoid sites with mineral deposits



Geology

- Suitable soil type for agricultural purposes which can minimize the requirement for soil modification

Accessibility

- Easily accessible, economically connected to major road network
- Construction materials should be available either locally or near vicinity of the site (to reduce transportation cost)

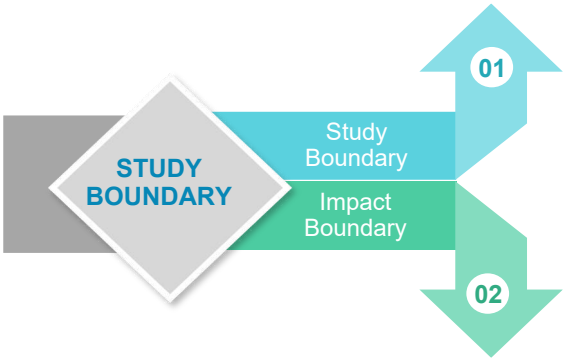
Water Pollution

- Avoid or exclude water from tributaries carrying high percentage of silt in water
- Good water quality for irrigation use

A ‘No Project’ option shall also be assessed and its implications discussed comparatively with the ‘With Project’ option.

3.5 Study Boundary

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



- This defines the Zone of Study (ZOS)
- In terms of criteria, the ZOS is the study area generally encompassing a 5 km radial zone from the project boundary (refer to *Figure 3.2*)
- For linear projects such as irrigation canal, the ZOS shall cover a 1 km corridor (500 m on either side of the ROW) (refer to *Figure 3.3*)
- In terms of criteria, the ZOS is left to the Qualified Person to define the limits of the spatial boundary

- This defines the spatial area of potential impacts hence, this area is termed the Zone of Impact (ZOI) (refer to *Figures 3.2* and *3.3*)
- The ZOI may decrease or extend further afield, depending on various factors
- The extent of the ZOI shall also be subject to the findings of the Consultant and as advised by relevant technical agencies

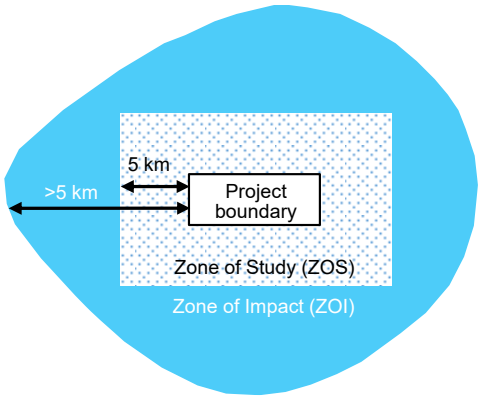


Figure 3.2
Extent of ZOS and ZOI

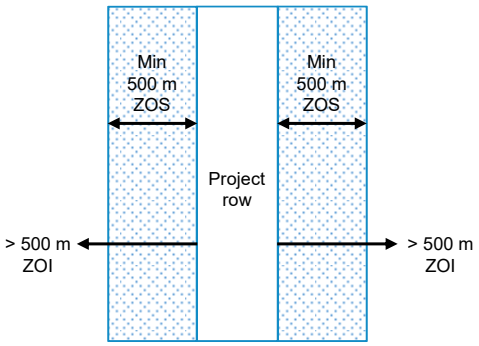


Figure 3.3
Extent of ZOS and ZOI for linear projects

The boundary for both ZOS and ZOI may extend over the boundary of a neighbouring state. If that is the case, it is imperative for the study and the stakeholders engagement to cover the affected area in the neighbouring state as well.

3.6 Baseline Data Review

The baseline information must be sufficiently adequate to assess the potential impacts on the ESAs. Quantitative data and findings wherever available, must be provided to support the assessment. *Table 3.1* provides the indicative requirements for baseline description in the environmental scoping exercise.

For Second Schedule EIA, if any of the baseline data is unavailable at the time of scoping, the Qualified Person must state in the TOR that the data will be made available in the EIA report. Irrelevant and insignificant baseline data requirements can be omitted and reasons are addressed in the TOR.

Table 3.1 Baseline data requirements for environmental scoping

ENVIRONMENTAL COMPONENT	TYPE OF DATA	DATA SOURCE
Physical		
 Land Use	▪ Land use maps and its surrounding area ▪ Photos ▪ Description of existing and future land use (5 km ZOS)	▪ Topography maps (JUPEM) ▪ Aerial or satellite imagery ▪ Structure and local plans (PLANMalaysia) ▪ Ground truthing
 Geology/ Hydrogeology	Description of local and regional geology	▪ Geological and hydrogeological maps (JMG) ▪ Geological Terrain Mapping (GTM) report
 Soil Characteristics	▪ Soil profile ▪ Particle size distribution ▪ Construction suitability map	▪ Soil investigation (SI) report ▪ Soil map (DOA)
 Terrain	Topography and slopes	▪ Topography map ▪ Site survey
 Climate	Climate data (min 5 years)	Malaysian Meteorological Department (METMalaysia)

Table 3.1 (cont'd) Baseline data requirements for environmental scoping

ENVIRONMENTAL COMPONENT	TYPE OF DATA	DATA SOURCE
Physical		
 Hydrology	▪ River systems ▪ Catchment areas ▪ Flood prone areas ▪ Downstream receptors	▪ Hydraulic and hydrology report ▪ Topography map ▪ Flood map (DID)
 Water Quality	▪ Historical water quality data ▪ Surface water quality ▪ Groundwater quality*	▪ Published reports by water agencies and DOE ▪ State water resources departments ▪ Field data collection
 Air Quality	Historical air quality data	▪ Published reports by DOE ▪ Field data collection
 Noise and Vibration Level	Location of noise polluting sources	Field data collection
Biological		
 Ecosystem (terrestrial flora and fauna, fisheries, marine flora and fauna)	▪ Existing ecology and habitats ▪ Presence of endemic, rare, threatened, endangered and near extinct flora and fauna	▪ Published reports by PERHILITAN and JPSM ▪ Ground truthing and field data collection
Social		
 Demography	▪ Demographics data ▪ Stakeholders	▪ Population census (Department of Statistics) ▪ Local Plans (PLANMalaysia)
 Public health	Public health status	Morbidity statistics and public health data (MOH)

Note: * If groundwater is used for irrigation

Table 3.1 (cont'd) Baseline data requirements for environmental scoping

ENVIRONMENTAL COMPONENT	TYPE OF DATA	DATA SOURCE
Social		
 Heritage, Culture and Archaeology	▪ Locations of historical and cultural sites ▪ Location and numbers of *Orang Asli* areas and settlements	Data from JAKOA
 Ecotourism	Locations of ecotourism sites	Data from Ministry of Tourism, Arts and Culture Malaysia (MOTAC)
Others		
 Land Traffic	Road network	▪ Aerial or satellite imagery ▪ Ground truthing
Environmentally Sensitive Areas*		

TYPE OF ESA	DATA SOURCE
▪ Central Forest Spine (CFS) ▪ Water intakes (downstream of project area) ▪ Aquaculture ▪ River	▪ NPP3 ▪ GPPPP ▪ Aerial or satellite imagery ▪ Structure and local plans (RTD) (PLANMalaysia) ▪ Ground truthing

*Other baseline data e.g. contour areas, biological ecosystems, heritage areas etc. are also considered as ESAs. This section highlights specific ESAs that may need to be considered for the project.

3.6.1 Identification of Existing Environmental Site Constraints

Subsequent to the reviewing of available baseline data, a list of existing site constraints can be generated based on the data in hand. Examples of environmental site constraints are:

01 Flood-prone areas;

02 Slope areas;

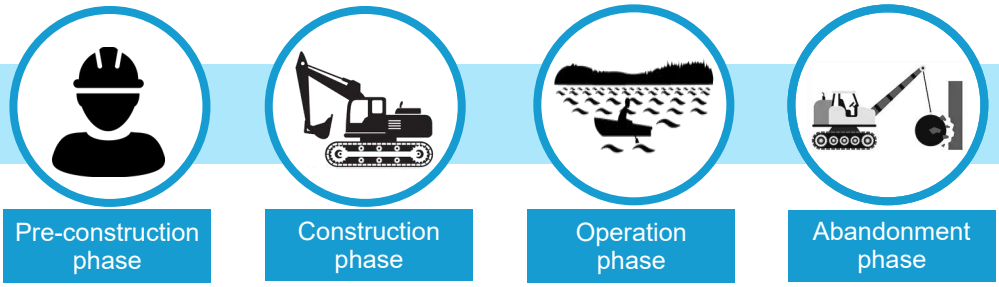
03 Central forest spine; and

04 *Orang Asli* settlement or roaming area.

The identification of these constraints must be done as early as possible to ensure that the proposed project can be designed and implemented smoothly. This includes any mitigation to alleviate the anticipated impacts.

3.7 Determination of Key Project Activities

Typically, there are four main phases involve throughout the entire lifecycle of the development of scheduled waste treatment and disposal facilities namely:



Generally, key project activities during pre-construction, construction and abandonment phases are quite common in nature. A big chunk of the activities during these phases revolve around civil and structural activities particularly earthworks activities.

On the other hand, activities during the operation phase are different for each of the prescribed activity. These activities shall be determined by the Qualified Person together with the Project Proponent's team to make sure focus is given to address the key project activities. A list of key project activities general for drainage and/or irrigation project is shown in *Table 3.2*.

It should be noted that some of the activities are closely linked to reservoir construction, which is covered under separate EIA Guidelines as it is considered as another Prescribed Activity by itself.

Table 3.2
Activities associated with drainage and/or irrigation project

ACTIVITY	DETAILS
Pre-Construction Activities	
 **Survey**	▪ Putting surveyors into new areas ▪ Cutting sights lines through vegetation ▪ Establishing base camps
 **Investigation**	▪ Introduction of workforce in new areas ▪ Establishing base camps ▪ Putting in access tracks ▪ Drilling holes and/or digging pits
 **Land acquisition**	▪ Acquire land ▪ Resettlement of affected occupants

Table 3.2 (cont'd) Activities associated with drainage and/or irrigation project

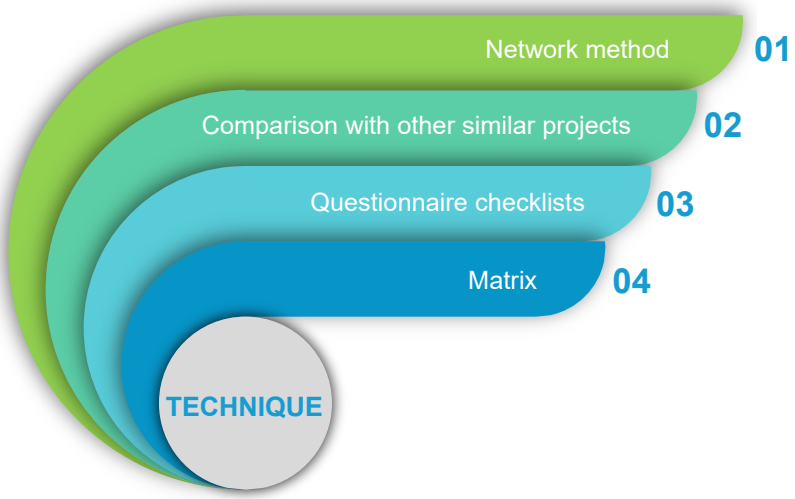
ACTIVITY	DETAILS
Construction Activities	
 **Temporary occupation**	▪ Construction of temporary buildings, storage facilities and working areas ▪ Water supply ▪ Solid waste disposal ▪ Sewage disposal ▪ Workforce ▪ Pest control ▪ Machine servicing & maintenance
 **Site preparation**	▪ Demolition & removal of structures ▪ Removal and disposal of vegetation (including trees) ▪ Removal and disposal of unsuitable material (USM) ▪ Construction access roads ▪ Operating equipment (chainsaw, bulldozers)
 **Earthwork**	▪ Removal and disposal of USM ▪ Canal excavation ▪ Construction of irrigation bunds and maintenance tracks ▪ Diverting surface water ▪ Spoil disposal ▪ Operating equipment (diggers, bulldozers, truck)
 **Reservoir construction**	▪ Operation of equipment (bulldozers, diggers, trucks, scrapers) ▪ Construction of haul roads ▪ Cutting, quarrying/ blasting, borrow areas ▪ Transportation of construction materials ▪ Filling/ pouring/ grouting ▪ Building structures (concrete or rollcrete)
 **Culvert, control weirs, pumping station**	▪ Operation of equipment ▪ Diversion of surface water ▪ Transportation of structure, plant and materials ▪ Pouring concrete
 **Reservoir filling**	▪ Raising groundwater levels ▪ Inundation of land ▪ Vegetation decomposition ▪ Alteration of surface water hydrology

ACTIVITY	DETAILS
Construction Activities	
 **Permanent access road formation**	▪ Transportation of aggregate ▪ Laying and compaction of aggregate
 **Demobilisation**	▪ Demobilisation and removal of temporary buildings ▪ Waste removal/ disposal (including rubbish, equipment and liquid wastes) ▪ Rehabilitation of occupied site
Operation Activities	
 **Reservoir presence**	▪ Wetland ▪ Evaporation ▪ Micro-seismicity ▪ Community severance ▪ Provision of habitat for disease vectors
 **Operation – agriculture use**	▪ Flood irrigation ▪ Ploughing, soil preparation ▪ Fertiliser and pesticide use
 **Maintenance**	▪ Canal excavation and spoil disposal ▪ Weed control ▪ Repair of bund failure
Decommissioning/ Abandonment	
 **Decommissioning/ Abandonment**	▪ Demolition and removal of structure (pump, weir, culverts, gates, etc.) ▪ Transportation and disposal of construction waste

3.8
Identification of Significant Impacts and Priority Setting

3.8.1
Technique to Prioritise Environmental Impacts

There are various techniques that can be used to conduct environmental scoping, such as:



The recommended technique to analyse and prioritise important issues in an EIA study is by using a matrix table (*Table 3.3* and *Table 3.4*). The matrix is structured whereby the activities are set out along the X-axis and the components of the environment are set out along the Y-axis. This Guideline subdivides a development into its main activities within three phases; pre-construction, construction and operation.

The contents of the matrix table are not fixed and may vary based on the project activities and location. The matrix table provides a means to assess the cause-effect relationship between the project activities and their impacts on the environment. The Qualified Person is required to determine the significance of an impact. It is recommended that the matrix table is incorporated in the ESI document.

In addition to the impact matrix established, there are also several criteria that need to be considered in prioritizing significant impacts to be studies in the EIA which are as follow:

01 Magnitude

- The degree and scale of an impact (positive/negative) towards sensitive receptors due to the proposed activity

02 Permanence

- Nature of the effects whether they are temporary or permanent (residual impact)

03 Reversibility

- A measure of whether mitigation measures can be implemented in rehabilitating the site back to its original state or better

04 Cumulative impacts

- A measure of whether the effects will be accumulative singly or in combination with other effects from nearby sites/activities (positive/ negative) over a period of time

Table 3.3 Specific EIA matrix for drainage projects

PROJECT ACTIVITY	PHYSICOCHEMICAL																	
	Land Compatibility										Surface Water							
	Landforms	Soil profile	Soil composition	Slope stability	Subsidence and compaction	Seismicity	Flood plains/ swamps	Land use	Engineering and mineral resources	Buffer zones	Shoreline	Bottom interface	Flow variation	Water quality	Drainage pattern	Water balance	Flooding	Existing use
Pre-Construction Activities																		
▪ Survey																		
▪ Investigation																		
▪ Land acquisition																		
Construction																		
▪ Temporary occupation																		
▪ Site stripping																		
▪ Earthworks																		
▪ Culverts, control weirs & pumping stations																		
▪ Permanent access road formation																		
▪ Abandonment																		
Operation																		
▪ Drainage																		
▪ Maintenance																		
▪ Consequent activities																		
▪ Abandonment																		

Key:

X Insignificant and excluded from EIA study
T Environmental impact that is potentially significant but on a temporary basis, and will assume equilibrium after certain period of time
I Environmental impact that is potentially significant but about which there is insufficient data to make a reliable prediction. Close monitoring and control is recommended
S Potentially significant adverse environmental impact for which a design solution has been identified
R Residual and significant adverse environmental impact
P Significant positive environmental impact

Table 3.3 (cont'd) Specific EIA matrix for drainage projects

PROJECT ACTIVITY	PHYSICOCHEMICAL												
	Groundwater						Atmosphere				Noise		
	Water table	Flow regime	Water quality	Recharge	Aquifer characteristics	Existing use	Air quality	Air flow	Climate change	Visibility	Intensity	Duration	Frequency
Pre-Construction Activities													
▪ Survey													
▪ Investigation													
▪ Land acquisition													
Construction													
▪ Temporary occupation													
▪ Site stripping													
▪ Earthworks													
▪ Culverts, control weirs & pumping stations													
▪ Permanent access road formation													
▪ Abandonment													
Operation													
▪ Drainage													
▪ Maintenance													
▪ Consequent activities													
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P Significant positive environmental impact

Table 3.3 (cont'd) Specific EIA matrix for drainage projects

PROJECT ACTIVITY	BIOLOGICAL													
	Species and Populations						Habitats and Communities							
	Terrestrial vegetation	Terrestrial wildlife	Other terrestrial fauna	Aquatic/ marine flora	Fish	Other aquatic/ marine fauna	Terrestrial habitats	Terrestrial communities	Aquatic habitats	Aquatic communities	Estuarine habitats	Estuarine communities	Marine habitats	Marine communities
Pre-Construction Activities														
▪ Survey														
▪ Investigation														
▪ Land acquisition														
Construction														
▪ Temporary occupation														
▪ Site stripping														
▪ Earthworks														
▪ Culverts, control weirs & pumping stations														
▪ Permanent access road														
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P Significant positive environmental impact

Table 3.3 (cont'd) Specific EIA matrix for drainage projects

PROJECT ACTIVITY	HUMAN																							
	Health and Safety					Social						Aesthetic and Cultural												
	Physical safety	Physiological well-being	Parasitic safety	Communicable disease	Physiological disease	Employment	Housing	Education	Utilities	Amenities	Property & settlement	Landforms	Biota	Wilderness	Water quality	Atmospheric quality	Climate	Tranquility	Sense of community	Community structure	Man-made object	Historic places or structure	Religious places or structure	Landscape
Pre-Construction Activities																								
▪ Survey																								
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P Significant positive environmental impact

Table 3.4 Specific EIA matrix for irrigation projects

PROJECT ACTIVITY	PHYSICOCHEMICAL																	
	Land Compatibility										Surface Water							
	Landforms	Soil profile	Soil composition	Slope stability	Subsidence and compaction	Seismicity	Flood plains/ swamps	Land use	Engineering and mineral resources	Buffer zones	Shoreline	Bottom interface	Flow variation	Water quality	Drainage pattern	Water balance	Flooding	Existing use
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▪ Reservoir presence																		
▪ Drainage																		
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P Significant positive environmental impact

Table 3.4 (cont'd) Specific EIA matrix for irrigation projects

PROJECT ACTIVITY	PHYSICOCHEMICAL												
	Groundwater						Atmosphere				Noise		
	Water table	Flow regime	Water quality	Recharge	Aquifer characteristics	Existing use	Air quality	Air flow	Climate change	Visibility	Intensity	Duration	Frequency
Pre-Construction Activities													
▪ Survey													
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Operation													
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▪ Drainage													
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Table 3.4 (cont'd) Specific EIA matrix for irrigation projects

PROJECT ACTIVITY	BIOLOGICAL													
	Species and Populations						Habitats and Communities							
	Terrestrial vegetation	Terrestrial wildlife	Other terrestrial fauna	Aquatic/ marine flora	Fish	Other aquatic/ marine fauna	Terrestrial habitats	Terrestrial communities	Aquatic habitats	Aquatic communities	Estuarine habitats	Estuarine communities	Marine habitats	Marine communities
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Table 3.4 (cont'd) Specific EIA matrix for irrigation projects

PROJECT ACTIVITY	HUMAN																							
	Health and Safety					Social						Aesthetic and Cultural												
	Physical safety	Physiological well-being	Parasitic safety	Communicable disease	Physiological disease	Employment	Housing	Education	Utilities	Amenities	Property & settlement	Landforms	Biota	Wilderness	Water quality	Atmospheric quality	Climate	Tranquility	Sense of community	Community structure	Man-made object	Historic places or structure	Religious places or structure	Landscape
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3.8.2
Linkage between Activities, Issues and Impacts

Environmental impacts result from actions, or activities, associated with planning, constructing, operating and closing of drainage and/or irrigation projects.

Activities which result in environmental changes that are potentially significant are issues. The amount and degree of environmental change is the impact. Impacts can be grouped under issues and can be broken down into primary and secondary impacts. Impacts can also be grouped under broad environmental components which are subject to change.

Environmental issues basically arise when the project activities:

01 Have the potential to cause pollution or other physical effects;

02 Result in resource depletion (i.e. not sustainable);

03 Threaten biodiversity; and

04 Are not acceptable to the host community or wider public (possibly as a result of all points above among other matters).

3.8.3
Issues and Impacts

A fundamental requirement of an EIA is to come to grips with the issues. In the context of these guidelines, issues are overall concerns or problems which must be addressed if the potentially significant adverse environmental effects (primary or secondary) are to be managed. Unless the issues are faced, mitigation measures are likely to focus on the symptoms (impacts) rather than in tackling the cause(s) of the problems.

This section sets out to establish the key issues and the significant effects (adverse and beneficial) of drainage and/or irrigation projects in Malaysia.

Drainage

Drainage of wetlands, usually referred to as swamps or swamp lands, is usually undertaken to convert idle land into productive agriculture land.

Wetlands are wildlands of particular importance both economically and environmentally. The most important roles which wetlands perform are:

Source: www.nst.com.my

Wetlands can contribute to local rainfall and can be an efficient, low cost water purification system (herbaceous swamps), a recreation area (hunting, fishing, boating), a buffer against floods, and protection from coastal erosion by storms (mangroves).

01 Production of services

For many species of mollusc, crustaceans, fish, and waterfowl, tidal and fresh water marshes, coastal lagoons and estuaries are of vital importance as breeding grounds as well as staging areas in their migration routes. All types of wetlands may harbour unique plants and animals.

02 Preservation of biological diversity

Wetlands are among the most productive ecosystems in the world. Estuaries and tidal wetlands, in particular mangroves, are important nursery areas for most species of fish and shrimp which are later caught offshore. Shallow water areas are, in general, rich fishing grounds. Floodplains are important grazing areas for cattle and wildlife, and vital spawning grounds for many fish species. Swamp forests may also yield valuable timber.

03 Production of goods

The key issues for drainage of wetlands can be summarised as illustrated in *Table 3.5*.

Table 3.5 Key issues for drainage of wetlands

ISSUES	IMPACTS
Lowered water levels	**Loss of habitat, biodiversity, flora and fauna** ▪ Loss of habitat which often contain many endemic species ▪ Wetlands are often nesting refugees and important feeding and resting sites for birds
	Loss of carbon sink ▪ Conversion of the wetlands or forests into another type of land use directly correlate with the loss of carbon sink
	Increased fire risk ▪ Loss of moisture from peat forests will increase the risk of fire
	Loss of water resources ▪ Wetlands acts as natural storage of excess waters ▪ The loss of recharge source may depress the groundwater
	Impaired water quality Wetlands play an important role in water purification in both physical (settling) and biological (chemical/nutrient cycling)
	Increased flooding downstream ▪ Wetlands regulate flow where flood water is stored in soils or surface water ▪ Wetlands vegetation slows the flow water
	Increase in soil acidity ▪ Drainage may result in pH to drop to less than 3.5 for acid sulphate soil ▪ The low pH would render the drained area unsuitable for agriculture
	Saline water intrusion Drainage canals in coastal areas can allow saltwater inland which may affect surrounding agricultural areas
	Reduction of water-borne disease Drainage of standing water reduces habitats of disease vectors
	Production land Drainage can enable productive use of land e.g. agriculture, settlement and infrastructural sites

Note: Potential beneficial effects

As for the creation of man-made lakes, the key issues are described under the irrigation as the nature of the issues is similar with related facilities and infrastructure of irrigation projects which are dams, watershed, reservoirs, etc.

Source: www.pinterest.com

Irrigation

Irrigation projects manage water supplies for the purpose of agricultural production. There is a wide variety of irrigation types depending on the source of water (surface or groundwater), means of water storage, conveyance and distribution systems, and methods of delivery (field application).

Previously, the dominant delivery method is surface irrigation (flood or furrow irrigation) in which water is distributed over the irrigated area by gravity in overland flow. However, the use of drip irrigation has become more widespread and commonly deployed in vegetable and fruit farms.

Irrigation projects can include the following facilities and infrastructure:

01 Dams, watershed and reservoirs;

02 Diversion and intake facilities;

03 Wells, pumping stations, canals, ditches and pipelines for the conveyance of water (including drainage); and

04 Distribution systems for sprinkle and drip irrigation

For man-made lakes and irrigation projects, the key issues can be summarised as in *Table 3.6*.

Table 3.6 Key issues for man-made lakes and irrigation projects

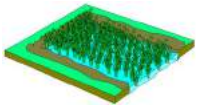
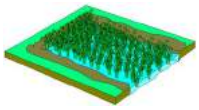
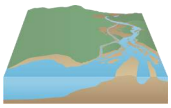
ISSUES	IMPACTS
 Inundation	**Altered water resources** ▪ Downstream flow can be affected through abstraction, impoundment and control ▪ Decomposition may deplete oxygen levels in the water in inundated areas ▪ Groundwater resources will be altered within the inundated land or elsewhere by the changed water flow
	Wildlife habitat and access ▪ Loss of wildlife habitat ▪ Inundation may block traditional wildlife and/or livestock access routes
	Adverse soil modification ▪ Undesirable soil modification due to water logging, soil salinization, soil alkanilisation, nutrient leaching and soil impermeability from excessive sodium ▪ This may render soils infertile for agricultural purposes ▪ Loss of natural sediment-borne fertility bought by annual flood

Table 3.6 (cont'd) Key issues for man-made lakes and irrigation projects

ISSUES	IMPACTS
 **Inundation**	**Reduced water quality due to agrochemical residues** ▪ Use of pesticides and herbicide that accumulate in soils and stream sediments will reduce water quality ▪ Risk of uptake of pesticides and herbicides by micro-organisms, causing biomagnification along the food chain ▪ Eutrophication in the canal system or downstream waterways caused by excessive fertiliser runoff
	Water-borne disease ▪ Increase of water-borne disease, where vectors can proliferate in the irrigation waters ▪ Reuse of wastewater for irrigation has potential of transmitting communicable diseases ▪ Sprinkler irrigation potentially disperse pathogens through the air
	Saline water intrusion Drainage canals in coastal areas can allow saltwater to intrude inland which may then affect surrounding agricultural areas
	Social change Relocation of families and communities
	Release of greenhouse gases Decomposition of biomass in the inundated land may produce significant amount of greenhouse gases
	Productive land use Increase agricultural potential and production of food
	Inland fisheries Irrigation and flooded crop fields provide suitable habitat for the culture of inland fishes
 **Location of reservoir and/ or dam**	**Loss of habitat, flora, fauna and biodiversity** ▪ Reservoir filling and land use changes in the watershed cause loss of habitat ▪ Migratory patterns of wildlife may be affected ▪ Aquatic ecosystem will change from a riverine to a lacustrine environment
	Resettlement ▪ Reservoir filling results in forced relocation of those living on the land ▪ Rehabilitation is needed for settlers moving into a new location
	Encroachment via access routes Access roads built for the reservoir project will often serve to accelerate inroads into the watershed by farmers, hunters, timber, exploiter, etc.
	Land use conflict Existing land use of the watershed area may not be compatible, thus affecting water quality of the reservoir
 **Regulated flow**	**Impaired navigation at low flow** Low flows (especially during dry season) can considerably impair downstream navigation
	Changes in hydrology ▪ Altered levels of water table. Above and below the reservoir ▪ Salinization problems that affect downstream water uses

Note: Potential beneficial effects

Table 3.6 (cont'd) Key issues for man-made lakes and irrigation projects

ISSUES	IMPACTS
 **In-stream barrier**	**Reduction in stream fishing (fish barrier)** ▪ Riverine fisheries usually decline due to change in river flow and barrier to fish migration ▪ Changes in water flow and quality will affect biologically productive estuaries
	Depletion of sediments/aggregate/nutrients downstream ▪ Suspended particles carried by the river settle in the reservoir ▪ Loss of nutrients on the floodplain downstream as sediment is no longer deposited ▪ Scouring of the downstream riverbeds
	Reduced flooding downstream Flow fluctuation control can control or prevent flash floods occurring downstream
 **Watershed (catchment) protection**	**Erosion of access roads and borrow areas** ▪ Exposed or incompletely turfed road access cuts and embankments and borrow areas are subjected to erosion ▪ Inadequately designed cut slopes present risk of slope failure
	Surrounding land use ▪ Determine the quality of water entering the irrigation area ▪ Large sediment loads may result in canal clogging ▪ High sediment content can raise the land level to a height where irrigation is impaired
	Accessibilities and security ▪ Restriction on the allowable development/land use in the watershed area ▪ Access restriction on the watershed area to avoid discharge of pollutants, whether accidental or illegal actions
 **Water-related diseases**	**Water-related disease** Creation of reservoir will increase the risk of malaria, dengue, etc.
 **Earthworks (Construction Issue only)**	**Erosion and sedimentation** Substantial cutting and filling may produce high sediment yields, which affect surface water quality by increasing turbidity and nutrient levels
 **Sustainable Groundwater Yield (Groundwater Extraction)**	**Sustainable groundwater yield** Over-abstraction will cause progressive or irreversible depletion or degradation of groundwater resource
	Groundwater drawdown ▪ Conflicts with existing groundwater use ▪ Impacts on surface hydrology ▪ Effects on groundwater quality
	Ground settlement Groundwater extraction may cause excessive ground settlement
	Surface water quality ▪ Heavy metals typically present in groundwater, which will be introduced to the surface water ▪ Significant quantity of heavy metals will affect surface water quality

3.9 Selection of Mitigation Measures

The Qualified Person with the assistance from the technical consultants and specialists, are to assess the following:

The proposed P2M2 must be able to address and reduce the identified key environmental issues. At the point of the TOR and ESI stages for Second Schedule EIA, the proposed P2M2 are to be qualitative and descriptive only and to be detailed later during the EIA stage.

Table 3.7 lists the example of brief descriptions of potential mitigation measures to be implemented.

Table 3.7 Brief description for mitigation measures

ENVIRONMENTAL IMPACT	BRIEF DESCRIPTION FOR MITIGATION MEASURES
 Ecological	Confine land clearing and construction activities within the designated working area only
 Erosion	Incorporate the slope designs into the measures in the LD-P2M2 shall to ensure slope stability
 Solid waste and scheduled waste	Implement best management practices to handle wastes comprise biomass, municipal, construction and demolition and scheduled wastes
 Water quality	Install sediment control structure to trap physical constituents such as silt and sediments except for dissolved materials and oil and grease before final discharge

Table 3.7 (cont'd) Brief description for mitigation measures

ENVIRONMENTAL IMPACT	BRIEF DESCRIPTION FOR MITGATION MEASURES
 Air quality	Minimise and control fine dust dispersion and emissions
 Noise and vibration	Minimise and control noise and vibration disturbance
 Safety and health	Ensure workers and public's safety and health are not compromised with on-going construction activities
 Land traffic	Identify and manage traffic along logistic roads during construction stage

3.10 Establishment of EIA Study Requirements

Several individual studies are required to address the identified impacts of the project activities. The type of study is dependent on the scale and extent of the Project Site by considering the adjacent land uses and sensitive receptors. The Qualified Person shall provide the methodologies, assessment or modelling tools, and expected outputs for each study.

Table 3.8 shows the general studies required for drainage and/or irrigation projects. Consultation between the Qualified Person and related Government Agencies is important to ensure all the requirements by Government Agencies are covered in the EIA report.

Table 3.8 List of applicable study to be considered in the EIA Report

TYPE OF STUDY	GOVERNMENT AGENCIES	ACTIVITY			
		FIRST SCHEDULE		SECOND SCHEDULE	
		3(a) - Construction of man-made lakes and enlargement of artificial lakes with surface areas	3(b) - Irrigation schemes covering an area of 500 hectares or more.	3(a) - Construction of man-made lakes and artificial enlargement of lakes with surface areas of 50 hectares or more in or adjacent or near to environmentally sensitive area.	3(b) - A drainage of wetland, wild-life habitat or of dry inland forest covering an area of 20 hectares or more.
Water Quality Assessment	DOE	/	/	/	/
Noise and/or Vibration Assessment	DOE	/	/	/	
Soil Assessment	▪ DOE ▪ JMG		/		
Geological Assessment	JMG	/	/	/	/
Geotechnical Report	JKR Geotechnical Branch	/		/	
Hydrological Assessment	▪ DOE ▪ DID	/	/	/	/
Socio-economic study	▪ DOE ▪ Local Council	/	/	/	/
Social Impact Assessment (SIA)	PLANMalaysia		/		
LD-P2M2	DOE	/	/	/	/
Erosion and Sediment Control Plan	DID	/	/	/	/
Ecological Study	▪ PERHILITAN ▪ JPSM ▪ DOF			/	/

3.11
EIA Study Team Members

The EIA study team can be formed upon identifying the environmental issues and impacts of a drainage and/or irrigation project.

The Qualified Person who is part of the EIA study team must be registered with DOE either as an EIA Consultant or Subject Consultant and has to ensure that his/her EIA registration is valid throughout the EIA study period.

Subsequently, in order to ensure that all environmental issues and impacts are captured comprehensively in the EIA study, the EIA team members are encouraged to further refine the environmental issues and impacts in *Section 3.8.3*.

The organisation chart of the EIA study team is shown in *Figure 3.4*.

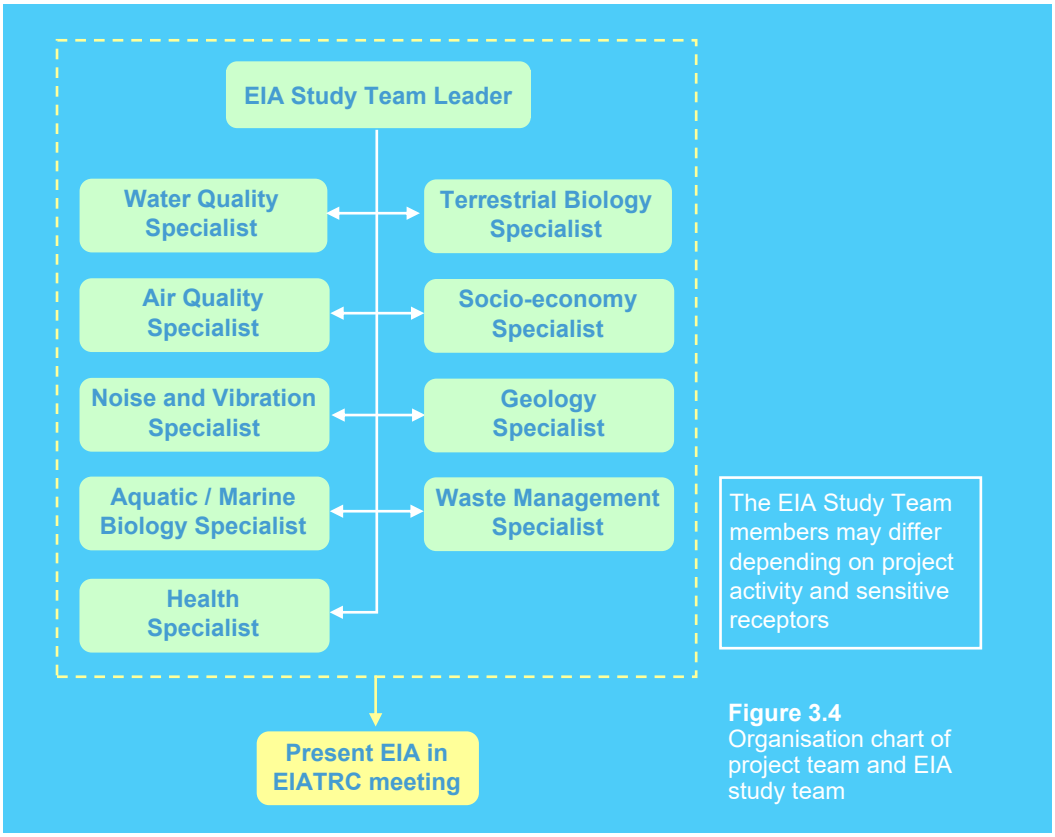


Figure 3.4
Organisation chart of project team and EIA study team

Roles and responsibilities of an EIA study team member:

01 Identify and map Environmentally Sensitive Areas (ESA);

02 Identify all important tasks to be performed in the EIA study (e.g.: studies, modelling, public engagements, etc.);

03 Ensure all TOR components are covered;

04 Ensure data and information are factually correct, can be verified and technically defensible;

05 Assess impacts holistically and comprehensively;

06 Propose P2M2 with consideration of Best Available Technology (BAT) or Best Management Practices (BMPs) using suitable modeling tools; and

07 Propose EMP and monitoring framework.

3.12 Preparation of Scoping Notes, TOR and ESI Report

The outcomes of the environmental scoping shall be based on the type of EIA submission required. For First Schedule EIA, Scoping Notes shall be incorporated in Chapter 2: Terms of Reference of EIA Study in the EIA report. As for Second Schedule EIA, the scoping outcome, termed as ESI, will form the basis to develop the TOR for DOE endorsement. The TOR must be submitted to DOE State for review and endorsement before proceeding to the EIA stage.

3.12.1 Content for Scoping Notes

The Scoping Notes shall contain the following:

1	**The project title stating nature of proposed activity**
2	**The presence of sensitive receptors** List the sensitive receptors in and around the project site.
3	**Significant impacts due to the project or activity identified** List environmental impacts which are likely to be significant (not taking into account control or mitigation measures.
4	**Impacts which are unknown or uncertain as to the impacts but may occur** List environmental impacts which are uncertain or could arise and require further investigation.
5	**Social issues** List potential social issues such as relocation, land acquisition, previous or ongoing protest. If there are social issues, explain the stakeholder engagement process.
6	**Any special requirements for the EIA** Special requirements include any baseline survey or study (example - long term wind data, ecological survey, public consultation).

3.12.2
TOR Table of Content

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

Chapter 1 Introduction	This Terms of Reference is for the preparation of an Environmental Impact Assessment (EIA) Study for "Project Title".
Chapter 2 List of Consultants/ Study Team	Details of each individual (must be registered with DOE) who will carry out the EIA study, which include: ▪ DOE registration number ▪ Academic background ▪ Experience ▪ Area of study ▪ Declaration (signatures) The EIA consultant team is to be led by a Team/ Project leader/ manager who is responsible for the EIA report. Include contact details (complete address, phone and fax numbers) of the appropriate and responsible person(s) to whom enquiries regarding the EIA should be directed to.
Chapter 3 Scope of Project	List out those components of the Project which fall under the Prescribed Activities under the EIA Order, and describe with enough details for the reader to understand the scope of the significant project work components, without the technical details, including a well-described engineering implementation programme of the Project.
Chapter 4 Alternatives Consideration	Outline alternative solutions (project site, technologies etc.) that will be studied or described to justify that the Project will result in the least environmental impacts.
Chapter 5 Significant Environmental Impacts to be Studied	List and describe those significant environmental impacts which will potentially be affected by the project works or components that need to be covered in detail in the EIA.
Chapter 6 Study Boundaries	Delineate study boundaries for each of the above significant environmental elements to be investigated, identify the critical groups of sensitive receptors and how the impacts on the sensitive receptors will be studied.
Chapter 7 Assessment Standards	List out standards, criteria, acceptable limits, etc. that will be used to assess the environmental impacts to be investigated.
Chapter 8 Timeline of Studies	Details of all studies/investigations to be carried out; who, where, when, how, etc. with indicative dates.
Chapter 9 Consideration of Concurrent Projects	List out potential concurrent or planned projects that may result in cumulative impacts
Chapter 10 Description of Modeling Tools, Assessment Methodologies	List out modeling tools, methodologies etc. for undertaking impact assessment and evaluation of significance. The extent of accuracy of these tools will also need to be provided, including name of models, applicability of models and tools, verifiability of results, how results are verified, grid size (for water modeling).
Chapter 11 Possible Mitigation Measures	Outline possible mitigation measures or best management practices from similar projects that may be used to address the environmental impacts on this project.

Source: Adapted from EGiM (DOE)

3.12.3
ESI Table of Content

The ESI must be included with the TOR submission as an annex or appendix. The following is an indicative list of information which must be included in the ESI:

Chapter 1 Introduction to ESI	▪ **Introduction:** Provide a short introduction to the ESI. ▪ **Preparer:** Provide the name, designation, contact number and affiliation company of the ESI preparer. ▪ **The Need for EIA:** Describe the need for an EIA for the Project.
Chapter 2 Basic Information of Project	▪ **Project Title:** Provide name of Project. ▪ **Purpose and Nature of Project:** Provide brief description on the Project's background, previous studies, statement of need, and Project concept, size, components and outline of process technologies, and Project development phases including future phases. ▪ **Identification of Project Proponent:** Provide Project Proponent's name and address. If the Proponent is a Joint Venture partnership, the Joint Venture partners shall be identified, together with the Project Manager for the Joint Venture. ▪ **Location and Scale of Project:** Provide coordinates of Project, extent of Project coverage and maps at appropriate scales. ▪ **History of Site:** Provide a brief history of the site where Project is to be sited. ▪ **Project Justification:** Describe any alternatives evaluated during early proposal (e.g. location, siting, technology, process) and summarize the criteria used to compare options and select the preferred Project proposal. ▪ **Number and Types of Prescribed Projects:** Describe which category the Project falls under the EQA and state the criteria that made the activity fall under the Prescribed Activity. ▪ **Previously Approved EIA Reports or Studies:** List out any previous EIAs or studies that were conducted for other projects around the proposed Project site. ▪ **Regional Setting of Project:** Describe how the Project is placed in the regional biophysical and social context. ▪ **Name and Telephone Number of Contact Person:** Provide contacts of key personnel of Project proponent. Normally not more than 2 persons.
Chapter 3 Alternative Consideration	Outline alternative solutions (project option, project site, technologies etc.) that will be studied or described to justify that the Project will result in the least environmental impacts.

Note: The items listed above are not exhaustive. Other items shall be included whenever relevant. The ESI shall be included with the TOR submission as an annex or appendix.
Source: Adapted from EGiM (DOE)

Chapter 4 Major Elements of the Environment in the Vicinity of Project Site and Study Boundaries	A relatively comprehensive list of elements of the environment is mentioned in this paragraph. Attention shall be given only to the more significant elements associated with the proposed Project. ▪ **Air Quality:** Briefly describe the prevailing air streams and wind directions at the Project site and identify a list of air sensitive receivers within a study boundary of 500 metres. ▪ **Noise and Vibration:** Briefly describe the existing noise contributors at and around the project site and identify a list of sensitive noise receptors within a study boundary of 500 metres. ▪ **Water Quality:** Briefly describe the existing waterbodies and rivers at and around the project site and identify a list of water sensitive receivers within a study boundary of 500 metres. ▪ **Hydrology and Hydrogeology:** Briefly describe the hydrology and hydrogeology at and around the project site within a study boundary of 1000 metres. ▪ **Flood Risk:** Briefly describe the existing risk of flooding and flood defence infrastructure at and around the project site within a study boundary of 500 metres. ▪ **Erosion Risk:** Briefly describe the existing risk of erosion and erosion mitigation infrastructure at and around the project site within a study boundary of 500 metres. ▪ **Waste Management:** Briefly describe the existing sources of solid and hazardous waste arising at and around the Project site. ▪ **Ecology:** Briefly describe the existing habitats (land and marine including bathymetric characteristics for marine projects) at and around the Project site within a study boundary of 500 metres. ▪ **Cultural Heritage:** Briefly describe any historical evidence of cultural importance at and around the Project site within a study boundary of 500 metres. ▪ **Land Contamination:** Briefly describe the existing and previous land uses at and around the Project site that may have caused any land contamination within a study boundary of 500 metres. ▪ **Land Use, Landscape and Visual:** Briefly describe the existing land use and landscape at and around the Project site within a study boundary of 500 metres and identify a list of visually sensitive receptors. ▪ **Traffic:** Briefly describe the existing traffic conditions at and around the Project site within a study boundary of 3000 metres. ▪ **Hazards and Risk Assessment:** Briefly describe any existing hazardous installations at and around the Project site or risks associated with the project itself within a study boundary of 500 metres (including possibilities such as seismic and geological events). ▪ **Socio-economy:** Briefly describe the socio-economic conditions at and around the Project site within a study boundary of 500 metres. ▪ **Geology:** Briefly describe the topographical and geological features at and around the Project site within a study boundary of 500 metres and include information on mineral deposits and soil characteristic.

Note: The items listed above are not exhaustive. Other items shall be included whenever relevant. The ESI shall be included with the TOR submission as an annex or appendix.
Source: Adapted from EGiM (DOE)

Chapter 5 Outline of Planning and Implementation Programme	▪ **Relevant Policies:** Briefly describe government policies (federal, state or local) which are relevant to the Project. ▪ **Project Implementation:** Briefly describe who will implement and construct the Project works, and who will undertake the detailed EIA studies. ▪ **Project Timetable:** Provide indicative dates when the project will commence and end. ▪ **Interactions with other Projects:** List out all concurrent or planned projects in the vicinity of this Project. The purpose of this list is to enable DOE to assess the significance of cumulative impacts from all the projects. ▪ **Project Assessment Timeline:** Provide a proposed target timeline for the whole assessment process. The time table for proposed studies and investigations shall be included and, as a minimum, shall have: TOR submission; TOR public review (if relevant); environmental studies; consultation programme; EIA report submission; EIA report public display; Project proponent's response to public comments. ▪ **Proposed Studies:** Describe scope of works of studies/ investigations/ surveys that will be undertaken to obtain the baseline information on the major elements of the environment.
Chapter 6 Possible Impacts on the Environment	Outline the methodologies used in the impact analysis/ assessment and provide a brief **qualitative** description of the potential impacts during construction and operational phases of project implementation on the following: ▪ Air quality ▪ Noise and vibration ▪ Water quality ▪ Hydrology and hydrogeology ▪ Flood risk ▪ Erosion risk ▪ Waste management ▪ Ecology ▪ Cultural heritage ▪ Land contamination ▪ Groundwater ▪ Land use, landscape and visual ▪ Traffic ▪ Hazards/ Risk assessment ▪ Socio-economy ▪ Geology Note: A relatively comprehensive list of impacts is mentioned in this paragraph. Attention shall be given only to the more **significant impacts** associated with the proposed Project.
Chapter 7 Mitigation Measures to be Incorporated in the Design	**Qualitatively** describe the proposed pollution prevention and mitigation measures (P2M2) or generally referred to as **best management practices** that will be implemented to address the impacts from pre-construction (including feasibility studies and design), construction and operational phases of the Project implementation as described in "Possible Impacts on the Environment" section of the ESI.

Note: The items listed above are not exhaustive. Other items shall be included whenever relevant. The ESI shall be included with the TOR submission as an annex or appendix.
Source: Adapted from EGiM (DOE)

Chapter 8 Use of Previously Approved EIA Reports or Studies	Outline and describe any relevant information that is referenced from the previous EIAs or studies that were identified in Section 3 (ii) above and briefly discuss how this information is suitable to be used for this Project.
Chapter 9 List of Drawings, Flowcharts, Diagrams and Photographs	Provide the following: ▪ Clear, coloured and readable maps, diagrams and photographs to illustrate the nature of the Project and its general layouts indicating the location of the Project and all its components and Project boundaries. ▪ Macro scale maps (1:50,000 & 1:25,000), plans, photographs or satellite images, clearly identifying the location of the proposed project location. ▪ An updated satellite image to indicate the recent existing environment may be used. The coverage of the land use map must be at least within a 5 km radius (intervals of 250 metres). Other types of map that may be relevant to the key and critical issues of the proposed Project. They may include cadastral map, topography and geological map, bathymetry map, hydrological map, coral population map etc. ▪ For industrial-based projects, clear and readable flowchart of the production processes and explanation on the processes and the Project's maximum capacity.
Chapter 10 References	Provide a list of documents and studies used to prepare the Environmental Scoping Information (ESI).

Note: The items listed above are not exhaustive. Other items shall be included whenever relevant. The ESI shall be included with the TOR submission as an annex or appendix.
Source: Adapted from EGiM (DOE)

Environmental Baseline Data

04

Kangar, Perlis
Source: Md. Nasiruddin Md. Nasir on unsplash.com

4.1
Introduction

4.2
Baseline Data Collection

4.3
Components of Environmental Baseline Data

Kangar, Perlis
Source: Md. Nasiruddin Md. Nasir on unsplash.com

04

Environmental Baseline Data

4.1 Introduction

This chapter describes a range of baseline data normally gathered for the EIA study. Objectives for the description on baseline conditions include:

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

02 identify sensitive issues or areas requiring mitigation or compensation;

03 provide input data to analytical models for prediction of impacts; and

04 provide baseline reference for compensation during project implementation stage.

The following chapters shall detail the requirements for baseline data collection as part of the EIA.

4.2
Baseline Data Collection

In general, the baseline data can be grouped into two categories namely:

Primary Data

Primary data is collected to obtain first-hand data for detailed assessment.

Common methodologies include field surveys and sampling exercise at-site and off-site. Primary data can also be collected to fill in the gaps in information that is gathered through secondary data collection.

Typically, the sampling and assessment area shall be bounded by the ZOS. However, if assessment shown that the impacts may extend much further away, the ZOI shall be included as part of the sampling and assessment area.

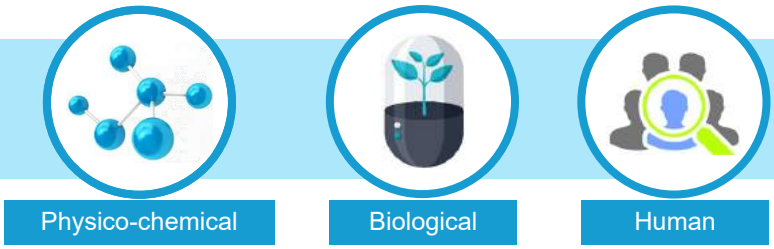
Secondary Data

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

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

4.3
Components of Environmental Baseline Data

Environmental baseline data collection covers three major environmental components namely:



4.3.1
Physico-chemical Environment

Normally, the EIA study will focus on the core aspects of pollution in physico-chemical environment namely:

Baseline information on these three core aspects are needed to determine the condition of the environment before, during and after project implementation. These conditions shall be benchmarked against 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 and its activities. Details of the sampling plan and methodologies must be clearly stated in the EIA.

Table 4.1 shows a range of baselines for sampling and studies of physico-chemical environment. The recommended parameters for water, air, noise and vibration are provided as referenced together with standards to benchmark them against. Other baseline data requirements are listed in Table 3.2 in **Chapter 3**.

All samples must be analysed by a laboratory accredited by the Skim Akreditasi Makmal Malaysia (SAMM). All test certificates and data shall be included in the appendix of the EIA as supporting evidence.

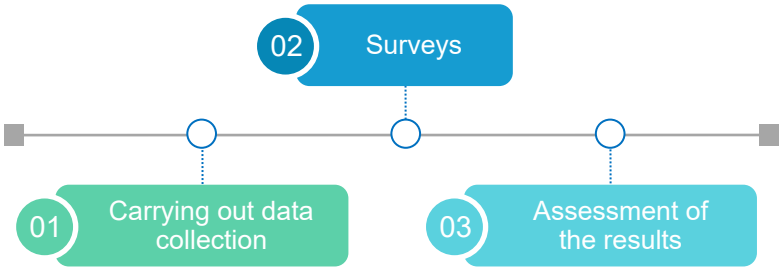
The proposed procedures for sampling practices for water, air, noise and vibration are appended in *Attachment 2*.

Table 4.1 Recommended baseline sampling requirement for physico-chemical environment

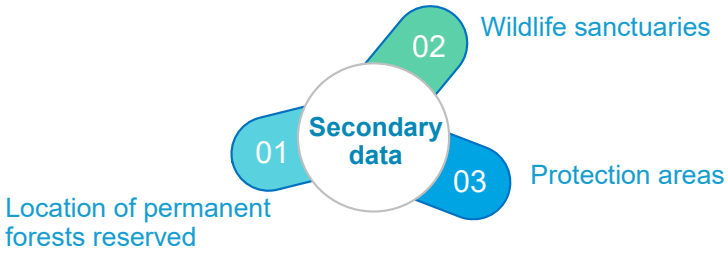
COMPONENT	RECOMMENDED PARAMETER	REFERENCE STANDARD	RECOMMENDED REQUIREMENTS
 **Surface Water Quality**	As stated in: ▪ National Water Quality Standards of Malaysia (NWQS) ▪ National Lake Water Quality Criteria and Standards of Malaysia (NLWQS)	▪ National Water Quality Standards of Malaysia (NWQS) (*Attachment 3*) ▪ National Lake Water Quality Criteria and Standards of Malaysia (NLWQS) (*Attachment 4*)	▪ Upstream and downstream of major rivers, lakes and streams within the ZOI ▪ Multi-depth sampling for deep lakes or rivers ▪ Pesticides testing required for agricultural projects
 **Air Quality**	▪ $PM_{2.5}$ ▪ PM_{10} ▪ Carbon monoxide (CO) ▪ Sulphur dioxide (SO_2) ▪ Nitrogen dioxide (NO_2) ▪ Ozone (O_3)	Malaysian Ambient Air Quality Standards (MAAQS) (*Attachment 5*)	▪ Minimum two sampling locations (upwind and downwind) ▪ Sampling at project boundary and nearest receptors
 **Noise**	▪ L_{Aeq} ▪ L_{max} ▪ L_{min} ▪ L_{10} ▪ L_{50} ▪ L_{90}	Guidelines for Environmental Noise Limits and Control (*Attachment 6*)	▪ 24-hour sampling for day time and night time ▪ Sampling at project boundary and nearest receptors
 **Vibration**	Requirements as per Schedule 1-6 of the Planning Guidelines for Vibration Limits and Control	The Planning Guidelines for Vibration Limits and Control in the Environment (*Attachment 7*)	▪ Depending on site conditions and need ▪ Sampling at project boundary and nearest receptors
 **Hydrology**	Stream flow	DID requirements	▪ Site survey to verify river system and drainage ▪ Stream gauging to ascertain flow ▪ Identification of downstream sensitive receptors
 **Soil Characteristics**	▪ Particle size distribution ▪ Texture ▪ Organic matter ▪ pH ▪ Alkali metals ▪ Sodium Absorption Ratio (SAR) of soils	-	Sampling done within the agricultural/cropland area

4.3.2
Biological Environment

The biological environment scope is very wide. Therefore, the relevant agencies such as JPSM and PERHILITAN must be consulted (preferably at the scoping/TOR stage) prior to the following:



A lot of general information already exists in the publication of various agencies that can be referred to as secondary data, such as:



Similarly, agencies such as the FRIM have published research and inventories of flora and fauna in selected forest areas and conservation zones.

Field survey can be conducted if secondary data is not available. The survey should cover habitat mapping, species inventory (with photograph) as well as abundance and diversity assessment. By doing so, the survey will provide an indication of the types of animals found in the area, population and their habitat.

The scope and requirement for terrestrial and aquatic biological environment are determined by the magnitude of the foreseeable impacts. If the biological impact of the Project is not significant, secondary data would suffice.

The recommended baseline sampling requirements of biological environment are shown in *Table 4.2*.

Table 4.2 Recommended baseline sampling requirement for biological environment

COMPONENT	RECOMMENDED PARAMETER	REFERENCE GUIDELINES/ STANDARDS	RECOMMENDED REQUIREMENTS
 **Terrestrial Flora**	▪ Tree species inventory (photograph) – family, species, local name ▪ Species distribution ▪ Conservation status ▪ Legal status ▪ Diameter (for saplings and trees) ▪ Tree quality ▪ Non-timber species, climbers, ferns and orchids ▪ Rattan, bamboo and palms	International Union for Conservation of Nature (IUCN) Red List of Threatened Species	▪ Surveys within project site and adjacent ▪ Approaches: ∗ stratification ∗ ground samples ▪ Survey methods: ∗ transect line or transect survey ∗ interviews and local knowledge ∗ other relevant methods
 **Terrestrial Fauna**	▪ Groups: ∗ avifauna ∗ volant mammals ∗ non-volant mammals ∗ insects ∗ herpetofauna ▪ Fauna species inventory (photograph): ∗ local name, scientific name, English name ▪ Habitat preference ▪ Species distribution ▪ Conservation status ▪ Legal status	▪ IUCN Red List of Threatened Species ▪ Wildlife Conservation Act 2010 (Act 716)	▪ Surveys within project site and adjacent ▪ Approaches: ∗ habitat mapping ∗ fauna diversity surveys ▪ Survey methods: ∗ transect line or transect survey ∗ live-trapping ∗ mist netting ∗ camera trapping ∗ harp trap ∗ night-spotting ∗ sweeping net ∗ interviews and local knowledge ∗ other relevant methods
 **Aquatic (flora and fauna)**	▪ Groups ∗ Fish survey ∗ Plankton (zooplankton and phytoplankton) ∗ Macro invertebrates ∗ Aquatic plants ∗ Periphyton ▪ Species inventory (photograph) ∗ local name, scientific name, English name ▪ Species distribution ▪ Conservation status ▪ Legal status	▪ IUCN Red List of Threatened Species ▪ Fisheries Act 1985 (Act 317)	▪ Surveys within project site and adjacent ▪ Approaches: ∗ aquatic sampling ∗ ground truthing (aquaculture operators) ▪ Survey methods: ∗ dip nets ∗ surber samplers ∗ grab samplers ∗ suction samplers ∗ colonisation samplers ∗ interviews and local knowledge ∗ other relevant methods

4.3.3
Human Environment

Relevant data collection will be required for the section on socio-economic assessment in the EIA. For primary data, a series of engagement with stakeholders can be arranged to convey information about the proposed project in order to receive perception and feedback from the stakeholders.

The stakeholder engagements can be further focused by having direct interview, focus group discussion (FGD), public dialogue, workshop, exhibition and road show, and round table discussion. Details of these methods are listed in Section 2.8.3 in **Chapter 2**.

Secondary data includes the population census but for an accurate population statistic, these data is best collected from the:

01 local authorities; and

02 district offices

If Social Impact Assessment (SIA) is required, the study shall follow the requirements, guidelines and procedures of PLANMalaysia. PLANMalaysia shall review, endorse and enforce the requirements of the SIA. For the purpose of the EIA, only the main findings from the SIA shall be incorporated.

The recommended baseline data requirements for human environment are tabulated in *Table 4.3.*

Table 4.3 Recommended baseline data requirements for human environment

COMPONENT	RECOMMENDED PARAMETER	REFERENCE GUIDELINES/ STANDARDS	RECOMMENDED REQUIREMENTS
 Socio-economic	▪ Settlement pattern ▪ Population distribution ▪ Demography and population dynamics ▪ Population socio-economic profile ▪ Existing infrastructure, utilities and amenities	SIA Manual (PLANMalaysia)	▪ Surveys on target stakeholders potentially affected by the project ▪ Surveys must represent the stakeholders in the ZOI ▪ Conduct stakeholder engagement
 Public Health	▪ Population profile ▪ Public health status	Guidance Document on Health Impact Assessment (HIA) in EIA (DOE Malaysia)	▪ Surveys on target stakeholders potentially affected by the project ▪ Surveys must represent the stakeholders in the ZOI ▪ Conduct stakeholder engagement
 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 ▪ As specified in local plan, special area plan
 Ecotourism	Identify and determine significance of value of such sites within or near to project site	-	▪ Surveys on target stakeholders potentially affected by the project ▪ Conduct stakeholder engagement ▪ As specified in local plan, special area plan

4.3.4 Identification of Environmentally Sensitive Areas

Identification of Environmentally Sensitive Areas (ESA) is central in carrying out the EIA study. The ESA identification shall be based on nine main documents namely the:

01 Physical plans/policies (NPP/RFZPPN);
02 State plans;
03 Local plans (RTD);
04 Planning guidelines (GPPP); and
05 *Buku Panduan Kawasan Sensitif Alam Sekitar Malaysia* (DOE, 1993);
06 Environmental Quality Act 1974;
07 Environmental Essentials for Siting in Malaysia (EESIM);
08 Guidelines for Siting and Zoning of Industry and Residential Areas (SZIRA); and
09 Ground truthing.

NPP-3 defines ESA as:

"a special area that is very sensitive to any form of changes to the ecosystem as a result of the natural process or activity in or around it, either directly or indirectly"

ESA sensitivity level is determined based on three characteristics, namely:

01 the elements of disaster risk function;
02 the life support; and
03 the treasures and heritage of the area.

According to NPP-3, ESA are managed by the criteria stated below.

Rank 01

Description
- Protected Area (existing and proposed)
- Endangered habitat outside the protected area
- Catchment areas for dam (existing and proposed)
- Areas above 1,000 m contour

Criteria
No development, agriculture or logging shall be permitted except for low-impact, nature tourism, research and education.

Rank 02

Description
- All forests and wetlands outside the protected area
- 500 m buffer zone for ESA Rank 1
- Areas between 300 - 1,000 m contour

Criteria
No development or agriculture. Sustainable logging and low-impact nature tourism may be permitted subject to local constraints.

Rank 03

Description
- 500 m buffer zone of ESA Rank 2
- Catchment area for water intakes and groundwater recharge zones
- Areas between 150 - 300 m contour

Criteria
Controlled development where the type and intensity of the development shall be strictly controlled depending on the nature of constraints.

Source: NPP-3 (2016)

All identified ESAs within the ZOS must be presented in a satellite image and each of the ESAs must be listed in a table which consist of:

However, important and sensitive ESAs outside of the ZOS must still be identified and shown in the satellite image (*Figure 4.1*). An example of the table is shown in *Table 4.4*. In addition, a brief description of each of the categories must be provided to determine their existing condition.

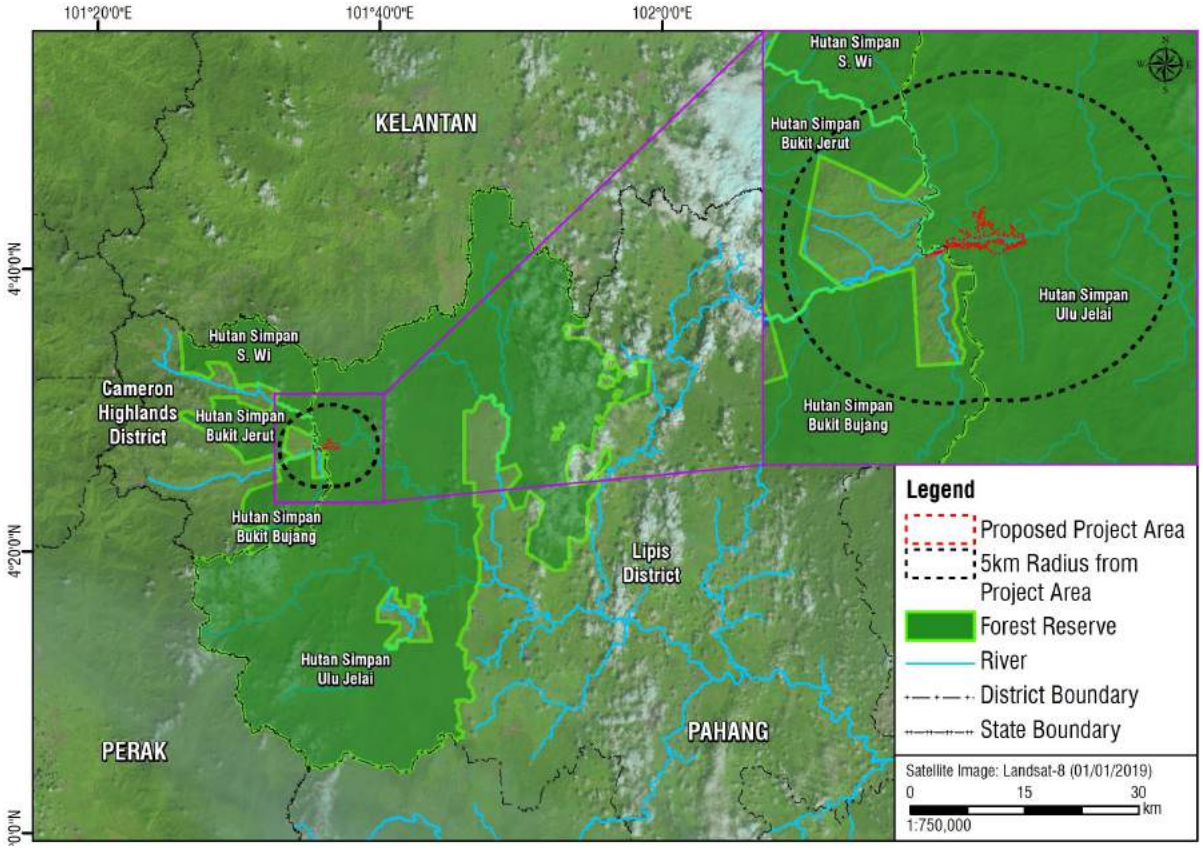


Figure 4.1 Example of ESAs identified at a project site

Table 4.4 Example of ESAs and its details

ESA RANK	CATEGORY	LOCATION	NEAREST DISTANCE FROM PROJECT BOUNDARY (KM)	SOURCE
1	Forest Reserve	*Hutan Simpan Kekal Ulu Jelai, Pahang*	Within the Forest Reserve	▪ NPP-3 (PLANMalaysia, 2016) ▪ Katalog Metadata Geospatial (JPSM, 2011)
		Hutan Simpan Kekal Bukit Jerut	2.0	▪ NPP-3 (PLANMalaysia, 2016) ▪ Katalog Metadata Geospatial (JPSM, 2011)
		Hutan Simpan Kekal Bukit Bujang	1.0	▪ NPP-2 (PLANMalaysia, 2010) ▪ Katalog Metadata Geospatial (JPSM, 2011)

Meanwhile, GPPPP provides further refinement on ESA management policy as outlined in NPP-3. While GPPPP uses the same definition of ESA as NPP-3, it provides further additional characterisation as shown below.


Source: in.pinterest.com

01 Special area

ESA is a physical area that can be recognised on a map and consists of environmental characteristics that are important, significant or unique.

02 Special area that sensitive towards development or specific activity

Typically, new developments are not encouraged within ESA especially activities that cause significant changes to land use and density. However, controlled development can be considered for ESA that have low sensitivity values.


Source: asianwanderlust.com


Source: www.thebrokebackpacker.com

03 Rehabilitation

ESA is an area that must be preserved and have to be protected and managed properly via laws, administration, zoning and development control.

04 Heritage value

Heritage value ESA is defined as areas with high historical, biological diversity, cultural and scientific values.


Source: www.southeastasian archaeology.com


Source: www.airbnb.com

05 Life support value

Defined as areas with features that are important to support the basic needs of human and other organisms such as water sources, highland ecosystem, coastal area and mineral deposit area.

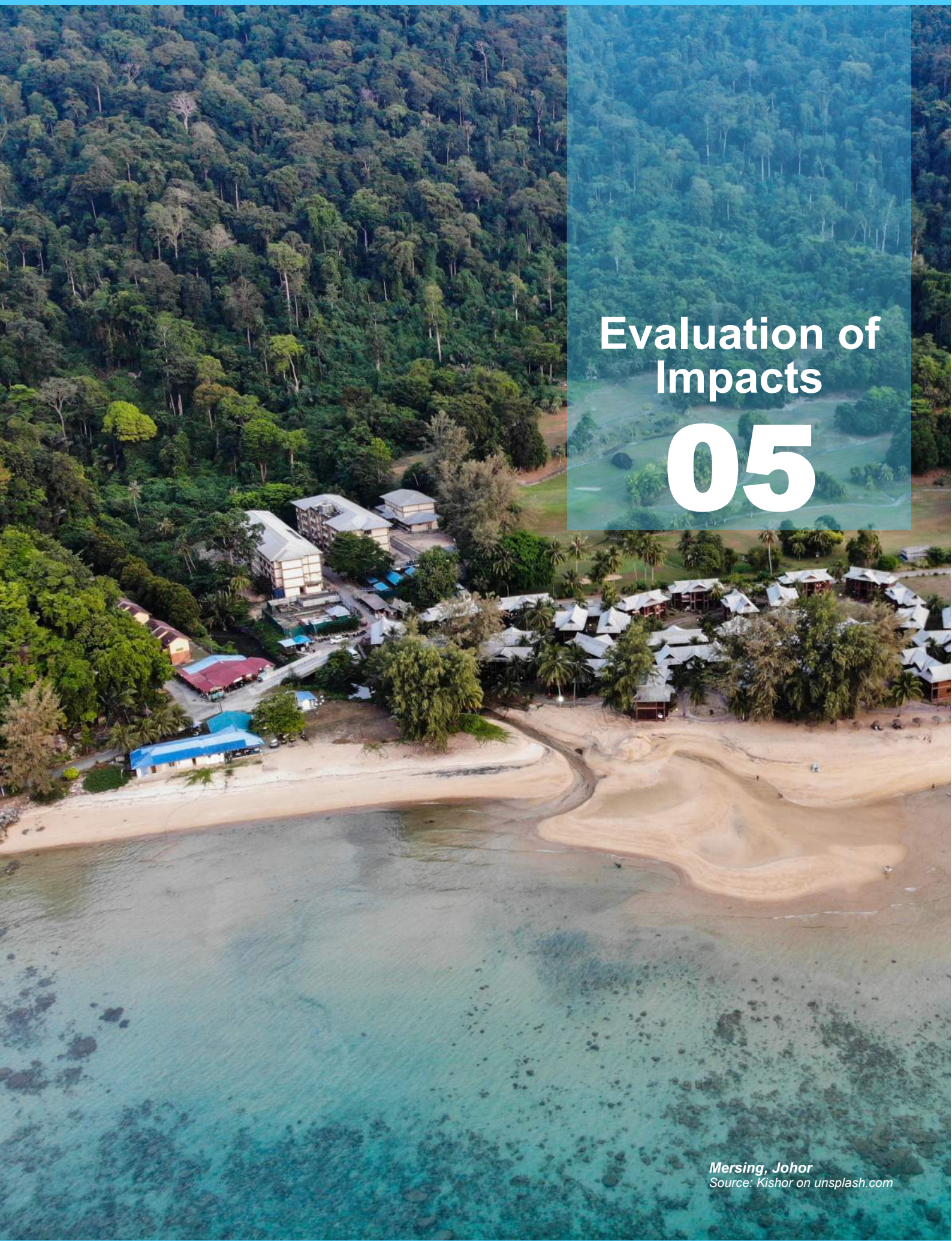
06 Disaster risk

Defined as areas with high risk of natural disasters or casualties if subjected to development or human activities encroachment.


Source: www.nst.com.my

Evaluation of Impacts

05



Mersing, Johor
Source: Kishor on unsplash.com

5.1 Introduction

5.2 Prediction of Environmental Impacts

5.3 Evaluation of Environmental Impacts

5.4 Environmental Criteria and Standard

5.5 Environmental Trade-offs

Mersing, Johor
Source: Kishor on unsplash.com

05

Evaluation of Impacts

5.1 Introduction

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

The predictions and evaluations are done quantitatively or qualitatively or even both.

01 Quantitative method

- based on the measurement of a quantity or amount via numerical tools such as modeling
- the result is usually a number or a set of numbers

02 Qualitative method

- involves quality where the results are expressed in words; for example significant, insignificant, temporary, permanent, high, medium or low
- can be used to understand the meaning of the numbers obtained from quantitative method

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

01 Established and proven methods and models;

02 Adequate, accurate and up-to-date data for assessment;

03 Results can be replicated and are reproducible by independent evaluators; and

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

It is up to the Qualified Person to select the best method to conduct the assessments and/or generate practical scenarios from reliable datasets to ascertain the magnitude, extent and significance of impacts from the project. Only significant issues shall be addressed in detail in the EIA. Issues that are not significant shall only be addressed qualitatively.

5.2 Prediction of Environmental Impacts

There are various methodologies that can be used for prediction, evaluation and assessment of impacts. 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. Among the method and tools that can be employed are:

01 Expert opinion

02 Checklists

03 Spatial analysis

04 Matrices

05 Case studies

The EIA report must be scientifically and technically sound and whenever necessary, quantitative impact prediction on the more significant impacts should be carried out. If computer modeling is carried out (water quality, flooding, etc.), the following information is required:

01 Name and description of method/ model;

02 Model set-up;

03 Data collection and analysis;

04 Calibration and validation;

05 Details of scenarios for modeling;

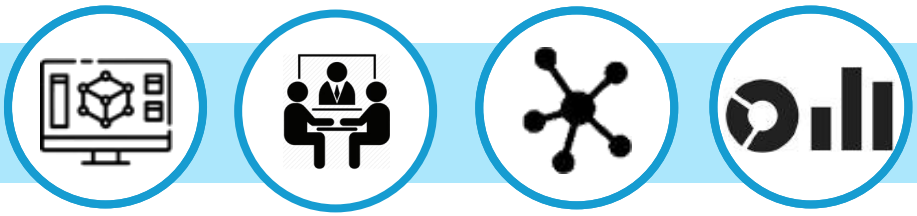
06 Presentation of results (raw data, table form, graphs); and

07 Limitations in data collection or method chosen.

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

Necessary technical report, data analysis, tables and raw data shall be included as appendix in the EIA to support the impact assessment methodology.

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



06 Mathematical and computer modeling

07 Consultation and questionnaires

08 Network and system analysis

09 Carrying capacity analysis

5.3 Evaluation of Environmental Impacts

Evaluation is the stage of an EIA where predicted adverse effects are judged as to their significance. The latter determines the level of mitigation necessary to bring the impacts to acceptable levels.

The judgement of significance can be based on one or more of the following, depending on the environmental component being evaluated. These are:

Pollution limits

- comparison with laws, regulations or accepted national or international standards

Nature conservation

- reference to pre-set criteria such as conservation or protected status of a site, features or species

Sustainability

- consistence with pre-set policy objectives (such as for agriculture, national forestry, economic development, land use and others)

Social acceptability

- consultation and acceptability with the relevant decision makers, local community or the general public.

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

01 Scale of the project (land area, total disturbed areas, etc.):
- total land area size
- total disturbed area

02 Intensity of development (total land clearing, phasing of land clearing):
- total land clearing
- phasing of land clearing
- rate of construction/ development

03 Potential pollution sources from the project:
- land clearing works
- construction activities
- operation

04 Magnitude and complexity of impacts:
- quantitative or qualitative assessment
- longevity of the impact (residual impact)

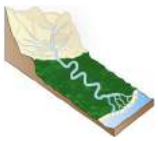
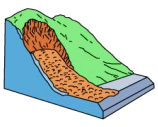
05 Area of impacts :
- localised versus transboundary

06 Probability of cumulative impacts:
- effect of project on adjacent or downstream land areas and vice versa
- pollution load

07 Sensitivity of nearby receptors
- ESA ranks
- human environment

Table 5.1 summarises the major evaluation of impacts and its expected output based on typical significant components of drainage and/or irrigation project.

Table 5.1 Key impact evaluation and its expected output

ENVIRONMENTAL COMPONENT	SOURCE OF POLLUTION	ASSESSMENT REQUIREMENTS
 **Ecology**	Construction Stage ▪ Land disturbing activities e.g. site clearing, construction of access road Operation Stage ▪ Pollutants and nutrients introduced by fertilizers and pesticides	▪ Mapping of important habitats and ESA ▪ Inventory of existing flora and fauna ▪ Identification of critical species ▪ Recommendation of mitigation measures for flora and fauna that need relocation or protection
 **Erosion and Sedimentation**	Construction Stage ▪ Land disturbing activities ▪ Pollutants of concern: TSS and turbidity Operation Stage ▪ Land disturbing activities within the catchment area ▪ Exposed canal lining or lake/ reservoir embankment	▪ Assessment of land clearing scale to determine rate of erosion ▪ Assessment of the conditions of the hydrological and drainage system ▪ Assessment of the extent of erosion and sedimentation ▪ Determination of suitable best management practices (BMP)
 **Hydrology**	Construction Stage ▪ Land disturbing activities e.g. site clearing, cut and fill Operation Stage ▪ Changes in existing hydrological flow and drainage pattern	▪ Assessment of land clearing scale and alterations to hydrological and drainage characteristics of the site ▪ Determine the scale of drainage system that may be altered ▪ Evaluation of hydrological condition before and after project implementation ▪ Determination of the impacts to downstream ▪ Determination of environmental flow setting
 **Geotechnical Hazards**	Construction Stage ▪ Slope cutting ▪ Piling activities	▪ Assessment of areas of the project site and its surroundings for risk. For example, slope failure, erosion, landslides, seismic activities, etc. ▪ Determination of the adequacy of buffer to avoid or reduce risk of hazards to the project area ▪ Identification of suitable engineering and geotechnical measures required to ensure that hazards are fully addressed

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

PREDICTION METHOD	EVALUATION OF IMPACTS	OUTPUT
▪ Comparative assessment of conservation status and sensitivity of habitat, flora and fauna ▪ Ecological models for species diversity and population change ▪ Limit of Acceptable Change (LAC) ▪ Spatial models, such as GLOBIO3 <u>Output</u> ▪ Habitat map ▪ Species inventory, especially of rare, endangered, threatened and near extinct species that may require protection	▪ Determine the level of encroachment into ESA ▪ Indication of possible loss of habitat and its flora and fauna ▪ Identify project activities that could disturb animal behaviour ▪ Forest fragmentation and its consequences ▪ Increase in poaching and roadkill ▪ Impacts from increased human-wildlife conflict (HWC)	▪ Highlight important area to be protected ▪ Identification of critical areas for mitigation measures ▪ Develop wildlife management plan
▪ Revised Universal Soil Loss Equation (RUSLE) ▪ Modified Universal Soil Loss Equation (MUSLE) ▪ Computer models <u>Output</u> ▪ Soil loss rates and sediment yields during pre-construction, construction, construction with measures and post construction stages ▪ Erosion risk and potential soil loss maps	▪ Calculate the rate of erosion and sediment yield using standard formulae and site-specific information ▪ Provide erosion scenarios i.e. with and without mitigation measures	▪ Adoption of avoidance principles ▪ Identify suitable BMP to incorporated in land-disturbing pollution prevention and mitigation measures (LD-P2M2)
▪ Hydrological procedures (DID) ▪ Computer models for estimating peak flood, runoff, watershed analysis, flood plain hydraulics, etc. Examples include HEC-HMS, HEC-RAS, FLO-2D, TUFLOW, EXTRAN and Storm Water Management Model (SWMM) ▪ Hydrological analysis in accordance with Manual Saliran Mesra Alam 2 (MSMA-2) and approved by DID <u>Output</u> ▪ Estimation of pre-construction and post-construction runoff ▪ Flood risk map ▪ Environmental flow (upstream and downstream)	▪ Delineate the river basins or system that are affected ▪ Collect hydrological data and assess long-term rainfall trends ▪ Use mathematical or simulation models to ascertain the different hydrological condition pre and post project implementation	Hydrological and drainage systems of the project and its impact on the surrounding as input to the technical and engineering works
▪ Soil Investigation (SI) ▪ Geological Terrain Mapping (GTM) ▪ Site assessment by qualified geotechnical engineer and/or geologist ▪ Risk analysis ▪ Engineering design and estimation of Factor of Safety (FOS) <u>Output</u> ▪ Identification and mapping of high risk areas to avoid or to apply mitigation measures	▪ Develop risk map and determine FOS for all engineered slopes and hazard areas ▪ Assess the impact and extent of damages/losses in the event of slope failure and sensitive receptors that may be affected. ▪ Determine areas in need of mitigation measures or engineering solutions to reduce risk	▪ Hazard areas shall be clearly mapped out as part of the GTM study to determine construction suitability ▪ Areas of high risks shall be avoided being built upon or with adequate geotechnical and engineering measures being proposed ▪ Monitoring programme for slopes

Table 5.1 (cont'd) Key impact evaluation and its expected output

ENVIRONMENTAL COMPONENT	SOURCE OF POLLUTION	ASSESSMENT REQUIREMENTS
 **Water Quality**	Construction Stage ▪ Land disturbing activities (Parameters of concern; TSS and turbidity) ▪ Sewage discharge from on-site workers quarters (Parameters of concern; DO, BOD, ammoniacal nitrogen) Operation Stage ▪ Overdosing of pesticide and fertilizers	▪ Assessment of types and scale of impairment to water quality ▪ Determination of potential sources of pollutants e.g. land clearing, biomass degradation, etc.
 **Air Quality**	Construction Stage ▪ Land disturbing activities e.g. site clearing, construction of access road	Identify potential air pollution generating sources
 **Noise**	Construction Stage ▪ Piling activities ▪ Vehicle and machineries movement	Assessment of ambient noise environment and activities that pose impairment hazards to the workers and nearby sensitive receptors
 **Vibration**		Assessment of ambient vibration and activities that pose impairment hazards to the workers and nearby sensitive receptors
 **Land Use**	Construction Stage ▪ Land disturbing activities e.g. site clearing ▪ Construction of buildings Operation Stage ▪ Permanent change in land use	Assessment of the compatibility of the project towards the surrounding land use

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

PREDICTION METHOD	EVALUATION OF IMPACTS	OUTPUT
▪ Mathematical models (one, two or three-dimensional) analysis of pollution loads and dispersion in the waterways e.g. QUAL2K, MIKE11, etc. ▪ Simple mass balance models e.g. Streeter-Phelps Model Output ▪ Estimation of pollutant concentration affecting a stretch of river and downstream sensitive areas ▪ Estimation of pollutant load and extent of effect on sensitive receptors	▪ Determine pollutant loading via variety of models and determine the magnitude and extent of impacts further downstream ▪ Identify potential water polluting sources ▪ Identify and determine users and sensitive habitat located downstream	Identify suitable BMP and treatment system
▪ Gaussian plume dispersion model to assess dust generation over an area under the worst-case scenario Output ▪ Dispersion contour map indicating levels at sensitive receptors ▪ Comparison of computed values with the Malaysian Ambient Air Quality Standards (MAAQS) ▪ Determination of location of maximum air pollution concentration	Assess the level of pollutants pre and post development for major sensitive receptors. If necessary, air quality models shall be used	▪ Identify the extent of potential impacts to nearby sensitive receptors ▪ Critical levels for disturbance at sensitive receptors shall be identified and mitigated
▪ Mathematical models to assess noise levels for point source or linear sources ▪ Noise modeling software, such as SoundPlan, CadNa or Geographic Information System (GIS) acoustic models ▪ Traffic noise models Output ▪ Quantitative values for noise level at sensitive receptors ▪ Noise contour map indicating levels at sensitive areas ▪ Comparison of computed values to DOE's permissible noise limits	Model or calculate the increase in noise level, mapped as noise contours	
▪ Continuous vibration ▪ Ground vibration ▪ Human annoyance and discomfort	Comparison with Recommended Limits for Human Response and Annoyance from Short Term Vibrations, Planning Guidelines for Vibration Limits and Control in the Environment 2007	
▪ Compatibility assessment based on structure plan, local plan and other guidelines ▪ Adherence to required setback based on national and state guidelines ▪ Visual assessment on scenic and aesthetic value of the area ▪ 2-D and 3-D Viewshed Analysis Output ▪ Land use compatibility and buffer requirements	▪ Identify the designated land use of the project site as per the spatial plan ▪ Evaluate the suitability of the project on the surrounding development	▪ Determine the suitability of the project on the designated site ▪ Highlight possible land use conflict that may arise

Table 5.1 (cont'd) Key impact evaluation and its expected output

ENVIRONMENTAL COMPONENT	SOURCE OF POLLUTION	ASSESSMENT REQUIREMENTS
 **Climate**	**Operation Stage** ▪ Site clearing, removing vegetation in wetlands/irrigation area, access road, etc. ▪ Presence of water body	▪ Loss of carbon sink due to wetland drainage or forest clearance ▪ Changes of micro climate due to the presence of impounded water body
 **Social**	Construction Stage ▪ Relocation of settlements ▪ Employment opportunities ▪ Social conflict between foreigners and locals ▪ Nuisance from construction activities; noise and dust Operation Stage ▪ Reduced water quality may affect water-based economic activities e.g. fisheries	▪ Determine whether there is land and property acquisition and relocation of communities ▪ Assessment of extent of impacts both negative (dust, noise, pollution, hazards, etc.) and positive (job and business opportunities) ▪ Assessment of the views and perception of the affected stakeholders
 **Waste Management**	Construction Stage ▪ Land disturbing activities e.g. site clearing ▪ Construction activities Operation Stage ▪ Biomass from agriculture activities	▪ Identify types of waste generated during construction and operations ▪ Assessment of the impacts from these wastes and the required management measures
 **Safety and Health**	Construction Stage ▪ Hazard from construction activities	Assessment of safety and health towards workers and surrounding community
 **Traffic**	Construction Stage ▪ Hazard from construction activities	▪ Description on traffic arrangement during construction ▪ Identification of the need for mitigation measures

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

	PREDICTION METHOD	EVALUATION OF IMPACTS	OUTPUT
	▪ The Greenhouse Gas Protocol (GHG Protocol) of the World Resources Institute (WRI) ▪ The technical reports and methodology guidelines of the Intergovernmental Panel on Climate Change (IPCC) Output ▪ Estimation of pre-construction and post-construction carbon sink	▪ Determine loss of carbon sink due to wetland drainage and/or vegetation clearance ▪ Determine potential carbon sink of aquatic vegetation (microphyte) in the water body	Identity potential measures to offset the loss of carbon sink
	▪ Social and economic surveys on affected population ▪ Perception survey to ascertain acceptance of project ▪ Social Impact Assessment (SIA) Output ▪ Socio-economic profiling ▪ Public opinion survey results ▪ Stakeholder feedback for EIA including possible mitigation measures	▪ Identify the extent of land acquisition and affected stakeholders ▪ Delineate the survey catchment determine statistically the number of surveys required ▪ Evaluation to focus on communities within the ZOS. If there is a need, those in ZOI shall also be assessed ▪ Main findings from Social Impact Assessment (SIA) shall be incorporated	Land and property acquisition and relocation of communities must first be settled prior to EIA commissioning and submission
	▪ Estimation on total biomass based on vegetation types and published studies values ▪ Solid waste generation estimation based on population ▪ Identification of potential scheduled waste generation during construction and operations based on project activities Output ▪ Estimated amount of waste generated	▪ Identify and estimate the quantum of all waste sources ▪ Assess the severity of impacts from improper management ▪ Identify locations of temporary storage within the site ▪ Identify locations for disposal site	▪ Identification of proper temporary disposal sites and storage facilities ▪ Develop mitigation measures against spillage and other impacts ▪ Mitigation measures to be incorporated into project site management
	▪ Social and economic surveys on affected population ▪ Perception survey to ascertain acceptance of project ▪ Social Impact Assessment (SIA) Output ▪ Socio-economic profiling ▪ Public opinion survey results ▪ Stakeholder feedback for EIA including possible mitigation measures	▪ Determine the level of risk to neighbouring receptors ▪ Identify the existing health conditions of receptors ▪ Assess the possible impacts on workers safety and health during construction stage ▪ If necessary, use risk assessment models to ascertain the level of risk	▪ Determine the qualitative/ quantitative risk to receptors to identify appropriate BMP ▪ Findings from Health Impact Assessment (HIA) can also provide possible preventive and mitigation measures
	▪ Qualitative/quantitative health risk assessment (HRA) encompassing hazard identification, exposure assessment and risk characterisation Output ▪ Potential health impacts to nearby population	▪ Review and incorporate main findings from TIA into the EIA ▪ Main impact elements are communities living along the logistic road during construction	▪ Identification of potential issues during construction and incorporation of structural and non-structural measures ▪ Identification of risk factors

5.4 Environmental Criteria and Standard

The method to determine the level of significant impact is to compare the results against the stipulated current criteria and standard limits imposed by the DOE and/or various Government Agencies (GAs). The environmental criteria and standards are provided in *Attachment 3* to *7*.

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

Table 5.2 lists the evaluation of criteria and standards for environmental parameters.

Table 5.2 Examples of criteria and standards for environmental parameters

IMPACTS	EVALUATION CRITERIA
 **Erosion and Sedimentation**	**Guidance Documents** ▪ Guidance Document for Addressing Soil Erosion and Sediment Control Aspects in the EIA Report (DOE) ▪ Guidance Document for the Preparation of the Document on LD-P2M2 (DOE) ▪ Guidelines for Erosion and Sediment Control in Malaysia (DID) ▪ Manual Saliran Mesra Alam Edisi-2 (MSMA-2) (DID, 2012) **Sediment basin/silt trap discharge** ▪ TSS: 50 mg/L or depending on locality ▪ Turbidity: 250 NTU or depending on locality

Note: The list is not exhaustive and not all of the above may be relevant to the project. The Project Proponent and Qualified Person shall make reference to the latest standards and requirements by the authorities

Table 5.2 (cont'd) Examples of criteria and standards for environmental parameters

IMPACTS	EVALUATION CRITERIA
 **Water Quality and Pollution Control**	▪ Ambient water quality: National Water Quality Standards for Malaysia (NWQS) ▪ Ambient marine/brackish water quality: Malaysian Marine Water Quality Standards (MMWQS) ▪ Lake water quality: National Lake Water Quality Criteria and Standard (NLWQCS) ▪ Sewage discharge: Environmental Quality (Sewage) Regulations 2009 ▪ Toilet and septic tanks: Design and requirements approved by SPAN
 **Flood/Runoff Management**	MSMA-2 requirements
 **Air Quality**	▪ Environmental Quality (Clean Air) Regulations 2014 ▪ New Malaysia Ambient Air Quality Standard (DOE, 2013)
 **Noise Level**	▪ The Planning Guidelines for Environmental Noise Limit and Control (DOE, 2019) ▪ Factories and Machinery (Noise Exposure) Regulations 1989
 **Vibration**	▪ The Planning Guidelines for Vibration Limits and Control in the Environment (DOE, 2007) ▪ JMG requirements for blasting operations
 **Ecology**	▪ International Union on the Conservation of Nature (IUCN) and Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) listing ▪ Wildlife Conservation Act 2010 ▪ Feedback from Department of Fisheries (DOF), PERHILITAN and Forestry Department Peninsular Malaysia (JPSM)
 **Land Use**	▪ Structure Plans, Local Plans, Special Area Plans (RKK) ▪ ESAs ▪ Local authority requirements
 **Land Traffic**	▪ Acceptable level of service (LOS) for traffic flows ▪ Local authority/JKR requirements

Note: The list is not exhaustive and not all of the above may be relevant to the project. The Project Proponent and Qualified Person shall make reference to the latest standards and requirements by the authorities

Table 5.2 (cont'd) Examples of criteria and standards for environmental parameters

IMPACTS	EVALUATION CRITERIA
 **Safety and Health**	▪ Occupational Safety and Health Act 1994 ▪ Factory and Machinery Act 1967 ▪ Department of Occupational Safety and Health (DOSH) ▪ Guidance Document on Health Impact Assessment (HIA) in EIA (DOE) ▪ EIA Guidelines for Risk Assessment (DOE)
 **Socio-economy**	▪ Public perception on acceptability ▪ National Heritage Register (National Heritage Department) ▪ Preservation of cultural, heritage, historical and archaeological items and sites of significance ▪ Social Impact Assessment (SIA) requirements in the context of the Town and Country Planning Act (Amendment) 2017 (Act A1522)
 **Wastes**	**Scheduled wastes** ▪ Environmental Quality (Scheduled Wastes) Regulations 2005 **Other wastes** ▪ Solid Waste and Public Cleansing Management Act 2007 ▪ Local authority requirements
 **Visual Aesthetics**	Public perception on acceptability

Note: The list is not exhaustive and not all of the above may be relevant to the project. The Project Proponent and Qualified Person shall make reference to the latest standards and requirements by the authorities

5.5 Economic Valuation of Environmental Impact (EVEI)

Due to the substantial capital investment, the proposed project is expected to provide substantial economic and business opportunities to market participants. However, the construction and operation of the proposed project are also likely to cause some negative environmental impacts that must be mitigated as required by law, besides going through the EIA approval process.

The objective of the EVEI is to quantify and monetize the impacts of the proposed project on the flow of environmental services. This requires valuation in monetary terms of the changes (both negative and positive if any) in environmental services arising from project implementation over an assessment period of 50 years.

A critical step in the valuation process revolves around the need to ensure valid attribution of impacts on environmental services to the proposed project. In order to satisfy this requirement, physical environmental impacts that can reasonably be attributable to the proposed project must first be demonstrated. In other words, the approach requires the establishment of a clear link between project impacts on the physical functions of the environment and the alteration of the quality and quantity of streams of environmental goods and services. The Guidelines on the Economic Valuation of the Environmental Impacts for EIA Projects (DOE,2008) is very clear in this regards where it specifies that:

> *"… a key issue is to identify and quantify the changes in the flow of goods and services produced by the environment which are impacted by a development project, and then to monetize these changes into costs or benefits"*

The valuation process can be divided into nine distinct steps, as follows:

01 Identify the project stakeholders

- The stakeholders are determined by establishing clear links between the degradation in environmental services to the impacted parties.

02 Define the "with project" and "without project" scenario

- A contrast is considered under the "with" and "without" project scenarios, as opposed to "before" and "after" scenarios. It involves the conceptualization of the "with" and "without" project scenarios. For the current project under evaluation, the "with Project" scenario is defined as the situation where the project is implemented. The "without Project" scenario is depicted as the situation in which the proposed project is not implemented i.e. maintenance of the status quo.

03 Describe the physical impacts

- A listing of potential physical impacts of the project that can be reliably attributed to the project is prepared and described by focusing on the physical extent of the impact and the link between the project and its impact on the flow of environmental services.

04 Quantify the impacts on the environment over the duration of the project

- The physical impacts of the project on the environment is explained and quantified via scientific assessments of the study team that include among others marine biologists, air and water quality specialists, hydraulic specialist and etc.

05 Monetize the impacts

- The quantified impacts produced in Step 4 are monetized using market and non-market valuation techniques. Value parameters of similar environmental services obtained in other studies are used as reference points for evaluation.

06 Discounting

- Costs and benefits over time (25 years) are discounted to present values using several discount rates (4%, 6% and 8%). Twenty-five years is typically used as the standard period of evaluation since the present value of future benefits/costs beyond 50 years tend to become quantitatively insignificant.

07 Determine the net present value

- The net present value is computed in this step by adding up the discounted values of the losses and gains in environmental services.

08 Perform sensitivity analysis

- Sensitivity test is conducted for different discount rates to demonstrate the impact of variation in rates on the net present value of the environmental costs and benefits.

09 Make a recommendation

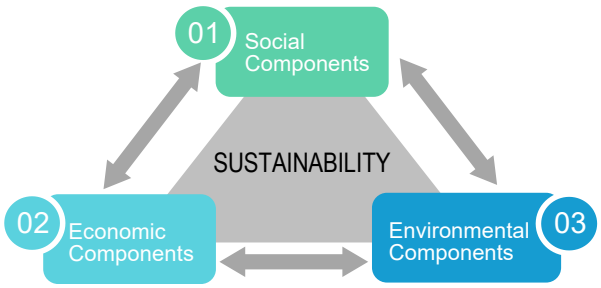
- An overall assessment is made based on the magnitude of Net Present Values at different levels of discount rates.

5.6 Environmental Trade-offs

Trade-off can be defined when components of a system are competing with or exclusive of each other. In short, trade-offs can be said as a win-lose situation. It implies a decision to be made with full comprehension of both the upside and downside of a particular choice.

In environmental terms, trade-offs occur when the provision of services from a particular ecosystem or environmental component is reduced as a consequence of development. In short, any environmental impacts that cannot be sufficiently mitigated is considered as trade-offs.

Managing environmental trade-offs is important in achieving the goal of sustainable development. Sustainability can only be attained by providing equal emphasis on the relation between three major components as illustrated as follow.



New developments are normally related to the:

01 advancement of economic components; and

02 customarily thought to impede on the environmental components.

The outcome from this reaction will have both positive and negative impacts on the social components.

It is imperative that the Project Proponent to carefully deliberate the interweaving of these components so that the environmental trade-offs can be:

01 strongly justified and appropriately managed; and

02 the proposed new development will be beneficial in terms of socio-economy as well as spurring the progress of the country.

Acknowledging that most EIA projects will cause some sort of environmental trade-off does not mean that there are no alternative ways in mitigating the impacts. One of the tangible ways in addressing environmental trade-offs is by conducting environmental offset, which shall be discussed in **Chapter 8**.

Mitigation Measures

06

Ipoh, Perak
Source: Ash Hayes on unsplash.com

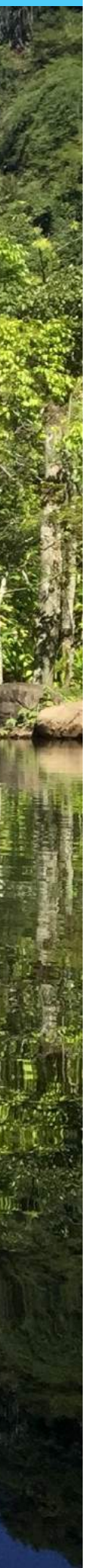
6.1
Introduction

6.2
Pollution Prevention and Mitigation Measures (P2M2)

6.3
Land-Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2)

6.4
Environmental Offset

Ipoh, Perak
Source: Ash Hayes on unsplash.com

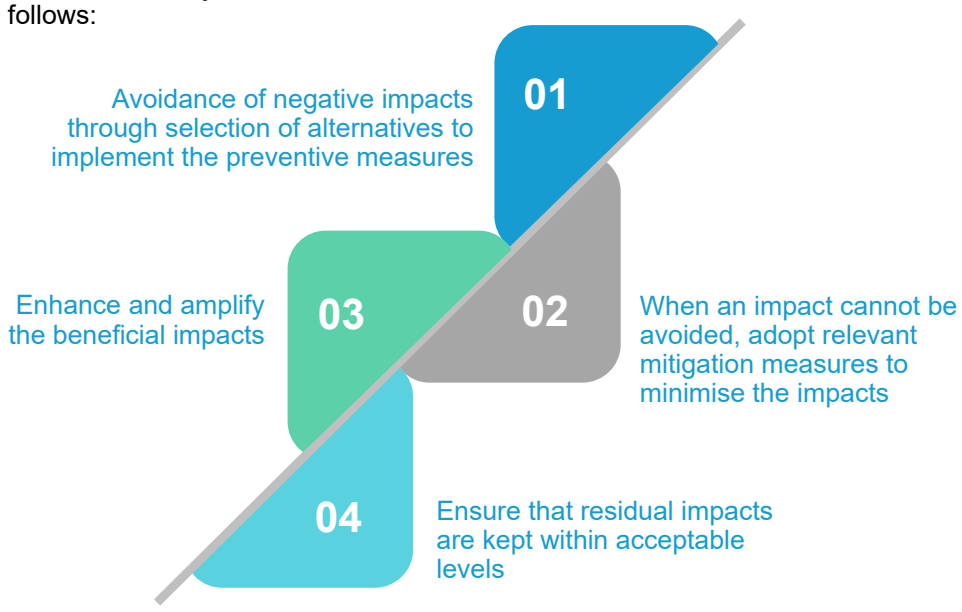


06

Mitigation Measures

6.1 Introduction

Pollution prevention and mitigation measure (P2M2) is the stage to determine applicable preventive, remedial or compensatory measures for each of the adverse impacts evaluated as significant. The objectives of P2M2 are as follows:



The mitigation measures provided in this chapter shall serve as a guide only. It is the responsibility of the Project Proponent and Qualified Person to tailor-make the mitigation measures based on the project parameters such as technology and project site location. Project Proponent must understand all P2M2 stated in the EIA and implement all P2M2 throughout the development of the project.

6.1.1
General Approaches

The key objectives of implementing P2M2s are to reduce environmental degradation and pollution through management measures that best suited to the site conditions. The P2M2s implementation include:

01 The need and extend of P2M2s required shall correspond to the significance of the predicted impact:
- For significant issue, P2M2s must be identified and elaborated in the EIA. Example: engineering design and calculations for slope reinforcement works on cut slopes; and
- For minor issue, management actions and simple measures need to be highlighted. Example: water bowser for dust control at site during construction.

02 Priority shall be on control at source and rectifying the impacts;

03 Solutions shall be project-specific and designed for the site conditions;

04 The P2M2s shall not be complex and costly, but instead be practical, easy to implement and effective;

05 The explanation on the design and function of P2M2s shall be supported by diagrams, illustrations, photos and maps. The technical reports and specifications shall be attached in the EIA as appendix;

06 The use of new technology is encouraged if it can be proved to be effective. The Project Proponent or the Qualified Person is responsible to provide supporting document that the proposed technology is tried and tested and able to mitigate the impacts;

07 The proposed P2M2s require regular inspection, maintenance and rehabilitation and shall be incorporated as part of the management requirements of the project as addressed in Section 9.3.2 of Chapter 9; and

08 Effectiveness of the P2M2s shall be documented and this is done through the implementation of a monitoring programme.

The Qualified Person shall also identify and propose Best Management Practices (BMPs) based on the findings of the EIA. The P2M2s and BMPs shall be incorporated into the overall design of the project. It is recommended that alternative measures and/ or newer technology which have been proven effective are introduced.

The submission of the EIA and the pledge agreed by the Project Proponent shall reflect the agreement and commitment towards ensuring implementation of the P2M2s and BMPs on-site during all stages of work.

6.2 Pollution Prevention and Mitigation Measures (P2M2)

The Qualified Person shall detail out P2M2 as specific as possible in the EIA report. The Project Proponent and Qualified Person shall also recommend any alternative measures and/or introduce newer technology provided it is proven to be effective.

The applicable P2M2s for construction of drainage and/or irrigation project are listed in *Table 6.1*.

Table 6.1 P2M2 for construction of drainage and/or irrigation project

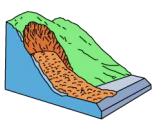
ENVIRONMENTAL ASPECT	SIGNIFICANT POTENTIAL IMPACTS	POLLUTION PREVENTION AND MITIGATION MEASURES
Earthwork Activities		
 **Air Quality**	▪ Suspension of dust and particulate matter ▪ Exhaust emission	▪ Water-bowsing at exposed surface area ▪ Minimize the exposed area by phasing ▪ Maintain and regularly check the equipment and machineries ▪ Prohibition of open burning ▪ Blasting activities should include supervisions and adherence to safety measures ▪ Any emissions from genset, machineries and equipment must comply with relevant agencies requirements and limits
 **Land Disturbance**	▪ Erosion and sedimentation ▪ Increase in flooding risk (localized or downstream) ▪ Generation of USM	▪ Establish proper scheduling and phasing of P2M2 implementation in accordance with the project phasing and project implementation schedule ▪ Retain much of the natural vegetation by reducing the total working area ▪ Install temporary perimeter drain to manage runoff water during rain ▪ Install series of check dams to reduce velocity and peak flows ▪ The size and capacity of the drains must be sufficient to cater at least a storm of 10-year ARI event (refer MSMA -2) ▪ Install sediment control devices and structures ▪ Use Active Treatment System if required ▪ Provide wash trough/wheel washing facility at main entrance/exit ▪ Design retardation/capture structures to accommodate the calculated runoff volume to allow adequate time for suspended sediments to settle ▪ Identify disposal ground (within or outside of the project site)
 **Slope Stabilisation**	Occurrence of slope failures, erosion or landslide/mudslide	▪ Adequate buffer zone/setback ▪ Slope benching with appropriate protection measures (runoff and erosion control) ▪ Geotechnical measures for identified hazard areas ▪ Periodical monitoring and maintenance of the slopes

Table 6.1 (cont'd) P2M2 for construction of drainage and/or irrigation project

ENVIRONMENTAL ASPECT	SIGNIFICANT POTENTIAL IMPACTS	POLLUTION PREVENTION AND MITIGATION MEASURES
Construction Works		
 **Waste Management**	▪ Generation of solid waste ▪ Generation of scheduled waste	▪ Wastes comprise biomass, municipal, construction and demolition and scheduled wastes, all of which require specific management strategies <u>Solid waste:</u> ∗ Temporary disposal area ∗ Waste bins in active working areas ∗ Regular housekeeping ∗ Disposal at landfill (licensed by local authority) <u>Scheduled waste:</u> Management of scheduled waste according to Environmental Quality (Scheduled Wastes) Regulations 2005, that includes: ∗ Storage area with bunding ∗ Provide inventory ∗ Proper labelling ∗ Spill kit ∗ Competent person (CePSWaM) <u>Biomass waste:</u> ∗ Proper biomass management controls ∗ Selection of disposal areas ▪ To ensure proper storage facilities or disposal sites are provided on-site
 **Water Pollution**	▪ Pollutant carried by surface runoff to nearby water bodies ▪ Domestic wastewater discharge ▪ Inappropriate waste storage and disposal	<u>Erosion and Sedimentation</u> ▪ Prepare and implement LD-P2M2. Further details is provided in Section 6.3 <u>Wastewater Discharge</u> ▪ Septic tank and toilet facility at base camp as per National Water Services Commission (SPAN) requirements ▪ Sewage discharge to meets the limit of Environmental Quality (Sewage) Regulations 2009 ▪ Proper desludging and other maintenance works on the sewage treatment system ▪ Installation of oil and grease trap <u>Material and Waste Storage</u> ▪ Proper workshop area ▪ Bunded storage for scheduled waste, chemical and fuel tank area ▪ All scheduled wastes shall be handled, stored and disposed of in accordance with the Environmental Quality (Scheduled Wastes) Regulations 2005
 **Noise and Vibration**	▪ Noise and vibration generated from machineries and equipments ▪ Noise and vibration induced by vehicle movements	▪ Perimeter hoarding to reduce noise propagation ▪ Regular maintenance for vehicle and machinery ▪ PPE for workers ▪ Scheduling of certain activities (piling, transportation via heavy vehicles, etc.) to be within working hour only ▪ Establish grievance mechanisms for disturbance complaints

Table 6.1 (cont'd) P2M2 for construction of drainage and/or irrigation project

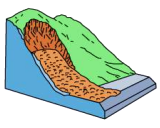
ENVIRONMENTAL ASPECT	SIGNIFICANT POTENTIAL IMPACTS	POLLUTION PREVENTION AND MITIGATION MEASURES
Construction Works		
 **Ecological Management**	▪ Destruction to sensitive habitat ▪ Impact to local flora and fauna	▪ Ban on poaching and illegal hunting ▪ Delineate work area to ensure no accidental encroachment ▪ Wildlife Management Plan ▪ Reforestation Plan ▪ Monitor displaced and stranded wildlife ▪ Provide sufficient environmental flow to maintain biological function of waterbodies ▪ Notify the relevant authorities (JPSM or PERHILITAN) of any sighting of rare, endangered, threatened and near extinct wildlife for further actions
 **Land Traffic**	▪ Increase in accident risk ▪ Reduction in level of service of local road network	▪ Identify logistic routes and prepare traffic management plan ▪ Schedule transportation plan especially for heavy vehicle traffic ▪ Impose speed limits ▪ Road signage ▪ To install zebra crossing, yellow lines, traffic lights and bumpers
 **Safety and Health**	▪ Accident risk at construction site ▪ Health risk to workers and locals from prolonged exposure to air emission pollutants and dust ▪ Transmission of communicable diseases and vector-borne diseases	<u>Health</u> ▪ Implementation of P2M2 on air pollution ▪ Clean water supply and proper solid waste disposal ▪ Housekeeping to prevent mosquito breeding ▪ Periodical health checks on workers <u>Safety</u> ▪ To employ a Health, Safety and Environment (HSE) Officer ▪ PPE requirement ▪ Workers to have CIDB green card ▪ Preparation of Emergency Response Plan (ERP) ▪ Provision of sufficient training
Operation		
 **Water Pollution**	▪ Discharge of pollutants for drainage and/or irrigation water ▪ Pollutants carried by surface runoff into reservoir	▪ Controlled use of fertilizer and pesticide ▪ Controlled development within the catchment area ▪ Sufficient buffer zone for development surrounding the catchment area ▪ Periodical monitoring of water quality within and surrounding the project area
 **Slope stabilization**	Occurrence of slope failures	Slopes are required to be periodically monitored and maintained

Table 6.1 (cont'd) P2M2 for construction of drainage and/or irrigation project

ENVIRONMENTAL ASPECT	SIGNIFICANT POTENTIAL IMPACTS	POLLUTION PREVENTION AND MITIGATION MEASURES
Operation		
 **Ecological Management**	Loss of habitat and biodiversity of important flora and fauna	▪ Viaduct/animal crossings ▪ Signage to warn road users ▪ Human-Wildlife Conflict (HWC) resolution mechanism
 **Runoff and Stormwater Management**	▪ Erosion and sedimentation ▪ Increase in flooding risk (localized or downstream)	▪ Permanent drainage network and drainage systems to be installed at site to capture runoff from the site ▪ Slope maintenance and rehabilitation in the case of erosion and failure
 **Waste Management**	Generation of solid waste	▪ Adequate bins and disposal sites ▪ Regular disposal services
Abandonment		
 **Safety and Health**	Dismantling and removal of construction material from the site	▪ An abandonment plan shall be submitted to DOE at least three (3) months prior to project abandonment. In the event of abandonment, this plan is shall be followed closely to allow for a systematic and proper abandonment. ▪ All scheduled wastes shall be properly disposed of at a licensed disposal facility upon Project abandonment. ▪ Ample time should be allowed for the demolishing and removal of on-site equipment, machinery and building structure. ▪ Appropriate cover vegetation to be established on cleared area to ensure no severe soil erosion. ▪ All construction waste should be properly disposed by the Proponent such that it will not be a burden to the local council.

6.3 Land-Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2)

The LD-P2M2 addresses on how to prevent, reduce and eliminate pollutants from land-disturbing activities such as **SITE CLEARING, TREE FELLING** or **EARTHWORK**. It refers mainly on the BMPs comprising activities, facilities, measures, planning or procedures used to minimize accelerated erosion and sedimentation and to manage runoff water.

The formulation of LD-P2M2 must be conducted based on the following guidelines produced by Department of Environment (DOE):

01 Guidance Document for Addressing Soil Erosion and Sediment Control Aspects in the EIA (DOE); and

02 Guidelines Land Disturbing Pollution Prevention and Mitigation Measures (DOE).

At the EIA stage, the elements of LD-P2M2 should be considered as conceptual although still site specific. The LD-P2M2 can be further refined later in the EMP stage (adjustments on BMP design to be made based on actual site condition), and compiled as a stand-alone document to be submitted together with the EMP report for approval. The LD-P2M2 document should be regularly updated (when necessary, based on site conditions) to ensure that it can be fully implemented on site.

6.3.1 Work Breakdown Structure

A Work Breakdown Structure (WBS) for the project activities must be produced to list all activities or work packages that must be performed in the project (although each work package may have several activities within it). An example of a WBS is shown in *Figure 6.1*.

If any of the project activity involves land disturbance including sub-components under WBS, its LD-P2M2 must be submitted and approved by the Department of Environment (DOE).

Figure 6.1
Example of a WBS

6.3.2
LD-P2M2 Checklist

The LD-P2M2 to be detailed out in the EIA report should cover all the basic information required as specified in the Guidance Document.

For ease of reference, a submission checklist is shown in *Table 6.2* which was adapted from EGiM. It is important that all submission must be accompanied by relevant technical drawings and maps.

Table 6.2 LD-P2M2 checklist for EIA Report submission

COMPONENT	INFORMATION REQUIRED	PAGE IN EIA REPORT
Project Activity and Implementation	▪ Phasing plan ▪ Project implementation schedule ▪ Description of construction activities ▪ Construction timeline, including BMP installation ▪ Construction method statement	
Information and Analysis on Project Site and Development	▪ Selected weather and rainfall data ▪ Site runoff velocity and flow rates (pre and post development) ▪ Description of soil and geological characteristics ▪ Description of adjacent areas that may be affected by land disturbance ▪ List of drainage, streams and river onsite, including receiving water bodies ▪ List of BMP proposed ▪ Access roads and project components located outside of project boundary ▪ Earthworks cut and fill volume ▪ Availability of materials ▪ Biomass management ▪ Construction and domestic waste management ▪ Spill prevention and control plan ▪ Soil loss prediction (pre, during and post development as well as with and without BMP scenarios) ▪ Projected runoff flows ▪ Calculation for BMP (sediment traps/basins, check dams, etc.)	
Map of Site Plan with Existing Condition	▪ Topographic survey map ▪ Geological terrain map ▪ Erosion risk map ▪ Land use map ▪ Site development plan	

6.3.3 Best Management Practices (BMPs)

BMPs for LD-P2M2 must be proposed in accordance to the Guidelines on LD-P2M2 (DOE). There are two types of BMPs which are structural BMPs and non-structural BMPs.

6.3.3.1
Structural BMPs

Structural BMPs such as sediment trap, silt fence and Active Treatment System (ATS) can be calculated and engineered. Thus, it can be assumed that all design of structural BMPs will be in accordance to both DOE and DID guidelines.

6.3.3.2
Non-structural BMPs

Despite the fact that structural BMPs can be designed appropriately, problems may arise from the actual implementation of the BMPs on site, in which where the non-structural BMPs

Non-structural BMPs involve management of people and monitoring of the effectiveness of BMPs. Cooperation and integration of different parties can ensure the success of an LD-P2M2 plan.

This can be seen from projects involving forest clearing or tree felling. Tree felling contractors are appointed by JPSM; making it difficult for the Project Proponent to control their activities. Hence, the management of this obstacle must be parked under the Environmental Monitoring Committee (EMC) in which the Project Proponent must control the tree felling contractors while actively engaged with JPSM. A coordination committee headed by the State Administration, consist of State DOE, State JPSM, Project Proponent and tree felling contractor must be established. This can be illustrated in *Figure 6.2* and *Figure 6.3*.

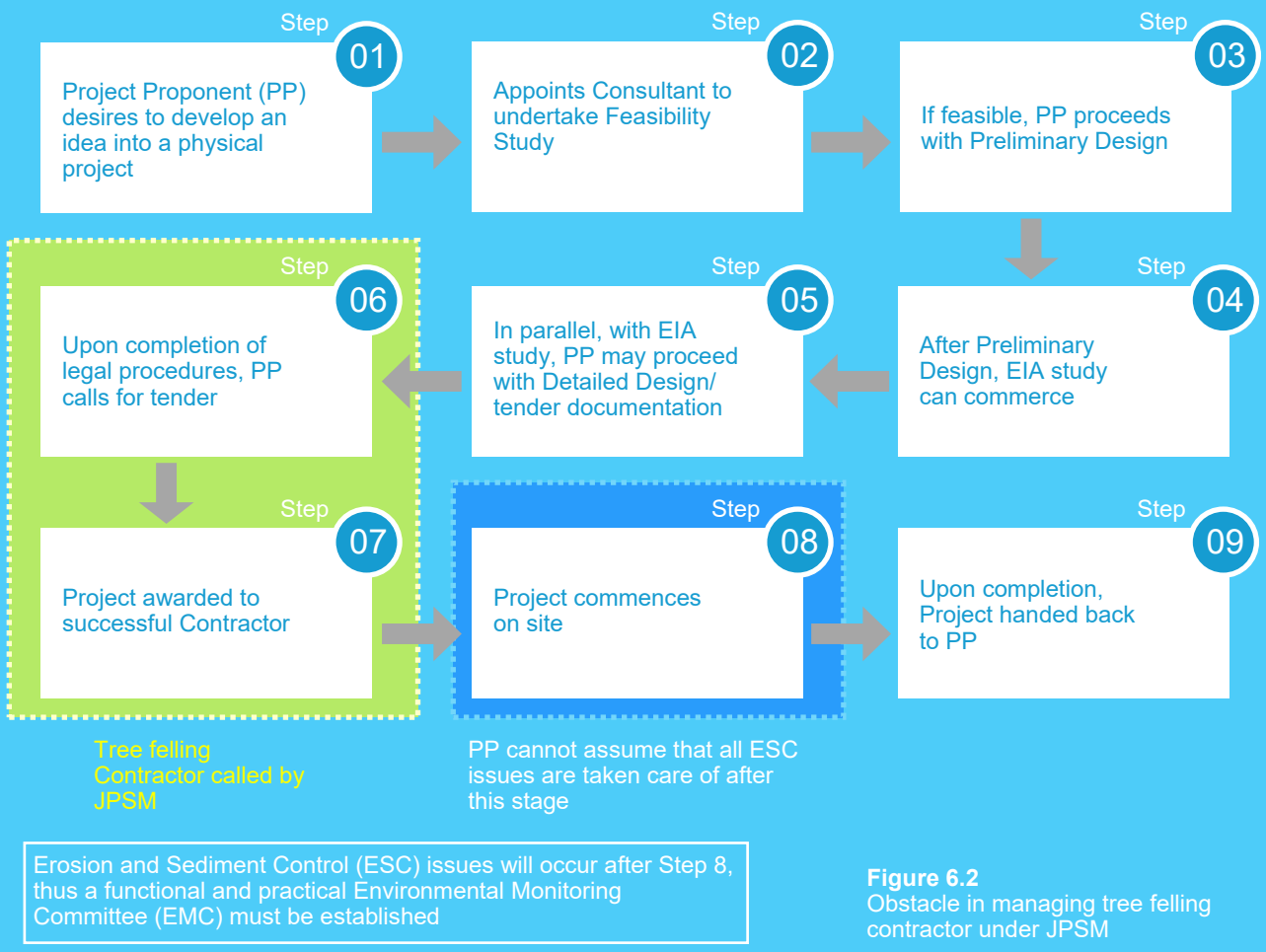


Figure 6.2
Obstacle in managing tree felling contractor under JPSM

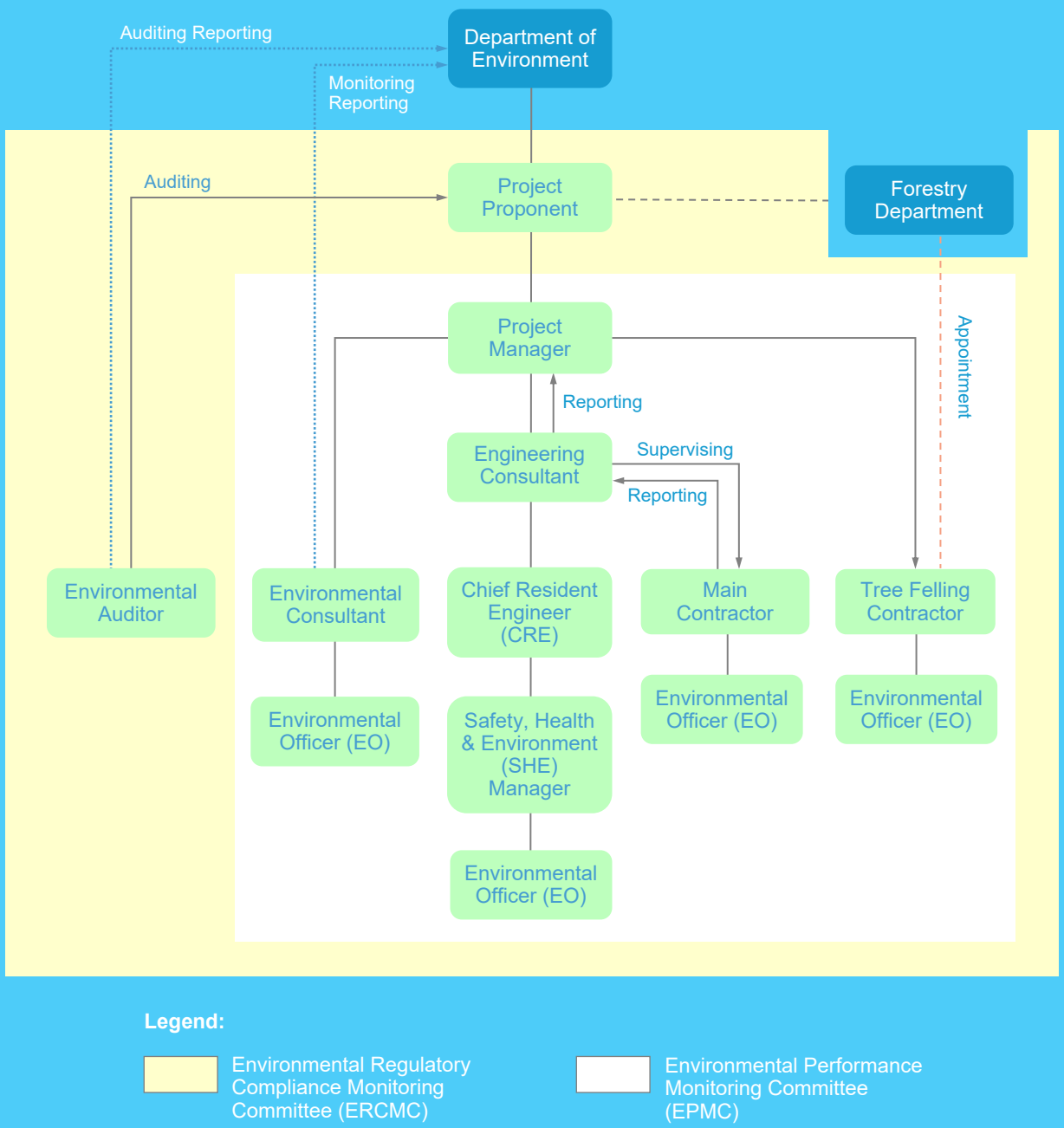


Figure 6.3
Example of an organisation chart of an EMC for projects involving tree felling activity

6.4
Environmental Offset

According to Australian Environmental Offsets Act 2014, an **environmental offset** is defined as an activity undertaken to counterbalance a **significant residual impact** of a prescribed activity on a prescribed environmental matter.

An environmental offset compensates for unavoidable impacts on significant environmental matters, (e.g. valuable species and ecosystems) on one site, by securing land at another site, and managing that land over a period of time to offset those significant environmental matters which were lost.

Figure 6.4 provides a simple illustration of the basic concept of providing an environmental offset. It illustrates land containing environmental values at one site being cleared for development. Those environmental values are then `replaced' by providing an environmental offset at another site, which contains those same environmental values which were impacted as a result of the development.

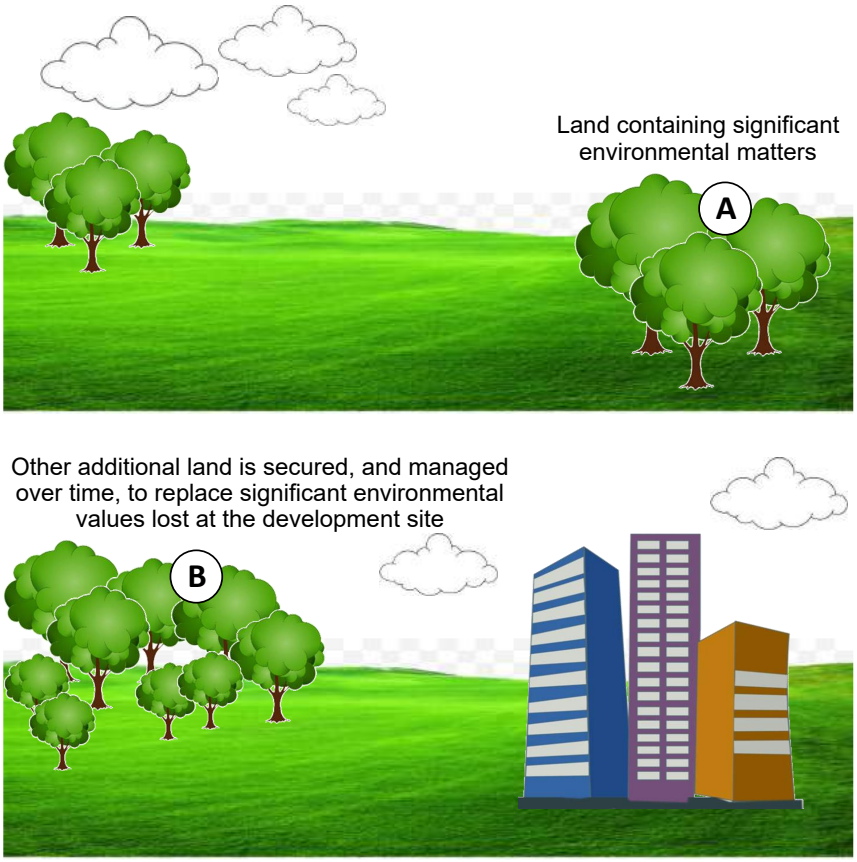
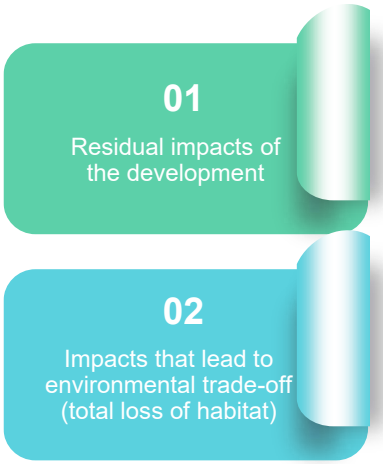


Figure 6.4 Basic concept of providing an environmental offset

When is an environmental offset required?

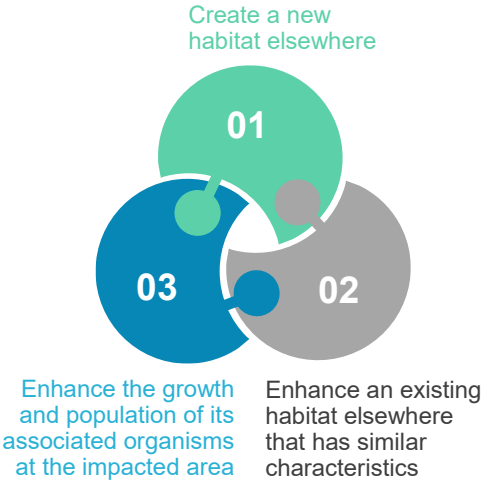
An environmental offset may be required as a condition of approval, following consideration of avoidance and mitigation measures when prescribed activity is likely to result in a significant residual impact on a prescribed environmental matters. Where appropriate, offsets are considered during the assessment phase of an EIA.

Environmental offset is a method in mitigating the environmental impacts that still occur even after appropriate mitigation measures were put in place. In short, environmental offset can be defined as measures that compensate for:



Meanwhile, Environmental Protection Agency (2006) defines environmental offsets as "environmentally beneficial activities undertaken to counterbalance an adverse environmental impact, aspiring to achieve 'no net environmental loss' or a 'net environmental benefit' outcome".

Certain habitats or ecosystems, once affected, cannot be replaced or to have the capacity or resilience to return to their original state. As such, environmental offset can be undertaken to:



6.4.1
Types of Environmental Offset

There are three types of environmental offset that can be implemented namely:

01 Direct Offset

Measures or actions that provide a measurable conservation gain for the impacted ecosystem. Examples of direct offset measures include habitat rehabilitation, enrichment or creation of a new habitat altogether.

02 Compensatory Offset

Measures that do not directly offset the impacts but are anticipated to be beneficial to the habitat and its inhabitants. One example of compensatory offset is by providing funds for research or educational programmes related to the affected habitat.

03 Advanced Offset

Implements identifying a new area with potential environmental gain that can be developed as future conservation site such as national/ state park, forest reserve, aquaculture zone, etc. Once identified, risks and threats for the habitat and its associated flora and fauna shall be managed accordingly.

6.4.2
Selection for Environmental Offset

There are several factors that need to be considered in selecting the most appropriate offset measures to be implemented. These include:

01 Time to achieve conservation gain

The conservation gain is required in short, medium or long term

02 Level of certainties to success

The probability of the offset programme to provide the desired effect

03 Site suitability

The availability of site that is able to provide a good chance of success within the stipulated timeframe using viable budget and expertise

04 Consultation with government/ private agencies

Support from government/ private agencies is needed in formulating a holistic approach to the offset implementation

05 Appropriate and transparent governance

A thorough and transparent supervision is needed during the implementation of the offset programme

Post-EIA

07

Bakuan Belaga, Sarawak
Source: Gem-Lyn on unsplash.com

Bakuan Belaga, Sarawak
Source: Gem-Lyn on unsplash.com

07

Post-EIA

7.1 Introduction

Post-EIA refers to the stage where the EIA has been approved and the Project Proponent has decided to commence with the construction and operation of the Project. It is perhaps the most important stage in the EIA cycle. This is when the EIA study will show its worth by being a planning tool for minimising negative environmental impacts and avoiding costly mistakes in project implementation.

Before physical works are allowed, the Project Proponent shall submit an EMP report to be approved by State DOE. This document shall provide more detailed mitigation measures to be implemented on site including project phasing etc.

In general, post-EIA can be divided into three main stages, namely:

Pre-construction

Construction

Operation

7.2
Environmental Mainstreaming Agenda and Self-Regulation Culture

Environmental mainstreaming agenda is adopted in EIA procedure to enhance its effectiveness in alleviating the negative impacts on the environment arising from the project development.

Environmental Mainstreaming Agenda and Self-Regulation Culture

01 Full responsibility and accountability in implementing appropriate P2M2 falls under the purview of the Project Proponent

02 The Project Proponent must also demonstrate regulatory compliance to the COA and other environmental requirements throughout the project implementation stages.

03 The Project Proponent stands to reap benefits by embracing the environmental mainstreaming and self-regulation aspirations

04 A potent business strategic tool where positive image of good governance and corporate social responsibility could be portrayed to the public, enhancing public's acceptance of the project.

7.3
Environmental Mainstreaming Tools

DOE has formulated a set of Environmental Mainstreaming (EM) tools in order to assist the Project Proponent in achieving the state of self-regulation. The EM tools to be implemented in the organizations include:

01 Environmental policy (EP)

02 Environmental budgeting (EB)

03 Environmental monitoring committee (EMC)

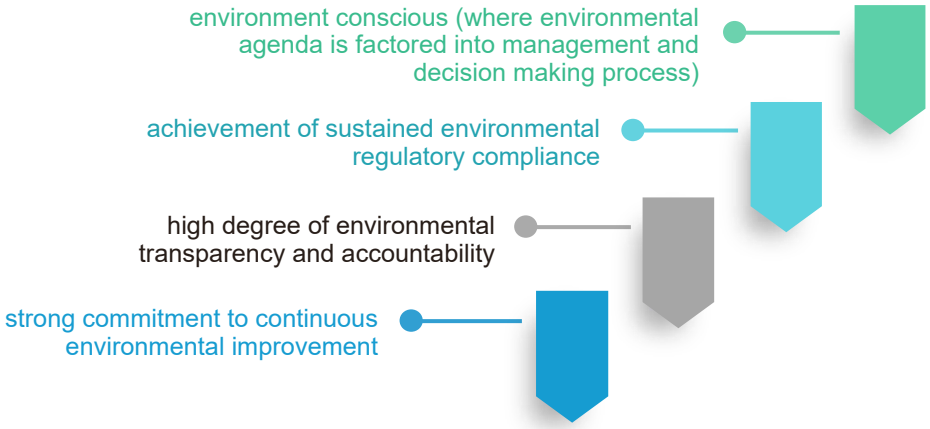
04 Environmental facility (EF)

05 Environmental competency (EC)

06 Environmental reporting and communication (ERC)

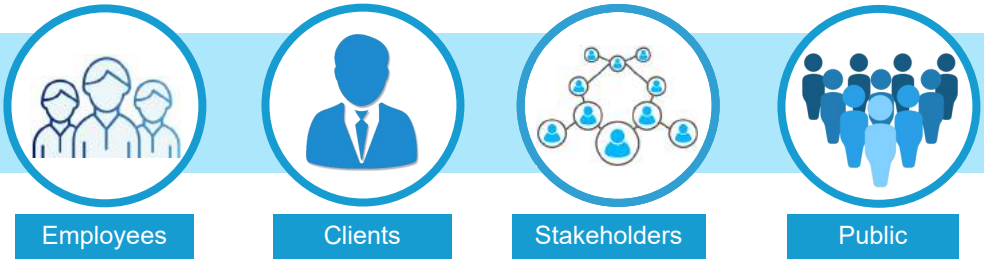
07 Environmental transparency (ET)

Rigorous implementation of the EM tools is expected to result in the Project Proponent achieving environmental excellence (EE). EE is exhibited in the intrinsic values of being:



7.3.1 Environmental Policy

The EP of the Project Proponent must use strong and unequivocal statements to convey their environmental commitment to their:



The EP must be disseminated to all relevant parties and translated into action in:

01 work procedures;
02 materials purchasing policy;
03 business decision making process; and
04 cascades down to the supply chain.

7.3.2
Environmental Budgeting

Sufficient budget must be set aside solely for the purpose of taking measures to comply with the environmental regulatory requirements and other environmental-related efforts.

The environmental budget must also include the cost for:

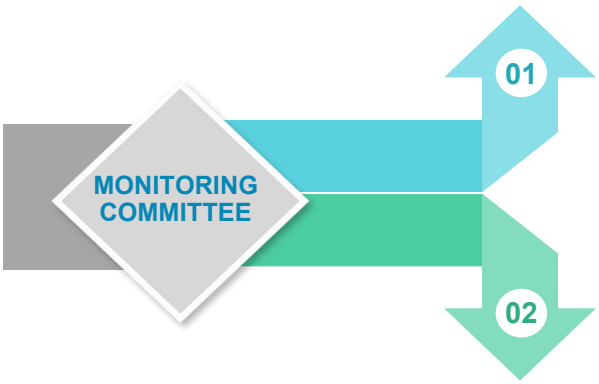
01 setting up of laboratory facilities;

02 provision of personnel; and

03 purchase of performance monitoring equipment.

7.3.3
Environmental Monitoring Committee

In order to promote collective responsibility to be environmentally compliant, two monitoring committees shall be established which are:



Environmental Regulatory Compliance Monitoring Committee (ERCMC)

The committee is set up at the policy level and shall be chaired by the Project Proponent's Chief Executive Officer or the Chairman. It meets on a minimum once a year

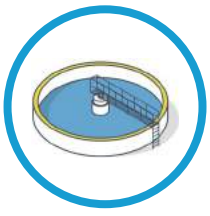
Environmental Performance Monitoring Committee (EPMC)

The committee is set up at the working level and shall be chaired by a senior official of the Project Proponent. It meets on a monthly basis, or at a minimum, once in a quarter year

7.3.4
Environmental Facility

The primary components of the EF include:

Associated support facilities such as laboratory, performance monitoring (PM) equipment, on-line instrumentation system & waste management infrastructure



Effluent Treatment System

Air Pollution Control System

Best Management Practices (BMP)

7.3.5 Environmental Competency

The relevant personnel involved in discharging various environmental responsibilities within an organization need to possess the required competencies. The personnel include those who have been assigned the task to perform DOE-regulated functions such as:

01 supervising BMP;
02 waste management;
03 air pollution control; and
04 effluent treatment systems.

The Project Proponent must draw up a comprehensive training programme to produce competent persons and trained support staff to ensure full compliance with DOE requirements in the regulated activities.

7.3.6 Environmental Reporting and Communication

A formal communication channel must be established for reporting environmental concerns and system upsets which warrant prompt actions to be instituted. Internal reporting can be initiated to report on a regular basis the regulatory compliance status of the organization to the Chief Executive Officer and various heads of the department within the organization. Updates of new environmental requirements and their implications can be disseminated to the relevant project personnel. Environmental reporting and communication (ERC) requires systematic analysis of PM data, which must be summarized in appropriate format for easy understanding and communication and shall be maintained for management review purposes.

7.3.7 Environmental Transparency

In order to foster rapport with immediate neighbours (residential, industrial, etc.), promote green image and improve public confidence, the Project Proponent is encouraged to be more transparent in their environmental compliance and achievement.

Example of transparency approach are:

01 Display or communicate compliance status via website, pamphlet, etc.;
02 Notice board at project site; and
03 Preparation of Environmental Sustainability Report (ESR)

7.4 Roles and Responsibilities during Post-EIA Stage

During the post-EIA stage, implementation of COA and P2M2 as described in the EIA report requires the involvement of several parties on both DOE and the Project Proponent's side. Fundamentally, there are five different parties involved namely:

01 DOE

02 Project Proponent

03 Environmental Officer

04 Environmental Consultant

05 Environmental Auditor

7.4.1 DOE

DOE acts as the enforcer of the EQA 1974, in which the main objective of the said act is to prevent, abate and control pollution as well as enhancing the quality of the environment. The major roles and responsibilities of DOE in the post-EIA stage include the following:

01 Reviewing and approving LD-P2M2 plan and EMP

02 Facilitate the Project Proponent in matters related to the implementation of EMP and compliance to environmental regulations

03 Ensuring appropriate implementation of COA and other related environmental regulations through periodical enforcement checks/visits

04 Taking appropriate legal action for occurrence of non-compliances via Notice, Prohibition or Stop Work Order, Compound and Prosecution

In some cases, DOE may be supported by other authorities or agencies in their respective field or jurisdiction.

7.4.2
Project Proponent

The major roles and responsibilities of the Project Proponent include the following:

01 Formulating an EP of the organisation with respect to the EIA project, which shall be communicated to the stakeholders, consultants, contractors and other parties involved in the project planning and implementation

02 Establishing an organisational structure which clearly shows the emplacement of an EO

03 Allocation of sufficient funds with itemised budget required for water quality monitoring, air quality and noise monitoring, for implementation of EMP including P2M2. P2M2 shall be those which can be described as:

- "state-of-the-art" technologies
- best available technologies (BAT)
- industry best practices

04 Appointing an EO at the stage of post-EIA to be charged with responsibilities to execute environmental quality control and performance monitoring functions during the construction and operation phases of the project implementation. The service of an EO can also be obtained from an Environmental Service Provider. However, this is allowed during the construction phase only. The Project Proponent shall employ his own EO at the operational stage

05 Establishing a project EPMC to monitor:

- environmental performance
- effectiveness of P2M2
- status of regulatory compliance of the project

The EPMC shall be represent all relevant parties involved in project implementation chaired by a senior member representing the Project Proponent. The EPMC shall meet at a minimum of once in every three months and the minutes of the meeting shall be recorded

06 Setting up a mini laboratory, wherever appropriate, to facilitate the implementation of environmental performance monitoring programme. This mini laboratory shall be adequately equipped with relevant resources including staff and portable analytical testing equipment

07 Ensuring the EMP, including temporary and permanent P2M2, are implemented and maintained according to industry's best practices (BAT and BMP)

7.4.3
Environmental Officer

The EO is the main project personnel responsible for ensuring regulatory compliance at the project implementation stage. The roles and cores duties of the EO include the following:

01 Implementing the EMP and installing temporary and permanent P2M2

02 Preparing Environmental Performance Monitoring Document (EPMD). EPMD is done to ensure the optimal functionality of the P2M2 is maintained by describing in detail how EIA approval conditions are going to be complied and how performance monitoring of the various P2M2 will be conducted. EPMD shall include PM equipment/instrument, sampling protocols and analysis

03 Performing or supervising the conduct of performance monitoring (PM) programme as specified in the EPMD

04 Preparing Performance Monitoring Report (PMR):

- PMR discusses the results of the performance monitoring conducted as described in the EPMD
- PMR shall also make some definitive conclusions on the overall performance of the P2M2 and suggest improvement measures to be taken if necessary
- PMR be submitted to the EPMC and maintained for the inspection of the DOE officers

05 Communicating the status of environmental regulatory compliance of the project during construction and operation phases to the Project Proponent

06 Maintaining a detailed record of major upset conditions encountered, if any, for the duration of the project construction and operation phases. The date of occurrences, nature and causes of upset conditions, and the corrective actions taken shall be recorded

07 Acting as an environmental advisor to the Project Proponent in advising him to undertake additional efforts, if any, to further ensure effective implementation of EMP including temporary P2M2 on a sustained basis

7.4.4
Environmental Consultant

The duties of the Environmental Consultant are:

01 To ensure the Project Proponent is briefed on the requirements of the COA and other related environmental requirements

02 As the qualified person, the Environmental Consultant shall prepare the LD-P2M2 and EMP document

03 Inform the Project Proponent on the environmental protection commitment that they shall take in implementing the project

04 Define the necessary environmental monitoring programmes in accordance with the objectives and requirements of the EMP

7.4.5
Environmental Auditor

An EIA project will necessitate the appointment of a third-party environmental auditor during the post-EIA stage. The audit team should be independent from the Project Proponent to ensure the objectivity of the audit as well as its findings and conclusions.

The roles and responsibilities of the environmental auditor are:

01 Planning the audit procedures according to the Environmental Audit Guidance Manual that covers:

- scope
- checklist
- date
- timetable

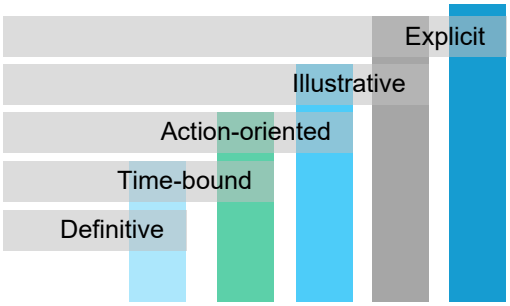
02 Notify the audit visit dates to DOE and the Project Proponent

03 Ensuring the efficient and effective conduct and completion of the audit within the audit scope and plan

04 Preparing and submitting the audit report to DOE

7.5
Environmental Management Plan

An EMP translates the P2M2 recommended in the EIA report and the COA into action. The EMP is a concrete plan of action which is:



The EMP document states the following in explicit terms:

01 What actions will be taken

- Project concepts
- Project details

02 What measures will be instituted

- P2M2
- Safety measures

03 What structures will be built

- Project components
- Construction method statement

04 What the actions will be executed

- Project phasing
- Project work programme

EMP is by nature a living document which needs to be revised and updated. Among the situations that require the EMP to be revised are:

01 variations in project concept, activities and its execution method*;

02 changes in project phasing*;

03 modifications to P2M2*; and

04 replacement of important personnel e.g. EO, auditor, etc.

Note:* several aspects of the changes may relate to specific COA imposed by DOE, thus any changes to that aspects must be approved by DOE beforehand

7.5.1
Preparation of EMP

Firstly, the Project Proponent and the Consultant (must be a Qualified Person) who has been tasked to prepare the EMP shall study and understand the P2M2 as recommended in the EIA report and the COA.

Then, the Consultant shall identify each of the P2M2 and COA: whether it is administrative or physical in nature. Subsequently, the Consultant shall identify actions required to be executed in order to implement the P2M2 or comply with the COA.

Thirdly, the Consultant shall compute an estimated cost to be incurred for each of the executable actions.

Lastly, the Consultant shall brief the Project proponent on the executable actions to be undertaken and the cost implication. Later, the Project Proponent shall make a declaration or pledge that all the actions stipulated in the EMP will be implemented.

The logical steps to be followed in the EMP preparations are outlined in *Figure 7.1.*

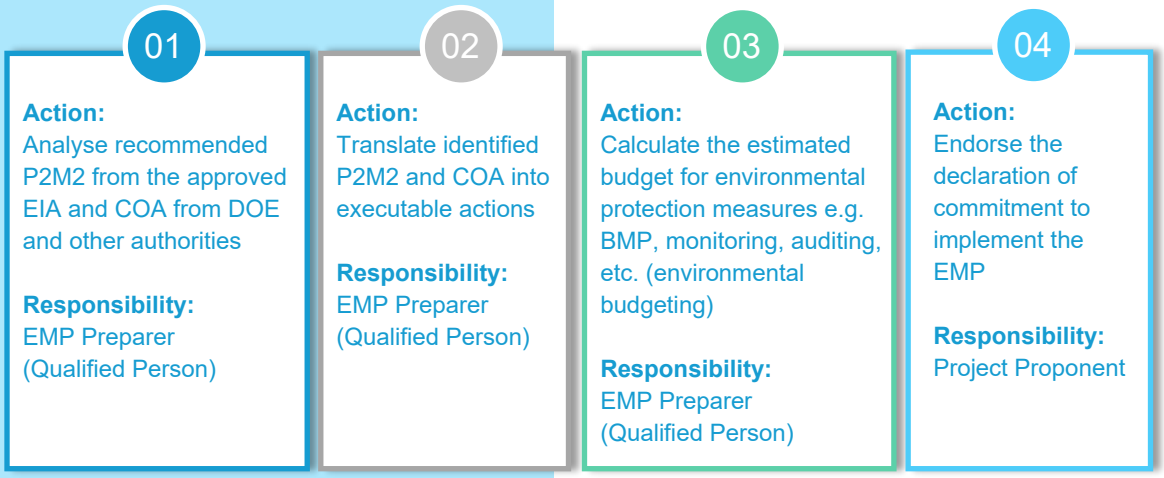


Figure 7.1
Typical steps in EMP preparation

7.5.2
Preparation of Land Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2)

The LD-P2M2 document is a legal pledge made by the Project Proponent to take efforts, measures, actions or due diligence in protecting the environment and in mitigating the environmental impact. The focus of the LD-P2M2 is on the prevention, mitigation and control of discharge from the development area containing the major pollutant (suspended solids) resulting from land-disturbing activities.

The LD-P2M2 document gives guidance to the Project Proponent's personnel, especially the EO, in supervising the implementation of the LD-P2M2 that includes the installation, inspection and maintenance of the BMP as well as in preparing the required documentation and reports.

The LD-P2M2 document is to be attached or inserted into the EMP as part of the EMP submission requirement.

7.5.2.1
Content of LD-P2M2 Document

Generally, the following shall be prepared and provided in the LD-P2M2 document:

01

Narrative description

The narrative describing the:

- project description;
- existing site conditions;
- conditions after development;
- major land disturbing activities;
- total site area;
- total disturbed area;
- soil types;
- design criteria for P2M2;
- expected rainfall;
- runoff velocities and peak flows; and
- illustration of how, what, where, why and when P2M2 is to be installed, inspected and maintained.

02

Schedule of construction (land disturbing) activities

Schedule of construction activities detailing the project phasing, construction of stages and sequences that progress with the implementation of each of the LD-P2M2 in a timely manner. It is imperative that the implementation of BMP should be prioritised first before any land disturbing activity can commences.

Holding a pre-construction meeting to be attended by the Project Proponent, EO, project contractors and subcontractors is an example of an initial construction sequence conducted prior to any land disturbing activities.

03

LD-P2M2 plan and construction notes

A plan consisting of maps and/or site plans showing the existing geomorphology and land use of the site, to be overlaid with the site development map that depict the proposed land disturbing activities or earthworks, inclusive of proposed area alterations and the locations of all P2M2 facilities. Construction notes which refer to general instruction of P2M2 applications shall be included in the LD-P2M2 plan or written on a separate sheet.

04

Method statement

Method statement refers to Environmental Method Statement that details how, what, where, why and when the elements of environmental protection will be integrated and implemented into each of the land-disturbing activity. The typical land-disturbing activities include, but are not limited, to:

- site land clearing;
- excavation of cuttings;
- forming of embankments and fills;
- excavation of foundation pits, trenches and tunnels or viaduct;
- stream or river diversion;
- stream or river crossing;
- in-stream works; and
- drilling of boreholes.

Further details on formulating an effective LD-P2M2 can be referred in Guidelines on LD-P2M2 (DOE).

7.5.3
EMP Report Format

The EMP shall follow the general specifications and format, and shall contain five chapters as explained below.

01 Introduction

Provide information on:

a. Project layout as approved in the Development Order by Local Authority;
b. Project implementation schedule; and
c. Name of the EMP preparer and the consulting firm.

02 Policy

Provide information on:

a. Company's corporate policy statement on environmental management and protection; and
b. Commitment by the top management on the mainstreaming of environmental agenda, instilling of self-regulation in the development project and on ensuring continuous compliance with the environmental regulatory requirements.

03 Organisational Structure

Provide information on:

a. Organisation chart of the company's top management with responsibilities on environmental management and protection (Provide names, positions, mobile phone contact numbers and e-mail addresses);
b. Name, mobile phone contact number and e-mail address of environmental manager, EO, engineering consultant, contractor, site supervisor and competent person* (wherever relevant and available);
(Note: *Competent person is a person certified by DOE through the certification programme administered by EiMAS).
c. Name of environmental consultant and accredited laboratory conducting environmental monitoring, analysis of environmental samples and submitting reports to DOE.

04 Training Requirement

Provide information on:

a. Plan for staff training in order to develop competency to discharge responsibilities on environmental requirements and compliance. The training areas shall include maintenance and performance monitoring of all P2M2, wherever relevant.

05 Environmental Requirements

Provide information on:

a. EIA Approval Condition (COA);
b. Environmentally-related COA from other authorities e.g. DID, DOA, JPSM etc.;
c. LD-P2M2 document; and
d. P2M2 to be implemented as in *Table 7.1*.

Table 7.1 Pollution Prevention and Mitigation Measures (P2M2) to be implemented

PROJECT ACTIVITIES AND ENVIRONMENTAL ISSUES CONCERNED	IMPACTS	P2M2 RECOMMENDED IN EIA REPORT	P2M2 TO BE IMPLEMENTED

Note: The contents of the above table are to be derived from "Summary of Impacts and Pollution Prevention and Mitigation Measures" recommended in the EIA Report and additional requirements stipulated in the EIA approval condition (COA). P2M2 shall be those which can be described as "state of the art technologies" or "industry best practices".

e. Water Pollution Control
   - Water pollution control monitoring;
   - Effluent treatment;
   - Temporary sullage and sewage treatment;
   - Permanent sullage and sewage treatment; and
   - Oil and grease, concrete wash, etc.

f. Control of Air Pollution and Noise
   - Air pollution monitoring; and
   - Air pollution control.

g. Materials and Waste Management
   - Raw materials and stockpiles;
   - Solid waste;
   - Biomass;
   - Spoils/dredge materials/construction waste;
   - Open burning avoidance; and
   - Housekeeping.

h. Scheduled Waste Management
Management of scheduled waste to comply with the Environmental Quality (Scheduled Waste) Regulations 2005.

i. Emergency Response Plan (ERP)
Name and contact details of the professional who has been tasked to prepare the ERP.

j. Abandonment and Closure Plan
In a particular case where the Project Proponent intends to abandon a project whether it is in the construction stage or after it has started operation, an abandonment and closure plan shall be prepared.

k. Declaration and Checklist

Declaration

The Project Proponent is required to make a declaration that all actions/ measures/plans outlined in the EMP will be implemented as in *Figure 7.2*. The following form is required to be filled out and submitted to DOE together with the EMP document

DECLARATION BY PROJECT PROPONENT/AUTHORISED PERSON

I certify that the Environmental Management Plan (EMP) has been prepared with my knowledge and I shall undertake the responsibility to ensure the actions, plans and pollution prevention and mitigation measures (P2M2) stated in the EMP will be implemented. I have provided sufficient allocation for the implementation of the EMP and P2M2

Project Title:
……
……
……
……

Project Address/Location:
……
……
……
……

Name of Project Proponent/Authorised Person

……

Signature: ……

Date: ……

Source: EGiM (DOE)
Figure 7.2 Declaration by Project Proponent/Authorized Person

Checklist

A checklist to assist the Consultant in the EMP preparation and to summarise the EMP actionable items is given in *Figure 7.3*.

ENVIRONMENTAL MANAGEMENT PLAN PREPARATION CHECKLIST

Project Title:
……
……

Name of Project Proponent:
……

Name of Consultant:
……

RECOMMENDED POLLUTION PREVENTION AND MITIGATION MEASURES (P2M2) AND EIA APPROVAL CONDITIONS (COA) COMPLIANCE CHECKLIST

P2M2 Recommended or COA Number	Actionable Item in EMP on Page	Notes

Name of Project Proponent/Authorised Person

……

Signature: ……

Date: ……

Source: EGiM (DOE)
Figure 7.3 Environmental Management Plan Preparation Checklist

7.6
Environmental Monitoring

Environmental monitoring shall be conducted after the EMP document has been approved and the physical work of the project is about to commence.

In general, monitoring activities can be grouped into three different aspects namely Impact Monitoring (IM), Performance Monitoring (PM) and Compliance Monitoring (CM).

01

Impact Monitoring (IM)

- Effective method to verify the potential impacts identified in the EIA report are accurate
- Appropriate mitigation and prevention measures are properly implemented
- The measures are effective in mitigating the adverse impacts to the environment

02

Performance Monitoring (PM)

- Involve monitoring the performance of pollution control systems and other mitigation measures
- PM is an important part of preventive maintenance procedure to ensure smooth and uninterrupted operation of pollution control systems
- Preventive maintenance helps detect early onset of deteriorating performance of the control, thus it will avoid failures that may necessitate the suspension of project activities

03

Compliance Monitoring (CM)

- Intended to ensure the COA are complied with
- CM can be collaborated together with the environmental audit exercise to assess the overall project compliance and opportunity for optimisation and further improvement in environmental management of the project

7.6.1
Monitoring Programme

The purpose of a monitoring programme is to provide information that the predicted impacts from a project are within the environmental acceptable limits, and to provide early warning information of unacceptable environmental condition.

Monitoring for key sectors should begin before construction to determine the baseline conditions. Subsequently, monitoring conducted during construction and operation will determine the degree and significance of impacts that will occur during these phases of the project.

The monitoring programme should be designed to do the following:

01 Provide scientifically sound information useful for determining the status of the environment

02 Provide information to predict future effects; and

03 Provide information for management decisions on possible mitigation

9.6.1.1
Monitoring of Physical Environment

Monitoring of physical environment is generally designed for the purpose of observing the impact to the environment as well as ensuring compliance to a set of standards or level. In general, the monitoring of physical environment covers the following components:

Monitoring of surface water quality should focus on the impacts that may materialize from the effect of sediment, pesticide and fertilizer discharge into the water bodies. Monitoring should be conducted upstream of the point of discharge, and downstream from the discharge in any receiving water body considered environmentally significant (e.g. rivers, lakes, water intakes). Expected pollutants (e.g. suspended sediments, nutrients) should be measured together with important parameters for environmental preservation and human health.

Meanwhile, air quality monitoring of dust (particulate matter), noise and vibration are central in measuring the level of nuisance generated during the construction stage to the sensitive receptors. These also related to the safety and well-being of the personnel working for the Project as well as the properties and their inhabitants in the surrounding area.

The operation of irrigation project will cause changes to the soil structure, which may cause salinity and/or alkalinity issues. Diversion of surface water will also cause reduction in downstream flows. As such, direct and/or indirect monitoring of soil modifications and downstream flow regime should be conducted.

7.6.1.2
Monitoring of Biological Environment

The advantage of biological monitoring over physical parameters of the environment is that it measures the actual effect of a pollutant on living organisms in their natural habitat. Generally, biological monitoring is far more time consuming and expensive than physical monitoring. Therefore, biological monitoring programme has to be considered thoroughly and devised in a way that the feedback can be significant.

Biological monitoring methods and subjects vary greatly and are likely to be site specific. In order to establish a good and rigorous monitoring procedure, it is imperative that the objective and purpose of the biological monitoring is clear.

For an irrigation project that is located within an area of significant inland fishing/ aquaculture activities, monitoring of pesticide bioaccumulation in the tissue of fish and/or shellfish can be done to ensure the produce is safe for human consumption.

7.6.1.3
Suggested Environmental Monitoring Programme

This guideline has set out a suggested environmental monitoring programme that was contrived based on the typical issues that occur during the implementation of drainage and/or irrigation projects. The suggested environmental monitoring programme is shown in *Table 7.2*.

Ideally, environmental monitoring programme for any EIA project shall be tailored to suit the specific project activities, location and forecasted impacts. In addition, any outlying parameters identified during the baseline sampling exercise (e.g. elevated heavy metals) shall be included in the monitoring programme.

Table 7.2
Suggested Environmental Monitoring Programme of drainage and/or irrigation project

CATEGORY	PROJECT STAGE	PARAMETER
Sediment Control	During construction	▪ Suspended solids ▪ Turbidity
Ambient Air	During construction	Particulate matter
Noise	During construction	▪ L_{Aeq} ▪ L_{10}
Vibration	During construction	Vibration
Ambient Water Quality	During construction	As stated in National Water Quality Standards of Malaysia (NWQS) or Malaysian Marine Water Quality Standards (MMWQS)
	During operation	▪ Suspended solids ▪ Turbidity ▪ BOD ▪ COD ▪ Nutrients ▪ Persistent organic pollutant (POP) ∗ Organochlorine ∗ Organophosphate ∗ Phyteroid
Fish/Shellfish	During operation	Bioaccumulation of POP
Soil Modification	During operation	▪ Alkalinity ▪ Salinity
Hydrology	During construction	River/stream flow
	During operation	River/stream flow

7.7 Environmental Audit

Third-party environmental audit provides a systematic accumulation of evidence about the project's compliance status to the regulatory requirements relevant to the project. The environmental audit can also be viewed as a performance improvement tool where the Project Proponent gains a better understanding on their current standard of environmental management. Ideally, the audit process shall start after the EMP has been approved but before the commencement of physical work at site.

The requirement for environmental audit is covered under Section 33A(1) of the EQA 1974 which stipulated that:

"*The Director General may require the owner or occupier of any vehicle, ship or premises, irrespective of whether the vehicle, ship or premises are prescribed under Section 18 or otherwise, to carry out an environmental audit and to submit an audit report in the manner as may be prescribed by the Minister by regulations made under this Act.*"

The environmental audit generally has the following objectives:

01 As a tool to assess compliance with environmental legislation;

02 To improve environmental performance through monitoring the effectiveness of P2M2; and

03 To increase the Project Proponent's knowledge of themselves and their activities, thus increasing their ability to continually improve and minimize future potential liabilities

Audit requirements are guided by the Environmental Audit Guidance Manual published by DOE. The audit must be undertaken by an independent, third-party, DOE-registered auditor, as stated in Section 33A(2) of the EQA 1974:

"*For the purpose of carrying out an environmental audit and to submit a report thereof, the owner or occupier so directed shall appoint qualified personnel who are registered under subsection (3).*"

PLACE OF MEASUREMENT	FREQUENCY
Final discharge outlet	Continuous (after each significant rain event)
▪ Boundary of project area ▪ Sensitive receptor	Quarterly
▪ Boundary of project area ▪ Sensitive receptor	Quarterly
▪ Boundary of project area ▪ Sensitive receptor	Quarterly
Surrounding water bodies e.g. river, lake estuarine and marine	Monthly
▪ Lake/reservoir ▪ Downstream of irrigation area	Monthly
Surrounding water bodies	Yearly
Within project area	Yearly
Downstream of project area	Continuous
Downstream of project area	Continuous

The typical audit process involves the following:

01 Pre-audit

Preparation of a pre-audit checklist and information request to the auditee. Notification of the audit must be submitted to DOE.

02 On-site audit

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

03 Post-audit

Lead Auditor shall submit an Audit Report to the state DOE and the Project Proponent to respond with a Corrective Action Report (CAR) within two weeks from the audit date.

7.8 Environmental Sustainability Report

Environmental Sustainability Report (ESR) is an organizational report that gives information about environmental performance, compliance and monitoring.

This report can be taken as part of the self-regulation approach whereby it is for the internal use of the organization, rather than for submission to DOE. ESR can be made up of several different reports that relate to the three important stages of project cycle management, namely evaluation, monitoring and audit.

In general, there are two main types of environmental report, namely:

01 Compliance Report

- Form EIA 2-18
- EMP and LD-P2M2
- Audit reports
- Minutes of Meeting (ERCMC and EPMC)

02 Monitoring Report

- Environmental Monitoring Report (EMR)
- In-situ measurement data
- Inventory of scheduled waste
- Implementation of EMT

Pertinent findings from the environmental reports mentioned above shall be collated, digested, summarised and presented in an executive summary form that is the ESR. The environmental reports are mainly prepared by the EO and the Environmental Consultant.

These two shall ensure that information from the ground is compiled and presented in an easy to understand format covering the essential aspects on environmental performance of the project. Subsequently, the ESR report shall be made available to the EMC for their purview.

It is proposed that the content and format of the ESR report are as follow:

01 Project Status and Progress

- Physical progress of the project/ operation
- Financial progress of the project/ operation
- List of achieved and future requirement/milestone
- Status of P2M2 implementation
- Status of environmental budgeting
- Update of environmental reports submitted/to be submitted

02 Environmental Monitoring Data

- Summary of recent compliance monitoring data
- Summary of recent performance monitoring data
- Summary of recent impact performance monitoring data
- Overview of P2M2 effectiveness
- Highlights of upset conditions and/or non-compliances
- Proposed mitigation and/or non-compliances

03 Material and/or Waste Management

- Summary of material storage and waste generation
- Summary of SW inventory
- Capacity status for material and waste storage
- Overview of waste disposed and/ or recycled

04 Audit and Inspection

- Summary of findings from:
  - ◊ Daily site inspection
  - ◊ Third-party audit
  - ◊ Authorities enforcement visit

05 Overall Compliance Status

- Status of overall compliance
- Highlights of pertinent issues regarding non-compliances
- Compliance matter needing higher management attention

It is important that a good record-keeping practice is established as all type of records as well as correspondence related to environmental management shall be retained throughout the duration of the project. Among the importance of good record-keeping practice are:

- the record serve as evidence/proof of actions taken;
- provide evaluation results;
- allow for communication between the committees (ERCMC and EPMC);
- help in decision-making process based on administrative and technical findings;
- evidence of compliances and non-compliances;
- create a sense of accountability; and
- provide summary of analysis and interpretation.

7.9 Environmental Database

The implementation of EIA projects may encounter possible issues from various sources e.g. authorities, stakeholders and the public.

Thus, it is recommended that an environmental database is established in order to assist the Project Proponent in managing those issues in an effective way. There are three main benefits in setting up an environmental database which include:

Environmental Scanning

01

Environment changes rapidly. By having a full record of the previous and current trends in the socio-economic environment, the Project Proponent can monitor threats and opportunities and address it early before it becomes serious environmental issues.

A Fact Library

02

The database system holds data and facts that are collected from various sources, both primary and secondary (e.g. monitoring report, scientific papers, previous studies, filed surveys and authorities' publications). The information derives from each source can be used in addressing any issues regarding the Project.

Financial Viability

03

Having a large and structured database that covers the whole, or in some cases beyond the area of interest is far more useful and cost effective in identifying information that are needed to address any prevailing issues.

7.9.1 Approach and Methodologies

It is advisable that various data and documents related to the project are kept in digital form so that they can be easily retrieved when needed. Common methodologies that can be used in setting up the environmental database are shown below.

Data definition

Creation and modification that define the structuring of the data.

Update

Insertion, modification and deletion of the data.

Retrieval

Providing information in a form directly usable or for further processing by other applications. The retrieved data may be made available in a form that is basically the same as when stored in the database, or in a new form obtained by altering or combining existing data from the database.

Administration

Registering and monitoring users, enforcing data security, monitoring performance, maintaining data integrity, dealing with concurrency control and recovering information that has been corrupted by an unexpected event such as system failure.

TOR & EIA Checklist

08

Kuala Lumpur, Malaysia
Source: Co Goh on unsplash.com

Kuala Lumpur, Malaysia
Source: Co Goh on unsplash.com

08

TOR & EIA Checklist

8.1 Introduction

This chapter provides checklists to assist the Qualified Person in preparing the:

01

TOR / ESI

**Note: Second Schedule EIA only*

EIA

02

Both checklists must be filled in and incorporated at the front of the respective reports. Besides the Qualified Person, these checklists can also be used by the EIATRC as a reference.

The checklists are:

- Checklists for TOR / ESI as per in *Table 8.1*; and
- Checklist for EIA as per in *Table 8.2*.

Table 8.1 Checklists for TOR / ESI

ITEM		ADEQUACY CHECK		PAGE	REMARKS
		YES	NO		
1.0	**Is the project a NEW development?**				
2.0	**Is the project an *AMENDMENT to an existing development? If so,**				
	a) Was there an EIA for the existing development?				
	b) Does the addition involve new area development? If so, how much and where?				
3.0	**Has policies compliance been met by the Project Proponent?**				
	a) Federal approval				
	i. NPPC				
	ii. Others				
	b) State approval				
	c) Land status / acquisition				
	d) Land use compatibility				
	e) Environmentally Sensitive Areas				
	f) Others				
	i. Forestry Department of Peninsular Malaysia				
	ii. Department of Wildlife and National Parks (PERHILITAN) Peninsular Malaysia				
	iii. Department of Drainage and Irrigation Malaysia				
	iv. PLANMalaysia				
	v. Department of Orang Asli Development (JAKOA) Malaysia				
	vi. Land and Mines Office				
4.0	**Who were involved in the scoping tasks?**				
	a) Project Proponent				
	b) Engineering consultants				
	c) Environmental consultant				
	d) Affected public / stakeholders				
	e) Government agencies				
	f) Others				

Table 8.1 (cont'd) Checklists for TOR / ESI

	ITEM	ADEQUACY CHECK		PAGE	REMARKS
		YES	NO		
5.0	**Does the project involve the following activities?**				
	a) Survey				
	b) Establish accessibility				
	c) Base camp and site facilities				
	d) Logging activity				
	e) Quarrying activity				
	f) Earthworks and haul roads				
	g) Mobilisation of workers, equipment and materials				
	h) Site clearing and biomass removal				
	i) Construction of intakes & spillway				
	j) Diversion				
	k) Drainage works				
	l) Civil and structural works				
	m) Electrical and mechanical works				
	n) Testing and commissioning works				
	o) Construction materials handling and storage				
	p) Process controls				
	q) Air pollution control system				
	r) Sewage effluent treatment system				
	s) Noise / vibration controls				
	t) Safety controls				
	u) Waste generations				
	v) Weed control				
	w) Others				
6.0	**Land use on site and surrounding areas**				
	a) Are the following features intersected by the Project?				
	i. Rivers and/or lakes				
	ii. Coastal areas				
	iii. Wetlands / Mangroves				
	iv. Coral reefs / Seagrass beds				
	v. Forest reserve				
	vi. Agriculture				
	vi. Aquaculture				
	vii. Built-up areas				
	viii. Tourism / Recreational areas				
	ix. Orang Asli settlements				
	x. Orang Asli roaming area/*kawasan rayau*				
	xi. Wildlife roaming area				
	xii. Archaeology area				
	b) Are the environmental issues with each feature identified?				

Table 8.1 (cont'd) Checklists for TOR / ESI

ITEM		ADEQUACY CHECK		PAGE	REMARKS
		YES	NO		
7.0	**Timeline**				
	a) Project implementation schedule (by stage)				
8.0	**Project information provided**				
	a) Project concept and layout				
	b) Project activities				
	c) Project components				
	d) Material sources and storage				
	e) Infrastructure, utilities and amenities requirement				
9.0	**Site Suitability Assessment**				
	a) Siting constraints / suitability addressed?				
	b) Have the affected public been informed/ consulted?				
	c) Alternative project layout provided?				
	d) Best available technology (BAT) considered?				
	e) No-project option considered?				
11.0	**Significant impacts scoped and prioritized?**				
	a) Identified Impacts				
	i. Water quality				
	ii. Air quality				
	iii. Noise and vibration				
	iv. Safety impact				
	v. Health impact				
	vi. Geology				
	vii. Hydrology				
	viii. Flood risk				
	ix. Soil erosion				
	x. Terrestrial flora				
	xi. Terrestrial fauna				
	xii. Ecology				
	xiii. Waste generation				
	xiv. Others				
	b) For each significant impact, were the methods and scope sufficient for impact assessment?				
	c) Were mitigation measures proposed to address the significant impact?				

Table 8.2 Checklists for EIA

ITEM		ADEQUACY CHECK		PAGE	REMARKS
		YES	NO		
1.0	**Executive Summary (Brief and concise)**				
	a) In Bahasa Malaysia				
	b) In English				
2.0	**Introduction**				
2.1	a) Title of the project				
	b) Project Proponent details				
	c) EIA Consultant details				
	d) Project location (boundary coordinates) in A3 size				
	e) Relevant maps showing project location and ESAs				
2.2	Legal requirements				
3.0	**Terms of Reference**				
4.0	**Statement of Need**				
	a) Principal reasons for proposed project (include relevant supporting documents)				
	b) Aim of Project				
5.0	**Project Options**				
	a) Alternatives considered?				
	b) Project optimization done?				
6.0	**Project Description**				
6.1	Project Concept:				
	a) Layout plan				
	b) Size and land requirement				
	c) Project component				
	d) Method statement				
	e) Labour requirement				
	f) Raw material requirement				
	g) Infrastructure/ Utilities/ Amenities				
6.2	Project activities: Construction				
6.3	Project activities: Operational				
6.4	Project Implementation schedule (chart)				

Table 8.2 (cont'd) Checklists for EIA

ITEM		ADEQUACY CHECK		PAGE	REMARKS
		YES	NO		
7.0	**Description of Existing Environment**				
7.1	a) Physico-chemical				
	i. Land use, land use zoning and compatibility				
	ii. Topography / Bathymetry				
	iii. Geology and soil				
	iv. Hydrology				
	v. Hydrogeology				
	vi. Soil erosion				
	vii. Climate				
	viii. Water quality				
	ix. Ambient air quality				
	x. Ambient noise				
	xi. Vibration				
	b) Biological (where applicable)				
	i. Terrestrial flora				
	ii. Terrestrial fauna				
	iii. Marine ecology				
	iv. Freshwater ecology				
	c) Socio-economy				
	i. Anthropology				
	ii. Public health				
	iii. Historical, cultural and archaeological aspects				
	iv. Ecotourism				
	v. Stakeholders Engagements				
	d) Environmentally Sensitive Areas				
7.2	Technical Studies (where applicable):				
	a) Social Impact Assessment (SIA)				
	b) Traffic Impact Assessment (TIA)				
	c) Health Impact Assessment (HIA)				
	d) Heritage Impact Assessment				
	e) Wildlife Management Plan (WMP)				
	f) Topographic survey				
	g) Soil Investigation (SI) study				
	h) Hydraulic and Hydrology study				
	i) Geotechnical study				
	j) Geological Terrain Mapping				
	k) Erosion and Sediment Control Plan (ESCP)				

Table 8.2 (cont'd) Checklists for EIA

ITEM		ADEQUACY CHECK		PAGE	REMARKS
		YES	NO		
8.0	**Evaluation of Impacts**				
8.1	Detailed assessment of impacts during:				
	a) Pre-construction Stage				
	i. Survey				
	▪ Sending surveyors into new areas				
	▪ Cutting sights lines through vegetation				
	▪ Establish accessibility				
	ii. Investigation				
	▪ Introduction or workforce in new areas				
	▪ Establishing base camps				
	▪ Putting in access tracks				
	▪ Drilling holes and/or digging pits				
	iii. Land acquisition				
	▪ Acquire land				
	▪ Resettlement of affected occupants				
	iv. Others				
	b) Construction Stage				
	i. Temporary Occupation				
	▪ Construction of temporary buildings, storage facilities and working areas				
	▪ Water supply				
	▪ Solid waste disposal				
	▪ Sewage disposal				
	▪ Workforce				
	▪ Pest control				
	▪ Machine servicing & maintenance				
	▪ Resources abstraction – logging, mining				
	ii. Site Preparation				
	▪ Demolition & removal of structures				
	▪ Removal and disposal of vegetation				
	▪ Constructing access roads				
	▪ Constructing temporary drainage				
	▪ Operating equipment (chainsaw, bulldozers				
	iii. Earthwork				
	▪ Canal excavation				
	▪ Construction of irrigation bunds and maintenance tracks				
	▪ Diversion of surface water				
	▪ Spoil disposal				
	▪ Operating equipment (diggers, bulldozers, truck)				

Table 8.2 (cont'd) Checklists for EIA

	ITEM	ADEQUACY CHECK		PAGE	REMARKS
		YES	NO		
8.1	iv. Reservoir Construction				
	▪ Operation of equipment (bulldozers, diggers, trucks, scrapers)				
	▪ Construction of haul roads				
	▪ Cutting/ quarrying/ blasting, borrow areas				
	▪ Transportation of construction materials				
	▪ Filling/ pouring/ grouting				
	▪ Building structures (concrete or rollcrete)				
	v. Culvert, Control Weirs, and Pumping Station Construction				
	▪ Operation of equipment				
	▪ Diversion of surface water				
	▪ Transportation of structure, plant and materials				
	▪ Pouring concrete				
	vi. Reservoir Filling				
	▪ Raising groundwater levels				
	▪ Inundation of land				
	▪ Vegetation decomposition				
	▪ Alteration of surface water hydrology				
	vii. Permanent Access Road Formation				
	▪ Transportation of aggregate				
	▪ Laying and compaction of aggregate				
	vii. Demobilisation				
	▪ Demobilisation and removal of temporary buildings				
	▪ Waste removal/ disposal (including rubbish, equipment and liquid wastes)				
	▪ Rehabilitation of occupied site				
	vii. Others				
	c) Construction Stage				
	i. Reservoir Presence				
	▪ Wetland				
	▪ Evaporation				
	▪ Micro-Seismic				
	▪ Community severance				
	▪ Provision of habitat for disease vectors				

Table 8.2 (cont'd) Checklists for EIA

ITEM		ADEQUACY CHECK		PAGE	REMARKS
		YES	NO		
8.1	ii. Agriculture Operation				
	▪ Flood irrigation				
	▪ Ploughing and soil preparation				
	▪ Fertilizer and pesticide use				
	iii. Maintenance				
	▪ Canal excavation and spoil disposal				
	▪ Weed control				
	▪ Repair of bund failure				
	iv. Decommissioning/abandonment				
	▪ Demolition and removal of structure				
9.0	**Pollution Prevention and Mitigation Measure (P2M2)**				
9.1	Environmental Aspects				
	a) Water pollution				
	b) Air pollution				
	c) Noise and vibration				
	d) Waste management				
	e) Socio economy				
	f) Land traffic				
	g) Others				
10.0	**Environmental Management Plan (EMP)**				
10.1	Environmental Mainstreaming Tools:				
	a) Environmental policy (EP)				
	b) Environmental budgeting (EB)				
	c) Environmental monitoring committee (EMC)				
	d) Environmental facility (EF)				
	e) Environmental competency (EC)				
	f) Environmental reporting and communication (ERC)				
	g) Environmental transparency (ET)				
10.2	LD-P2M2				
10.3	Environmental Monitoring Programme:				
	a) Impact monitoring (IM)				
	b) Performance monitoring (PM)				
	c) Compliance monitoring (CM)				
	i. Location of monitoring points				
	ii. Frequency of monitoring				
	iii. Parameters to be measured				
	iv. Environmental quality criteria				
	v. Procedures for reporting				

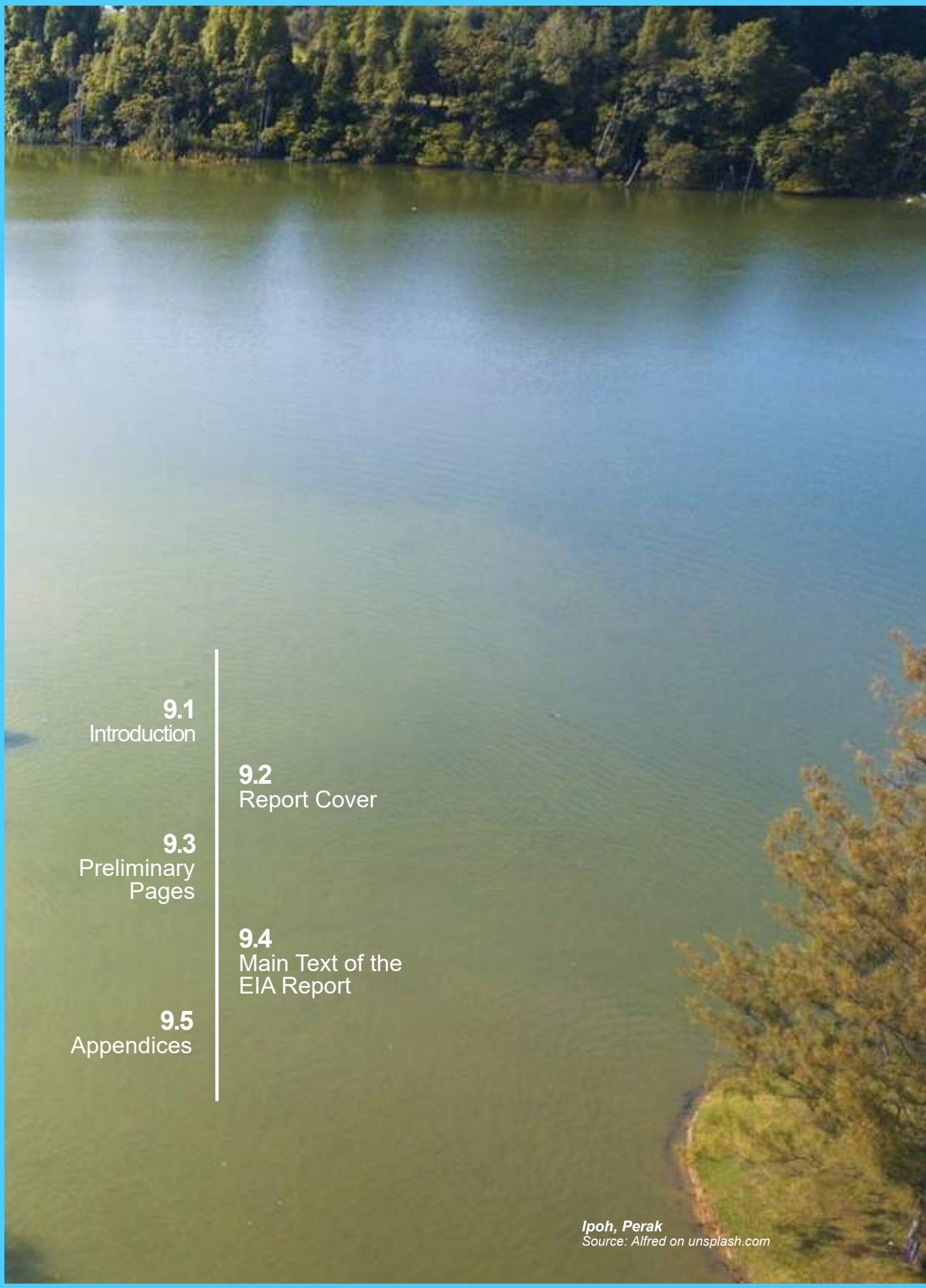
Table 8.2 (cont'd) Checklists for EIA

ITEM		ADEQUACY CHECK		PAGE	REMARKS
		YES	NO		
10.4	Environmental Audit Programme				
10.5	Environmental Sustainability Report				
10.6	Environmental Database				
11.0	**Study Findings**				
12.0	**Reference**				
13.0	**Appendices**				

EIA Report Format

09

Ipoh, Perak
Source: Alfred on unsplash.com



9.1
Introduction

9.2
Report Cover

9.3
Preliminary Pages

9.4
Main Text of the EIA Report

9.5
Appendices

Ipoh, Perak
Source: Alfred on unsplash.com

09

EIA Report Format

9.1 Introduction

DOE has stipulated a specific format for the EIA report, as detailed in Appendix 9 of EGiM. The standard EIA report format encompasses the cover page, preliminary pages, chapters arrangement and appendices. It is important that format is followed to ensure the final EIA report able to meet the required standard set by DOE.

9.2 Report Cover

The EIA report cover shall follow the arrangement as shown in *Figure 9.1*.

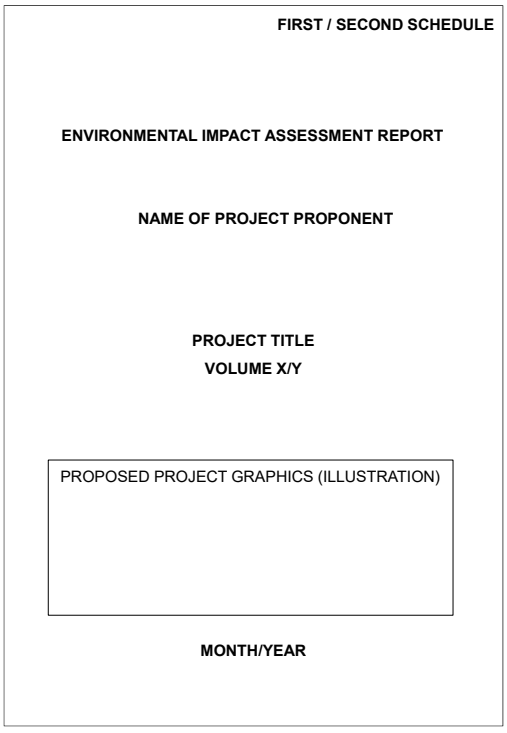


Figure 9.1
Format for EIA report cover

9.3
Preliminary Pages

The preliminary pages are an important part of the EIA report that shall not be overlooked. Items that must be provided here are:

01 **Environmental Pledge by the Project Proponent**

02 **Declaration by the Qualified Person**

03 **Executive Summary**

Environmental Pledge by the Project Proponent

The environmental pledge is a document that state the Project Proponent is fully aware on the environmental protection required and affirm their commitment in undertaking the pollution control measures specified in the EIA report. The pledge shall be written on the official letterhead of the Project Proponent's company, as illustrated in *Figure 9.2.*

PROJECT PROPONENT'S LETTERHEAD

ENVIRONMENTAL PLEDGE FROM PROJECT PROPONENT

Environmental Impact Assessment (First Schedule) for
.....
.....
.....
.....

I hereby declare that the entire EIA Report is the product of the EIA Consultant engaged by my company and all the facts stated in the Report and the accompanying information are to the best of my knowledge and belief true and correct, and that I have not withheld or distorted any material facts. I agree and I undertake the responsibility to implement all the pollution prevention and mitigating measures (P2M2) described in the EIA Report, in the Environmental Management Plan (EMP) and in the Land Disturbing Pollution Prevention (LD-P2M2) as proposed by the EIA Consultant. I have allocated sufficient funds for the above purpose.

Name :
NRIC Number :
Designation :
Signature :
Date :
Company's Stamp :

Figure 9.2
Environmental Pledge by the Project Proponent

Declaration by the Qualified Person

EIA Team Leader, as the Qualified Person, shall make a declaration that the EIA report was prepared truthfully, and the Project Proponent was briefed on the environmental protection requirement stated in the EIA report. The declaration must be written on the official letterhead of the Qualified Person's company, as shown in *Figure 9.3.*

EIA STUDY TEAM LEADER'S LETTERHEAD

DECLARATION FROM EIA STUDY TEAM LEADER

Environmental Impact Assessment (First Schedule) for
.....
.....
.....
.....

I declare that the entire EIA Report is the product of my own and the work of my team members (i.e. other consultants who are also Qualified Persons) who worked under my supervision and all the facts stated in the Report and the accompanying information are to the best of my knowledge and belief true and correct and that I have not withheld or distorted any material facts. I have briefed the Project Proponent on the content of the Report and highlighted to him all the pollution prevention and mitigating measures (P2M2) described in it, and in the Environmental Management Plan (EMP), and in the Land Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2), and the Project Proponent has agreed to implement them (i.e. P2M2).

Name of EIA Consultant Team Leader :
NRIC Number :
Designation :
Signature :
Date :
Company's Stamp :

Figure 9.3
Declaration by the Qualified Person

Executive Summary

Executive Summary is a gateway to the main EIA. Thus, it shall succinctly summarize the details of the proposed project, its main issues as well as the proposed P2M2 to be implemented. The Executive Summary is intended not only to be reviewed by DOE and other agencies, but also to be read by the public. As such, it must be written in non-technical language.

The Executive Summary must be prepared in English and Bahasa Malaysia, whereby both versions must have similar format. Information that needs to be included in the Executive Summary are:

- Name / Title of the Project;
- Name and contact details of the Project Proponent and the Qualified Person (contact person, address, telephone number and e-mail);
- Location of the project (coordinates, lot number, district name);
- Description of the project and the surrounding existing environment;
- Relevant maps showing project location and sensitive receptors;
- Tabulation of potential impacts, their magnitude and the proposed P2M2, as shown in *Table 9.1*; and
- Description of relevant monitoring programmes (performance monitoring, compliance monitoring, and impact monitoring).

Table 9.1
Summary of potential impacts, their magnitude and proposed P2M2

SIGNIFICANT POTENTIAL IMPACTS	MAGNITUDE OF SIGNIFICANT POTENTIAL IMPACTS	PROPOSED P2M2	REFERENCE PAGE IN EIA REPORT

9.4 Main Text of the EIA Report

The main text or body of the EIA report shall contain at least the following chapters as summarised below.

01 Introduction

a. The type of project and its specific location shall be specified in the project title.
b. Relevant maps showing project location and sensitive receptors.
c. Identify the Project Proponent by providing details on:
   - Company's name;
   - Authorised person / contact person; and
   - Contact details (address, telephone number and email).
d. Provide the details of the EIA consulting firm, which are:
   - Company's name;
   - EIA Team Leader and the registration number;
   - Subject Matter Consultants and the registration number; and
   - Contact details (address, telephone number and email).
e. State the relevant prescribed activity related to the project.
f. Provide definitive statement on the conformance of the project to the:
   - NPP;
   - Structure Plan;
   - Local Plan;
   - Regional Plan (inter-state planning);
   - SZIRA; and
   - EESIM.

02 Terms of Reference

a. First Schedule EIA
   - Provide Scoping Notes

b. Second Schedule EIA
   - Provide the TOR of the EIA study which has been endorsed by DOE; and
   - Cite reference of the endorsement.

03 Statement of Need

a. Outline the background of the project and the reasons for it being proposed;
b. Establish social, economic or other needs for the project;
c. Conclude with definitive statement on the aim and purpose of the project; and
d. Substantiate the statement with accurate facts and figures.

04 Project Option

a. Discuss the advantages and disadvantages from the technical, economic, social and environmental perspective; and
b. Project options that can be deliberated are:
   - Site options;
   - Layout options;
   - Alignment options;
   - Technology options;
   - Raw materials options;
   - Construction method options;
   - Operation options; and
   - No project / scaled-down project options.

05 Project Description

a. Describe the project according to:
   - Size and capacity;
   - Land requirements;
   - Raw materials required;
   - Energy and water source and consumption;
   - Labor requirement;
   - Transportation;
   - Ancillary facilities; and
   - Special infrastructural requirements.
b. Provide related maps and diagrams;
c. Summarise the technical, economic and environmental features that are essential to the project;
d. State the project implementation schedule and the project lifespan; and
e. Describe the operation and maintenance activities.

06 Existing Environment

a. Define the zone of study;
b. Describe in qualitative and quantitative terms the baseline conditions for:
   - Physico-chemical;
   - Biological;
   - Social; and
   - Economic setting.
c. Outline in great details the ESAs and areas of special or unique scientific, socio-economic or cultural values; and
d. Sources of information must be explained. Uncertainties of the information must be discussed.

07 Evaluation of Impacts

a. Present analysis of the predicted impacts in quantitative and qualitative terms;
b. The impacts shall be characterised according to:
   - Magnitude;
   - Extent;
   - Duration; and
   - Significance.
c. Discussion on impact identification and prediction shall cover the following aspects:
   - Zone of impact shall be based on the complexity of the project and supported by appropriate modelling exercise;
   - The nature of environmental effect; and
   - The source and nature of impact.
d. Describe the methodologies used for predicting impacts;
e. Indicate general impacts of pollutant emission in the study area based on the output of modelling exercise (if applicable). Contours of pollution shall be presented on maps;
f. All modelling exercise shall undergo the completed stages of modelling which area:
   - Model verification;
   - Calibration; and
   - Validation.
g. Quantify the environmental and development trade-offs anticipated from the proposed project using cost-benefit evaluation technique.

08 Mitigation Measures

a. Discuss all the mitigation measures which have been incorporated into the design and implementation of the project;
b. The mitigation measures shall be identified for each potential adverse impact at each stage of the project implementation;
c. Mitigation measures can be structural, non-structural, procedural or administrative;
d. The proposed mitigation measures must adhere to:
   - Guidance Document for addressing soil erosion and sediment control;
   - Guidance Document for the preparation of LD-P2M2; and
   - Other relevant guidelines and guidance document issued by DOE.
e. Selected mitigation measures must be considered as the “state-of-the-art”, or “BAT” or “industry best practices”.

09 Environmental Management Plan

a. Outline the detailed framework for the EMP document to be prepared after the EIA is approved;
b. Proposed the appropriate monitoring programme that covers performance monitoring, compliance monitoring and impact monitoring; and
c. Discuss the proposal for environmental audit programme.

10 Study Findings

Draw appropriate conclusions of the study findings from the perspective of the impacts of the proposed project.

References

Provide full citation of all the references used.

9.5 Appendices

Relevant data, information or analysis that was not incorporated in the main text of the EIA report shall be compiled in the Appendices. These includes the following:

- Certificate of Analysis of laboratory tests from data collection activities;
- Input data and results of modelling studies;
- Field work report during existing environment study;
- Supporting documents such as SSA, ESI, etc.; and
- Relevant public engagement documents such as list of attendance, meeting minutes, photographs, etc.

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Attachment 1

Project Description

ATTACHMENT 1
Project Description

CONTENT	DESCRIPTION
Project location	▪ Site location on satellite image within 5 km radius (ZOS) and ZOI (if required). ▪ Site location on topography map and landuse map. ▪ Project boundary and layout (with coordinates). ▪ Description of location in relation to identifiable landmarks (e.g. city centers, rivers, main roads, town, forest).
Existing site description	Descriptions of general environmental features of the project site within 5 km radius.
Project components	Descriptions of each project component and detailed design or layout plan e.g.: ▪ Access road. ▪ Logging and vegetation clearing. ▪ Canal/drainage design. ▪ Canal/drainage network. ▪ Design of the lake/reservoir. ▪ Quarry and construction materials. ▪ Other associated works.
Project concept	▪ Detailed explanation on the selected type of canal/drainage/lake design, network, its capacity and purpose. ▪ Process flow diagram. ▪ Lifespan of the development.
Project activities	▪ Method statement for key project activities during pre-construction, construction, operation stages. ▪ Manpower and vehicle requirements. ▪ Transportation materials/resource (volume, no. of trips, routes, location). ▪ Workers camps location including waste management. ▪ Working platform. ▪ Disposal area (spoil, biomass). ▪ Storage area.
Infrastructure, utilities and amenities requirement	Details of the estimated demand for: ▪ Water supply. ▪ Power supply. ▪ Telecommunications. ▪ Road system. ▪ Waste management.
Project implementation schedule	▪ Estimated timeline for each project stage starting from project planning to construction and operational stages. ▪ Details of each project stage. ▪ Provide in Gantt chart.

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

Attachment 2

Procedures for Sampling Practices

ATTACHMENT 2
Procedures for Sampling Practices

<table>
<tr><th>SAMPLING STATION SELECTION</th><th>GOOD PRACTICES</th></tr>
<tr><td colspan="2">1. WATER QUALITY</td></tr>
<tr><td colspan="2">a) Surface Water</td></tr>
<tr><td>i. Lake

1) Avoid areas near structures to avoid point sources of contamination), unless these structures are targeted for the study.
2) Use in situ field measurements to determine the vertical and lateral distribution of water quality. This is because the water is stagnant and commonly become stratified and water quality can vary greatly among the stratified sectors.</td><td rowspan="3"><u>In-situ water quality sampling:</u>

1) Before taking an instrument into the field, field personnel must be familiar with the contents of the operating manual for that specific instrument, and ensure that it is stored, calibrated, maintained and used as per manufacturer’s instructions.
2) Detailed records of calibration and maintenance must be kept. Calibration must be undertaken as per the instrument manufacturer’s instructions.
3) Sensors on sondes should be kept moist or wet at all times, and not be allowed to dry out.
4) Do not allow the sonde to touch the substrate as there is a risk of damage to the sensors from sticks, rocks, debris and anoxic sediments. Thoroughly clean the sonde if it has accidently made contact with the substrate before taking any further readings.
5) Depth can be determined in a boat by using the depth sounder.
6) Stratification with the water column can occur for a number of parameters, therefore depth profiling is necessary in waterbodies deeper than 5 m.
7) Follow the manufacturer’s direction for taking the readings. Allow the readings to stabilise. Typical readings for dissolved oxygen, electrical conductivity and pH in potable (drinking), fresh and marine water are presented in Table 1.

Table 1: Typical ranges for dissolved oxygen, conductivity and pH in different water types

<table><tr><th>Parameter</th><th>Potable Water</th><th>Fresh Water</th><th>Marine Water</th></tr><tr><td>Dissolved oxygen (DO)</td><td></td><td colspan="2">Typical concentrations under ambient conditions 6 - 10 mg/L. Values may be higher if algal blooms are present, or lower if anoxic conditions are present.</td></tr><tr><td>Electrical conductivity (EC)</td><td>50–500 µS/cm</td><td><1500 µS/cm</td><td>~52 000 µS/cm</td></tr><tr><td>pH</td><td></td><td colspan="2">6 - 8.5. These may be lower if acid rock drainage or acid sulfate soils/sediments are present. The total range of pH values is generally 0 - 14.</td></tr></table>Source: Department of Environment and Science, Queensland (2018)

8) Record the measured values in a notebook, and save the reading if a memory function is available. Record the following details:
a. Site details (e.g. site code, site name, waterway, GPS co-ordinates).
b. Date and time of measurement.
c. Any factor that may have affected the measurement (e.g. presence of an algal bloom, recent rainfall etc.).</td></tr>
<tr><td>ii. River or stream

1) Identify stream where constituents are well mixed along the cross section.
2) Far enough above and below confluences of streamflow or point sources of contamination to avoid sampling at a cross section where flows are poorly mixed or not unidirectional.
3) At a stream reach where representative samples can be collected safely during all flow regimes.</td></tr>
<tr><td>iii. Marine

1) Sampling shall be done during low tide which represent worst water quality condition.
2) Sampling sites should form a gradient away from the source (e.g., STP outfall) towards the ecosystem of concern (coral reefs, aquaculture, etc.).</td></tr>
</table>

GOOD PRACTICES	QUALITY CONTROL	REFRENCES
<u>Ex-situ water quality sampling:</u> 1) Prior to leaving for the field, inspect all equipment and ensure it is in good working order and has been cleaned appropriately. Make sure if you are using an intermediate container that is appropriate for the analytes/s being sampled for. 2) Samples should be collected directly into the laboratory supplied containers when sampling waters where possible, as this will reduce the risk of contamination. Direct sample collection is the preferred procedure if the environment is safe (e.g. during low flow conditions), and sample bottles do not contain preservative. 3) On reaching the sampling site, prepare a clean work area and ensure all equipment that you will require is unpacked and easily accessible. 4) Pre-label all sample containers if possible. 5) For surface water sampling, water is collected at the surface of the water with hand. A small air space should be left to allow the sample to be mixed before analysis. 6) For station that is deeper than 5 m, deploy the water sampler and lower into a representative area of water and to the required depth (surface: 0.2d, middle: 0.5d, bottom: 0.8d). Ensure the bottom of the sampler is at least 1 m above the riverbed/ seabed. 7) Refill by deploying the water sampler, lowering the sampler to the required depth and triggering the sampler. 8) Remove the sampler from the water and fill the labelled sampler containers. Do this quickly to avoid sediment particles from settling to the bottom of the water sampler. Recap the sample containers. 9) Complete a final check that details on the sample container are correct. 10) Place the sample container in a cooler box (with ice or ice bricks) or refrigerator and chill. Double bag samples if using ice. 11) Thoroughly rinse discrete depth sampler three times with high quality deionised water, allow to dry and store in a clean location prior to reuse at further sampling sites. 12) Fill out the chain of custody form.	The collection of quality control samples is essential in order to provide confidence in the results of a sampling program, and is part of the overall quality assurance program. The following methods are advisable to be conducted in order to quality control the sample. **1) Blanks** A blank sample is a sample named so that it is indistinguishable from the other samples. This means the source and chemical composition of the samples are not known to the analyst. Blind samples can determine variability within a laboratory or bias and variability between two or more laboratories. **2) Replicates** Replicate samples are obtained by collecting two or more samples across a site at the same time. Replicate samples provide estimates of the sample variability, including experimental sampling error and analytical error.	1) ASEAN Marine Water Quality Management Guidelines and Monitoring Manual. 2) Monitoring and Sampling Manual Environmental Protection (Water) Policy 2009 - State of Queensland, Australia. 3) National Field Manual for the Collection of Water Quality Data - US Geological Survey, 2018.

SAMPLING STATION SELECTION	GOOD PRACTICES
1. WATER QUALITY *(cont'd)...*	
b) Groundwater	
1) Implement safety precautions and site preparations before the commencement of the groundwater sampling. 2) The total depth and depth to the water level should be measured within the bore before any purging and sampling. 3) Using a pump for purging and sampling a bore ensures that representative sample of water residing in the aquifer will be obtained. 4) Make sure the pumping technique is consistent and every sample is obtained following the same procedure. 5) Purge the well and monitor field measurements. Purging the well of standing water is generally required to ensure that the sample water will be withdrawn directly from the aquifer. 6) During sample collection, make sure that the pump discharge line or the bailer does not contact the sample container. 7) All samples requiring preservation must be preserved immediately at the time of sample collection.	**<u>In-situ water quality sampling:</u>** (Refer to surface water column) **<u>Ex-situ water quality sampling:</u>** 1) Confirm that the location conforms to the network design of the study, with respect to areal and depth distribution. 2) Document land-use/land-cover characteristics of the watershed with respect to study objectives and potential effects on groundwater. Consider the effects of features such as landfills, waste-disposal or industrial sites, etc. 3) Review subsurface geology and verify that the existing or newly developed well is within the desired geologic units. 4) Evaluate the site for accessibility with respect to equipment needed for well installation and sample collection. 5) Measure and record the water level in existing wells by using steel or electrical tape. If the well does not have an access point for measuring water levels, note this fact in the station folder. 6) Review seasonal water-level declines that could make the well unsuitable for use as a sampling site. 7) Check that the yield of water is adequate for sampling; typically, a minimum of 0.25 gallons (approximately 1 liter) per minute is adequate.
2. AIR	
1) The site should be representative of the area selected that reflect concentrations and fluctuations of air pollution of air pollutant within the area. 2) The stations should be away from: a. Nearby sources of air pollution at least 25 m away from domestic chimneys. b. Absorbing surfaces at least 1m away from absorbing building material. c. Area where considerable building or land use changes are foreseen in the near future. 3) The site where the station is located should fulfil one or more of the following requirements depending on the types of instruments used: a. It should be available for a long period. b. It should be available for a long period; it should preferably be accessible any time throughout the year. c. Electrical power of sufficient rating should be available. d. It should be vandal-proof. e. It may need to be protected for extreme of temperatures.	1) Identifying type of pollutants to be monitor and use the established standard or guideline as the priority. 2) Determine the size and location of the monitoring stations to ensure that the measurements taken are adequate and representative of the air quality conditions of the area. 3) Determine the time and duration of the sampling aligns with the monitoring objective. 4) Determine the type of monitoring equipment or system to be use. 5) Determine the appropriate sampling frequency to ensure that the data collected is sufficient for statistical analysis.

QUALITY CONTROL	REFRENCES
The collection of quality control samples is essential in order to provide confidence in the results of a sampling program, and is part of the overall quality assurance program. The following methods are advisable to be conducted in order to quality control the sample. **1) Blanks** A blank sample is a sample named so that it is indistinguishable from the other samples. This means the source and chemical composition of the samples are not known to the analyst. Blind samples can determine variability within a laboratory or bias and variability between two or more laboratories. **2) Replicates** Replicate samples are obtained by collecting two or more samples across a site at the same time. Replicate samples provide estimates of the sample variability, including experimental sampling error and analytical error.	1) ASEAN Marine Water Quality Management Guidelines and Monitoring Manual. 2) Monitoring and Sampling Manual Environmental Protection (Water) Policy 2009 - State of Queensland, Australia. 3) National Field Manual for the Collection of Water-Quality Data - US Geological Survey, 2018.
All air measuring equipment shall be properly calibrated in accordance with current standards and thereafter, or recommendations governing the calibration of such equipment in accordance to the equipment manufacturer's instructions.	Methods for Measurement of Air Pollution, Part 14: Guidelines for Planning the Sampling of Atmosphere. IS 5182 (Part 14):2000.

SAMPLING STATION SELECTION	GOOD PRACTICES
3. NOISE	
1) Site selection depends on the purpose for which the measurement is made and is typically at locations that may be affected by noise or for which a noise severity assessment is to be undertaken. 2) The site can be residential and other noise sensitive premises, commercial or industrial premises. 3) The measurement shall be at the receptors' property boundary.	1) Baseline noise measurements shall require noise levels to be measured continuously over a day night time period that are divided into the following periods: a. Day: 7.00 am to 10.00 pm. b. Night: 10.00pm to 7.00 am the following day. 2) Microphone positions shall be mounted at least above 1.2 m above the ground and at least 3.5 m away from any reflecting surfaces other than the ground. 3) The microphone shall be orientated so that it is most uniformly sensitive to the incident sound from prevailing noise source. 4) Any non-representative or temporary noisy sources, such as roadworks, construction works (unless the construction work is the subject of assessment) shall be avoided where feasible. 5) The noise parameters to be measured shall be L_{Aeq} and the L_{max} over the nominated measurement interval. 6) The measurements may include other statistical parameters such as the L_{90}, L_{50} and L_{10}, or a full statistical distribution of the sound pressure levels recorded over the measurement interval. 7) Results to be reported shall be L_{Aeq} day, L_{Aeq} night and L_{Aeq} 24 hours. 8) Other statistical parameter s such as the L_{90}, L_{50}, L_{10} and L_{max} levels should also be reported in situations when noise levels are fluctuating in nature.
4. VIBRATION	
1) The vibration assessment should normally be at the nearest building. 2) The best position for the monitoring point would often be on the floor slab or foundation. 3) Monitoring points should be accessible to all parties concerned.	1) Vibration measurements shall usually include: a. Background (ambient) vibration levels at a receiver location or at the real property boundary of a source. b. These may be undertaken at locations prior to a project development. c. It could also be undertaken in the absence of the source operating (for example with a plant not operating, or without construction activities). 2) Vibration measured indoors may be undertaken outdoors or indoors on building floor slabs or foundation as the case may be. 3) Vibration could be assessed against an absolute numerical vibration limit and/or assessed based on the increase of the vibration levels with respect to the ambient level without the offending source. 4) Assessment of vibration levels against an acceptance limit is fairly straight forward, as it merely requires comparison of the measured level against the permissible levels.

QUALITY CONTROL	REFRENCES
1) Calibration of sound level meters and noise monitoring units should be conducted by a calibration laboratory or original equipment manufacturer at intervals not exceeding two years or other frequency determined by DG or recommended by manufacturer. 2) It is recommended that calibrated reference sound sources used to check calibration in the field (sound level calibrators) should also be calibrated at two years interval. 3) A field check of instrument calibration shall be made before and after each set of measurements, using a calibrated reference sound source to ensure accuracy of ± 1 dB. 4) Notwithstanding the above, where instrumentation used for long term permanent monitoring to be checked at regular intervals (once every 6 months) to ascertain reliability and stability of the monitoring system. 5) If during a field check of instrument calibration, the sound level meter reading differs from the calibrated reference level, the difference must be noted. Any measurements taken in the interval since calibration was last checked should be adjusted accordingly. In all cases, where a difference in field calibration of more than 1 dB is noted between consecutive checks, measurement data obtained during the previous interval should be discarded.	Guidelines for Environmental Noise Limits and Control (Third Edition) - Department of Environment (DOE), Malaysia.
All vibration measuring equipment shall be properly calibrated in accordance with current standards and thereafter, or recommendations governing the calibration of such equipment in accordance to the equipment manufacturer's instructions.	The Planning Guidelines for Vibration Limits and Control in the Environment - Department of Environment (DOE), Malaysia.

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Attachment 3

National Water Quality Standards for Malaysia (DOE, 2019)

ATTACHMENT 3

National Water Quality Standards for Malaysia (DOE, 2019)

PARAMETER	UNIT	CLASS				
		I	IIA/IIB	III#	IV	V
Al	mg/l	NL	-	(0.06)	0.5	>0.5
As	mg/l	NL	0.05	0.4(0.05)	0.1	>0.1
Ba	mg/l	NL	1	-	-	-
Cd	mg/l	NL	0.01	0.01* (0.001)	0.01	>0.01
Cr (IV)	mg/l	NL	0.05	1.4(0.05)	0.1	>0.1
Cr (III)	mg/l	NL	-	2.5	-	-
Cu	mg/l	NL	0.02	-	0.2	>0.2
Hardness	mg/l	NL	250	-	-	-
Ca	mg/l	NL	-	-	-	-
Mg	mg/l	NL	-	-	-	-
Na	mg/l	NL	-	-	3 SAR	
K	mg/l	NL	-	-	-	-
Fe	mg/l	NL	1	1	1(Leaf) 5 (Others)	
Pb	mg/l	NL	0.05	0.02*** (0.01)	5	>5
Mn	mg/l	NL	0.1	0.1	0.2	>0.2
Hg	mg/l	NL	0.001	0.004 (0.0001)	0.002	>0.002
Ni	mg/l	NL	0.05	0.9*	0.2	>0.2
Se	mg/l	NL	0.01	0.25 (0.04)	0.02	>0.2
Ag	mg/l	NL	0.05	0.0002	-	-
Sn	mg/l	NL	-	0.004	-	-
U	mg/l	NL	-	-	-	-
Zn	mg/l	NL	5	0.4*	2	>2
B	mg/l	NL	1	3.4	0.8	>0.8
Cl	mg/l	NL	200	-	80	>80
Cl_2	mg/l	NL	-	(0.02)	-	-
CN	mg/l	NL	0.02	0.06 (0.02)	-	-
F	mg/l	NL	1.5	10	1	>1
NO_2	mg/l	NL	0.4	0.4 (0.03)	-	-
NO_3	mg/l	NL	7	-	5	>5
P	mg/l	NL	0.2	0.1	-	-
Silica	mg/l	NL	50	-	-	-
SO_4	mg/l	NL	250	-	-	-
S	mg/l	NL	0.05	(0.001)	-	-

Notes:

1. NL : Natural levels or absent
2. * : At hardness 50mg/l $CaCO_3$
3. # : Maximum (unbracketed) and 24-hour average (bracketed) concentrations
4. N : Free from visible film sheen, discolouration and deposits

PARAMETER	UNIT	CLASS				
		I	IIA/IIB	III#	IV	V
CO_2	mg/l	NL	-	-	-	-
Gross-α	Bq/l	NL	0.1	-	-	-
Gross-β	Bq/l	NL	1	-	-	-
Ra-226	Bq/l	NL	<0.1	-	-	-
Sr-90	Bq/l	NL	<1	-	-	-
CCE	µg/l	NL	500	-	-	-
MBAS/ BAS	µg/l	NL	500	5000 (200)	-	-
O&G (Mineral)	µg/l	NL	40;N	N	-	-
O&G (Emulsified Edible)	µg/l	NL	7000;N	N	-	-
PCB	µg/l	NL	0.1	6 (0.05)	-	-
Phenol	µg/l	NL	10	-	-	-
Aldrin/ Dieldrin	µg/l	NL	0.02	0.2 (0.01)	-	-
BHC	µg/l	NL	2	9 (0.1)	-	-
Chlordane	µg/l	NL	0.08	2 (0.02)	-	-
t-DDT	µg/l	NL	0.1	(1)	-	-
Endosulfan	µg/l	NL	10	-	-	-
Heptachlor/ Epoxide	µg/l	NL	0.05	0.9 (0.06)	-	-
Lindane	µg/l	NL	2	3 (0.4)	-	-
2,4-D	µg/l	NL	70	450	-	-
2,4,5-T	µg/l	NL	10	160	-	-
2,4,5-TP	µg/l	NL	4	850	-	-
Paraquat	µg/l	NL	10	1800	-	-

Notes:
1. NL : Natural levels or absent
2. * : At hardness 50mg/l $CaCO_3$
3. # : Maximum (unbracketed) and 24-hour average (bracketed) concentrations
4. N : Free from visible film sheen, discolouration and deposits

PARAMETER	UNIT	CLASS					
		I	IIA	IIB	III	IV	V
Ammoniacal Nitrogen	mg/l	0.1	0.3	0.3	0.9	2.7	>2.7
Biochemical Oxygen Demand	mg/l	1	3	3	6	12	>12
Chemical Oxygen Demand	mg/l	10	25	25	50	100	<100
Dissolved Oxygen	mg/l	7	5-7	5-7	3-5	<3	<1
pH	-	6.5-8.5	6-9	6-9	5-9	5-9	-
Colour	TCU	15	150	150	-	-	-
Electrical Conductivity	µS/cm	1000	1000	-	-	6000	-
Floatables	-	N	N	N	-	-	-
Odour	-	N	N	N	-	-	-
Salinity	%	0.5	1	-	-	2	-
Taste	-	N	N	N	-	-	-
Total Dissolved Solid	mg/l	500	1000	-	-	4000	-
Total Suspended Solid	mg/l	25	50	50	150	300	300
Temperature	°C	-	Normal +2 °C	-	Normal +2 °C	-	-
Turbidity	NTU	5	50	50	-	-	-
Faecal Coliform**	count/ 100ml	10	100	400	5000 (20000)a	5000 (20000)a	-
Total Coliform	count/ 100ml	100	5000	5000	50000	50000	>50000

Notes:
1. N : No visible floatable materials or debris, no objectional odour or no objectional taste
2. * : Related parameters, only one recommended for use
3. ** : Geometric mean
4. a : Maximum not to be exceeded

Water Classes and Uses

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

Attachment

4

National Lake Water Quality Criteria and Standards (NAHRIM & NRE, 2015)

ATTACHMENT 4

National Lake Water Quality Criteria and Standards
(NAHRIM & NRE, 2015)

PARAMETER	UNIT	CATEGORY A	CATEGORY B	CATEGORY C	CATEGORY D
Physicals					
Colour	TCU	100-200	150 – 300	300	300
Conductivity	µS/cm	1,000	1,000	2,000	5,000
Salinity	ppt	NVD	NVD	<1	>1
Floatables	-	NV	NV	NV	NV
Dissolved Oxygen (DO)	mg/L	6.3 – 7.8	5.5 – 8.7	4.5 – 10.3	3.3 – 10.3
DO % Saturation	%	80 – 100	70 – 110	55 – 130	40 – 130
Odour	-	NOO	NOO	NOO	NOO
pH	-	6.5 – 8.5	6.5 – 8.5	6.0 – 9.0	5.5 – 9.0
Taste	-	NOT	NOT	NOT	NOT
Temperature	°C	28	28	28	28
Total Suspended Solid	mg/L	<100	100 – 500	200	>200
Turbidity	NTU	40	40 – 170	70	250
Transparency (Secchi)	m	0.6	0.6	0.3	0.3
Oil & Grease	mg/L	1.5	15	1.5	1.5
Nutrients					
Ammoniacal Nitrogen (NH_3-N)	mg/L	0.1	0.3	1	2.7
Nitrate-N (NO_3-N)	mg/L	7	7	10	10
Total Phosphorus	mg/L	0.01	0.035	0.035	0.05
Heavy Metals					
Arsenic (As)	mg/L	0.05	0.1	0.15	0.4
Cadmium (Cd)	mg/L	0.002	0.002	0.01	0.01
Lead (Pb)	mg/L	0.05	0.05	0.05	0.05
Mercury (Hg)	mg/L	<0.001	<0.001	<0.001	<0.001
Nickel (Ni)	mg/L	0.02	0.02	0.05	0.05
Biological/Microbiological					
Chlorophyll-a	µg/L	10	15	15	25
Biochemical Oxygen Demand (BOD_5)	mg/L	3	6*	6*	8*
Chemical Oxygen Demand (COD)	mg/L	10	25*	25*	50*
Clostridium perfringes (including spores)	-	ND	ND*	NVD*	NVD*
Total Coliform	Counts/ 100 mL	5,000	5,000*	5,000*	5,000*
E. coli	Counts/ 100 mL	100	600*	3,000*	3,000*
Giardia sp	-	ND	ND*	NVD*	NVD*
Leptospira sp.	-	ND	ND*	NVD*	NVD*
Cryptosporodium sp	-	ND	ND*	NVD*	NVD*
Enterococci	Counts/ 100 mL	33	230*	NVD*	NVD*
Cyanobacteria	Cells/ mL	15,000	15,000*	15,000*	15,000*

Notes:

1. ND : Not detected
2. NVD : No value determined (parameter that is not necessary to be measured for certain category)
3. NV : Not visible
4. NOO : No obvious odour
5. * : Optional parameters

Description of Categories

CATEGORIES	DESCRIPTION
Category A	Lakes that are managed in which the water to be used for recreational purposes – primary body contact such as swimming, diving and kayaking
Category B	▪ Lake used for recreational purposes – secondary body contact such as boating and cruising ▪ Swimming is not allowed in this category of lakes
Category C	The lakes are meant for preservation of aquatic life and biodiversity
Category D	▪ Lakes managed for the minimum preservation of good aquatic life in the lakes ▪ It applies good management practices of lakes

The Other Parameters

List of parameters that are not mandatory to be measured. The criteria of the parameters necessary for different categories are provided as reference or guideline values.

PARAMETER	UNIT	CATEGORY A	CATEGORY B	CATEGORY C	CATEGORY D
Calcium ion (Ca^{2+})	mg/L	200	200	**	**
Chloride	mg/L	250	250	250	250
Combined Chlorine	mg/L	1.0	1.0	1.0	1.0
Free Residual Chlorine	mg/L	1.5	1.5	1.5	1.5
Flourine	mg/L	1	1	1.5	1.5
Nitrite (NO_2^-N)	mg/L	0.04	0.4	0.4	0.4
Sulphate	mg/L	250	250	250	250
Total Dissolved Solid	mg/L	1,000	1,000	1,000	1,000
Total Nitrogen	mg/L	0.35	0.35	0.35	0.35
Potassium Ion (K^+)	mg/L	200	200	200	200
Hydrogen carbonate (HCO_{3-})	mg/L	200	200	**	**
Faecal Coliform	Counts / 100 mL	150	1,000	1,000	2,000
Microcystin - LR	µg/L	0	0	0	0
Enteroviruses	PFU/L	NVD	NVD	NVD	NVD
Aluminium (Al)	mg/L	0.1	0.1	0.1	0.1
Antimony (Sb)	mg/L	0.03	0.03	0.03	0.03
Barium (Ba)	mg/L	0.1	0.1	1	1
Beryllium (Be)	mg/L	0.004	0.004	0.004	0.004
Boron (B)	mg/L	1	1	1	1
Chromium (Cr)	mg/L	0.05	0.05	0.05	0.05

Notes:
1. NVD : No value determined (parameter that is not necessary to be measured for certain category)
2. ** : As alkalinity (C_aCO_3 in mg/L)

The Other Parameters

PARAMETER	UNIT	CATEGORY A	CATEGORY B	CATEGORY C	CATEGORY D
Cobalt (Co)	mg/L	0.05	0.05	0.05	0.05
Copper (Cu)	mg/L	0.02	0.02	0.02	0.02
Iron (Fe)	mg/L	1	1	1	1
Magnesium (Mg)	mg/L	150	150	150	150
Manganese (Mn)	mg/L	0.1	0.1	0.1	0.1
Silver (Ag)	mg/L	0.05	0.05	0.05	0.05
Sodium (Na)	mg/L	200	200	200	200
Sulphur (S)	mg/L	0.05	0.05	0.05	0.05
Zinc (Zn)	mg/L	3	3	5	5
1,2-dichloroethane	µg/L	30	30	30	30
2,4-D	µg/L	30	30	70	70
2,4-DB	µg/L	90	90	90	90
2,4-dichlorophenol	µg/L	90	90	90	90
2,4,5-T	µg/L	9	9	10	10
2,4,5-TP	µg/L	4	4	4	4
2,4,6-trichlorophenol	µg/L	200	200	200	200
Alachlor	µg/L	20	20	20	20
Aldicarb	µg/L	10	10	10	10
Aldrin / Dieldrin	µg/L	0.02	0.02	0.02	0.02
Anionic Detergent MBAS	µg/L	1,000	1,000	1,000	1,000
Atrazine	µg/L	NVD	NVD	NVD	NVD
BHC	µg/L	2	2	2	2
Carbofuran	µg/L	7	7	7	7
Carbon Chloroform Extract	µg/L	500	500	500	500
Chlordane	µg/L	0.08	0.08	0.08	0.08
Chloroform	µg/L	200	200	200	200
Cyanide	mg/L	0.05	0.05	0.05	0.05
DDT	µg/L	2	2	2	2
Heptachlor	µg/L	0.05	0.05	0.05	0.05
Glyphosate	µg/L	200	200	200	200
Hexachloro benzene	µg/L	1	1	1	1
Lindane	µg/L	2	2	2	2
MBAS / BAS (Methylene Blue)	µg/L	200	200	200	200
MCAP	µg/L	2	2	2	2
Methoxychlor	µg/L	20	20	20	20
Mineral Oil	µg/L	300	300	300	300
Oil & Grease (Emulsified Edible)	mg/L	7:N	7:N	7:N	7:N
Oil & Grease (Mineral)	mg/L	0.04:N	0.04:N	0.04:N	0.04:N
Paraquat	µg/L	10	10	10	10
Parathion	µg/L	30	30	30	30
PCB	µg/L	0.1	0.1	0.0001	0.0001
Pendimethalin	µg/L	20	20	20	20
Pentachlorophenol	µg/L	9	9	9	9
Permethrin	µg/L	20	20	20	20

Notes:
1. NVD : No value determined (parameter that is not necessary to be measured for certain category)
2. ** : As alkalinity (C_aCO_3 in mg/L)

The Other Parameters

PARAMETER	UNIT	CATEGORY A	CATEGORY B	CATEGORY C	CATEGORY D
Pesticides	µg/L	NVD	NVD	NVD	NVD
Phenol	µg/L	5	5	5	5
t-DDT	µg/L	0.1	0.1	0.1	0.1
Tetracholorethene and Trichloroethene	µg/L	10	10	10	10
Total Indicative Dose	µg/L	NVD	NVD	NVD	NVD
Total Organic Carbon	µg/L	NVD	NVD	NVD	NVD
Thrichloroacetic acid	µg/L	100	100	100	100
Trichloroaceto nitrile	µg/L	1	1	1	1
Trihalomethanes - Total	µg/L	1,000	1,000	1,000	1,000
Tritium	µg/L	NVD	NVD	NVD	NVD
Vinyl chloride	µg/L	5	5	5	5
Acrylamide	µg/L	0.1	0.1	0.1	0.1
Benzene	µg/L	10	10	10	10
Benzo(a) pyrene	µg/L	0.01	0.01	0.01	0.01
Bromate	µg/L	10	10	10	10
Bromodikloro methane	µg/L	60	60	60	60
Bromoform	µg/L	100	100	100	100
Dibromoaceto nitrile	µg/L	100	100	100	100
Dibromochloro methane	µg/L	100	100	100	100
Dichloroacetic acid	µg/L	50	50	50	50
Dichloroaceto nitrile	µg/L	90	90	90	90
Endosulfan	µg/L	10	10	10	10
Epichlorohydrin	µg/L	4	4	4	4
Polycyclic Aromatic Hydrocarbons (PAH)	µg/L	NVD	NVD	NVD	NVD
Propanil	µg/L	20	20	20	20
Simazine	µg/L	20	20	20	20
Selenium	mg/L	0.01	0.01	0.01	0.01
Toxicants (heavy metal, organics)	µg/L	NVD	NVD	NVD	NVD
Gross-alpha	Bq/L	0.1	0.1	0.1	0.1
Gross-Beta	Bq/L	1	1	1	1
Radium-226	Bq/L	<0.1	<0.1	<0.1	<0.1
Strontium-90	Bq/L	<1	<1	<1	<1

Notes:
1. NVD : No value determined (parameter that is not necessary to be measured for certain category)
2. ** : As alkalinity (C_aCO_3 in mg/L)

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Attachment 5

New Malaysian Ambient Air Quality Standards (DOE, 2013)

ATTACHMENT 5

New Malaysian Ambient Air Quality Standards (DOE, 2013)

POLLUTANTS	AVERAGING TIME	AMBIENT AIR QUALITY STANDARD		
		IT-1 (2015)	IT-2 (2018)	Standard (2020)
		µg/m^3	µg/m^3	µg/m^3
Particulate Matter with the size of less than 10 micron (PM_{10})	1 year	50	45	40
	24 hour	150	120	100
Particulate Matter with the size of less than 2.5 micron ($PM_{2.5}$)	1 year	35	25	15
	24 hour	75	50	35
Sulfur Dioxide (SO_2)	1 year	350	300	250
	24 hour	105	90	80
Nitrogen Dioxide (NO_2)	1 year	320	300	280
	24 hour	75	75	70
Ground Level Ozone (O_3)	1 year	200	200	180
	8 hour	120	120	100
*Carbon Monoxide (CO)	1 year	35	35	30
	8 hour	10	10	10

Note: * mg/m^3

Attachment 6

Guidelines for Environmental Noise Limits and Control (DOE, 2019)

ATTACHMENT 6

Guidelines for Environmental Noise Limits and Control (DOE, 2019)

FIRST SCHEDULE

Recommended Permissible Sound Level (L_{Aeq}) by Receiving Land Use for New Development

RECEIVING LAND USE CATEGORY	L_{Aeq} DAY 7.00 am – 10.00 pm	L_{Aeq} NIGHT 10.00 pm – 7.00 am
Low density residential, noise sensitive receptors, institutional (school, hospital, worship)	55 dBA	50 dBA
Suburban residential (medium density), recreational	60 dBA	55 dBA
Urban residential (high density), mixed development	65 dBA	60 dBA
Commercial business zones	65 dBA	60 dBA
Industrial zones	70 dBA	65 dBA

SECOND SCHEDULE

Recommended Permissible Sound Level (L_{Aeq}) by Receiving Land Use for Existing Built Up Areas

RECEIVING LAND USE CATEGORY	L_{Aeq} DAY 7.00 am – 10.00 pm	L_{Aeq} NIGHT 10.00 pm – 7.00 am
Low density residential, noise sensitive receptors, institutional (school, hospital, worship)	60 dBa	55 dBA
Suburban and urban residential, mixed development	65 dBA	60 dBA
Commercial business zones	70 dBA	65 dBA
Industrial zones	75 dBA	75 dBA

Note: The above prescribed L_{Aeq} limits are representative noise levels consistent with developed areas without noise disturbance generally deemed acceptable to majority of receptors occupying in premises at the respective land category.

THIRD SCHEDULE

Recommended Permissible Sound Level (L_{Aeq}) to be Maintained at the Existing Noise Climate

EXISTING LEVELS	RECOMMENDED PERMISSIBLE LEVELS
L_{Aeq}	Existing L_{Aeq}

Notes:
Existing L_{Aeq} is determined from baseline measurements of the prevailing noise in the absence of the new noise sources(s); typically undertaken just prior to the operations of the new road, railway line or industrial premises operations, or alternatively with the noise source(s) being assessed to be temporarily disabled.
Due to uncertainty in measurements, noise levels within + 1.5 dBA of the existing L_{Aeq} is acceptable and deemed maintained at the existing noise climate.

FOURTH SCHEDULE
Limiting Sound Level (L_{Aeq}) from Road Traffic
(for New Roads and/or Redevelopment of Existing Roads)

RECEIVING LAND USE CATEGORY	L_{Aeq} DAY 7.00 am – 10.00 pm	L_{Aeq} NIGHT 10.00 pm – 7.00 am
Noise sensitive areas, low density residential areas	60 dBa	55 dBA
Suburban and urban residential (medium and density)	65 dBA	60 dBA
Commercial and mixed development	70 dBA	65 dBA
Industrial	75 dBA	75 dBA

Note: in situations where the existing sound levels of receptors are higher than limits prescribed above, or within (less than) 2 dBA of the above prescribed limits, the maximum permissible levels stipulated in Schedule 3 shall apply.

FIFTH SCHEDULE
Limiting Sound Level (L_{Aeq}) from Road Traffic
(for New Roads and/or Redevelopment of Existing Roads)

RECEIVING LAND USE CATEGORY	L_{Aeq} DAY 7.00 am – 10.00 pm	L_{Aeq} NIGHT 10.00 pm – 7.00 am	L_{max} Day & Night
Noise sensitive areas, low density and suburban residential areas	60 dBa	55 dBA	75 dBa*
Urban residential areas	65 dBA	60 dBA	80 dBA*
Commercial and mixed development	70 dBA	65 dBA	80 dBA*
Industrial	75 dBA	75 dBA	NA

Notes:
1. *L_{max} noise levels prescribed herein are for train pass-by events only; assessed on trains pass-by events averaged over one hour (i.e. averages of train pass-by L_{max} noise levels from all trains in one hour)
   Care in measurements must be exercised to ensure the L_{max} levels being measured and assessed are not from extraneous noise sources (typically road traffic vehicle pass-by, horns, siren. etc.) not related to train pass-by events.

2. In situations where the existing L_{Aeq} sound levels of receptors are higher than limits prescribed above or within (less than) 2 dBA of the prescribed limits, the maximum permissible L_{Aeq} levels stipulated in Schedule 3 shall apply.

SIXTH SCHEDULE

Maximum Permissible Sound Levels (Percentile L_{10} and L_{max}) of Construction, Maintenance and Demolition Work by Receiving Land Use

RECEIVING LAND USE CATEGORY	NOISE PARAMETER	DAY 7.00 am – 10.00 pm	EVENING 7.00 pm – 10.00 pm	NIGHT 10.00 pm – 7.00 am
Residential, sensitive areas (Note 2**)	L_{10}	75 dBa	70 dBA	75 dBA
	L_{max}	90 dBa	85 dBA	85 dBA
	L_{Aeq}	-	-	*Note 1
Commercial and mixed development	L_{10}	80 dBA	80 dBA	75 dBA
Industrial	L_{10}	80 dBA	80 dBA	80 dBA

Notes:

1. *At night time, the maximum permissible levels as stipulated in Schedule 3 for respective residential density type shall apply.
2. **Limits for daytime L_{Aeq} or reduction of L_{10} levels in vicinity of sensitive premises (such as schools and hospitals) may be exercised by the Local Authority or Department of Environment. In such situations, limits for daytime L_{Aeq} + 3 dBA based on Schedule 3 may apply.
3. There are no prescribed limits for L_{max} and L_{Aeq} levels for construction noise for commercial and industrial land use. Assessment of L_{Aeq} levels if required shall be based on comparison against prevailing ambient noise (Schedule 3).

Attachment 7

Schedule of Recommended Vibration Limits (DOE, 2007)

ATTACHMENT 7

Schedule of Recommended Vibration Limits (DOE, 2007)

SCHEDULE 1

Recommended Limits for Damage Risk in Buildings from Steady State Vibration

DAMAGE DESCRIPTION	VERTICAL VIBRATION PEAK VELOCITY V_{max} [mm/s] (0 TO PEAK) (10-100 Hz)
Safe	Less than 3
Caution level (Damage not Necessary Inevitable)	3 to 5
Minor damage	5 to 30
Major damage	More than 30

Source: ISO DP 4688:1975

SCHEDULE 2

Recommended Limits for Damage Risk in Buildings from Short Term Vibration

TYPE OF STRUCTURE	VIBRATION VELOCITY V_i [mm/s] AT FOUNDATION (AS DEFINED BY THE RESPECTIVE RATING CURVES OF FIGURE 1	VIBRATION VELOCITY V_i [mm/s] AT PLANE OF FLOOR OF UPPERMOST FULL STOREY (ALL FREQUENCIES)
Industrial buildings and buildings of similar design	Curve C	40
Commercial building, dwelling and buildings of similar design and/or use	Curve B	15
Structures that, because of their particular sensitivity to vibration, do not correspond to those listed above, or of great intrinsic value (e.g. residential houses, or buildings that are under preservation order)	Curve A	8

Source: DIN 4150/3

SCHEDULE 3
Recommended Limits for Damage Risk in
Buildings from Single Event Impulsive Excitation*

TYPE OF STRUCTURE	GROUND VIBRATION PEAK PARTICLE VELOCITY V_{max} [mm/s]	
	AT LOW FREQUENCY <40 Hz	AT HIGH FREQUENCY >40 Hz
Industrial buildings and buildings of similar design	40	50
Commercial buildings, dwelling and buildings of similar design and/or use	20	50
Structures that, because of their particular sensitivity to vibration, do not correspond to those listed above, or of great intrinsic value (e.g. residential buildings, or buildings that are under preservation order)	12	50

* Single event impulsive excitation not exceeding 3 occurrences per day.
Source: Adapted from DIN 4150/3 and Swiss Standard for Vibration Damage to Buildings

SCHEDULE 4
Acceptable Road Traffic Induced
Vibrations in Buildings

TYPE OF BUILDING AND FOUNDATION	RECOMMENDED VERTICAL VELOCITY LIMIT V_{max} [mm/s]
Especially sensitive buildings, and buildings of cultural and historical value	1
Newly built buildings, and/or foundation of a foot plate (spread footings)	2
Buildings on cohesion piles	3
Building on bearing piles or friction piles	5

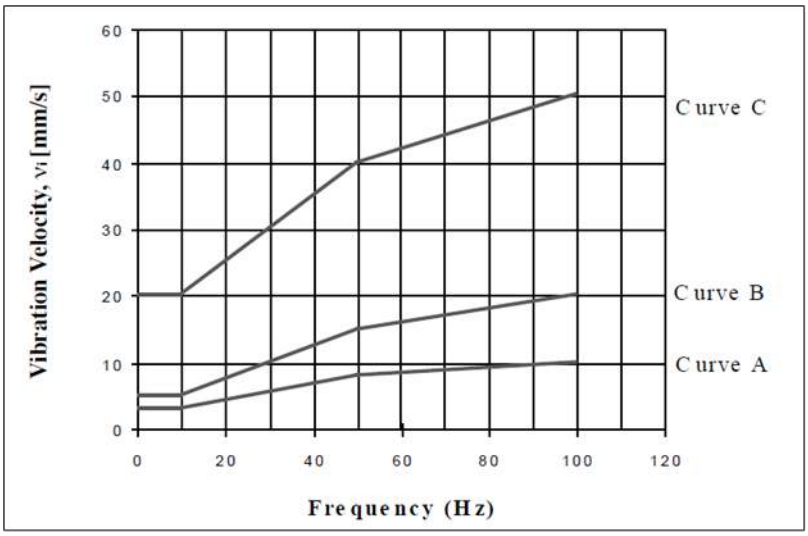

FIGURE 1
Foundation vibration velocity limiting values for vectorial sum of vibration levels in three orthogonal axes

SCHEDULE 5
Recommended Limits for Human Response and Annoyance from Steady State Vibrations

RECEIVING LAND USE CATEGORY	DAY TIME 7.00 am – 10.00 pm	NIGHT TIME 10.00 pm – 7.00 am
Vibration sensitive areas	Curve 1	Curve 1
Residential	Curve 2 to Curve 4	Curve 2
Commercial, business	Curve 4 to Curve 8	Curve 4
Industrial	Curve 8 to Curve 16	Curve 8 to Curve 16

SCHEDULE 6
Recommended Limits for Human Response and Annoyance from Short Term Vibrations

RECEIVING LAND USE CATEGORY	DAY TIME 7.00 am – 10.00 pm	NIGHT TIME 10.00 pm – 7.00 am
Vibration sensitive areas	Curve 1	Curve 1
Residential	Curve 8 to Curve 16	Curve 4
Commercial, business	Curve 16 to Curve 20	Curve 16 to Curve 20
Industrial	Curve 32	Curve 32

The above stipulated curves are defined in Figure 2 and 3. The base Curve 1 is based on the vibration perception threshold for human response as defined by BS 6472:1992 and ISO 2631. The designated numbers of subsequent curves are multiplying factors of the base curve.
Source: ISO 2631 and BS 6472

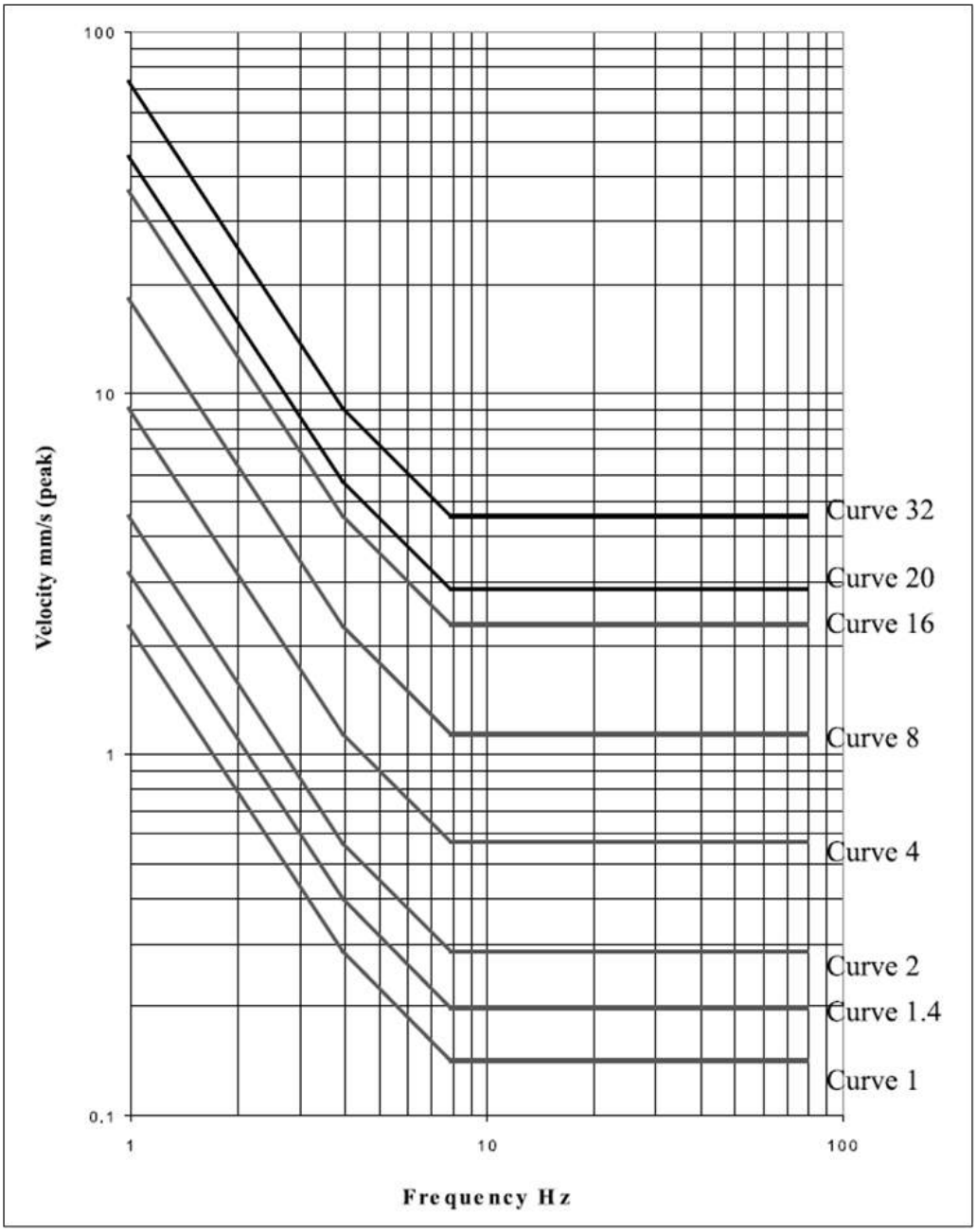

FIGURE 2
Building vibration z-axis curves for peak velocity

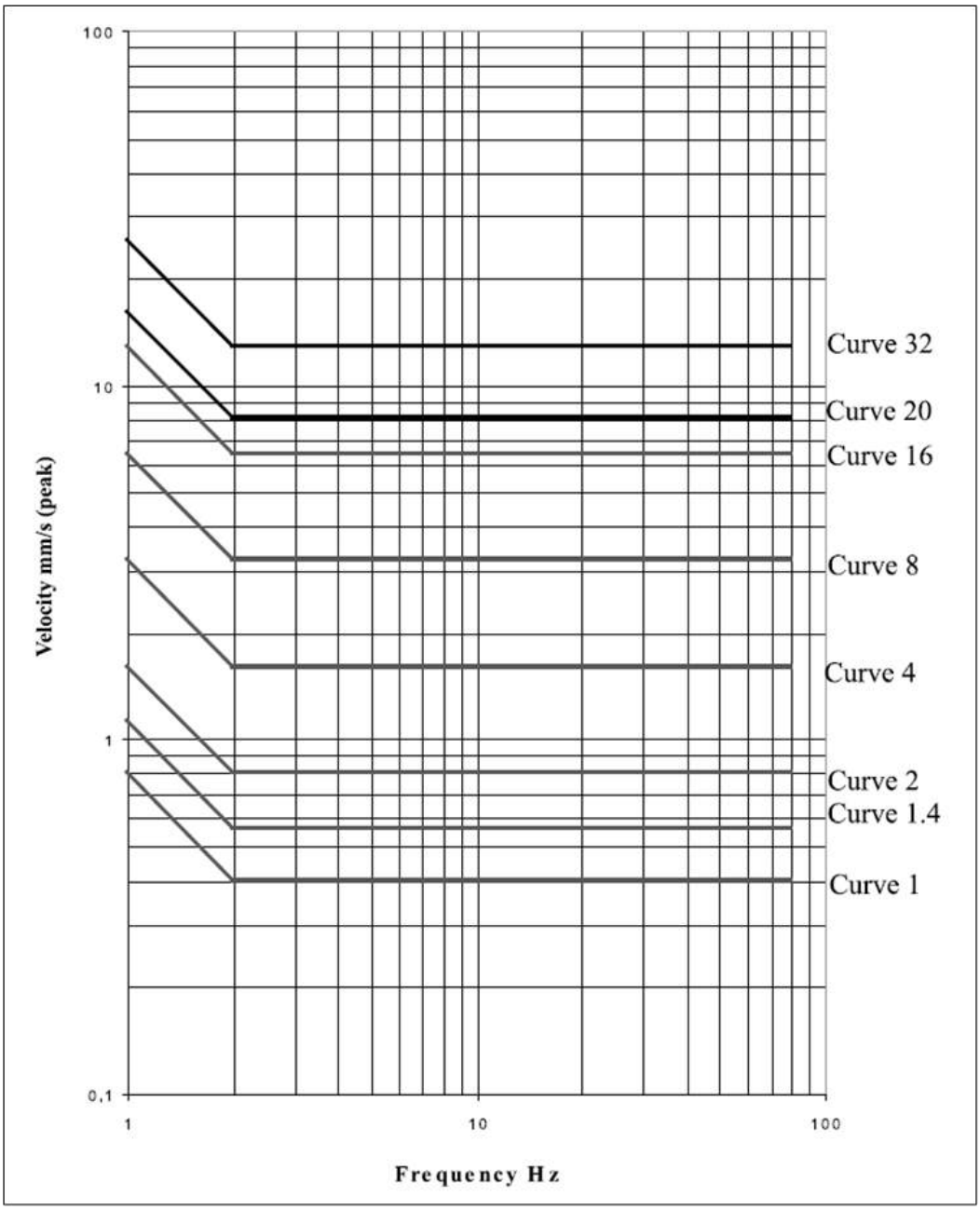

FIGURE 3
Building vibration x and y-axis curves for peak velocity