EIA GUIDELINES

GROUNDWATER SUPPLY PROJECTS

Department of Environment
Ministry of Environment and Water, Malaysia

EIA GUIDELINES FOR GROUNDWATER SUPPLY PROJECTS

2021

Department of Environment, Malaysia

ISBN 978-967-2845-05-8

Published by:
Department of Environment
Level 1-4, Podium 2&3
Wisma Sumber Asli
No. 25, Persiaran Perdana, Presint 4
62574 Putrajaya

Printed by:
DR. NIK & ASSOCIATES SDN. BHD.
No. 22 & 24, Jalan Wangsa Delima 6,
Kuala Lumpur Suburban Centre (KLSC)
Section 5, Pusat Bandar Wangsa Maju
53300 Kuala Lumpur
Tel: +603-4145 8888 Fax: +603-4145 8877
Email: dnasbenvironment@gmail.com

Acknowledgement

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 Guideline for Groundwater and/or Surface Water Supply Projects Guideline* developed by the Department of Environment (DOE) in 1995. However, the Guideline focuses only on groundwater supply projects while surface water supply projects can be referred to the *Environmental Impact Assessment Guidelines for Construction of Dam*.

This Guideline is meant to assist various stakeholders that are involved with the development of a groundwater supply. 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 in accordance to all related guidelines and standards. 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. 21 Water Supply

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

Other possible prescribed activities:

FIRST SCHEDULE

1. Agriculture
3. Drainage and Irrigation
4. Fisheries
6. Industry
8. Mining
11. Power Generation and Transmission
17. Industrial Estate Development

SECOND SCHEDULE

4. Fisheries
6. Industry
8. Mining
11. Power Generation and Transmission
15. Construction of Dam

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

TERMS AND DEFINITION

Groundwater
Water found underground in the cracks and spaces in soil, sand and rock. It is stored in and moves slowly through geologic formations of soil, sand and rocks called aquifers.

Industrial water supply
Provision of water for industrial usage which includes water used for fabricating, processing, washing, diluting, cooling, or transporting a product; incorporating water into a product; or for sanitation needs within the manufacturing facility.

Agricultural water supply
Provision of water used to grow fresh produce and sustain livestock.

Urban water supply
Provision of water for other usage besides agriculture and industries i.e. domestic use.

EIA REPORT REQUIREMENT

Scenarios that requires EIA

- Upgrading of an existing groundwater development that currently has a capacity of 4,500 m^3 or more per day for industrial, agricultural or urban water supply (the development may or may not already have an EIA study approved previously for its current operation).
- Construction and operation of new groundwater development at a green field area (undeveloped land) for industrial, agricultural or urban water supply with 4,500 m^3 or more per day.
- Construction and operation of new groundwater development at a brown field area (previously developed land; may have decommissioned or abandoned wells or other components) for industrial, agricultural or urban water supply with 4,500 m^3 or more per day.
- Construction and operation of an underground dam.
- Upgrading of an existing groundwater development for industrial, agricultural or urban water supply from less than 4,500 m^3 per day to 4,500 m^3 or more per day.

OVERVIEW OF THE EIA PROCESS

STEP 1
Project Proponent to provide project brief and technical studies

STEP 2
Identify applicable policies, laws and guidelines

STEP 3
Carry out preliminary stakeholders engagement

STEP 4
Carry out environmental scoping

STEP 5
Collect baseline data

STEP 6
Prepare EIA report

STEP 7
Carry out stakeholders engagement

STEP 8
Completion of EIA report

STEP 9
Submit EIA report

STEP 10
Post-EIA

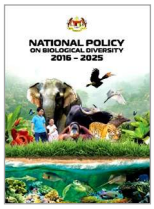
SUMMARY

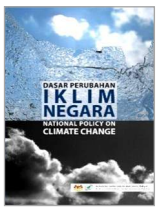
Chapter 2 | **Environmental Project Planning**

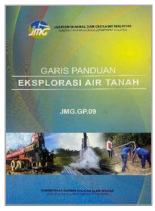
RELEVANT LEGISLATIONS

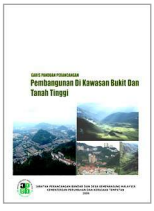
- Environmental Quality Act 1974
- Geological Survey Act 1974
- National Parks Act 1980
- National Land Code 1965
- Water Services Industry Act 2006
- Waters Act 1920
- Town and Country Planning Act 1976
- Food Act 1983

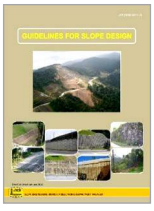
RELEVANT POLICIES AND GUIDELINES

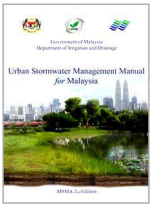


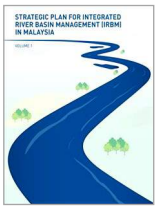















- Garis Panduan Pengukuran Paras Air Tanah dan Persampelan (JMG)
- Garis Panduan Penyediaan Laporan Hidrogeologi dan Geologi bagi Maksud Permohonan Lesen Punca Air Mineral Semulajadi (JMG)
- Garis Panduan Pemetaan Geologi Terain (JMG)

RELEVANT REQUIREMENTS AT VARIOUS PROJECT IMPLEMENTATION STAGE

01. PRE-FEASIBILITY STUDY

- Obtain approval in Principal by State Government
- Site suitability assessment (SSA)
- Application to State Water Regulatory Body

02. FEASIBILITY STUDY

- TELOS assessment
- Field activities (Geophysics study and well drilling)
- Land acquisition

03. PLANNING AND DESIGN

- 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 and Hydraulic study
- Hydrogeological study
- Geomorphology study
- Topographic survey
- DO submission

Note: * if required

04. PRE-CONSTRUCTION

- Written permission
- Environmental Management Plan (EMP)
- Social Impact Management Plan (SIMP)
- Written notification
- Emergency Response Plan (Construction & Operation Stages)

05. CONSTRUCTION

- Environmental monitoring
- Environmental audit
- Competent person

06. OPERATION AND MAINTENANCE

- Environmental monitoring
- Environmental audit
- Competent person

07. PRE-REHABILITATION OR PRE-ABANDONMENT

- Abandonment Plan
- Rehabilitation/Closure 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)

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 groundwater modeling and impact-causing project activities

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**: Hydrologeological/ geophysics survey, well exploration, topographical survey, land acquisition, site clearing and biomass management
- **Construction**: Temporary occupation, earthwork, well construction, construction of water treatment plant and construction of conveyance system
- **Operation**: Groundwater abstraction, treatment and supply, irrigation (agriculture), maintenance, effluent disposal and sludge disposal
- **Decommissioning**

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 Groundwater Supply Projects

- Sustainable yield
- Unfavourable land use changes
- Drawdown
- Saline intrusion
- Land subsidence
- Effluent discharge (water treatment)
- Handling of chemicals (water treatment)
- Treated sludge disposal
- Groundwater pollution

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 Scoping Notes

Preparation of scoping notes to be included in the EIA report

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

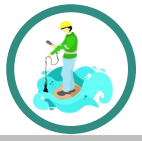
SUMMARY

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



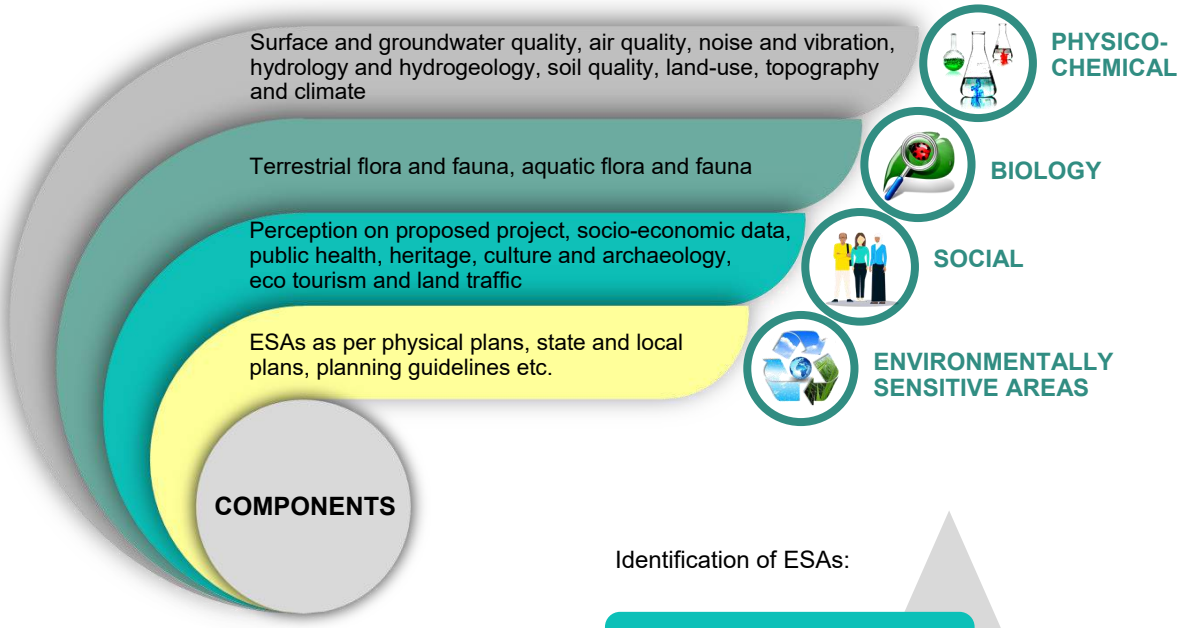
PRIMARY DATA

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

HYDROGEOLOGY

Assessment Requirements
- Extent of the aquifer and its recharge area
- Present abstraction
- Availability of groundwater
- Recharge rate of the aquifer
- Transportation of contaminants in the groundwater system (e.g. DNAPL, LNALPL)

Prediction Method
- Computer models e.g. MIKE SHE, MODFLOW, FEFLOW, MODPATH etc.

Evaluation of Impacts
- Groundwater condition pre and post project implementation
- Overall hydrologic regime within study area

Output
- Hydrogeological system of project area
- Identification of zone of impact
- Identification of monitoring requirements (frequency of monitoring, number and location of monitoring)

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

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

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

POLLUTION PREVENTION & MITIGATION MEASURES (P2M2)

Key P2M2s based on environmental components/aspects:

- Air quality
- Land disturbance
- Slope stabilization
- Waste management
- Surface water pollution
- Noise and vibration
- Ecological management
- Groundwater pollution and management
- Runoff and stormwater management
- Land traffic
- Land subsidence
- Land contamination

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.

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.)
- Ecological management

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

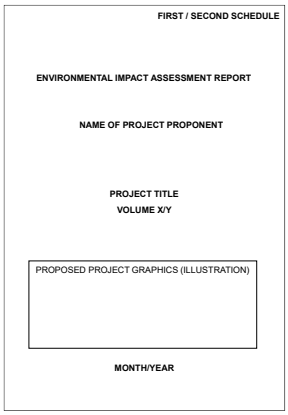
SUMMARY

Chapter 8 | **EIA Checklist**

Checklists to assist the Qualified Person in preparing the EIA report	The EIA checklist must be filled in and incorporated at the front of the report	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

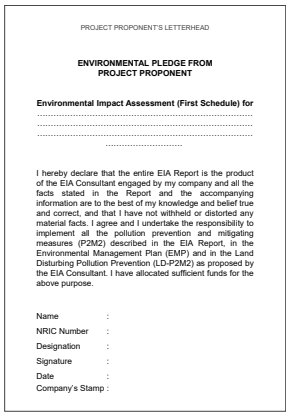
NAME OF PROJECT PROPONENT

PROJECT TITLE
VOLUME X/Y

PROPOSED PROJECT GRAPHICS (ILLUSTRATION)

MONTH/YEAR

EIA report cover



PROJECT PROPONENT'S LETTERHEAD

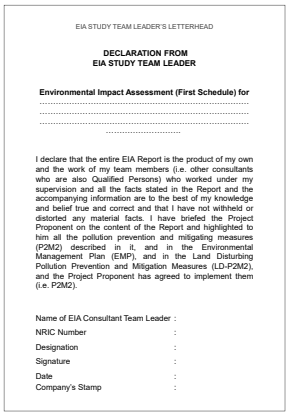
ENVIRONMENTAL PLEDGE FROM PROJECT PROPONENT

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

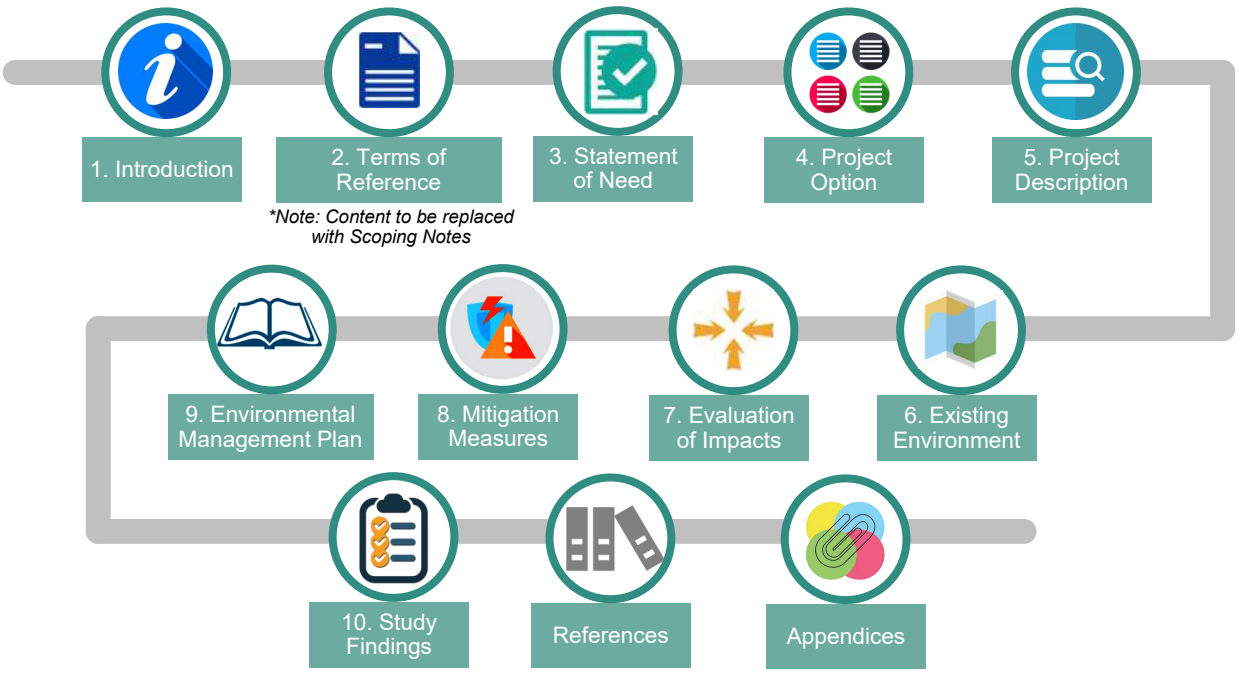
Environmental Impact Assessment (First Schedule) for

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



This page has been intentionally left blank.

Table of Contents

03
Terms of Reference

04
Environmental Baseline Data

05
Evaluation of Impacts

06
Mitigation Measures

07

Post-EIA

08

EIA Checklist

09

EIA Report Format

List of Figures

Chapter 1

Chapter 2

Chapter 3

Chapter 4

Chapter 6

Chapter 7

Chapter 9

List of Tables

List of Attachments

List of Abbreviations

AGC	Attorney General Chambers
AIs	appointed individuals
APCS	Air Pollution Control System
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
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
EAP	Emergency Action Plan
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
FDPM	Forestry Department of Peninsular Malaysia
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*
JMG	*Jabatan Mineral Dan Geosains Malaysia*
JUPEM	*Jabatan Ukur dan Pemetaan Malaysia*
km	kilometre
KM	*Kebenaran Merancang*
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
MarDep	Marine Department of Malaysia
METMalaysia	Malaysian Meteorological Department
min	minimum
MMWQS	Malaysian Marine Water Quality Standards
MOH	Ministry of Health
MOTAC	Ministry of Tourism, Arts and Culture Malaysia
MRA	Marine Risk Assessment
MSMA	*Manual Saliran Mesra Alam*
MUSLE	Modified Universal Soil Loss Equation
N/A	not available
NCIA	Northern Corridor Implementation Authority
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
PTD	*Pejabat Tanah dan Daerah*
PTG	*Pejabat Tanah dan Galian*
PWD	Public Works Department
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
SO_2	Sulphur dioxide
SPAN	*Suruhanjaya Perkhidmatan Air Negara*

STS	Sewage Treatment System
SSA	Site Suitability Assessment
SWMM	Storm Water Management Model
SYABAS	*Syarikat Bekalan Air Selangor*
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
WIA	Wildlife Impact Assessment
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 and Contract are adhered by the contractors. Other tasks include training of staff, taking samples for reporting and attending site walkabouts and meetings. EO is normally appointed by Contractor.

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.

Hydrogeology
The area of geology that deals with the distribution and movement of groundwater in the soil and rocks of the Earth's crust (commonly in aquifers).

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

Industrial Effluent Treatment System (IETS)
Systems used in the treatment of industrial effluent to ensure that the discharges meet the quality specified under Standard A/B of the Environmental Quality (Industrial Effluent) Regulations 2009.

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

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

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

1

INTRODUCTION

Source: ransprings.com

Source: ransprings.com

Chapter
1

Introduction

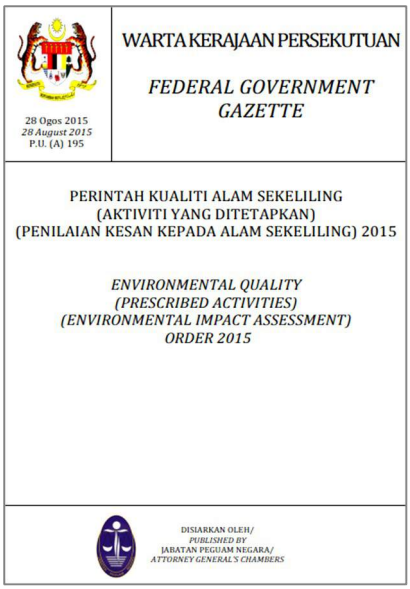
1.1 Introduction

This document is entitled:

‘Environmental Impact Assessment (EIA) Guidelines for Groundwater Supply Projects’

This document shall be referred as “**the Guideline**” hereinfater. It supersedes the ‘EIA Guidelines for Groundwater and/or Surface Water Supply 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.


28 Ogos 2015
28 August 2015
P.U. (A) 195

WARTA KERAJAAN PERSEKUTUAN

FEDERAL GOVERNMENT GAZETTE

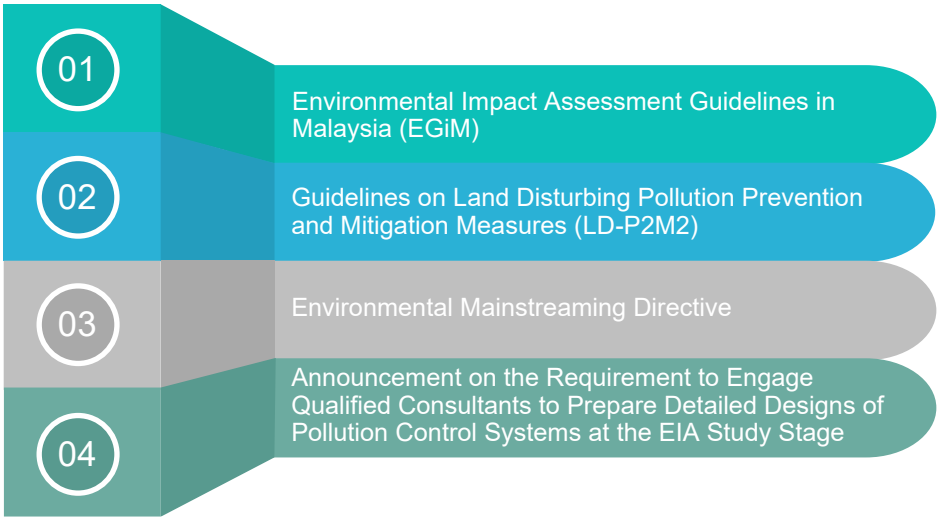
PERINTAH KUALITI ALAM SEKELILING
(AKTIVITI YANG DITETAPKAN)
(PENILAIAN KESAN KEPADA ALAM SEKELILING) 2015

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

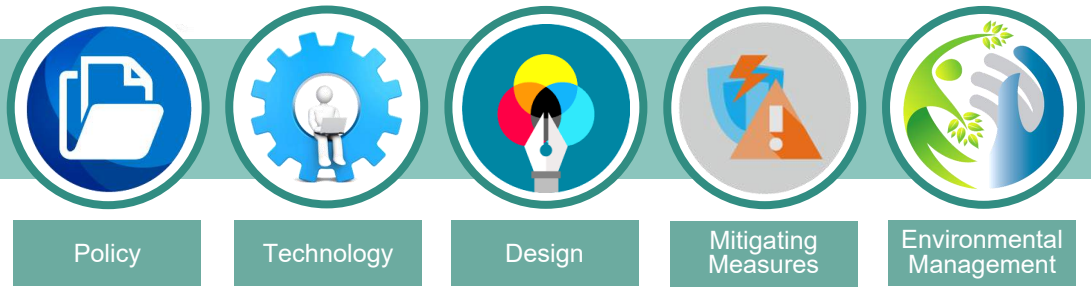
DISIARKAN OLEH/
PUBLISHED BY
JABATAN PEGUAM NEGARA/
ATTORNEY GENERAL'S CHAMBERS

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 below:



Apart from that, this document 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 Facilitating integration of the EIA into the overall project planning and development cycle.

03 Ensuring compliance with and adherence to the legal requirements.

04 Providing a detailed step-by-step guidance with explanations of the EIA procedures and submissions, comprising:

- Provide Scoping Notes
- EIA reporting
- Post-EIA

05 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.

06 Providing an integrated framework for DOE in assessing the EIA report.

1.3
Scope of the Guideline

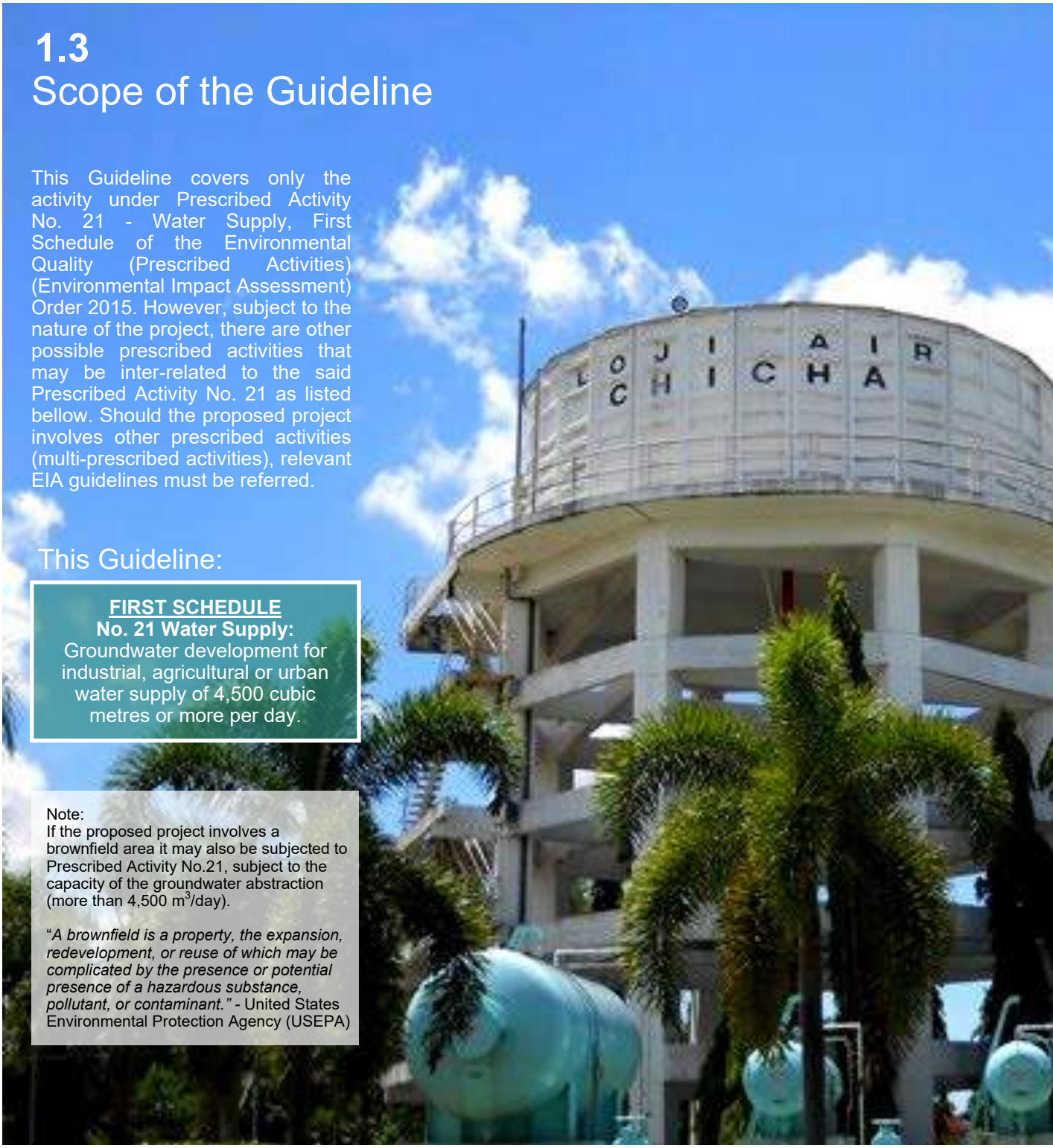
This Guideline covers only the activity under Prescribed Activity No. 21 - Water Supply, First Schedule of the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015. However, subject to the nature of the project, there are other possible prescribed activities that may be inter-related to the said Prescribed Activity No. 21 as listed bellow. Should the proposed project involves other prescribed activities (multi-prescribed activities), relevant EIA guidelines must be referred.

This Guideline:

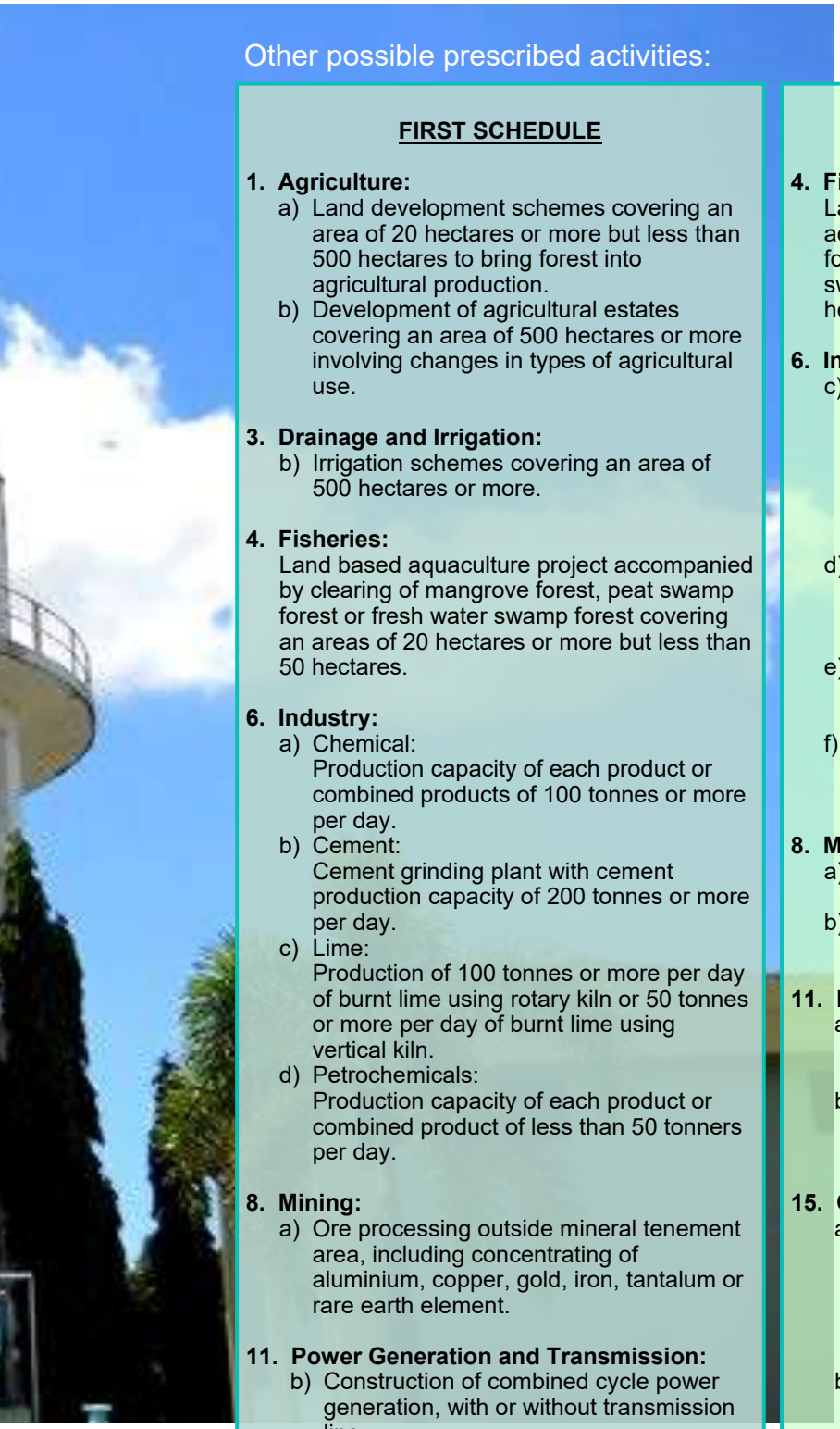
FIRST SCHEDULE
No. 21 Water Supply:
Groundwater development for industrial, agricultural or urban water supply of 4,500 cubic metres or more per day.

Note:
If the proposed project involves a brownfield area it may also be subjected to Prescribed Activity No.21, subject to the capacity of the groundwater abstraction (more than 4,500 m^3/day).

"*A brownfield is a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.*" - United States Environmental Protection Agency (USEPA)



Chicha Water Treatment Plant
Source: redhoallah.blogspot.com



Other possible prescribed activities:

FIRST SCHEDULE

1. Agriculture:
a) Land development schemes covering an area of 20 hectares or more but less than 500 hectares to bring forest into agricultural production.
b) Development of agricultural estates covering an area of 500 hectares or more involving changes in types of agricultural use.

3. Drainage and Irrigation:
b) Irrigation schemes covering an area of 500 hectares or more.

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

6. Industry:
a) Chemical:
Production capacity of each product or combined products of 100 tonnes or more per day.
b) Cement:
Cement grinding plant with cement production capacity of 200 tonnes or more per day.
c) Lime:
Production of 100 tonnes or more per day of burnt lime using rotary kiln or 50 tonnes or more per day of burnt lime using vertical kiln.
d) Petrochemicals:
Production capacity of each product or combined product of less than 50 tonners per day.

8. Mining:
a) Ore processing outside mineral tenement area, including concentrating of aluminium, copper, gold, iron, tantalum or rare earth element.

11. Power Generation and Transmission:
b) Construction of combined cycle power generation, with or without transmission line.

17. Industrial Estate Development:
Development of industrial estate covering an area of 20 hectares or more.

SECOND SCHEDULE

4. Fisheries
Land based aquaculture projects accompanied by clearing of mangrove forest, peat swamp forest or fresh water swamp forest covering an areas of 50 hectares or more.

6. Industry:
c) Iron and Steel:
i) Using iron ore as raw materials for production of 100 tonnes or more per day.
ii) Using scrap iron as raw materials for production of 200 tonnes or more per day.
d) Petrochemicals:
Production capacity of each product or combined product of 50 tonnes or more per day.
e) Pulp, or Pulp and Paper Industry:
Production capacity if 50 tonnes or more per day.
f) Recycle Paper Industry;
Production capacity of 50 tonnes or more per day.

8. Mining:
a) Mining of minerals in new areas involving large scale operation.
b) Mining of minerals within or adjacent to environmentally sensitive areas.

11. Power Generation and Transmission:
a) Construction of coal fired power station and having the capacity of 10 megawatts or more with or without transmission line.
b) Construction of nuclear-fuel power stations with our without transmission line.

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.
b) Dam and hydro-electric power scheme with either or both of the following:
i) Dam of 15 metres or more in height and ancillary structures covering a total area of 40 hectares or more;
ii) Reservoir with a surface area of 100 hectares or more.

1.4 Terms and Definitions

It is imperative to define the terms outlined in the Prescribed Activity No.21 (First Schedule) of EIA Order 2015 to ensure they are interpreted correctly and understood by all stakeholders.

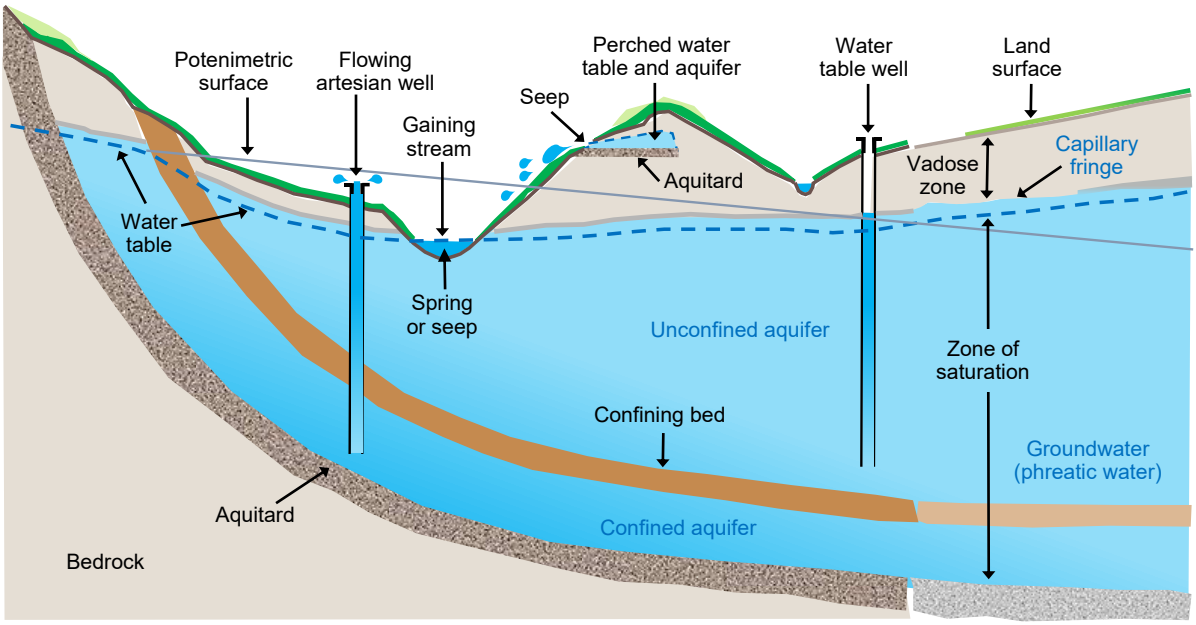
1.4.1 Groundwater*

The definition of groundwater adopted for this Guideline is based on a number of established sources which are:

i) Department of Mineral and Geoscience Malaysia Malaysia (JMG)

"Groundwater means the water found underground in the cracks and spaces in soil, sand and rock. It is stored in and moves slowly through geologic formations of soil, sand and rocks called aquifers."

"Aquifer means a geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield water to wells, springs and other purposes."



Source: Adapted from United States Geological Survey (USGS)

*For this Guideline, the spelling groundwater shall be adopted instead of ground water.

ii) Selangor Waters Management Authority Enactment 1999

"Ground water* means subsurface water that occurs beneath the water table in soils and geologic formations and includes:-

a) a well, borehole or similar work sunk into underground strata, including any adit or passage constructed in connection with the well, borehole or work for facilitating the collection of water in the well, borehole or work;
b) any excavation into underground strata where the level of water in the excavation depends wholly or mainly on water entering it from the strata; and any designated ground water."

iii) Kedah Water Resources Enactment 2008

"Subsurface water that occurs beneath the surface in soil and geological formations."

iv) United States Environmental Protection Agency (USEPA)

"Groundwater is fresh water (from rain or melting ice and snow) that soaks into the soil and is stored in the tiny spaces (pores) between rocks and particles of soil."

Source: ppic.org

v) United States National Ground Water Association (USNGWA)

"Groundwater is the water that soaks into the soil from rain or other precipitation and moves downward to fill cracks and other openings in beds of rocks and sand."

1.4.2
Relevant Terms

Table 1.1 lists the relevant terms with regards to Prescribed Activity No. 21.

Table 1.1 Relevant Terms for Prescribed Activity No. 21 - Water Supply

FIRST SCHEDULE
Prescribed Activity No. 21 - Water Supply: Groundwater development for industrial, agricultural or urban water supply of 4,500 cubic metres or more per day.
i) Industrial water supply a) Provision of water for industrial usage which includes water used for fabricating, processing, washing, diluting, cooling, or transporting a product; incorporating water into a product; or for sanitation needs within the manufacturing facility. Some industries that use large amounts of water produce such commodities as food, paper, chemicals, refined petroleum, or primary metals. [1] b) Process water includes boiler feed water, cooling water for heat exchangers or engine, chemical dilution etc. It should typically have a conductivity ranging from 0.1 µS/cm to 50 µS/cm, with little to no hardness to avoid scaling in heating system. [2] Industry "Any business, trade, undertaking, manufacture or calling of employers, and includes any calling, service, employment, handicraft or industrial occupation or avocation of workmen" - Industrial Relations Act 1967 Therefore, this includes natural mineral water industry that uses groundwater as its source. Natural Mineral Water "Groundwater obtained for human consumption from a strata containing groundwater through a spring, well, boring or any other way out, with our without the addition of carbon dioxide." - Ministry of Health
ii) Agricultural water supply a) Provision of water used to grow fresh produce and sustain livestock. Agricultural water is used for irrigation, pesticide and fertilizer applications and crop cooling.[3] Agriculture "The science or practice of farming, including cultivation of the soil for the growing of crops and the rearing of animals to provide food, wool, and other products" - Oxford Dictionary
iii) Urban water supply Provision of water for other usage besides agriculture and industries. Urban water use includes water used for drinking, toilets and showers, landscaping, businesses.[4] Urban "connected/in relation with a town or city" - Oxford Dictionary

Source:
[1]United States Geological Survey (USGS) (2020)
[2]Lenntech Water Treatment Solutions (2020)
[3]US Centers for Disease Control and Prevention (2020)
[4]Calfornia Department of Water Resources (2020)

1.5 Scope of the Prescribed Activity

This section details out the activities of a proposed project that entails it to fall under Prescribed Activity No. 21.

Table 1.2 Scope of Activity for Prescribed Activity No. 21 - Water Supply

FIRST SCHEDULE
Prescribed Activity No. 21 - Water Supply: Groundwater development for industrial, agricultural or urban water supply of 4,500 cubic metres or more per day.

Scope of Activity:

1. Construction and operation of new groundwater development at a green field area (undeveloped land) for industrial, agricultural or urban water supply with 4,500 m^3 or more per day.
2. Construction and operation of new groundwater development at a brown field area (previously developed land; may have decommissioned or abandoned wells or other components) for industrial, agricultural or urban water supply with 4,500 m^3 or more per day.
3. Construction and operation of an underground dam (Refer Section 1.5.2).
4. Upgrading of an existing groundwater development for industrial, agricultural or urban water supply from less than 4,500 m^3 per day to 4,500 m^3 or more per day.
5. Upgrading of an existing groundwater development that currently has a capacity of 4,500 m^3 or more per day for industrial, agricultural or urban water supply.
6. Capacity of 4,500 m^3 or more per day:
   - The total amount of groundwater abstracted is 4,500 m^3 per day or equivalent to 4.5 MLD and it does not include volume of water stored.
   - The total amount of groundwater abstracted is regardless on the number of wells constructed; either just one big well or many small wells.
   - This value applies even for wells constructed within the river reserve (to adopt riverbed filtration system) including horizontal collector wells.
   - The total amount of groundwater abstracted is regardless on the number of aquifers, layers of aquifers or location of aquifers (coastal areas and inland).
7. Groundwater development for agricultural water supply:
   Provision of groundwater (either treated or untreated) for agricultural purposes which includes irrigation and also aquaculture operation.

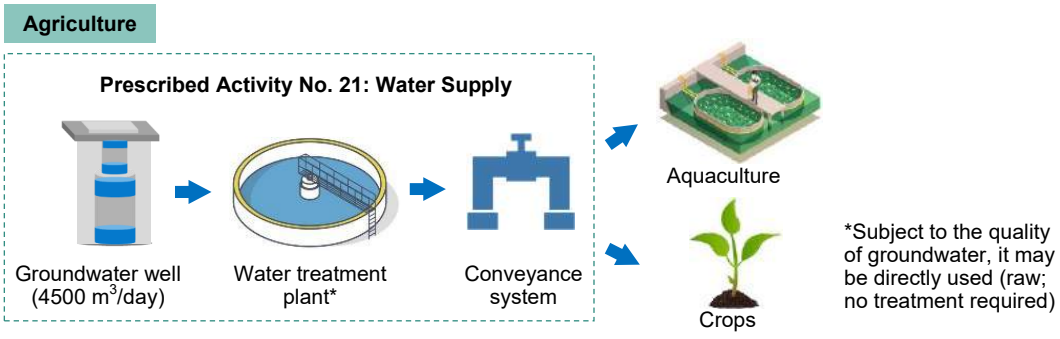
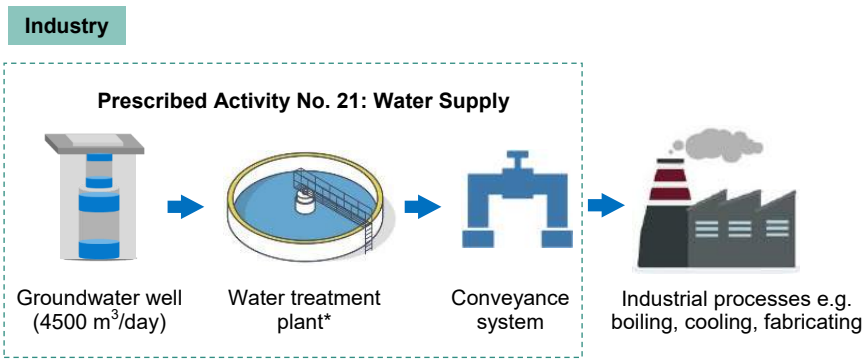


Table 1.2 (cont'd) Scope of Activity for Prescribed Activity No. 21 - Water Supply

FIRST SCHEDULE
Prescribed Activity No. 21 - Water Supply: Groundwater development for industrial, agricultural or urban water supply of 4,500 cubic metres or more per day.

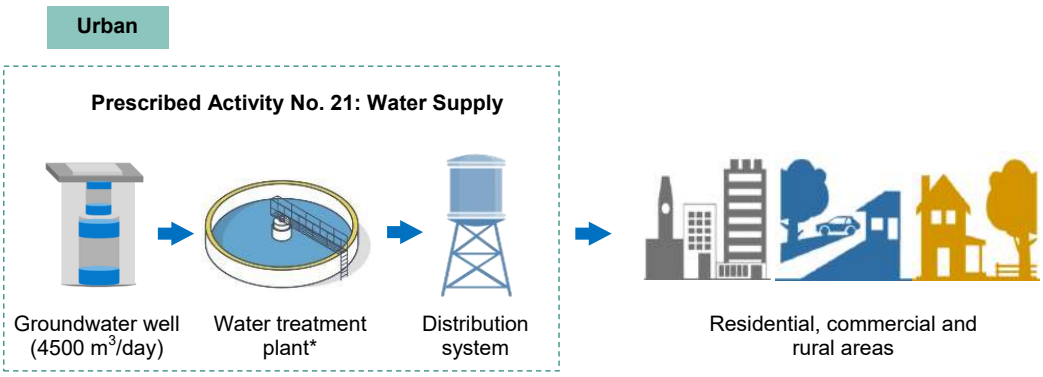
Scope of Activity:

8. Groundwater development for industrial water supply:
Provision of water (either treated or untreated) for the operation of an industry such as cooling, processing, product treatment, cleaning and for boilers (pressure chamber). This includes commercial bottled water industry.



*Subject to the quality of groundwater, it may be directly used (raw; no treatment required)

9. Groundwater development for urban water supply:
Provision of treated water for domestic use either in urban or rural areas.



*Subject to the quality of groundwater, it may be directly used (raw; no treatment required)

1.5.1
Groundwater Development

There are not many large scale (more than 4,500 m^3/day or 4.5 MLD) groundwater supply projects for industry, agriculture or urban water supply in Malaysia as this type of water resource for these activities is still being explored on its feasibility and sustainability status.

Generally, a groundwater development (the proposed project) is designed to satisfy a certain demand of water from each of the three sectors; agricultural, industry and urban. This section shall describe in detail the major components involved in these sectors as summarized in *Figure 1.1*.

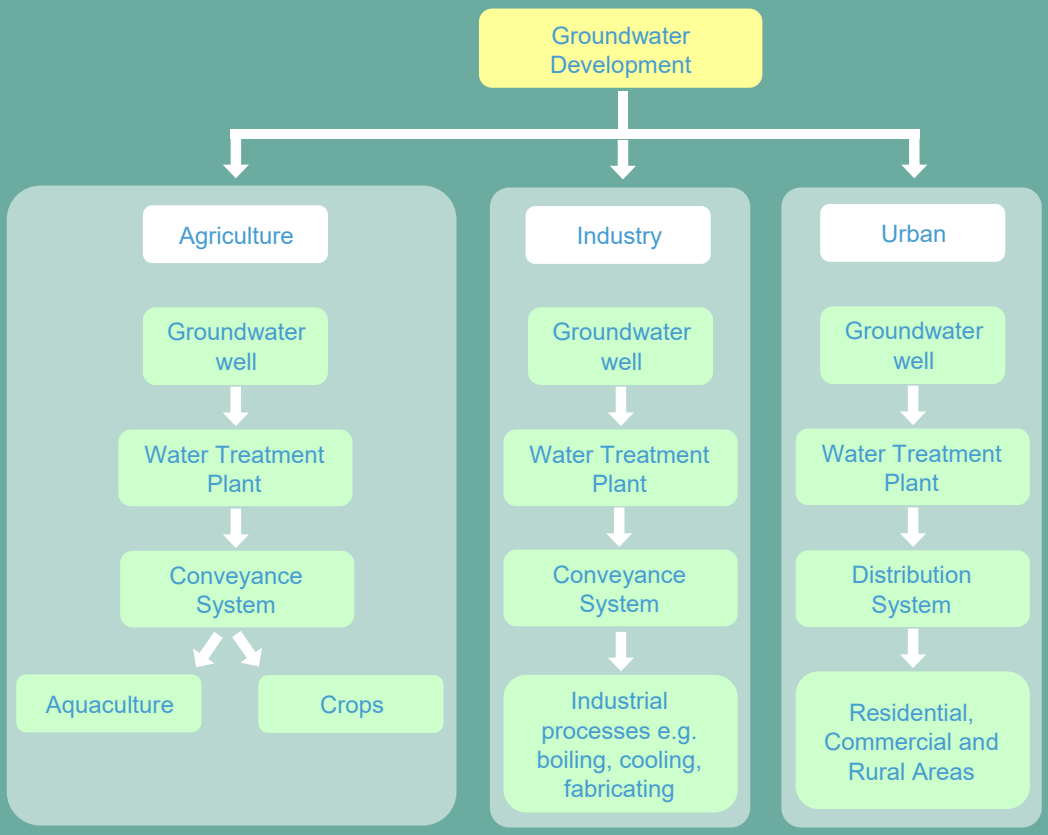


Figure 1.1
General components for groundwater supply projects

01 Groundwater Well

- Wells are required to be drilled and constructed in order to extract groundwater from their aquifer (either confined or unconfined).
- The construction of wells must adhere to the requirement of Akta Penyiasatan Kajibumi, 1974 and Geological Survey (Notification of Development of Wells and Excavations) Regulations 2013.
- This activity also needs to refer to Garis Panduan Eksplorasi Air Tanah (JMG.GP.09) for proper and standardised method of groundwater development in Malaysia.
- Exploratory wells/borings need to be installed to find the best location of the actual abstraction well. This exploration works are also used to determine the estimated groundwater quantity and its quality.
- There are two common types of groundwater wells used in Malaysia; vertical tube well and horizontal/radial collector well (HCW) (*Figure 1.2*).
- The components of the wells may differ according to its design and purpose. Generally, the HCW is able produce higher yield compared to tube well (*Figure 1.3* and *Figure 1.4*).
- In addition, the groundwater wells can also be categorized as shallow well and deep well. There is no exact value that indicates the actual depth that differentiates between these two wells. However, generally shallow wells are dug from 1 m to 20 m below ground level while deep wells are more than 20 m depth.
- Siting of the abstraction well is important to ensure that there is optimum yield and it will not be exposed to any current or future pollution that could contaminate the groundwater. Moreover, the acceptable values of the raw groundwater quality must be referred to the Groundwater Quality Standard and Index 2019 Edition published by DOE.
- The wells (vertical tube and HCW) that are sited near rivers are often associated with river bank filtration system (RBF system) whereby the water abstracted from the well originates from both river and groundwater.
- The number of vertical tubes or collector/ horizontal wells constructed may differ according to the availability of ground water and requirements by the particular industry, agriculture or urban area.
- Groundwater modeling needs to be done in this area in order to understand the behaviour of groundwater flow and interaction with surface water.

Source: greensborowellrepair.com

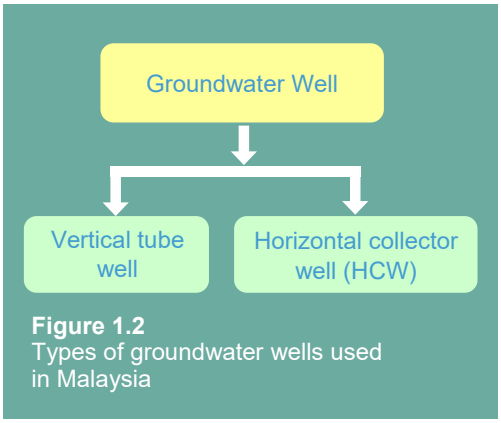
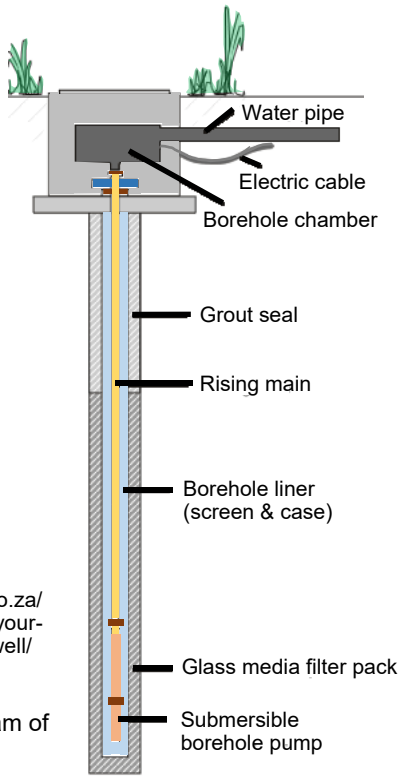


Figure 1.2
Types of groundwater wells used in Malaysia



Source: http://www.sealand.co.za/pumps/getting-your-own-borehole-well/

Figure 1.3
Typical diagram of a tube well

- Observation wells are constructed and positioned at strategic places to monitor the groundwater behaviour during pump operation.
- Subsidence markers are positioned surrounding the active wells to monitor the ground/land subsidence.

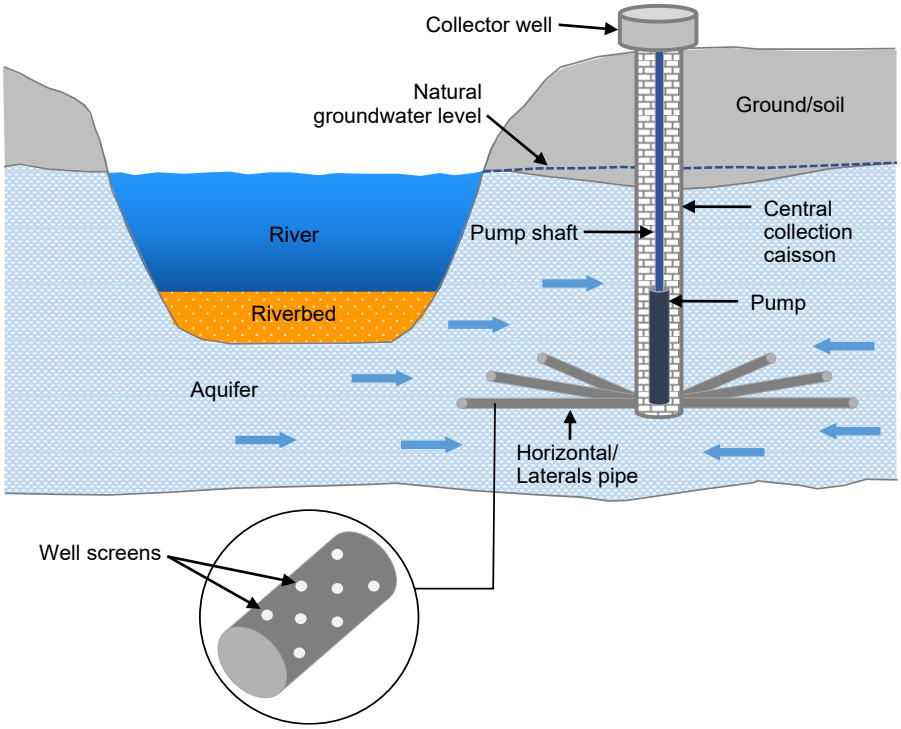


Figure 1.4
Typical diagram of a horizontal collector well (HCW)

02 Water Treatment Plant

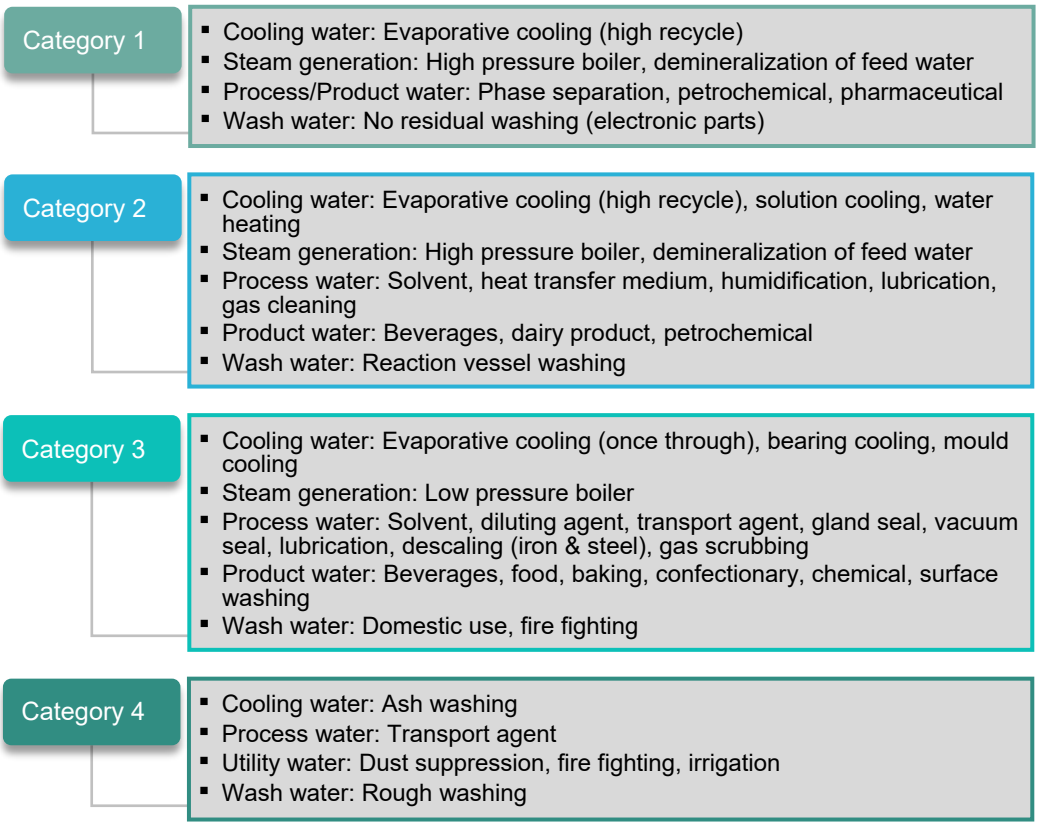
- Subject to the type of usage, the abstracted groundwater may require treatment prior to being used.
- The treatment standard must adhere to the requirements for each intended usage which are either for agriculture, industry or urban water supply.
- Unlike sewage treatment plants (STP), freshwater treatment plants (WTP) focus on chemical treatment methods rather than biological treatment.

Source: www.waterlossasia.com

a) Groundwater quality for agricultural use:
   - Good water quality for agriculture use is important to ensure good production.
   - Untreated groundwater could contain harmful bacteria, fungi and pathogens.
   - The basis of determining the suitability of groundwater quality for agricultural use is based on three factors which are:
     i) Phytotoxic related parameters;
     ii) Crop salinity tolerance; and
     iii) Criteria for livestock.
   - The recommended raw groundwater quality shall be as per Groundwater Quality Standard for Agricultural Use under the National Groundwater Quality Standard 2019 (*Attachment 1, page A-3*).
   - Subject to the quality of the raw groundwater at the project site, the treatment required and process could vary.
   - If the by-product of water treatment processes is sludge that contains scheduled waste, it will need to be disposed of appropriately according to the Environmental Quality (Scheduled Waste) Regulations 2005.
   - The location of the sludge to disposed of must be identified prior to commencement of the project and approved by DOE.

b) Groundwater quality for industrial use:
   - The industry sector uses large amount of water such as power generation, refineries, construction and, metal and quarry based industry.
   - The use of groundwater in the industry could reduce its operation cost rather than using treated water supplied domestically.
   - The basis of determining the suitability of groundwater quality for industrial use is based on the following:
     i) Its potential to cause damage to equipment e.g. corrosion and abrasion;
     ii) Problems that it may cause in the manufacturing process e.g. precipitates and colour changes;
     iii) Impairment of product quality e.g. taste and discolouration; and
     iv) Complexity of waste handling as a result of the water.
   - According to the South African Water Quality Guidelines (SAWQG), Volume 3: Industrial Use, there are four categories of industrial water as shown in *Figure 1.5*.
   - The recommended groundwater quality for industrial use e.g. boilers and coolers shall be as per Groundwater Quality Standard for Industrial Use under the National Groundwater Quality Standard 2019 (*Attachment 1, page A-4*).
   - Subject to the quality of the raw groundwater at the project site, the treatment required and process could vary. The parameters considered for industrial water includes solubility and heat transfer potential.

- If the by-product of water treatment processes is sludge, it will need to be disposed of appropriately according to the Environmental Quality (Scheduled Waste) Regulations 2005.
- The location of the sludge to disposed of must be identified prior to commencement of the project and approved by DOE.

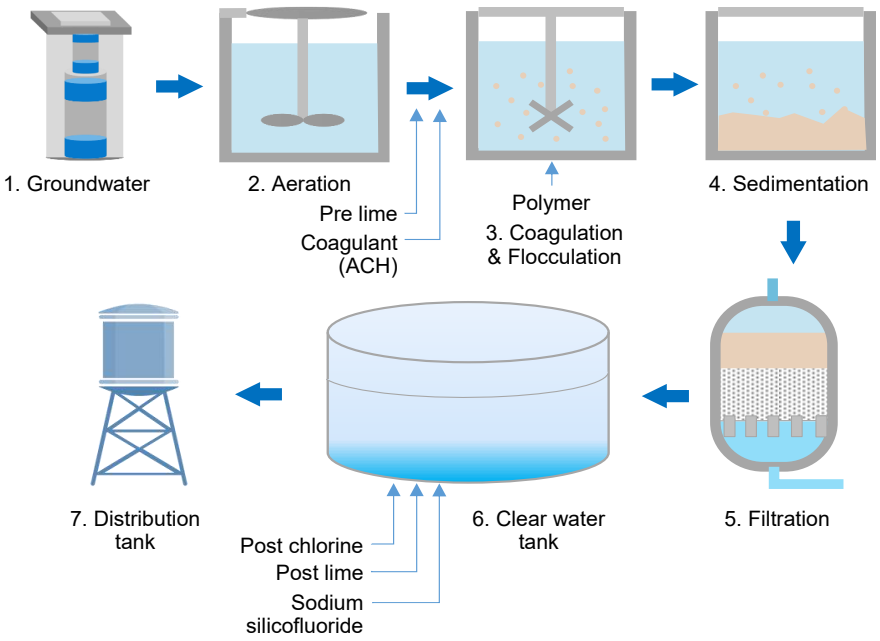


Source: Adapted from South African Water Quality Guidelines (SAWQG), Volume 3: Industrial Use

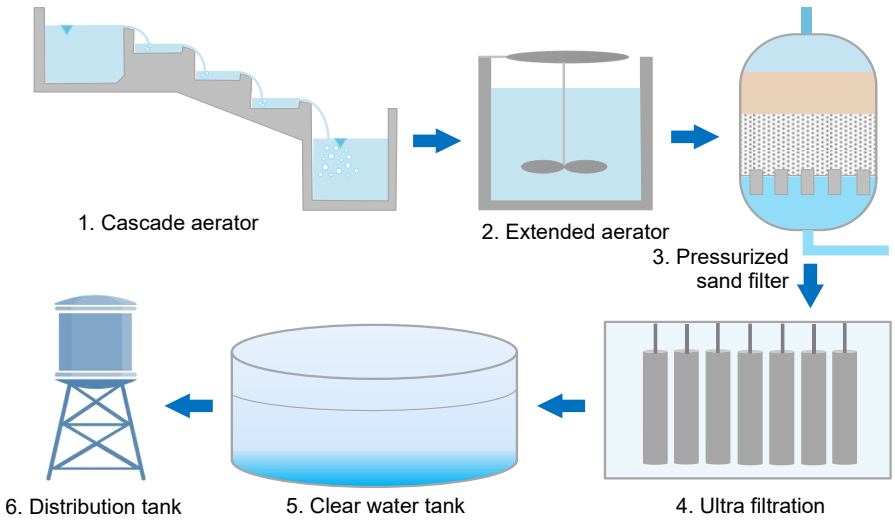
Figure 1.5 Category of industrial water

c) Groundwater quality for urban use (domestic):

- Groundwater abstractions for urban (domestic) use are common in the east coast Peninsular Malaysia (e.g. Kelantan).
- Common groundwater treatment methods for urban water supply (domestic) are shown in *Figure 1.6*.
- *Table 1.3* summarizes the process description of each of the method.
- Conventional water treatment involves aeration and the addition of lime, polymers and chlorine.
- The recommended groundwater quality for uses besides agriculture and industry i.e. Urban/domestic use shall be as per Groundwater Quality Standard for Drinking Water (Conventional Treatment) under the National Groundwater Quality Standard 2019 (*Attachment 1, page A-2 and A-3*).
- The usual by-product of water treatment processes is sludge that will need to be disposed of appropriately according to the Environmental Quality (Scheduled Waste) Regulations 2005.
- The location of the sludge to disposed of must be identified prior to commencement of the project and approved by DOE.



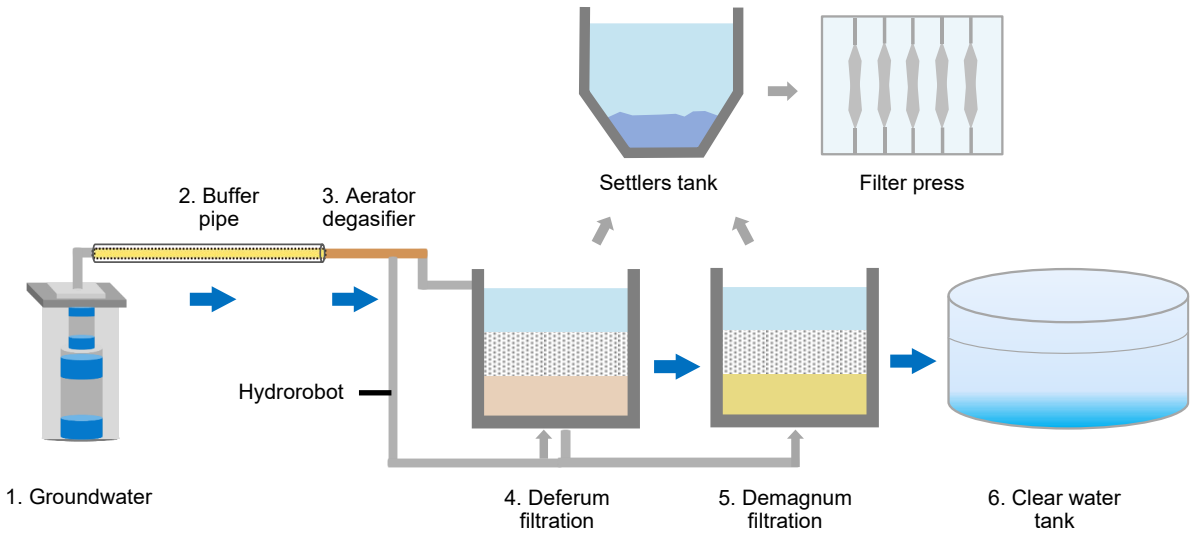
a) Conventional method



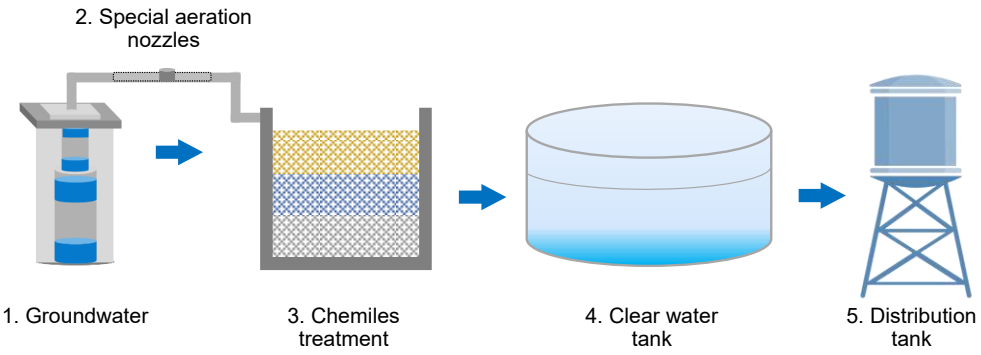
b) Ultrafiltration method

Source: Adapted from Air Kelantan Sdn. Bhd. (AKSB)

Figure 1.6 Common water treatment methods



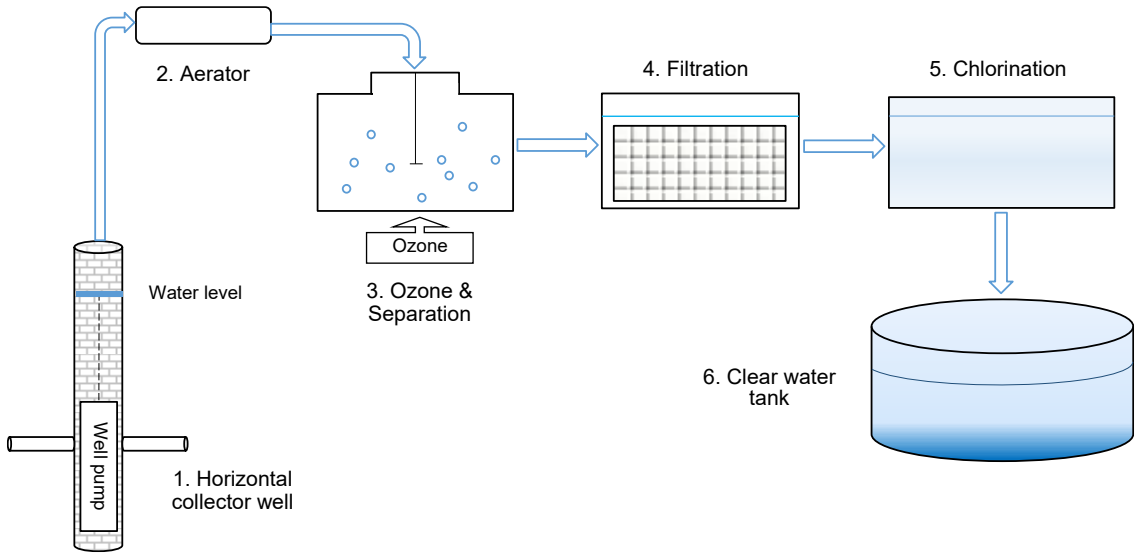
c) Deferum and demagnum method



d) CHEMILES method

Source: Adapted from Air Kelantan Sdn. Bhd. (AKSB)

Figure 1.6 (cont'd) Common water treatment methods



e) Ozonation method

Source: Adapted from Air Kelantan Sdn. Bhd. (AKSB)

Figure 1.6 (cont'd) Common water treatment methods

Table 1.3 Domestic water treatment process description

METHOD	PROCESS DESCRIPTION
Conventional	▪ Aeration: Removes undesirable gases such has carbon dioxide and hydrogen sulphide and/or oxidation of iron and manganese (This process occurs in the aeration tank/aerator. ▪ Coagulation and flocculation: Removes turbidity by coagulating colloids and settling them out via flocculation. Coagulants such as aluminium chlorohydrate/aluminium sulphate/ferric chloride is added to promote clumping. Polymer is also added to further enlarge the clumps into flocs to ease the separation process (Occurs in flocculation tank). ▪ Sedimentation: Suspended solids formed at the surface of the water via flocculation is separated through sedimentation. The flocs formed is denser and easier to settle naturally. This process removes the flocs and allows clear water to be obtained before filtration process. ▪ Filtration: A polishing process that removes remaining particles in the water. Usually sand or granular medium is used. This medium needs to be cleaned via backwashing to maintain its efficiency. ▪ Disinfection - Chlorination: Disinfection process is done by dosing chlorine into the filtrated water to kill any pathogenic bacteria. This process is usually done in the storage tank. ▪ pH Correction/Adjustment: Lime or calcium hydroxide is added in the treated water to increase its pH between 6.5 to 9 to ensure it meets the standards by Ministry of Health (MOH). ▪ Fluoridation: Sodium silicofluoride is also added to the treated water to prevent tooth decay and cavities. The content of fluoride in the treated water is monitored to not exceed MOH's Drinking Water Quality Standard for Malaysia.

Table 1.3 (cont'd) Domestic water treatment process description

METHOD	PROCESS DESCRIPTION
Ultrafiltration	▪ Ultrafiltration is a type of membrane filtration where it uses hydrostatic pressure to force water through a semi-permeable membrane. This membrane filtration is used to remove bacteria and other microorganisms, and suspended solids. ▪ The main function of this process is to filter small particles ranging from 0.1 to 0.01 micron whereby this system is designed to be fully automatic. ▪ The common material used for this process is hollow fibre. Particles collected is removed through conventional method i.e. normal backwash and chemical enhanced backwash (CEB). CEB involves cleaning the hollow fibre using sodium hydroxide and hypochlorite to increase the efficiency of the ultrafiltration.
Deferum and Demagnum	▪ A process that removes dissolved gases intensively followed by filtration using Polymer Floating Filtering Media. Via this method, conventional processes; aeration, flocculation and sedimentation are replaced with the dissolved gas removal in water. ▪ The system is a hydro-automatic system that uses floating filtering media that is designed for non-reagent removal of high levels of dissolved iron, dissolved gases such as hydrogen sulphide, carbon dioxide, methane, radon, odour, ammonia etc. ▪ Raw water is pumped via a buffer pipe and enters the system through its aerator degasifier before going through the Hydrorobot. The main function of the aerator degasifier is to remove dissolved gases in the water.
CHEMILES	▪ This method involves a biological system that uses nitrate and iron bacteria to treat water. It does not involve any chemicals making it an environmentally friendly method. ▪ Raw water will be fed into the system via a special aerator nozzle. The CHEMILES system requires minimal footprint and does not produces any effluent from the usage of chemicals.
Ozonation	▪ Ozonation is a chemical water treatment technique based on the infusion of ozone into water. ▪ It is a type of advanced oxidation process, involving the production of very reactive oxygen species able to attack a wide range of organic compounds and all microorganisms.

03 Conveyance System

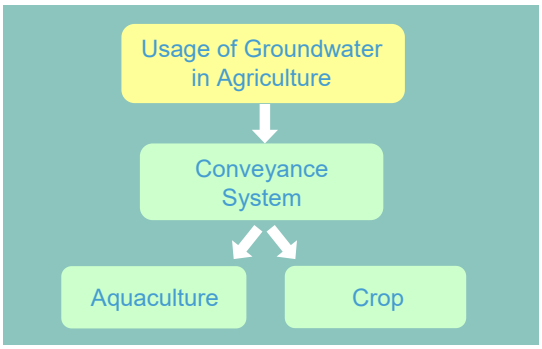
- Conveyance systems are water distribution networks which collect treated water before it is distributed to urban area.
- Typical pipelines are used to transfer either raw groundwater or treated groundwater from its tank/reservoir to its recipient i.e. within the same compound e.g.:
  - ◊ An industry's component (boiler, cooling tower within the same compound/area;
  - ◊ Irrigation area; or
  - ◊ Aquaculture area.
- Water systems are commonly delivered through an infrastructure that consists of pipes which are typically constructed from materials such as plastic, metal or even concrete.
- The groundwater is usually delivered to its destination through combination of pressure pumps and gravity flow.

Chicha Water Treatment Plant

Source: greensborowellrepair.com

04 Agriculture

- The agriculture sector comprises production of livestock, poultry, fish and crops.
- For crops, groundwater can be used to supplement their irrigation system, especially during drought season (*Figures 1.7* and *1.8*).
- However, the usage of groundwater for irrigation purposes is dependent on its quality especially in terms of salinity and toxicity that could affect the health of crops.
- Groundwater is also more favourable in the aquaculture sector as it is usually consistent in quantity and quality.
- Moreover, they are normally free from toxic pollutants and contamination, at a given site as opposed to surface water.



Source: www.criver.com

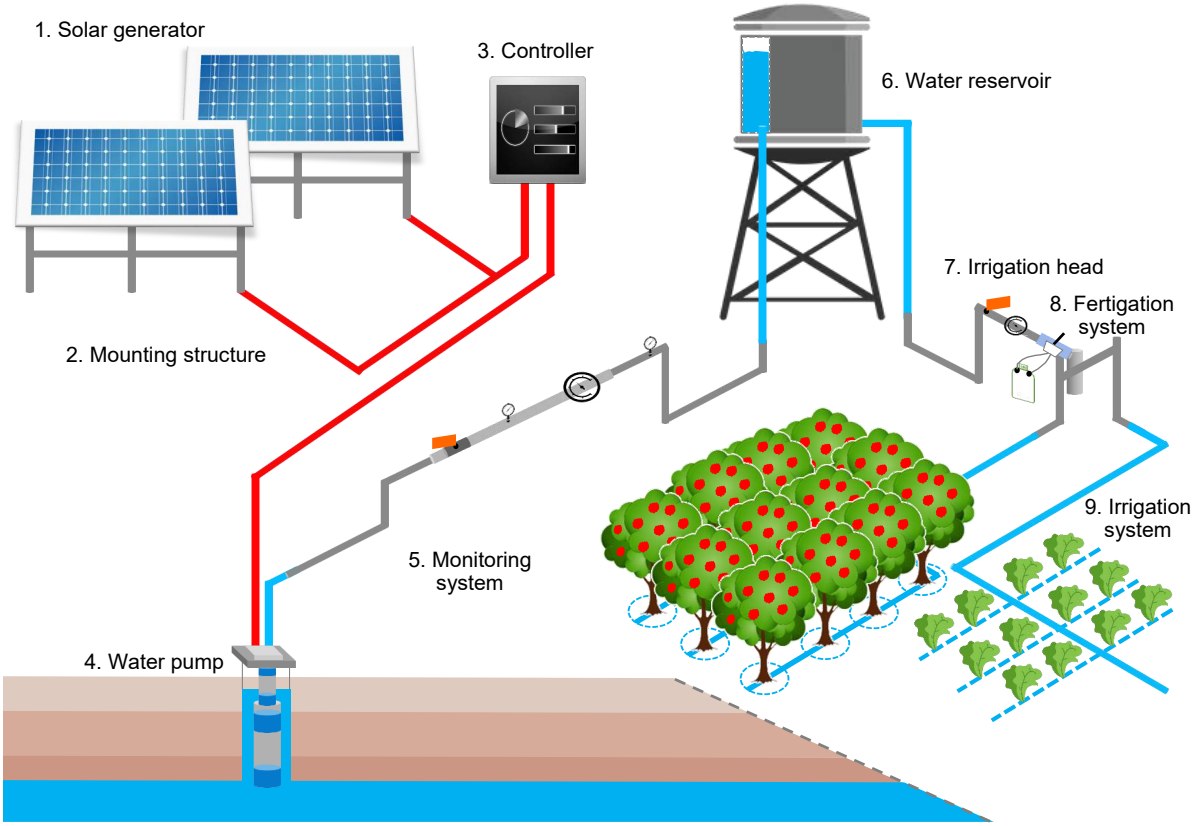


Figure 1.7
Example of groundwater development for agriculture (irrigation) use

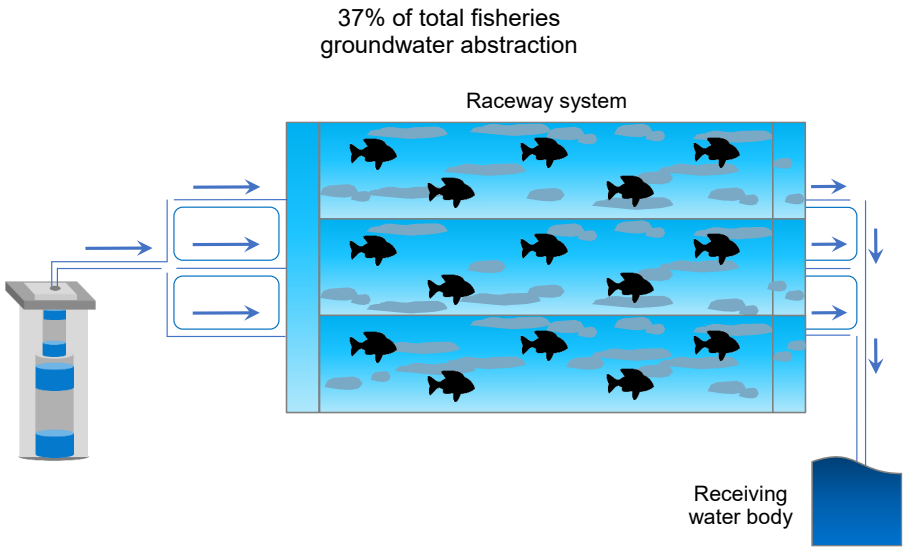


Figure 1.8
Example of groundwater development for agriculture (aquaculture) use

05 Industry

- There are a few types of industries that utilise groundwater to operate their plants.
- Large amounts of water are required for industries such as power generators, refineries, construction and, mining and metal-based industries.
- The water properties considered for industrial use includes its solubility and ability to transfer heat.
- Industries use water for cooling, processing, product treatment, cleaning and for boilers (pressure chamber).
- The usage of groundwater may supplement the industries' dependency on treated surface water or even become an alternate source for those that are located at areas where surface water is inaccessible.
- In addition, the natural mineral water industry needs to adhere to Ministry of Health's (MOH) *Garis Panduan Permohonan Lesen Punca Air Minuman Berbungkus dan Air Mineral Semula Jadi bagi Maksud Perdagangan atau Perniagaan* before being distributed to the market.

Source: tjn04.blogspot.com

06 Urban

- Urban water supply scheme using groundwater may exhibit similar characteristics for surface water supply apart from the addition of abstraction wells.
- It comprises a network of pipes for distribution, pumps and storage facilities (reservoir tanks).
- For the purpose of this Guideline, "urban" water supply implies **all domestic water usage** which includes rural areas.

Source: www.thestar.com.my

1.5.2 Underground Dam

Another method of abstracting groundwater is via construction of an underground dam. A structure is built underground which dams up groundwater flow within an aquifer so that a great amount of groundwater can be extracted from wells installed upstream (*Figure 1.9*). *Figure 1.10* summarises the typical components for the construction of an underground dam for the purpose of groundwater supply.

This is typically done at coastal areas where there are fluctuating groundwater levels and prevailing salt-water intrusion.

The underground dam cannot be constructed just anywhere. The following appropriate conditions are necessary:

- An aquifer with high effective porosity, sufficient thickness needs and great areal extent;
- An impermeable bedrock layer under the aquifer;
- Sufficient groundwater inflow to the underground area;
- An underground valley where an underground barrier can be built; and
- Land-use practices that do not contribute to groundwater contamination.

Should the proposed groundwater development involves the construction of an underground dam, the EIA study must also refer to the *Environmental Impact Assessment (EIA) Guidelines for Construction of Dam.*

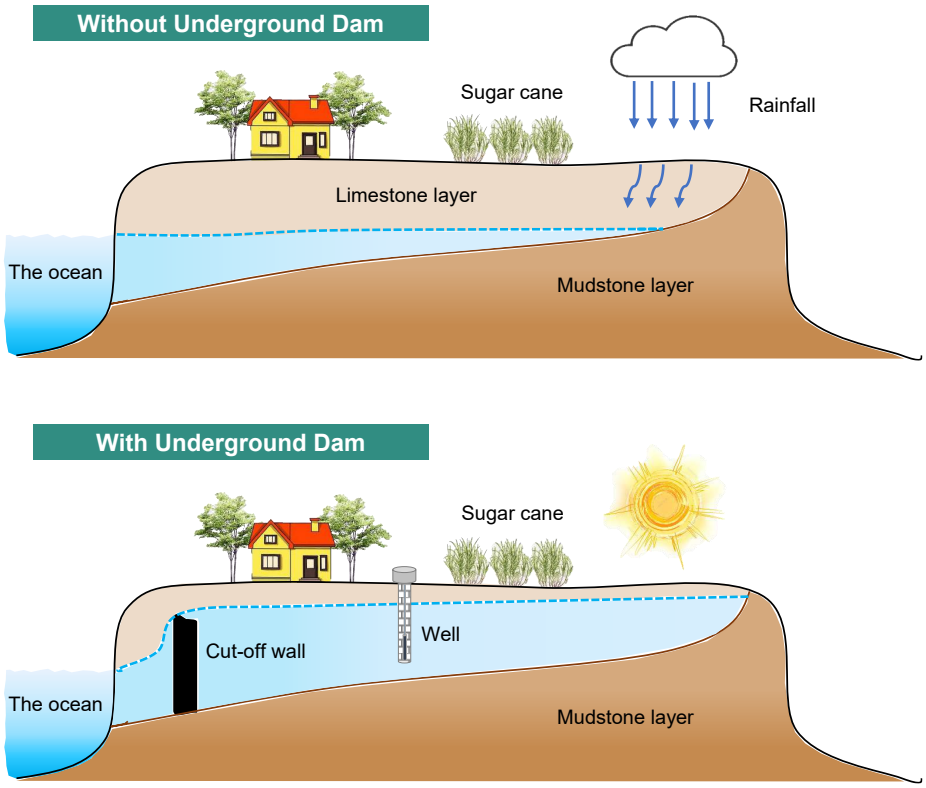


Figure 1.9 Concept of underground dam

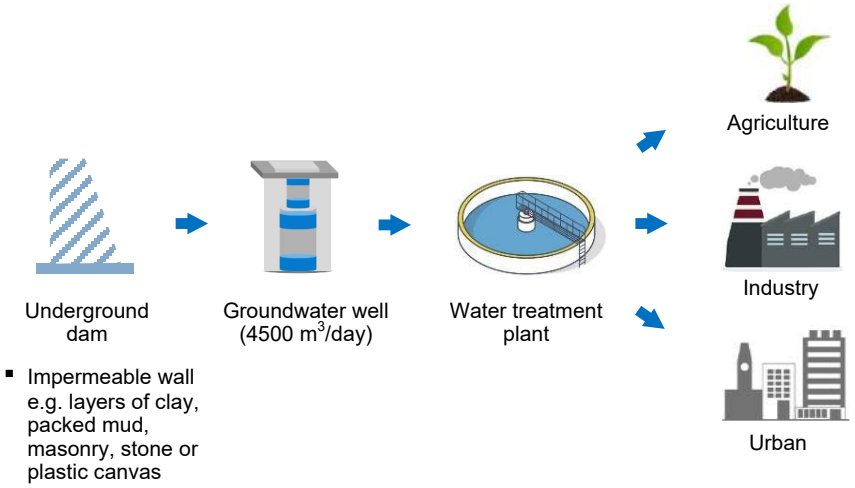


Figure 1.10 Typical components of an underground dam for groundwater supply projects

1.6 EIA Report Requirement

This section details out the activities of a proposed project that entails it to fall under Prescribed Activity No. 21.

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 authorities.

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

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

The development of groundwater supply projects falls under Prescribed Activity No. 21 of the EIA (First Schedule) and the description is as follows:

FIRST SCHEDULE **Prescribe Activity No.21:** **Water Supply**
Groundwater development for industrial, agricultural or urban water supply of 4,500 cubic metres or more per day

Since the development of groundwater projects fall under the First Schedule, their EIA approval process will be carried out by State DOE.

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

STATE	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

Below are a few possible scenarios/proposed projects that may requires it to conduct an EIA study under Prescribed Activity No. 21:

01 Construction and operation of new groundwater development at a green field area (undeveloped land) for industrial, agricultural or urban water supply with 4,500 m^3 or more per day.

02 Construction and operation of new groundwater development at a brown field area (previously developed land; may have decommissioned or abandoned wells or other components) for industrial, agricultural or urban water supply with 4,500 m^3 or more per day.

03 Construction and operation of an underground dam.

04 Upgrading of an existing groundwater development for industrial, agricultural or urban water supply from less than 4,500 m^3 per day to 4,500 m^3 or more per day.

05 Upgrading of an existing groundwater development that currently has a capacity of 4,500 m^3 or more per day for industrial, agricultural or urban water supply (the development may or may not already have an EIA study approved previously for its current operation).

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 the construction of groundwater supply development. 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.21 (First 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 State DOE for approval.	Chapter 2
3. Carry out preliminary stakeholders' engagement	▪ It is important for the Project Proponent to carry out stakeholders engagement prior to conducting environmental scoping. ▪ 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. Carry out environmental scoping and prepare Scoping Notes	▪ The submission of TOR for First Schedule EIA is not required. However, it is pertinent to carry out environmental scoping which general covers the following: 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

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

STEP	DESCRIPTION	REFERENCE IN THE GUIDELINE
5. Collect baseline data	▪ 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
6. 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. ▪ Project description must cover the following (refer *Attachment 2* 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

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

STEP	DESCRIPTION	REFERENCE IN THE GUIDELINE
7. 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
8. 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
9. Submit EIA report	▪ Hard copy and soft copy (in PDF format) of the EIA report must be submitted to State DOE for approval.	Chapter 8
10. 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 the relevant State 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 groundwater supply 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 groundwater supply projects and their interpretation

02 Environmental Project Planning

- Provides a concise review of legislations, policies and guidelines relevant to groundwater supply projects
- Describes the integration of environmental compliance into project planning

03 Terms of Reference

- 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 format of Scoping Notes

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 Measure

- 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 EIA Checklist

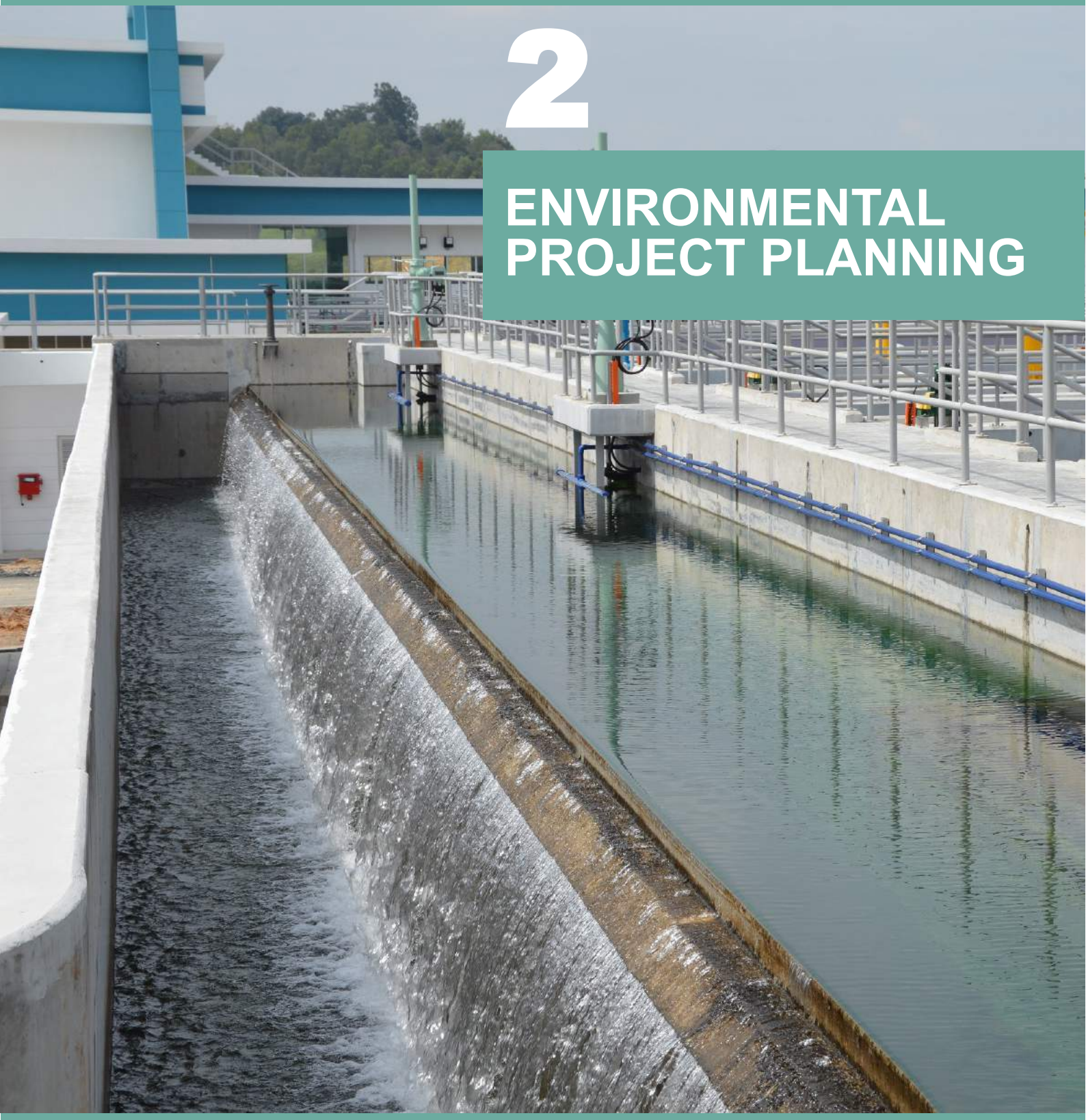
- Provides the checklist for environmental review criteria for EIA approval . The checklist is prepared to assist projects proponents, consultant and DOE

09 Report Format

- Presents the structure and content of the EIA report

2

ENVIRONMENTAL PROJECT PLANNING



Source: waterlossasia.com

Source: waterlossasia.com

Chapter
2

Environmental Project Planning

2.1 Introduction

This chapter highlights in general the concept of groundwater management 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 Groundwater Management in Malaysia

Malaysia is rich in water resources, whose development has been the basis for the socio-economic development of the country over. Generally, the water supply situation in the country has changed from one of relative abundance to one of scarcity. Population growth and urbanisation, industrialisation and the expansion of irrigated agriculture are imposing rapidly increasing demands and pressure on water resources, besides contributing to the rising water pollution.

Water resources development and management in Malaysia is associated with fragmented water related functions and activities of various government departments and agencies. There is no single body responsible for the planning, development, regulation and management of the water resources in the country and as such these activities tend to take place in isolation.

Nonetheless, managing water, in this case, groundwater has been a grand challenge problem and has become one of humanity's foremost priorities. Surface water resources are typically societally managed and relatively well understood; groundwater resources, however, are often hidden and more difficult to conceptualize.

In addition, declining quality of the remaining groundwater commonly cannot support all agricultural, industrial and urban demands and ecosystem functioning, especially in the developed world.

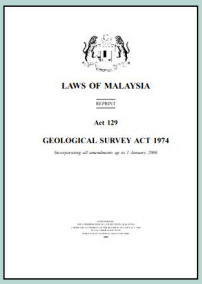
2.3 Institutional and Legal Framework of Ground-water Abstraction in Malaysia

It is generally accepted that "water" is constitutionally a State matter, and that water by definition includes rivers, lakes, streams and water beneath the surface of the land. Therefore, groundwater is considered a State matter as well. However, this is not necessarily and exclusively so, since the Federal Government has exclusive power on their water-based projects in the States pertaining to water supplies, river and canal works or also resource utilisation e.g. hydropower generation, navigation within ports, marine fisheries and mining.

For states that have their own water enactments, the abstraction of groundwater requires licensing application to be made at the respective water regulating body. In addition, for domestic water supply, the licensing approval also involves the Ministry of Health. Nonetheless, it is imperative to refer other legislations that govern the overall activities relating to groundwater supply development other than the EQA 1974.

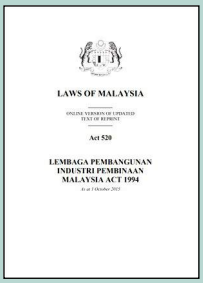
2.4 Relevant Legislations

This section discusses Federal laws that are directly and indirectly associated with groundwater supply development projects. The laws are as listed below (but not limited to).


LAWS OF MALAYSIA
REPRINT
Act 129
GEOLOGICAL SURVEY ACT 1974

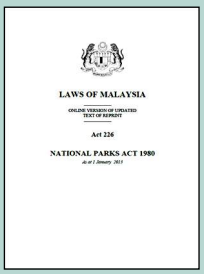
Geological Survey Act 1974

- This Act administers the requirements related to boring and drilling activities to develop a well for the purpose of extracting water. However, it is not applicable for wells which are less than 30 feet in depth without reaching bedrock or yield less than 500 gallons of water per day and is used only for domestic purposes.
- This Act also requires that any drilling works to be reported to JMG. In this case, the owner or contractor should follow Geological Survey (Notification of Development of wells and Excavations) Regulations 2013.


LAWS OF MALAYSIA
ONLINE VERSION OF UPDATED TEXT OF REPRINT
Act 520
LEMBAGA PEMBANGUNAN INDUSTRI PEMBINAAN MALAYSIA ACT 1994

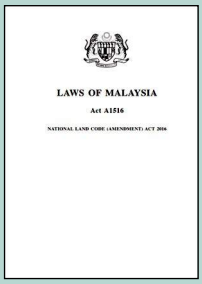
Construction Industry Development Board (CIDB) Act 1994

This Act governs the requirements for any construction works and its associated works including on site clearance, soil investigation and improvement, earth-moving, excavation, laying of foundation, site restoration and landscaping; and procurement of construction materials, equipment or workers.

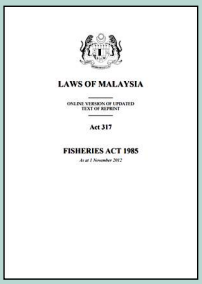

LAWS OF MALAYSIA
ONLINE VERSION OF UPDATED TEXT OF REPRINT
Act 226
NATIONAL PARKS ACT 1980

National Parks Act 1980

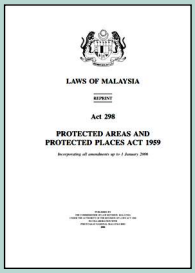
This Act preserves and protects flora and fauna within the National Park boundary.


LAWS OF MALAYSIA
Act A1516
NATIONAL LAND CODE (AMENDMENT) ACT 2016

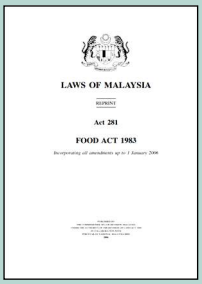
National Land Code 1965
This Act is to amend and consolidate the laws relating to land and land tenure, the registration of title to land and of dealings therewith.


LAWS OF MALAYSIA
ONLINE VERSION OF UPDATED TEXT OF REPRINT
Act 317
FISHERIES ACT 1985

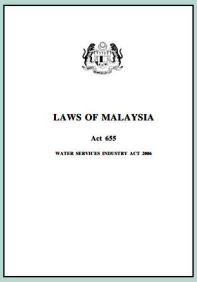
Fisheries Act 1985
This Act concerns the conserving, managing and developing any maritime and estuarine fishing and fisheries matters. For example, any aquaculture industry that wishes to abstract groundwater must also abide to this act.


LAWS OF MALAYSIA
REPRINT
Act 298
PROTECTED AREAS AND PROTECTED PLACES ACT 1959

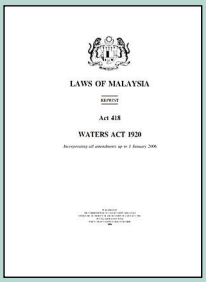
Protected Areas and Protected Places Act 1959
This Act is to provide for protected areas and places.


LAWS OF MALAYSIA
REPRINT
Act 281
FOOD ACT 1983

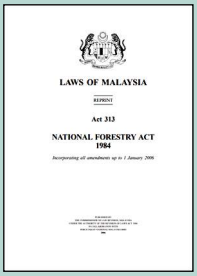
Food Act 1983
This Act safeguards the quality of potable water by providing drinking water quality standards that needs to be complied by water suppliers.


LAWS OF MALAYSIA
Act 655
WATER SERVICES INDUSTRY ACT 2006

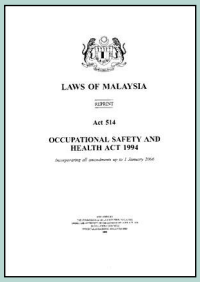
Water Services Industry Act 2006
This Act is to provide for and regulate water supply services and sewerage services and for matters incidental thereto.


LAWS OF MALAYSIA
REPRINT
Act 418
WATERS ACT 1920

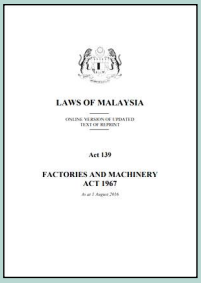
Waters Act 1920
This Act controls and licenses any disruption or diversion of water from rivers and streams.


LAWS OF MALAYSIA
REPRINT
Act 313
NATIONAL FORESTRY ACT 1984

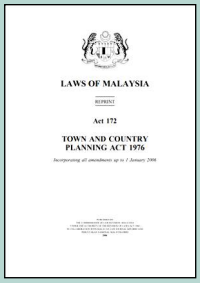
National Forestry Act 1984
This Act provides for the administration, management and conservation of forests and forestry development within Malaysia Subject to the location of the groundwater.


LAWS OF MALAYSIA
REPRINT
Act 514
OCCUPATIONAL SAFETY AND HEALTH ACT 1994

Occupational Safety and Health Act (OSHA) 1994
This Act secures the safety, health and welfare of persons at work, and for protecting others against risks to safety or health in connection with the activities of persons at work.


LAWS OF MALAYSIA
ONLINE VERSION OF UPDATED TEXT OF REPRINT
Act 139
FACTORIES AND MACHINERY ACT 1967

Factories and Machinery Act 1967
This Act concerns matters relating to the safety, health and welfare of person therein, the registration and inspection of machinery and on matters connected therewith during construction, structural alteration, repair or maintenance related to groundwater development works


LAWS OF MALAYSIA
REPRINT
Act 172
TOWN AND COUNTRY PLANNING ACT 1976

Town and Country Planning Act 1976
All applications for planning permission for any 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

Listed below (but not limited to) are the relevant water acts/enactments in each state regarding groundwater supply projects.

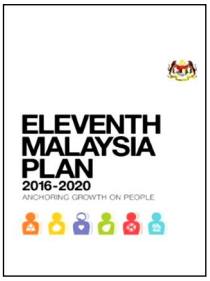
	**Johor** Water Enactment 1921
	**Kedah** ▪ Kedah Waters Management Board Enactment, 2007 ▪ Muda Agricultural Development Authority Act, 1972 ▪ Kedah Water Resources Enactment 2008
	**Melaka** ▪ Malacca River and Coastal Development Corporation Enactment 2005 ▪ Melaka Water Resources Enactment 2014
	**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.

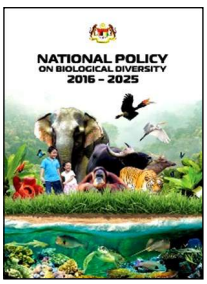
The national planning policies will be the guidance to formulate and prepare the local and regional planning policies. Below is a list (but not limited to) of the relevant policies regarding groundwater supply projects (subject to its location) that can be referred to for EIA study purposes.

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.

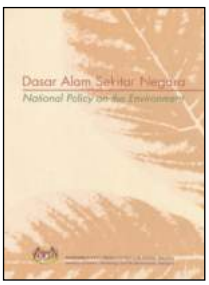


Five Year Malaysia Plan
Outlines the Malaysia's five-year development policies and strategies plan.

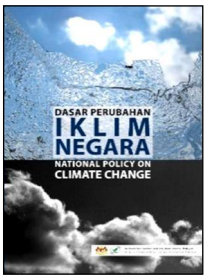
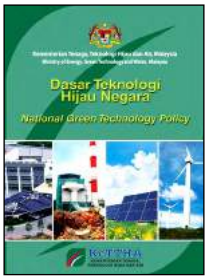
Third National Physical Plan (NPP-3) (PLANMalaysia, 2015)
Provides physical planning plans for the implementation of sustainable development strategies.



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.
	**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.
	**National Green Technology Policy (KETTHA, 2009)** Provide guidance in creating an economy or development that is based on sustainable solutions.

	**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.
	**Malaysia National Forestry Policy 1978 (Revised 1993) (Forestry, 1993)** Conserve and manage the forests through sustainable management and maintain their critical roles in the national economy and preservation of environmental stability.
	**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 Sustainable Development Goals

Goal 6 of the SDGs i.e. Clean Water and Sanitation highlights the importance of access to clean water for all. Therefore, in the context of the SDGs, groundwater is most explicitly linked to ensuring availability and sustainable management of water.

2.5.2 Third National Physical Plan (NPP-3) (PLANMalaysia, 2015)

The Third National Physical Plan (NPP-3) 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.

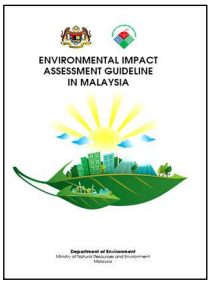
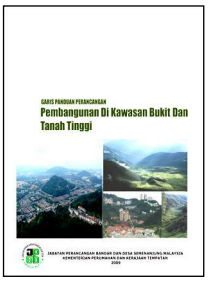
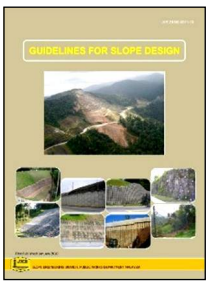
Under Section 22 (Subsections 2A) of Act 172, applications for planning permission involving development that may affect areas which have been designated as ESA in the development plan should be referred to the NPPC.

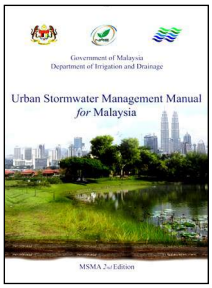
The NPP-3 has identified groundwater recharge zones as one of the ESAs that fall under Level 3. Subject to the location of the project, the State Structure Plan and Local Plan must be referred to in order to identify the exact location of the groundwater recharge zones.

2.6 Relevant Guidelines and Guidance Documents

Guidelines pertaining to groundwater projects 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.

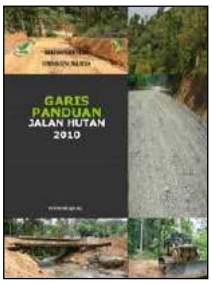
Listed below (but not limited to) are the guidelines and guidance documents relevant to groundwater projects that can be referred to for EIA study purposes. All relevant and latest guidelines must also be referred to.

	**Groundwater Quality Index and Standards 2019 Edition (MESTECC, DOE 2019)** Recommends raw groundwater quality for its intended purposes; drinking, industry and agriculture. Provides a method to easily assess the quality of groundwater via National Groundwater Quality Index (IKAT).		**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.
	**GPP Pemuliharaan dan Pembangunan Kawasan Sensitif Alam Sekitar (KSAS) (PLANMalaysia, 2017)** Provides the requirements for development in ESAs.		**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.
	**GPP Pembangunan di Kawasan Bukit dan Tanah Tinggi (PLANMalaysia, 2009)** Provides the requirements for development in hilly areas, upland, hillsides and hilltops.		**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).
	**Contaminated Land Management and Control Guidelines No.2: Assessing and Reporting Contaminated Sites** Provides a consistent and uniform approach to site investigation, assessment, risk assessment and reporting of all land properties classified as contaminated land.		**Guidelines for Slope Design (PWD, 2010)** Provides geotechnical design criteria for slopes.
	**Contaminated Land Management and Control Guidelines No.3: Remediation of Contaminated Sites** Provides important elements or steps in performing remediation at a contaminated site.		**Garis Panduan Pembangunan Melibatkan Sungai dan Rizab Sungai (DID, 2000)** Provides proper planning and sustainable development involve the river and its reserve area.



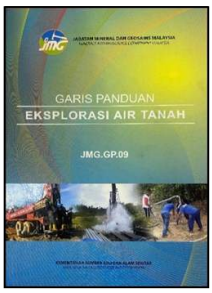
Urban Stormwater Management Manual for Malaysia (MSMA 2nd Edition) (DID, 2012)
Provides planning and design guidance to manage stormwater.

Guidelines for Siting and Zoning of Industry and Residential Areas (SZIRA) (DOE, 2012)
Provides guidance with regards to buffer distances according to a list of industries.

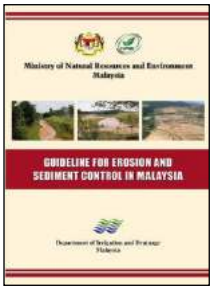


Garis Panduan Jalan Hutan 2010 (Pindaan 2013) (FDRM, 2014)
Guidance for forest road management that includes phases of planning, construction, maintenance and closure of forest roads.

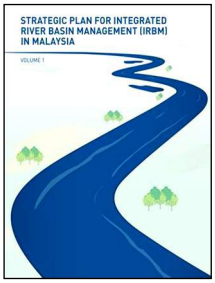
Environmental Essentials for Siting of Industries in Malaysia (EESIM) (DOE, 2017)
Provides guidance in selecting a suitable site for the setting up of an industrial facility.



- Garis Panduan Eksplorasi Air Tanah (JMG)
- Garis Panduan Pengukuran Paras Air Tanah dan Persampelan (JMG)
- Garis Panduan Penyediaan Laporan Hidrogeologi dan Geologi bagi Maksud Permohonan Lesen Punca Air Mineral Semulajadi (JMG)
- Garis Panduan Pemetaan Geologi Terain (JMG)



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.



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.

2.6.1 Groundwater Quality Index and Standards 2019 Edition (MESTECC, DOE 2019)

This guideline provides a reference for relevant parties in determining acceptable raw groundwater quality for agriculture, industry and drinking (potable water) purposes. The guideline highlights the following:

01 National Groundwater Quality Standard:
- Drinking Water Standard [Groundwater Quality Standard for Conventional Raw Water Treatment (Drinking Water)];
- Standard for Agriculture Usage; and
- Standard for Industry Usage.

02 National Groundwater Quality Index (IKAT).

The Drinking Water Standard [Groundwater Quality Standard for Conventional Raw Water Treatment (Drinking Water)] fully adopts the raw water quality recommended by the Ministry of Health (MOH) provided that conventional water treatment is used. For parameters that are not listed in MOH's recommendation, values from Class II of the National Water Quality Standards (NWQS) are adopted.

In addition, this guidance document also provides a means to assess the quality of groundwater which is by introducing the National Groundwater Quality Index (IKAT). IKAT comprises parameters that are deemed relevant to represent the quality of groundwater.

2.6.2 GPP Pemuliharaan dan Pembangunan Kawasan Sensitif Alam Sekitar (KSAS) (PLANMalaysia, 2017)

The GPP Pemuliharaan dan Pembangunan KSAS document is to facilitate State Governments and Local Authorities in determining the type of land use and development activities that are allowed in ESAs. The guideline is further divided into nine planning guidelines where one of these is relevant to groundwater development projects i.e. GPP Pemuliharaan dan Pembangunan KSAS for Reservoir and Groundwater Resources Area.

The planning guidelines consist of the following components:

01 Interpretation;

02 ESA characteristics;

03 Policies and type of land use allowed in ESAs; and

04 Development activities and conditions used according to the level of sensitivity.

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 groundwater development project and relevant requirements in each stage is shown in *Figure 2.1* and the details are listed in *Table 2.1*.

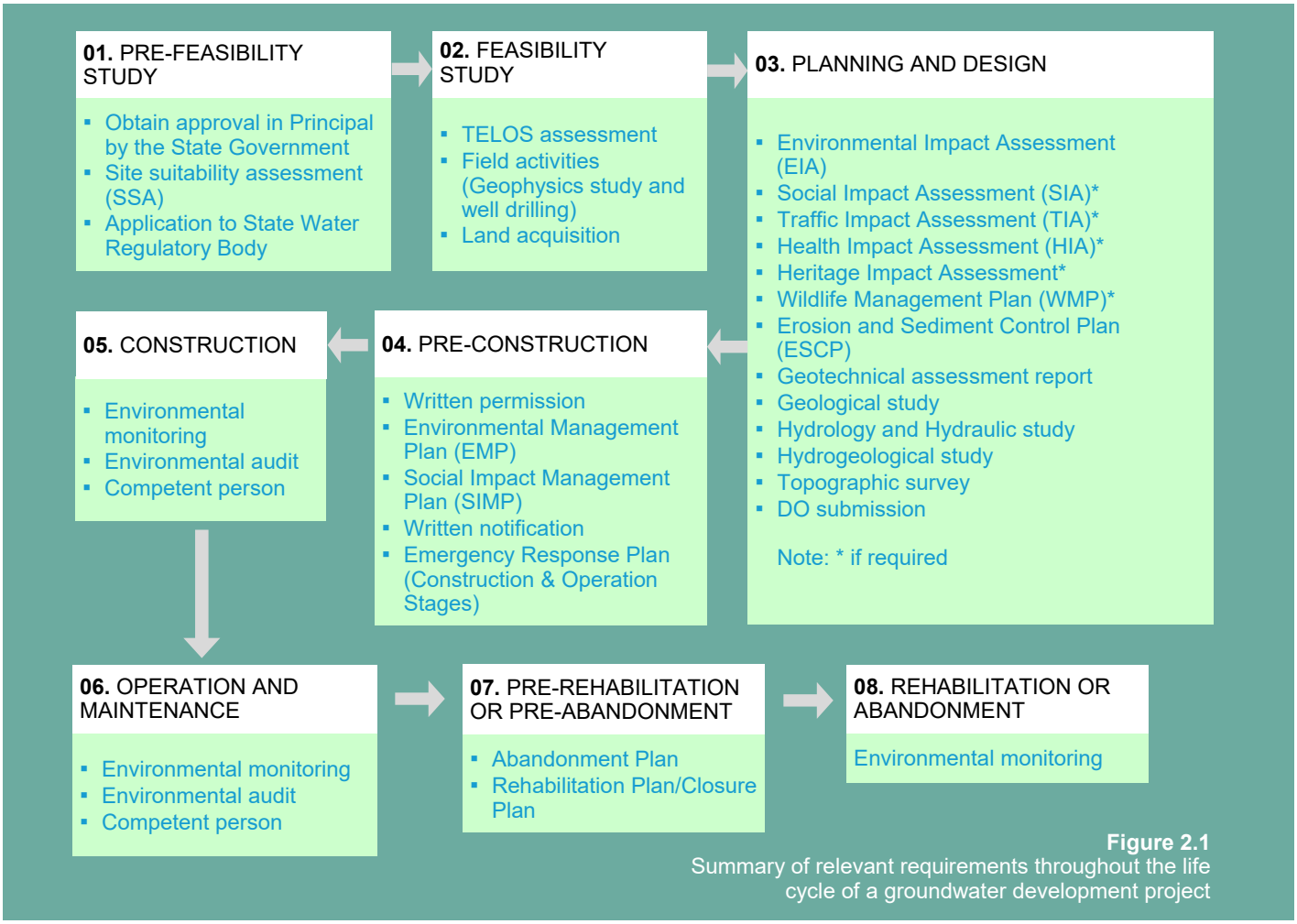


Figure 2.1
Summary of relevant requirements throughout the life cycle of a groundwater development project

Table 2.1 List of relevant requirements at various project implementation stage

REQUIREMENT	DETAILS	AGENCIES	LEGAL PROVISION
Pre-feasibility Study			
Obtain approval in Principle by State Government	Permission to develop the project	State government	Town and Country Planning Act 1976 (Act 172)
Site suitability assessment (SSA)	Land compatibility of the proposed groundwater development	▪ Department Of Director General Of Lands And Mines (JKPTG) ▪ State Land and Mines Office (PTG) ▪ JMG ▪ DOE	NA
Application Water Regulatory Body	▪ Application to obtain license for groundwater abstraction ▪ Approval to drill wells	▪ State Water Regulatory Body	State Water Enactment
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			
Environmental Impact Assessment (EIA)	▪ TOR and ESI ▪ Statement of need ▪ Project options ▪ Project description ▪ Existing environment ▪ Evaluation of impacts ▪ Mitigation measures ▪ Post-EIA	DOE State	EQA 1974
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	▪ PWD ▪ Local Council	▪ Road Transport Act 1987 ▪ Town and Country Planning Act 1976

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)..			
Health Impact Assessment (HIA)	▪ Project description ▪ Existing public health status ▪ Evaluation of health impacts ▪ Mitigation measures ▪ Post-HIA	Ministry of Health (MOH)	EQA 1974
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)
Wildlife Management Plan (WMP)	▪ Project description ▪ Existing wildlife status ▪ Evaluation of wildlife impacts ▪ Mitigation measures ▪ Post-WMP	DWNP	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) ▪ State Water Enactment and/ or related regulations
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
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 ▪ PWD (Geological Branch) ▪ IKRAM	Geological Survey Act 1974 (Act 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

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)..			
Hydrology and Hydraulic 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
Development Order	Approval of various submission to the technical agencies: ▪ EIA report – DOE ▪ SIA report – PLANMalaysia ▪ TIA report – PWD ▪ HIA report – MOH ▪ Heritage Impact Assessment report – Department of National Heritage ▪ ESCP report – DID ▪ Geotechnical report (if required) and other relevant technical studies	Local Authority	Town and Country Planning Act 1976 (Act 172)
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) ▪ Details of the project: ∗ Name of Environmental Officer (EO) ∗ Detailed design drawings ∗ Name of Contractors ∗ Name of Resident Engineer ∗ Name of Consultants	DOE	EQA 1974
Social Impact Management Plan (SIMP)	▪ Project description ▪ Existing human environment ▪ Social impact action plan ▪ Monitoring programme	▪ PLAN Malaysia ▪ PLAN Malaysia @Negeri	Town and Country Planning Act 1976 (Act 172)
Written notification	▪ Installation of any fuel equipment, generator and air pollution control system.	DOE	EQA 1974
Environmental reporting	▪ Form EIA 1-18 – EIA (EIA Project Information status ▪ Form EIA 2-18 – EIA Approval Conditions Compliance Report		
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

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

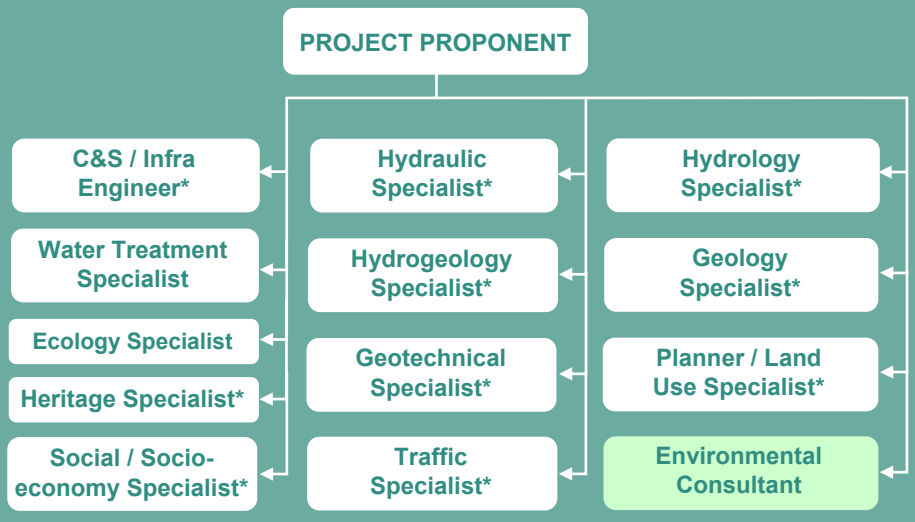
Table 2.1 (cont'd) List of relevant requirements at various project implementation stage

REQUIREMENT	DETAILS	AGENCIES	LEGAL PROVISION
Construction (cont'd)..			
Environmental audit	▪ Audit site administrative details ▪ Regulatory compliance summary ▪ Audit findings ▪ Recommendations	DOE	EQA 1974
Environmental reporting	▪ Form EIA 1-18 – EIA (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)		
Operation and Maintenance			
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
Environmental audit	▪ Audit site administrative details ▪ Regulatory compliance summary ▪ Audit findings ▪ Recommendations		
Environmental reporting	▪ Form EIA 1-18 – EIA (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)		
Pre-rehabilitation and Pre-abandonment			
Abandonment plan	Overall abandonment strategy	DOE	EQA 1974
Rehabilitation plan	Remedial Action Study (Interim and Long Term Measures) ▪ Alternative risk reduction options		
Closure plan	Proper closing of wells	State Water Regulatory Body	State Water Enactment
Rehabilitation and Abandonment			
Environmental monitoring	Performance, compliance and impact monitoring ▪ Water quality monitoring ▪ Noise monitoring ▪ Air quality monitoring	DOE	EQA 1974

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*.



Note: *May prepare other studies required by the Authority as tabulated in *Table 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
Environmental 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 ▪ Provide existing and future land use of the project area and its vicinity ▪ Prepare Development Proposal Report (LCP) ▪ Conduct viewscape assessment (if required) ▪ Prepare Planning Permission (KM) submission	PLANMalaysia
Geology Specialist (must be registered with Board of Geologist)	 Geological Study	▪ Determine geological characteristics of the project area ▪ Assess impact to the geology of the surrounding area	JMG
Hydrogeology Specialist (must be registered with Board of Geologist)	 Hydrogeology/ Geophysics Study	▪ Conduct geophysics study ▪ Identify potential groundwater locations present within or near the project area ▪ Assess impact to the hydrogeology of the surrounding area ▪ Construct exploration and test wells, and pump test ▪ Determine yields of wells and aquifers	JMG
Ecology Specialist	 Ecology Impact Assessment	▪ Conduct impact assessment on ecology ▪ Propose mitigating measures	▪ DOF ▪ DWNP ▪ FDPM

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

PROJECT TEAM MEMBER	STUDY / SECTOR	ROLE	ASSESSMENT AUTHORITY
Geotechnical Specialist	 Geotechnical / Foundation Study	▪ Conduct geotechnical assessment ▪ Design structure's foundation	▪ JMG ▪ PWD (Geotechnical Branch) ▪ IKRAM
Civil and Structure / Infrastructure Engineer	 River Hydraulic and Hydrology Study	▪ Assess the river's hydraulics and hydrology ▪ Design drainage masterplan	DID
Coastal Engineer / Hydraulic Specialist	 Coastal Hydraulic	▪ Assess the coastal hydraulics ▪ Design coastal structures	DID
Social / Socio-economic Specialist (Registered with Malaysian Association of Social Impact Assessment)	 Social Impact Assessment (SIA)	▪ Conduct impact assessment on social aspects ▪ Propose Social Impact Management Plan (SIMP)	▪ PLANMalaysia ▪ Local Council
Traffic Specialist	 Traffic Impact Assessment (TIA)	▪ Conduct impact assessment on present traffic conditions ▪ Predict future traffic conditions (with the development) ▪ Propose upgrading or new roads if necessary	▪ PWD ▪ 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

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

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

PROJECT TEAM MEMBER	STUDY / SECTOR	ROLE	ASSESSMENT AUTHORITY
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

Stakeholders engagement is an important factor in an EIA study. The stakeholders engagement must be conducted under the socio-economic study in the EIA. The stakeholders engagement is also another platform for the general public to voice their concerns on top of being able to review and comment the EIA report.

For EIA purposes, there will be at least three stages of stakeholder engagements:

01 Preliminary Stakeholders Engagement

It is important for the Project Proponent to carry out stakeholders engagement at the early stage of the EIA study. 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 stakeholders engagement for groundwater supply projects can be categorised 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.

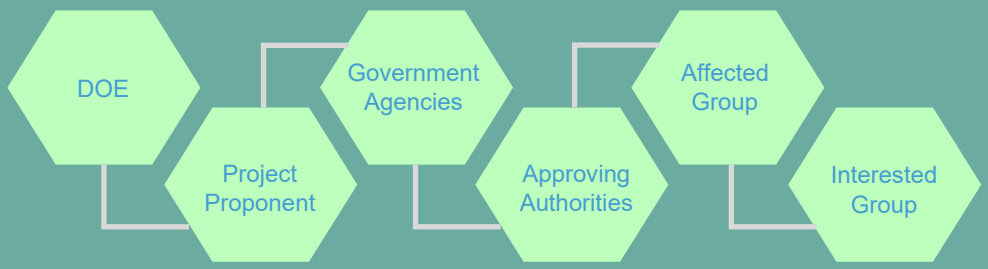


Figure 2.3
Relevant stakeholders to be engaged during the EIA process

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 groundwater development project. It is important for these representatives to highlight the relevant issues and give feedback of the project to be incorporated in the EIA report. The representatives sent for these engagements should be the same representatives to attend the 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	ROLE
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 ▪ Development order	▪ 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 ▪ Approve Development Order
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 ▪ Hydrology and hydraulic	▪ 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 ▪ Review and approve Erosion and Sediment Control Plan (ESCP) ▪ Review and endorse hydrology and hydraulic report.
Fisheries Development Authority of Malaysia (LKIM)	Fishermen livelihood	Adhere to Fisheries Development Authority of Malaysia Act 1971 (Act 49)
Malaysian Public Works Department (PWD) / Malaysian Highway Authority (LLM)	▪ Level of Service (LoS) of nearby PWD road ▪ Building code and standard ▪ Road design specification	Ensure compliance to all PWD / LLM Guidelines and Manuals
PWD (Geotechnical Branch)	▪ Slope design specification ▪ Geotechnical	Ensure compliance to all PWD Guidelines and Manuals

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

POTENTIAL STAKEHOLDERS	ISSUE/IMPACT OF INTEREST	ROLE
Department of Mineral and Geoscience Malaysia (JMG)	▪ Slope stability and protection requirements ▪ Geological conditions ▪ Soil conditions and suitability ▪ Geological Terrain Mapping (GTM) and geohazard requirements ▪ Hydrogeology/geophysics study	▪ 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 (FDPM)	▪ 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 (DWNP)	▪ 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 water regulatory body
Water Regulatory Body	Water resources	▪ Ensure conservation of water resources, river basin, coastal waters and the surrounding environment ▪ Ensure compliance to State's laws ▪ Work together with water operators ▪ Issue license (water resource abstraction) ▪ Enforcement and prosecution under the State's laws
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	ROLE
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 ▪ Issue license for trading or commercialization of natural mineral water
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

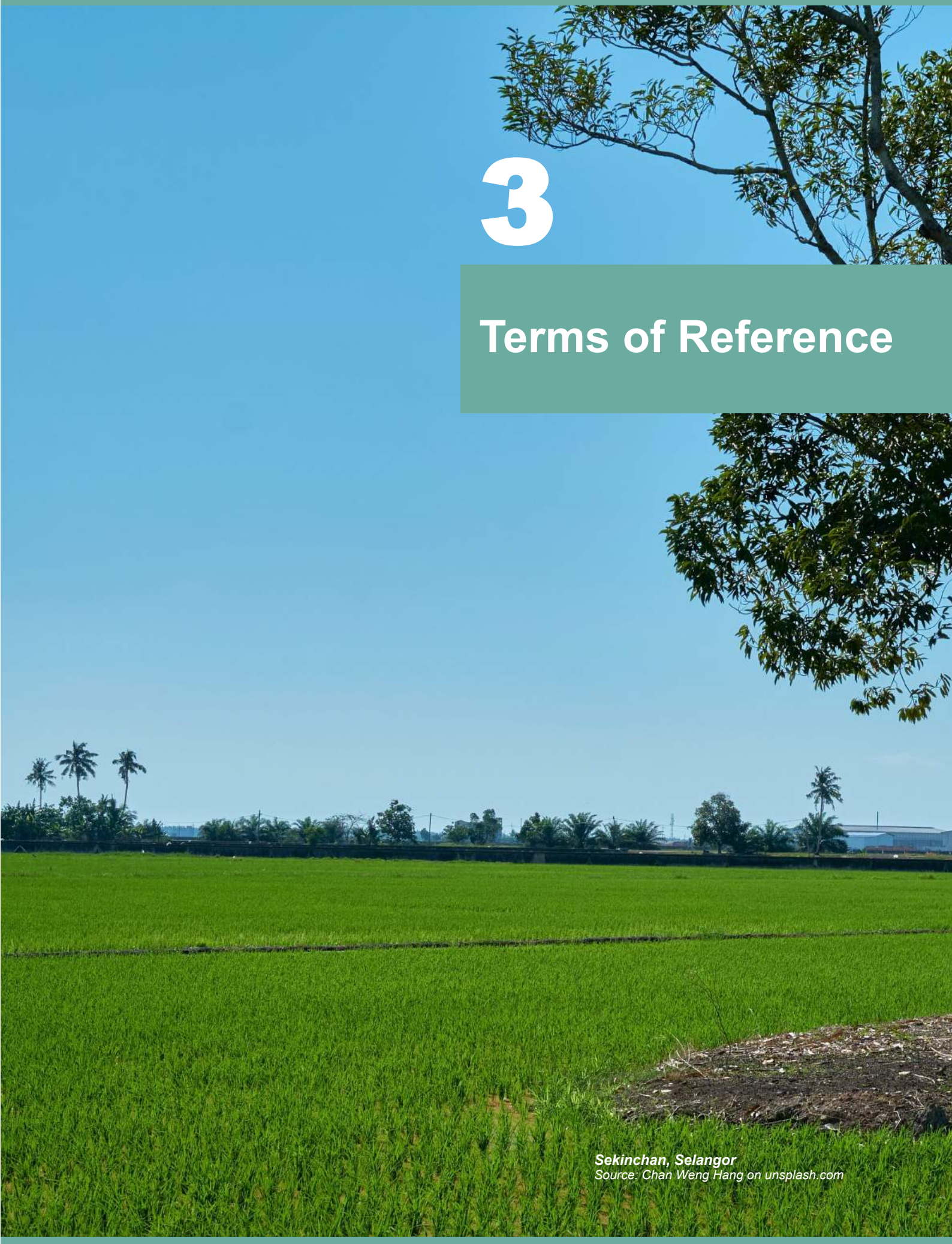
Details of the stakeholders engagement done throughout the EIA study must be properly recorded and presented in the EIA report. The details include:

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.

3

Terms of Reference



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

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

Chapter
3

Terms of Reference

3.1 Introduction

The Terms of Reference (TOR) is the first major milestone in the overall EIA process. However, for First Schedule EIA (this Guideline) the TOR 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;
02	To refine the project boundary according to the environmental sensitivity of the surrounding area;
03	To determine the zone of study (ZOS) and zone of impact (ZOI);
04	To identify baseline data required to be assessed for the project;
05	To outline the key project activities during the various stages of the project implementation namely pre-construction, construction and post construction;
06	To identify existing environmental issues within the EIA study boundary which cover physical, biological and social components;
07	To identify significant impacts and non-significant impacts of the project which are also to be categorised accordingly. All impacts during the various stages of the project implementation namely pre-construction, construction and post construction must be identified;
08	To identify and detail out the methodologies and assessment tools to be used in the EIA for the identified significant impacts; and
09	To propose applicable P2M2 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 EIA.

3.2 Environmental Screening

A preamble of the environmental scoping 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* in **Chapter 1**.

3.3 Environmental Scoping

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:

01 PHYSICAL

02 BIOLOGICAL

03 SOCIO-ECONOMIC

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

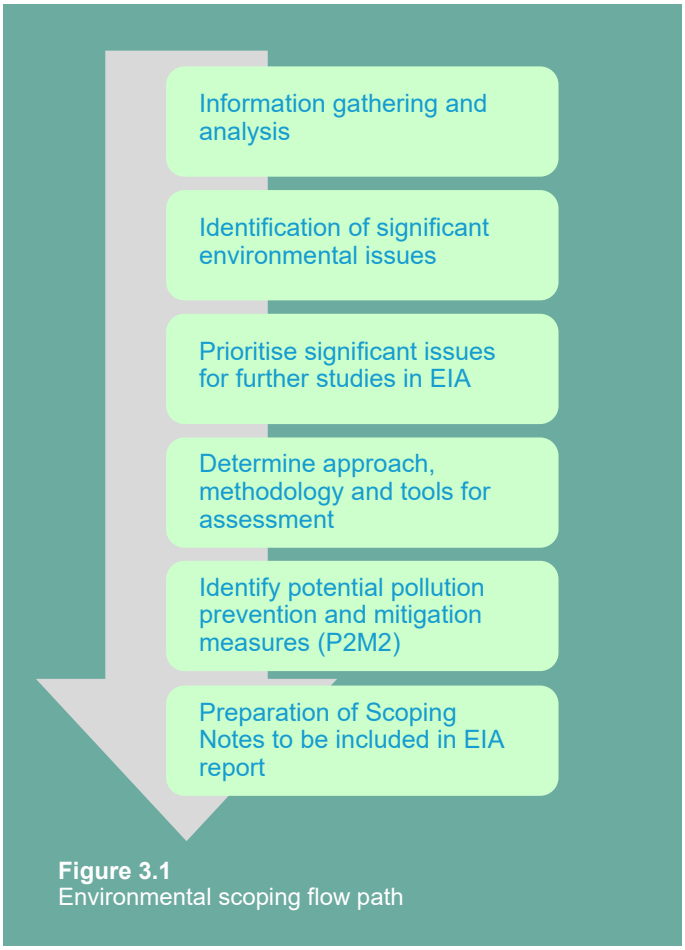


Figure 3.1
Environmental scoping flow path

3.4
Site Suitability Assessment (SSA)

The identification of a suitable site is normally undertaken 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, screening is introduced as a method for site selection.

Technical constraints

Availability of land

Environmental issues

GENERAL CRITERIA TO IDENTIFY SUITABLE SITE

Costs (land, utilities, and infrastructure facilities required)

Environmental effects

It is imperative that the nature of the proposed development 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 report 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 e.g. presence of other groundwater development or activities that may affect the groundwater quality (industrial areas)
- Location and proximity to sensitive receptors
- Buffer/setback availability and requirements (project buffer zone)
- Any alternative sites proposed for the project

Hydrology & Hydrogeology

- Site hydrology and hydrogeology condition
  - Sufficient amount of groundwater for abstraction (quality and quantity) via geophysics study, drilling and groundwater modeling.
  - Recharge zone and rate
- Water-holding capability
- Evaporation rates
- Storage zones

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

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

Accessibility

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

Project Component and Design

- Layout consideration
- Choice of method statement
- Type of groundwater treatment

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 groundwater development projects are listed below:

Land use

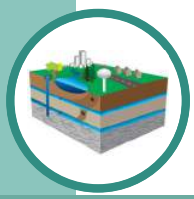
- Must be far from possible groundwater polluters e.g. industrial area within the same catchment
- Groundwater abstraction well should avoid flood prone areas

Terrain and Topography

- Suitable for the construction of abstraction wells

Hydrology & hydrogeology

- Good hydrological and hydrogeological conditions with sufficient amount of groundwater for abstraction (quality and quantity) (based on geophysics study and groundwater modeling)
- Avoid sites with mineral deposits



Geology

- Avoid active fault zones

Accessibility

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

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

3.5 Study Boundary

It is essential to determine the coverage and boundary of the EIA study to ensure significant environmental issues are comprehensively assessed and reported.

There are two types of study boundaries as per below. These boundaries are illustrated in *Figure 3.2*.

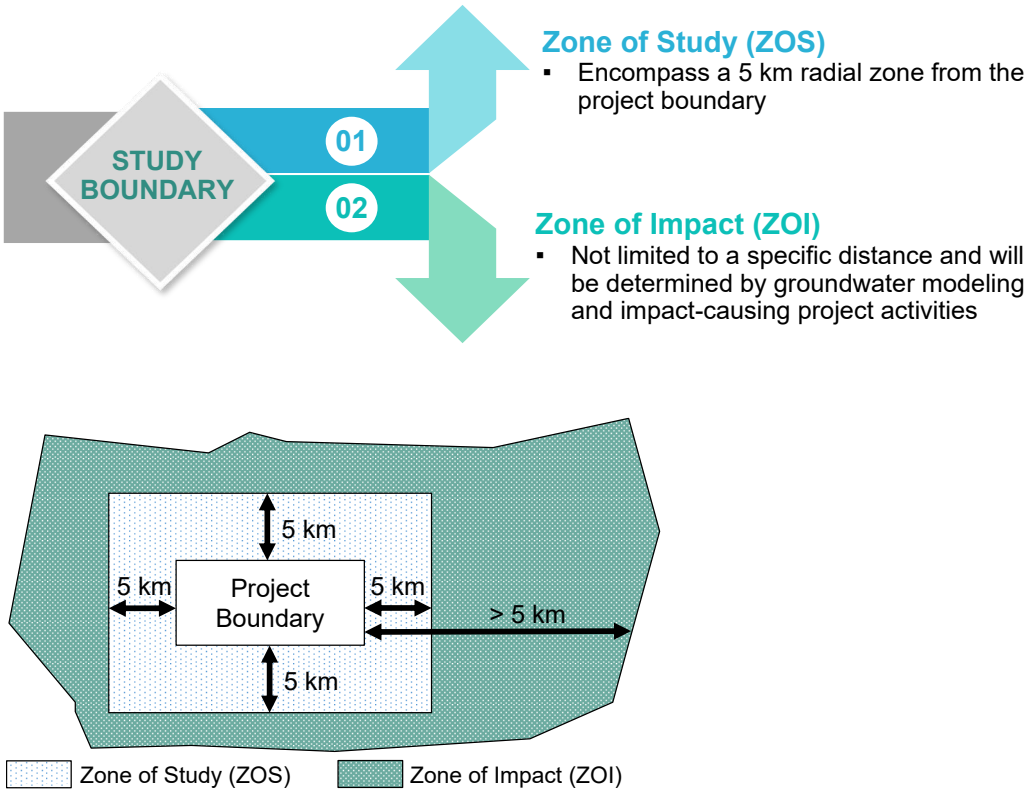


Figure 3.2 Types of study boundaries

3.6 Baseline Data Review

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

Table 3.1 Baseline data required for environmental scoping

	TYPE OF DATA	DATA SOURCE
Physical		
 Topography	▪ Contour ▪ Elevation ▪ Terrain - slope ▪ Description of existing morphology of the project area e.g. hilly, undulating etc. ▪ Construction suitability map	▪ Topography maps (JUPEM) ▪ Topographic survey
 Land Use	▪ Land use maps ▪ Photos ▪ Description of existing and future land use (5 km ZOS)	▪ Aerial or satellite imagery ▪ Structure and local plans (PLANMalaysia) ▪ Ground truthing
 Geology/ Hydrogeology	▪ Description of local and regional geology and hydrogeology ▪ Aquifers	▪ Geological and hydrogeological maps (JMG) ▪ Geological Terrain Mapping (GTM) report
 Soil Characteristics	▪ Soil profile ▪ Particle size distribution	▪ SI report ▪ Soil map (Department of Agriculture – DOA)
 Climate	Climate data (min 5 years): ▪ Rainfall data ▪ Wind rose ▪ Temperature ▪ Description of climate i.e. monsoon	Malaysian Meteorological Department (METMalaysia)

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

	TYPE OF DATA	DATA SOURCE
Physical		
 Hydrology	▪ River systems ▪ Catchment areas ▪ Flood prone areas	▪ Hydraulic and hydrology report ▪ Topography map ▪ Flood map (DID)
 Water Quality	Historical water quality data	▪ Published reports by water agencies and DOE ▪ State water resources departments ▪ Ground truthing
 Air Quality	Historical air quality data	▪ Published reports by DOE ▪ Ground truthing
 Noise and Vibration Level	Location of noise polluting sources	Ground truthing
Biological		
 ▪ Ecosystem ▪ Terrestrial flora and fauna ▪ Aquatic flora and fauna e.g. fisheries, marine flora and fauna	▪ Existing ecology and habitats ▪ Presence of endemic, rare, threatened, endangered and near extinct flora and fauna	▪ Published reports by Department of Wildlife and National Parks Peninsular Malaysia (DWNP) and Forestry Department (FDPM) ▪ Ground truthing
Social		
 Demography	▪ Demographics data ▪ Stakeholders	▪ Population census (Department of Statistics) ▪ Local Plans (PLANMalaysia)
 Public Health	Public health status	Morbidity statistics and public health data (Ministry of Health – MOH)

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

	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 Department of Museums, Department of National Heritage, Jabatan Kemajuan Orang Asli (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) ▪ Water intake catchment areas ▪ Groundwater recharge zones ▪ River ▪ Sensitive receptors	▪ NPP3 ▪ GPP Pemuliharaan dan Pembangunan KSAS ▪ 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;

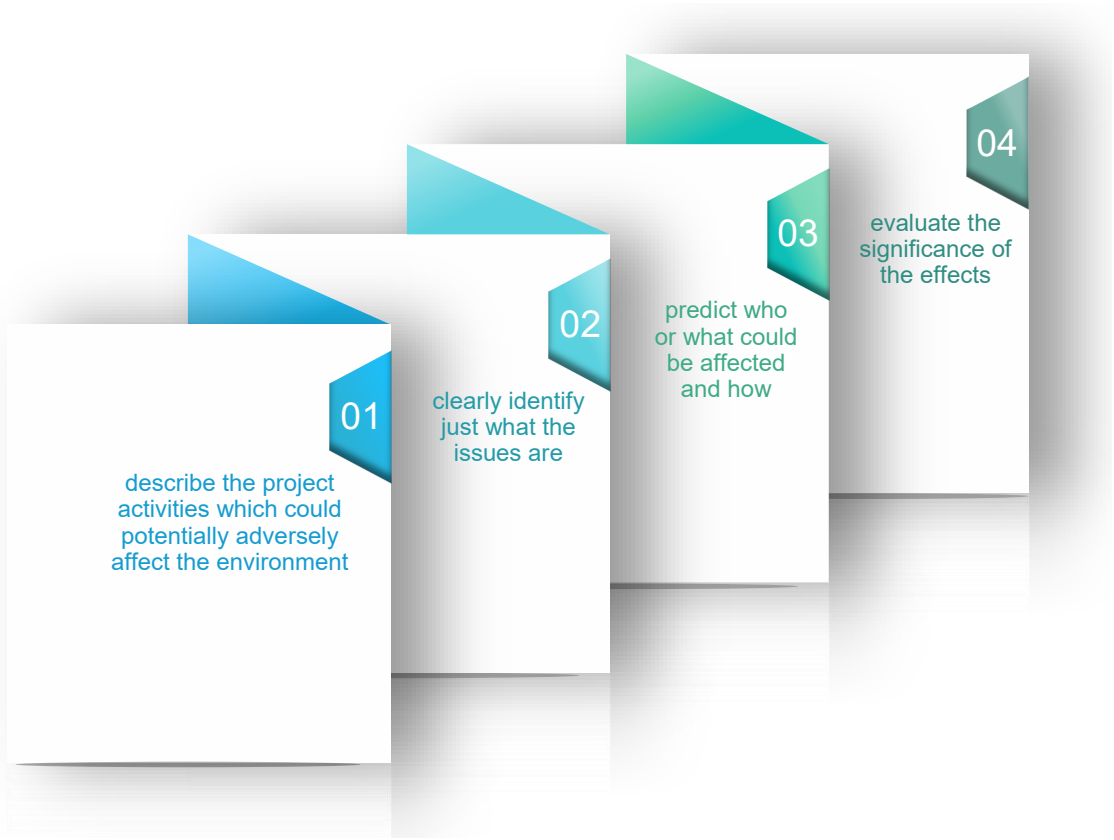
03 Industry areas within the groundwater catchment; and

04 Other groundwater abstraction wells within the catchment.

The identification of these constraints should 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

In order to successfully undertake an EIA, it is necessary to conduct the following:



Therefore, the identification of key project activities should be done as early as the scoping stage. Although the activities may be different, in many instances their impacts on the environment are similar.

When evaluating and describing the existing environment and the impact of the project on the environment from, **the relevant issues** and the environmental components likely to be impacted need to be highlighted and focused on.

When it comes to determining practical mitigating measures, however, such as specifying clauses within contract documentation, the focus changes back to **the project activities** (including siting), it is by controlling the project activities that environmental impacts can be most optimally mitigated.

Pre-construction

- Hydrologeological/ Geophysics (e.g. 2D resistivity) survey
- Well exploration (drilling)
- Topographical survey
- Land acquisition
- Site clearing
- Biomass management

Construction

- Temporary occupation
- Well construction
- Earthwork
- Construction of water treatment plant
- Construction of conveyance system

Operation

- Groundwater abstraction, treatment and supply
- Irrigation*
- Maintenance
- Effluent disposal
- Sludge disposal

*For agriculture purposes

Decommissioning - Abandonment

The Project Proponent must provide a description of key project activities to the Qualified Person during the scoping stage. A summary of a typical groundwater project activities at each project stage is presented in *Figure 3.3*. The key activities in each stage can be expanded further as shown in *Table 3.2*.

It should be noted that the lists provided in *Figure 3.2* and *Table 532* are not exhaustive and also may not be relevant to a particular project. It is therefore the responsibility of the Project Proponent and Qualified Person to determine the relevant information required for environmental assessment and compliance.

Figure 3.3
Typical groundwater supply project key activities at each project stage

Table 3.2 Details of the key activities

ACTIVITY	DETAILS
Pre-Construction Activities	
 **Hydrogeological/ Geophysics (e.g. 2D resistivity) survey**	▪ Clearing of pathways to access project site and proposed testing location ▪ Drilling test wells ▪ Pumping test
 **Topographical survey**	▪ Clearing of pathways to access project site ▪ Introduction of surveyor at site
 **Land acquisition**	▪ Acquire land ▪ Relocation of affected residents
 **Site clearing**	▪ Construction of temporary access road ▪ Installation of BMPs e.g. erosion and sediment control and stockpile area ▪ Removal of biomass and top soil
 **Biomass management**	▪ Stockpiling of biomass and topsoil ▪ Biomass disposal

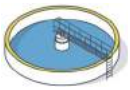
ACTIVITY	DETAILS
Construction Activities	
 **Temporary occupation**	▪ Construction of temporary buildings e.g. workers' quarters, storage facilities and working areas ▪ Installation of water supply facility ▪ Solid and scheduled waste disposal ▪ Sewage disposal ▪ Workforce ▪ Pest control ▪ Machine servicing and maintenance ▪ Resources abstraction – logging (if applicable)
 **Earthwork**	▪ Cut and fill ▪ Removal and disposal of unsuitable material (USM) ▪ Operating equipment (diggers, bulldozers, trucks)
 **Well construction**	▪ Well drilling ▪ Well development and pumping test ▪ Operating equipment (drilling rigs, tankers, compressors, generators)
 **Construction of water treatment plant**	▪ Construction of infrastructure and ancillary facilities ▪ Construction of treatment plant modules including reservoir/ storage tank
 **Construction of water conveyance system**	▪ Trenching/excavation works ▪ Overlaying of pipes ▪ Realignment with existing services ▪ Filling/Compaction ▪ Inspection, testing and commissioning of pipelines ▪ Connection with existing conveyance systems
 **Demobilisation**	▪ Demobilisation and removal of temporary buildings ▪ Waste removal/ disposal including rubbish, equipment and liquid wastes e.g. drilling fluid ▪ Rehabilitation of occupied site

Table 3.2 (cont'd) Details of the key activities

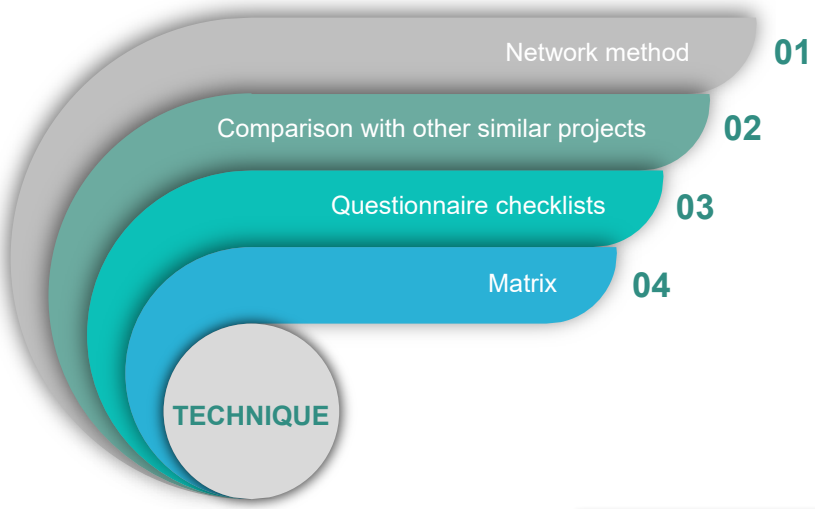
ACTIVITY	DETAILS
Operation Activities	
 Groundwater abstraction, treatment and supply	▪ Pumping rate ▪ Drawdown ▪ Groundwater treatment ▪ Conveyance of water for irrigation/industry/ domestic usage
 Maintenance	▪ Well screen test pumping and replacement/ reconditioning ▪ Pump replacement/reconditioning ▪ Treatment system replacement/reconditioning
 Effluent disposal	Direct discharge/reuse/recycle into the system
 Sludge disposal	Transportation of sludge to disposal area
Decommissioning/ Abandonment	
 Decommissioning/ Abandonment	▪ Well closure or abandonment ▪ Disconnection from conveyance system ▪ Demolition and removal of structure ▪ Transportation and disposal of construction waste

3.8 Identification of Significant Impacts and Priority Setting

3.8.1 Technique to Prioritise Environmental Impacts

Following the identification of key project activities, the issues and significant environmental impact can be identified.

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*). 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 groundwater development project into its main activities within three stages; pre-construction, construction and operation. The broad activity heading can be broken down into sub-activities, and also grouped into broad project activities such as pre-construction, construction and post-construction (operation, maintenance and, ultimately, closure).

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.

Table 3.3 Specific EIA matrix for groundwater supply 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																		
▪ Hydrological/ Geophysics survey																		
▪ Well exploration (drilling)																		
▪ Land acquisition																		
▪ Site clearing																		
▪ Biomass management																		
Construction																		
▪ Temporary occupation																		
▪ Well construction																		
▪ Construction of water treatment																		
▪ Construction of water conveyance system																		
Operation																		
▪ Groundwater abstraction & supply																		
▪ Irrigation*																		
▪ Maintenance																		
▪ Effluent disposal																		
▪ Sludge disposal																		
▪ Decommissioning-abandonment																		

Note: * Agriculture purpose

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 groundwater supply 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													
▪ Hydrological/ Geophysics survey													
▪ Well exploration (drilling)													
▪ Land acquisition													
▪ Site clearing													
▪ Biomass management													
Construction													
▪ Temporary occupation													
▪ Well construction													
▪ Construction of water treatment													
▪ Construction of reticulation system													
Operation													
▪ Groundwater abstraction & supply													
▪ Irrigation*													
▪ Maintenance													
▪ Effluent disposal													
▪ Sludge disposal													
▪ Decommissioning-abandonment													

Note: * Agriculture purpose

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 groundwater supply 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														
▪ Hydrological/ Geophysics survey														
▪ Well exploration (drilling)														
▪ Land acquisition														
▪ Site clearing														
▪ Biomass management														
Construction														
▪ Temporary occupation														
▪ Well construction														
▪ Construction of water treatment														
▪ Construction of water conveyance system														
Operation														
▪ Groundwater abstraction & supply														
▪ Irrigation*														
▪ Maintenance														
▪ Effluent disposal														
▪ Sludge disposal														
▪ Decommissioning-abandonment														

Note: * Agriculture purpose

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 groundwater supply projects

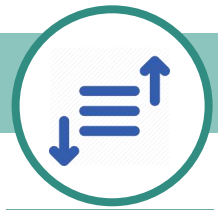
PROJECT ACTIVITY	HUMAN																							
	Health and Safety					Social						Aesthetic and Cultural												
	Physical safety	Physiological well-being	Parasitic safety	Communicable disease	Physiological disease	Employment	Housing	Education	Utilities	Amenities	Property & settlement	Landforms	Biota	Wilderness	Water quality	Atmospheric quality	Climate	Tranquility	Sense of community	Community structure	Man-made object	His	Religious places or structure	Landscape
Pre-Construction Activities																								
▪ Hydrological/ Geophysics survey																								
▪ Well exploration																								
▪ Land acquisition																								
▪ Site clearing																								
▪ Biomass management																								
Construction																								
▪ Temporary occupation																								
▪ Well construction																								
▪ Construction of water treatment																								
▪ Construction of water conveyance system																								
Operation																								
▪ Groundwater abstraction & supply																								
▪ Irrigation*																								
▪ Maintenance																								
▪ Effluent disposal																								
▪ Sludge disposal																								
▪ Decommissioning-abandonment																								

Note: * Agriculture purpose

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

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:



Magnitude

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

Permanence

- Nature of the effects whether they are temporary or permanent

Reversibility

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

Cumulative Effects

- 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

Figure 3.4
Criteria for determining significance of environmental impacts

3.8.2 Linkage Between Activities, Issues and Impacts

Environmental impacts are generated from actions, or activities, associated with planning, constructing, operating and closing of groundwater supply projects.

Activities which resulted in significant environmental changes and impacts that can create are potentially significant are issues. Specific activity can result in physical (primary) impact which in turn can possibly cause biological (secondary) impact that lead to socio-economic (tertiary) impact.

Environmental issues, or problems, 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
Key Issues Related to Groundwater Supply Project

A brief discussion on the environmental issues throughout the project period i.e. post-construction, construction and operation are itemised in *Table 3.4*.

Table 3.4 Key issues and impacts

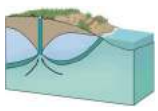
ISSUES	IMPACTS
1. Groundwater abstraction	
 **Sustainable Yield**	▪ Over-abstraction of groundwater could cause depletion and degradation of groundwater resource/aquifer ▪ Aquifer degradation/contamination through: ∗ consolidation or chemical change e.g. oxidation ∗ induced inflows of poor-quality water ▪ Abstraction rate higher than recharge rate causes unsustainable yield (limited term of supply) ▪ Financial lost – development cost higher than revenue due unsustainable supply
 **Unfavourable Land Use Changes**	▪ Contamination of groundwater from non-point and point source pollution ▪ Deterioration of groundwater quality
 **Drawdown**	▪ Over-abstraction may reduce groundwater level (quality and quantity) ▪ Eliminate availability of existing groundwater usage (disruption of water supply to domestic users, agricultural or industrial users) ▪ Alters interaction with surface hydrology e.g. reduced stream flow, reduced input to wetlands, lakes, estuaries and the sea ▪ Wetlands dewatering may affect sensitive ecology ▪ Reduced soil moisture levels where groundwater is shallow, affects its ecology and cropping viability ▪ Positive impacts: ∗ reduce surface flooding risk ∗ beneficial drainage e.g. developed wetlands and building foundations
 **Sea Water/ Saline Intrusion**	▪ Excessive groundwater pumping could cause saltwater intrusion in aquifers located near coastline or saltwater layers/bodies ▪ Limited supply of water ▪ May eventually deteriorate groundwater quality making it unsuitable ▪ Increases treatment cost

Table 3.4 (cont'd) Key issues and impacts

ISSUES	IMPACTS
1. Groundwater abstraction (cont'd)..	
 **Land Subsidence/ Ground Settlement e.g. sinkholes**	▪ Decline in groundwater level could cause consolidation and compression of sediments in the ground ▪ In limestone (karstic formation), sinkholes may develop as groundwater is pumped that causes the collapse of the surface layer ▪ Affect stability of structures (buildings, roads and pipelines) on the affected ground ▪ Increase flooding risk, possible permanent flooding at floodplains and coastal areas ▪ Change in surface gradients and drainage patterns may cause increase in drainage maintenance costs ▪ May cause safety hazards to nearby sensitive receptors e.g. houses and buildings collapse ▪ Positive impact – consolidation of soft sediments, increases baring capacity for future construction
2. Water treatment	
 **Effluent**	▪ Discharge of effluent from treatment processes (e.g. backwashing and sludge dewatering) may deteriorate quality of receiving water body ▪ May affect aquatic life
 **Handling of Chemicals for Water Treatment Processes**	Improper handling of chemicals e.g. coagulants (polymer), lime, fluoride, chlorine etc. may pose danger and health risk to human
 **Treated Sludge Disposal**	▪ Could deteriorate quality of receiving water body (improper handling) ▪ Treated sludge may contain accumulated pollutants/ chemical residuals that could contaminate the soil/land ▪ Loss of productive land ▪ Affect the land's aesthetics value ▪ May contaminate groundwater at the disposal area – affect downstream abstractors affected
3. Groundwater pollution	
 **Groundwater Contamination**	▪ Agricultural contaminants (fertilizers and pesticides) and industrial activities (irresponsible storage of chemical, illegal discharge of wastewater etc.) can infiltrate into the groundwater and cause contamination ▪ Will affect the overall groundwater supply and could cause long term contamination (groundwater and soil)

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.

Table 3.5 lists the example of brief descriptions of potential mitigation measures to be implemented.

Table 3.5 Brief description for mitigation measures

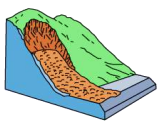
ENVIRONMENTAL IMPACT	BRIEF DESCRIPTION FOR MITGATION MEASURES
 **Ecological**	Confine land clearing and construction activities within the designated working area only
 **Slope Stabilisation and Protection**	Incorporate the slope designs into the measures in the LD-P2M2 shall to ensure slope stability
 **Solid Waste and Scheduled Waste**	Implement best management practices to handle wastes comprise biomass, municipal, construction and demolition and scheduled wastes

Table 3.5 (cont'd) Brief description for mitigation measures

ENVIRONMENTAL IMPACT	BRIEF DESCRIPTION FOR MITGATION MEASURES
 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
 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 Study Requirements for EIA

The scope of the EIA study is dependent on the scale and magnitude of the proposed project. This includes:

01 compatibility with adjacent land uses and ESA; and

02 the type of planning and study approvals as required by other relevant GA.

The relevant studies are listed in *Table 3.6*. However, it should be noted that the list provided is only indicative as site conditions and locations can vary between projects. As such, it is the responsibility of the Qualified Person to assess and verify the applicability and extent of these studies to be conducted for a specific project.

Table 3.6 List of relevant studies to be incorporated in EIA

STUDY REFERENCE	Government Agency
Social Impact Assessment (SIA)	PLANMalaysia
Slope Analysis ▪ Terrain and slope classification	JMG/PWD
Geological Assessment ▪ Geological Terrain Mapping * Erosion * Terrain classification * Terrain component * Construction suitability ▪ Geophysics Study * Groundwater/Aquifer characteristics * Yields of well and aquifers * Hydrogeological assessment	JMG
Erosion and Sediment Control Plan (ESCP)	DID
Traffic Impact Assessment (TIA)	PWD
Health Impact Assessment (HIA)	MOH
Heritage Impact Assessment ▪ Archaeological ▪ Heritage	Department of National Heritage
Wildlife Management Plan (WMP) ▪ Wildlife evacuation plan ▪ Wildlife monitoring plan	DWNP
Topographic survey	JUPEM
Soil Investigation (SI) study	JMG (for submission only)
Emergency Action Plan	BOMBA

3.11
EIA Study Team Members

The EIA study team can be formed upon identifying the environmental issues and impacts of a groundwater development 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 3.5.*

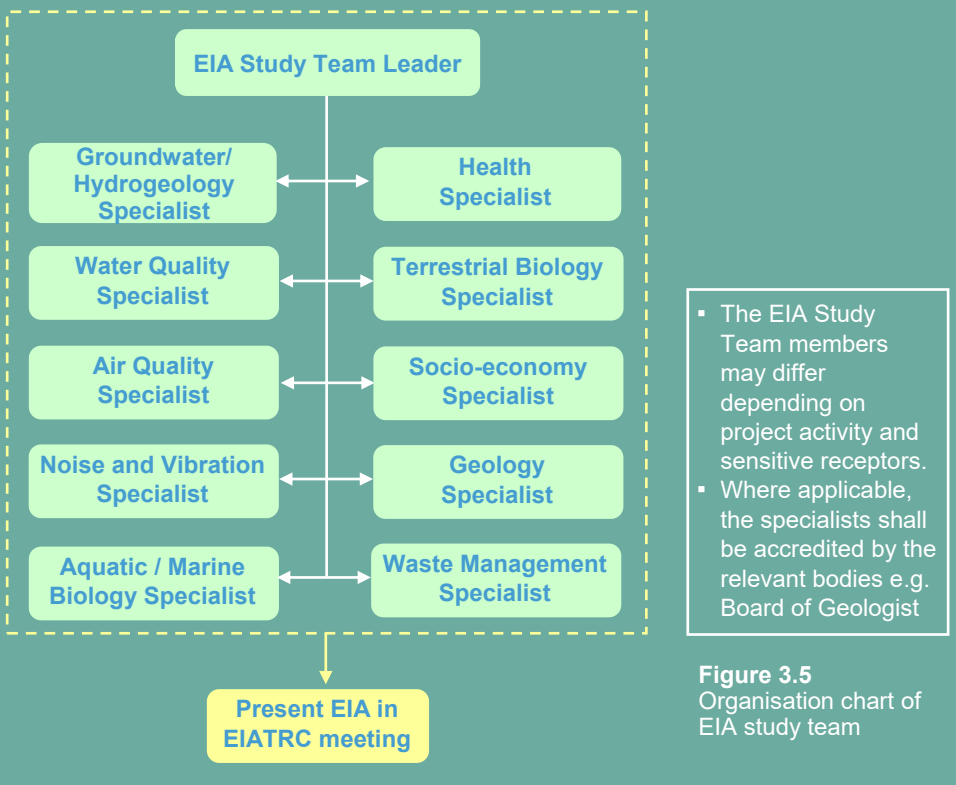


Figure 3.5
Organisation chart of EIA study team

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 components and issues identified during scoping 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

Considering that First Schedule EIA does not require any submission of TOR. The content of Chapter 2: Terms of Reference of EIA Study in the EIA report shall contain Scoping Notes that summarises the findings of the environmental scoping exercise done.

3.12.1 Content for Scoping Notes

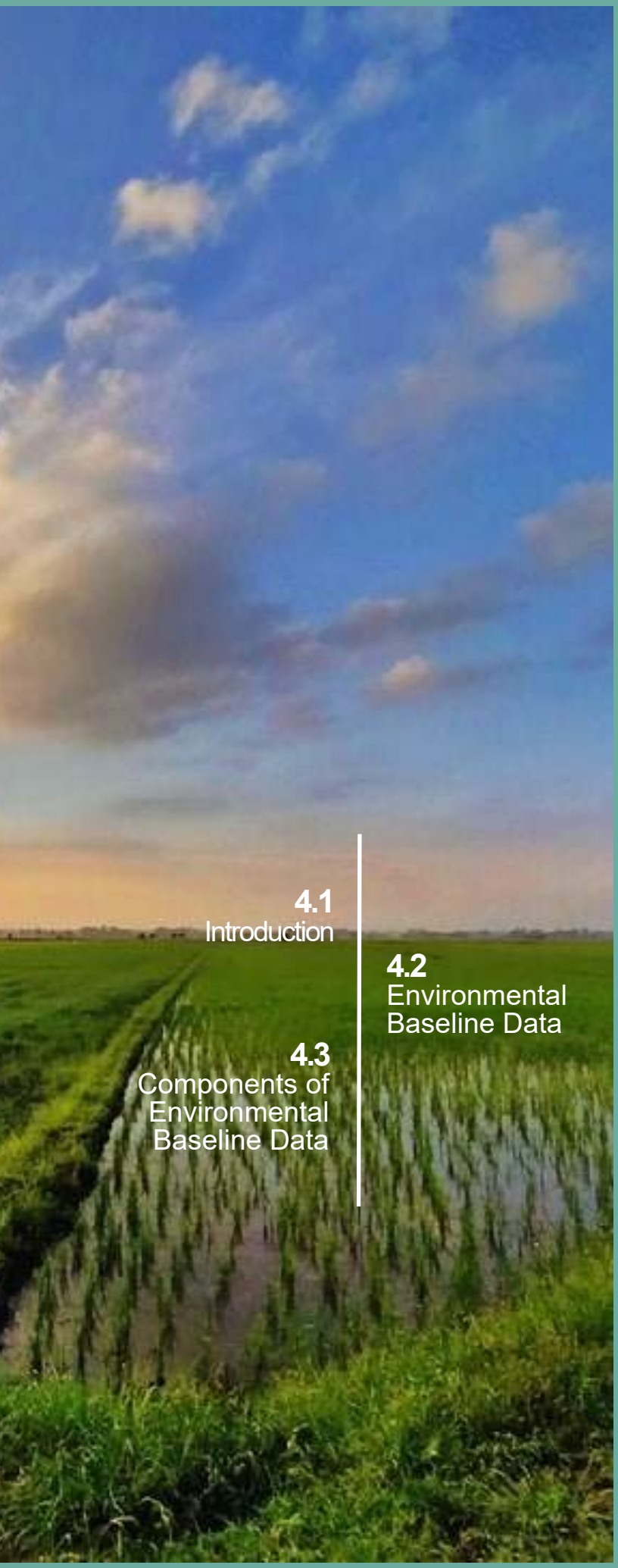
The Scoping Notes shall contain the following:

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).

4

ENVIRONMENTAL BASELINE DATA

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



4.1
Introduction

4.2
Environmental Baseline Data

4.3
Components of Environmental Baseline Data

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

Chapter

4

Environmental Baseline Data

4.1 Introduction

An EIA shall contain a description of the existing environment before the project commences (termed as 'baseline condition') that may or may not be affected directly or indirectly from the project. Objectives for the description on baseline conditions include:

01 identify existing environmental conditions which may influence project design decisions (project layout, project components)

02 identify sensitive issues or areas requiring mitigation or compensation

03 provide input data to numerical models for prediction of impacts

04 provide baseline reference for compensation during project implementation stage

The approach and methodology in obtaining detailed baseline data and technical studies will be described in the EIA report. However, in some cases, the Qualified Person can do a pre-consultation with the DOE, to obtain a consensus to carry out the baseline sampling.

4.2
Baseline Data Collection

There are two types of baseline data namely primary and secondary data which comprise of physico-chemical, biological and human environment. Identifications of ESAs are also defined in this chapter.

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 impact 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 by mainly cover 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 analysed 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 report by the Qualified Person.

Table 4.1 lists 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 requirement 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 3*.

Table 4.1 Recommended baseline sampling requirement for physico-chemical environment

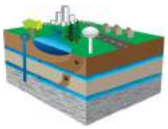
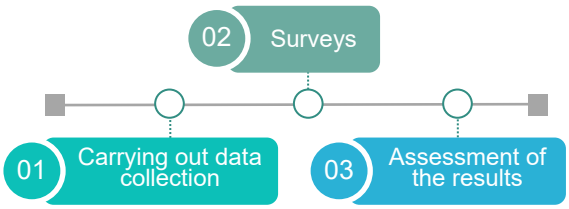
COMPONENT	RECOMMENDED PARAMETER	REFERENCE STANDARD	RECOMMENDED REQUIREMENTS
 Surface Water Quality	As stated in the National Water Quality Standards of Malaysia (NWQS)	National Water Quality Standards of Malaysia (NWQS) (*Attachment 4*)	▪ Upstream and downstream of major rivers, lakes and streams within the ZOI ▪ Multi-depth sampling for deep lakes or rivers ▪ Pesticides testing required for agricultural projects
 Groundwater Quality	As stated in National Groundwater Quality Standards	National Groundwater Quality Standards (drinking water, industry and agriculture) (*Attachment 1*)	Groundwater sampling procedure to follow Standard Operating Procedure practiced by DOE i.e. *Prosedur Operasi Tetap (SOP) Program Pengawasan Kualiti Air Tanah*
 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
 Hydrogeology	Groundwater / Aquifer characteristics	JMG requirements	▪ Geophysics study – 2D Resistivity survey ▪ Exploration well development (to support resistivity survey)
 Soil Characteristics	▪ Particle size distribution ▪ Texture ▪ Organic matter	-	Sampling done within project area and ZOS

Table 4.1 (cont'd) Recommended baseline sampling requirement for physico-chemical environment

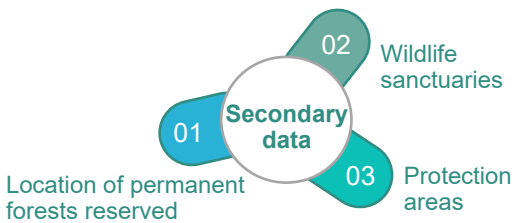
COMPONENT	RECOMMENDED PARAMETER	REFERENCE STANDARD	RECOMMENDED REQUIREMENTS
 Land Use	▪ Land use maps ▪ Photos ▪ Description of existing and future land use (5 km ZOS)	-	-
 Topography	▪ Contour ▪ Elevation ▪ Terrain - slope ▪ Description of existing morphology of the project area e.g. hilly, undulating etc. ▪ Construction suitability map	-	-
 Climate	▪ Climate data (min 5 years): ▪ Rainfall data ▪ Wind rose ▪ Temperature ▪ Description of climate i.e. monsoon	-	-

4.3.2 Biological Environment

The biological environment scope is very wide. Therefore, the relevant agencies such as FDPM and DWNP must be consulted 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**.

For secondary data, it 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.

Other aspects that may affect communities within the vicinity of the project site shall also be considered if they are deemed as significant issues. The requirements may include, but not limited to:

01 public health;

02 heritage and culture and archaeology;

03 ecotourism; and

04 land traffic.

The findings of these studies must be incorporated into the EIA.

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	NA	▪ 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 six main documents namely:

01 Physical plans/policies (NPP/RFZPPN);
02 State plans;
03 Local plans;
04 Planning guidelines (GPPP);
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 Residental 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.

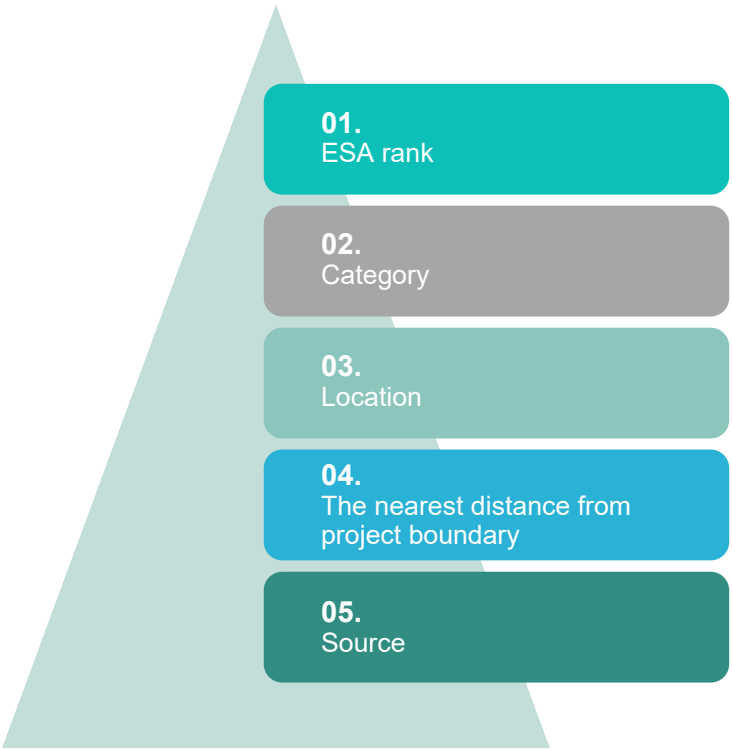
Rank 03

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.

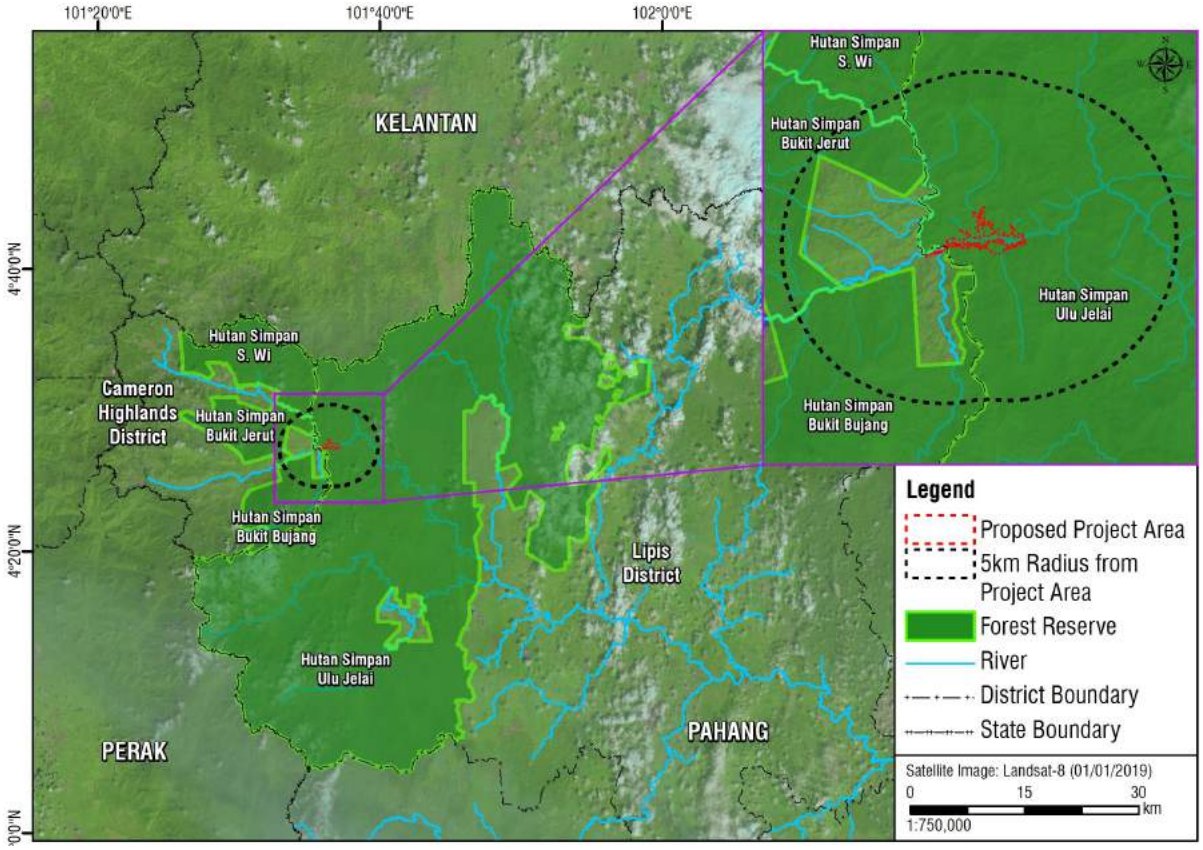


Figure 4.1 Example of ESAs identified at a project site

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 (FDPM, 2011)
		Hutan Simpan Kekal Bukit Jerut	2.0	▪ NPP-3 (PLANMalaysia, 2016) ▪ Katalog Metadata Geospatial (FDPM, 2011)
		Hutan Simpan Kekal Bukit Bujang	1.0	▪ NPP-2 (PLANMalaysia, 2010) ▪ Katalog Metadata Geospatial (FDPM, 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: www.theguardian.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: www.runsociety.com


Source: www.thestar.com.my

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: traveguide.easybook.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

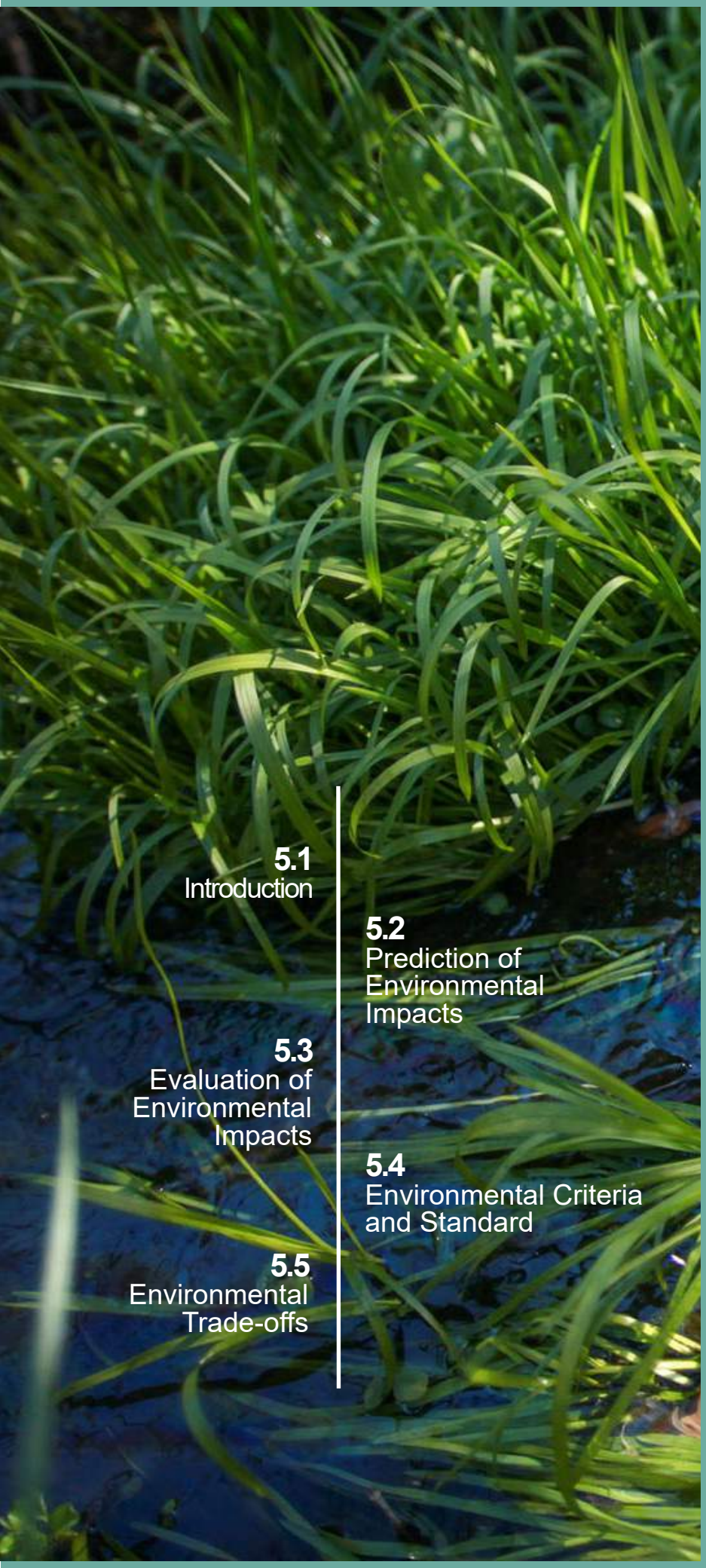
Defined as areas with high risk of natural disasters or casualties if subjected to development or human activities encroachment.


Source: uk.reuters.com

5

EVALUATION OF IMPACTS

Source: chesapeakerbay.net



Source: chesapeakerbay.net

Chapter

5

Evaluation of Impacts

5.1 Introduction

There are various methods to predict and evaluate environmental impacts. Generally, all these methods will assess the impacts of the project against the existing environment (status quo). These impacts are predicted to be caused by project activities during different stages of its implementation.

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

- 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

- 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

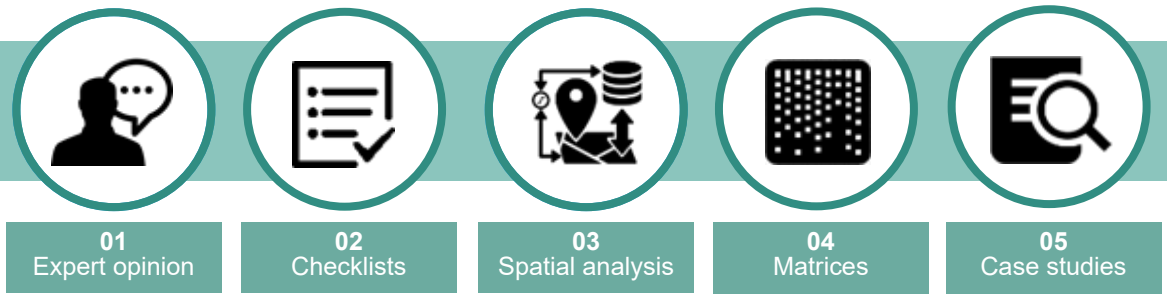
04 Cost-effective and, for any software, can be easily purchased (propriety software and tools can also be used). Widely accepted freeware is acceptable.

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

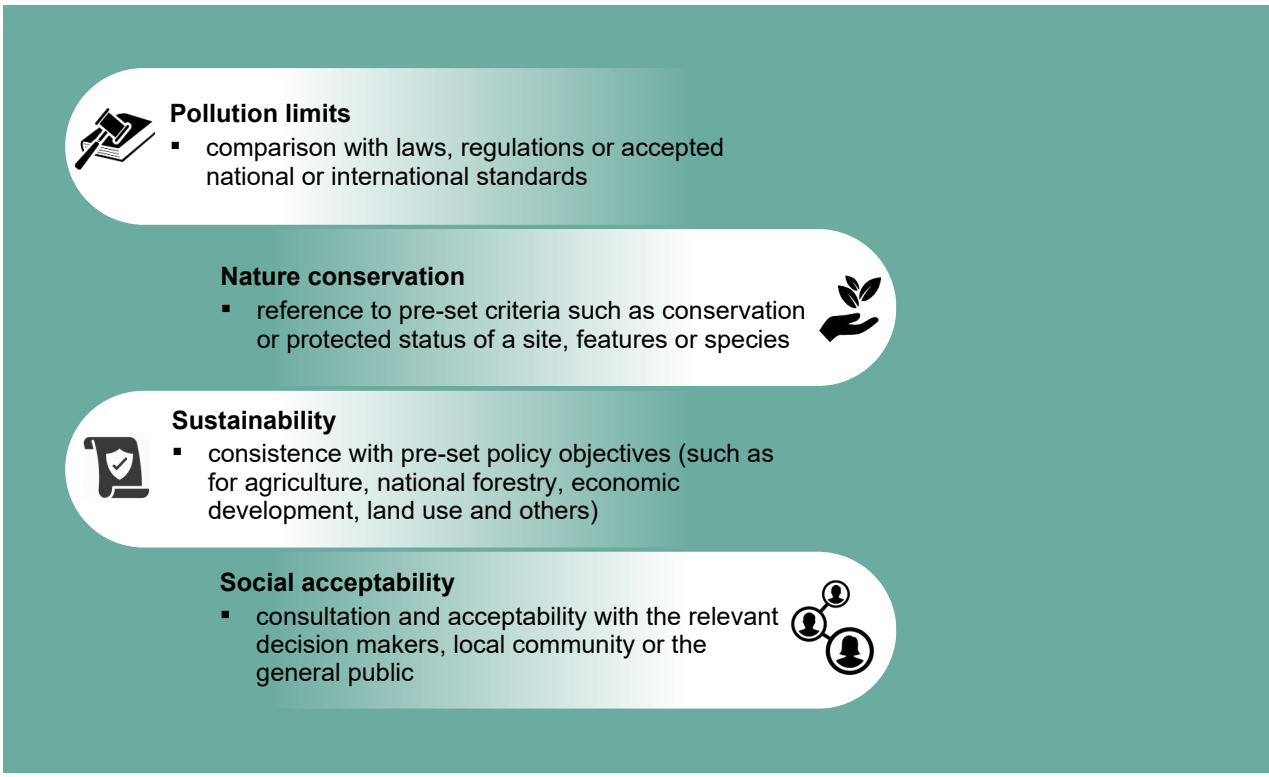
08 Network and system analysis

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:



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)

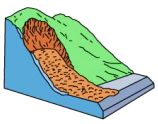
05 Area of impacts (localised versus transboundary):
- localised versus transboundary

06 Probability of cumulative impacts (effects of project on adjacent and downstream land areas and *vice versa*):
- 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 groundwater supply projects.

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	▪ 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
 **Climate**	**Operation Stage** ▪ Site clearing, removing vegetation in impounded areas, access road, etc. ▪ Presence of water body	▪ Loss of carbon sink due to forest clearance ▪ Changes of micro climate due to the presence of impounded water body
 **Erosion and Sedimentation**	Construction Stage ▪ Land disturbing activities ▪ Pollutants of concern: TSS and turbidity	▪ 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)
 **Geotechnical Hazards / Slope Stability**	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 behavior ▪ 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
▪ 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) <u>Output</u> ▪ Estimation of pre-construction and post-construction carbon sink	▪ Determine loss of carbon sink due to vegetation clearance ▪ Determine potential carbon sink of aquatic vegetation (microphyte) in the water body	Identity potential measures to offset the loss of carbon sink
▪ 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 ▪ Run simulation to determine the BMPs that shall be adopted to minimise negative impacts	▪ Adoption of avoidance principles ▪ Identify suitable BMP to incorporated in land-disturbing pollution prevention and mitigation measures (LD-P2M2)
▪ 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
 **Surface 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 chemicals in WTP ▪ Effluent discharge from WTP ▪ Pollutants of concern; e.g. chlorine	▪ Assessment of types and scale of impairment to water quality ▪ Determination of potential sources of pollutants e.g. land clearing, biomass degradation, etc.
 **Hydrology & Hydraulic**	Construction Stage ▪ Land disturbing activities e.g. site clearing, cut and fill	▪ 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
 **Hydrogeology (Groundwater Quality and Quantity)**	Operation Stage ▪ Abstraction of groundwater ▪ Groundwater contamination from agricultural and industrial activities (not caused by the proposed project) e.g. sub-surface waste disposal and seepage of contaminants from rivers and lakes, impoundment of toxic waste on unlined surfaces and excessive use of chemical fertilizers	▪ Assessment of the extent of the aquifer and its recharge area ▪ Assessment of the present abstraction of the groundwater catchment ▪ Estimate the availability of groundwater in the aquifer catchment ▪ Estimate the recharge rate of the aquifer ▪ Transportation of contaminants in the groundwater system
 **Air Quality**	Operation Stage ▪ Major emission (e.g. stack emission)	Identify potential air pollution generating sources

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
▪ 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 Hydrological Procedures and approved by DID ▪ Hydrology analysis taking into account weather extremity due to climate change (rainfall pattern) Output ▪ Estimation of pre-construction and post-construction runoff ▪ Flood map (flood risk map, flood hazard map, flood evacuation 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
▪ Computer models such MIKE SHE, MODFLOW, FEFLOW, MODPATH etc. Output ▪ Groundwater flow (existing and impact of new stresses) ▪ Groundwater recharge and discharge rate ▪ Determine aquifer conditions and its interaction with surface water ▪ Scenarios of groundwater contamination e.g. based on type of contaminants such as dense non-aqueous phase liquid (DNAPL) and light non-aqueous phase liquids (LNAPL)	Use modeling to determine the groundwater condition pre and post project implementation, and overall hydrologic regime within the study area	▪ Hydrogeological system of the project area ▪ Identification of zone of impact and propose mitigation measures ▪ Identification of monitoring requirements (frequency of monitoring, number and location of monitoring)
▪ 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 pollutant at sensitive receptors shall be identified and mitigated

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

ENVIRONMENTAL COMPONENT	SOURCE OF POLLUTION	ASSESSMENT REQUIREMENTS
 **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**	Construction Stage ▪ Piling activities ▪ Vehicle and machineries movement	Assessment of ambient vibration and activities that pose impairment hazards to the workers and nearby sensitive receptors
 **Land Use & Aesthetics**	Construction Stage ▪ Land disturbing activities e.g. site clearing ▪ Construction of buildings	Assessment of the compatibility of the project towards the surrounding land use
 **Waste Management (Biomass, solid waste, scheduled waste)**	Construction Stage ▪ Land disturbing activities e.g. site clearing ▪ Construction activities Operation Stage ▪ Sludge from water treatment	▪ Identify types of waste generated during construction and operations ▪ Assessment of the impacts from these wastes and the required management measures
 **Socio-economy**	Construction Stage ▪ Relocation of settlements ▪ Employment opportunities ▪ Social conflict between foreigners and locals ▪ Nuisance from construction activities; noise and dust Operation Stage ▪ Effluent discharge and sludge from WTP may disrupt economic activity of the community	▪ 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

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 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 <u>Output</u> ▪ 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	▪ Identify the extent of potential impacts to nearby sensitive receptors ▪ Critical levels for pollutant at sensitive receptors shall be identified and mitigated
▪ 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	▪ Identify the extent of potential impacts to nearby sensitive receptors ▪ Critical levels for pollutant at sensitive receptors shall be identified and mitigated
▪ 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 <u>Output</u> ▪ 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
▪ 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 <u>Output</u> ▪ 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) <u>Output</u> ▪ 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

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

ENVIRONMENTAL COMPONENT	SOURCE OF POLLUTION	ASSESSMENT REQUIREMENTS
Safety and Health	Construction Stage ▪ Hazard from construction activities	Assessment of safety and health towards workers and surrounding community
 Traffic	NA	▪ 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.

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 1, 4* to *8*.

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.

PREDICTION METHOD	EVALUATION OF IMPACTS	OUTPUT
▪ Qualitative/quantitative health risk assessment (HRA) encompassing hazard identification, exposure assessment and risk characterisation Output ▪ Potential health impacts to nearby population	▪ 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
▪ Traffic impact assessment e.g. peak traffic flow, junction analysis. ▪ Simulation using SIDRA Output ▪ Comparison of traffic scenarios pre, during and post project and need for road improvement	▪ 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

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
 **Water Quality and Pollution Control**	▪ Ambient water quality: National Water Quality Standards for Malaysia (NWQS) ▪ Sewage discharge: Environmental Quality (Sewage) Regulations 2009 ▪ Toilet and septic tanks: Design and requirements approved by SPAN

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
 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 Guidelines for Environmental Noise Limit and Control (DOE, 2019) ▪ Factories and Machinery (Noise Exposure) Regulations 1989
 Vibration	▪ The Planning Guidelines for Environmental Vibration Limits and Control in the Environment 3rd Edition (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), DWNP and Forestry Department Peninsular Malaysia (FDPR)
 Land Use	▪ Structure Plans, Local Plans, Special Area Plans (RKK) ▪ ESAs ▪ Environmental Essentials for Siting of Industries in Malaysia (EESIM) (DOE, 2017) ▪ Guidelines for Siting and Zoning of Industry and Residential Areas (DOE, 2012) ▪ Local authority requirements
 Land Traffic	▪ Acceptable level of service (LOS) for traffic flows ▪ Local authority/PWD requirements
 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)

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
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

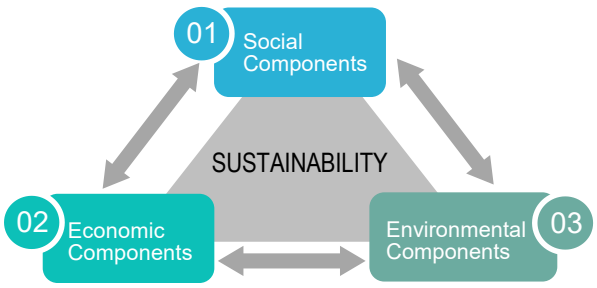
Note: The list is not exhaustive and not all of the above may be relevant to the project. The Project Proponent and Qualified Person shall make reference to the latest standards and requirements by the authorities

5.5 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 for 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

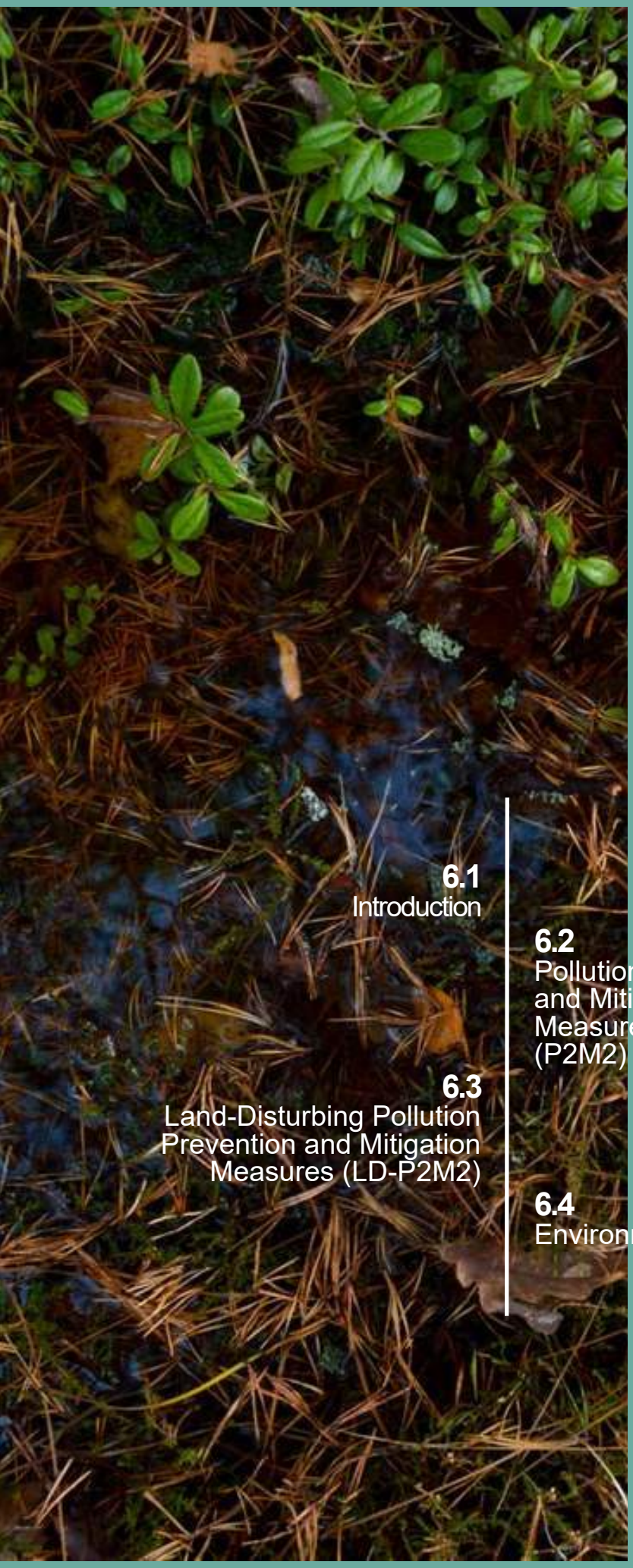
02 the proposed new development will be beneficial in terms of socio -economy as well as spurring the progress of the country.

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**.

6

MITIGATION MEASURES

Source: K8 on unsplash.com



Source: K8 on unsplash.com

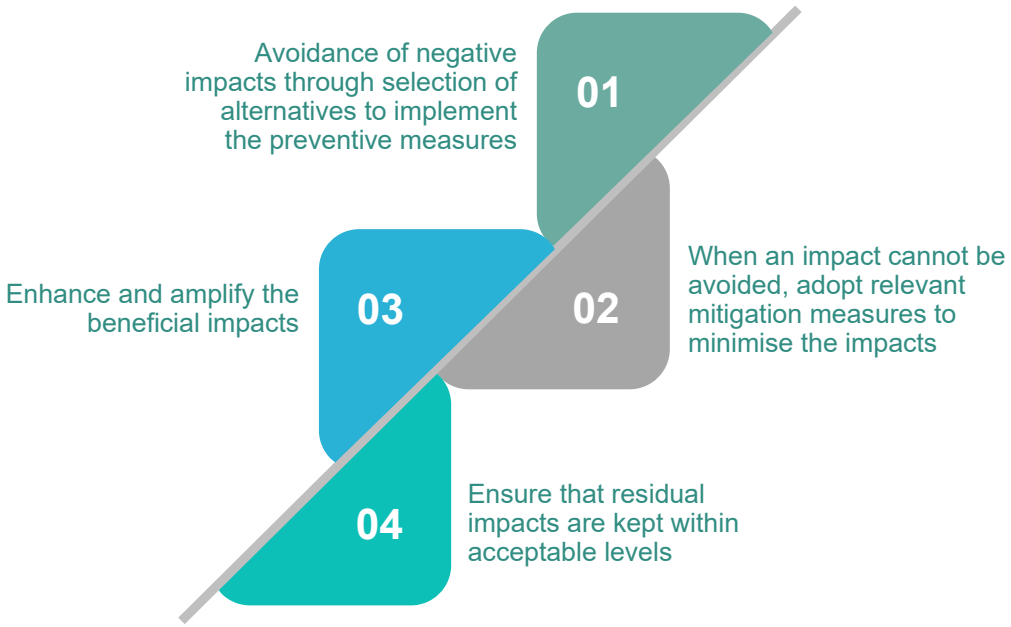
Chapter

6

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.

6.1.1
General Approaches

The key objectives in implementing P2M2s are to reduce environmental degradation and pollution through management measures that are 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: for and from engineering design and calculations for slope reinforcement works on cut slopes; and
- For minor issue, management actions and simple measures need only be highlighted. Example: need for 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 are proposed to introduce newer technology which has been proven effective.

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 applicable P2M2s for construction of groundwater supply development project are listed in *Table 6.1.*

Table 6.1 P2M2 for construction of groundwater development project

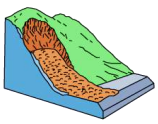
ENVIRONMENTAL ASPECT	SIGNIFICANT POTENTIAL IMPACTS	POLLUTION PREVENTION AND MITIGATION MEASURES
Project Activity: Earthworks		
 Air Quality	▪ Suspension of dust and particulate matter ▪ Exhaust emission	▪ Water-bowsing at exposed surface area ▪ Minimize the exposed area by phasing ▪ Maintain and regularly 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)	▪ Establish proper scheduling and phasing of P2M2 implementation in accordance to 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 ▪ Design retardation/capture structures ▪ to accommodate the calculated runoff volume to allow adequate time for suspended sediments to settle
 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 groundwater development project

ENVIRONMENTAL ASPECT	SIGNIFICANT POTENTIAL IMPACTS	POLLUTION PREVENTION AND MITIGATION MEASURES
Project Activity: Well Construction		
 **Groundwater Pollution & Management**	Well drilling could contaminate the groundwater by its drilling fluid	Use of non-toxic drilling fluids
Project Activity: 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
 **Surface 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

Table 6.1 (cont'd) P2M2 for construction of groundwater development project

ENVIRONMENTAL ASPECT	SIGNIFICANT POTENTIAL IMPACTS	POLLUTION PREVENTION AND MITIGATION MEASURES
Project Activity: Construction Works		
 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.) outside to be within working hour only ▪ Establish grievance mechanisms for disturbance complaints
 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 (FDPM or DWNP) 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 vehicle movements	<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

Table 6.1 (cont'd) P2M2 for construction of groundwater development project

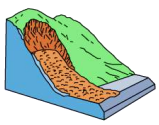
ENVIRONMENTAL ASPECT	SIGNIFICANT POTENTIAL IMPACTS	POLLUTION PREVENTION AND MITIGATION MEASURES
Project Activity: Operation		
 Surface water Pollution	Discharge of pollutants from water treatment plant	▪ Controlled use of chemicals for water treatment ▪ Periodical monitoring of water quality within and surrounding the project area
 Groundwater Pollution & Management	▪ Over abstraction causes drawdown which results: ∗ Disruption of supply to existing users ∗ Impacts on surface hydrology ∗ Reduced stream flow and alters stream flow gain ∗ Reduced inputs to wetlands, lakes and estuaries ∗ Wetland dewatering ∗ Reduced soil moisture levels where ground is shallow ∗ Groundwater quality degradation ∗ Saline intrusion	▪ Cash compensation, provide deeper wells or alternative water supply ▪ Controlled abstraction/pumping rate ▪ Establishment of drawdown limit of the well ▪ Compensation discharges to stream ▪ Outlet weir control of lake and wetland levels ▪ Monitoring of nearby river water level ▪ Monitoring of groundwater level
	▪ Surface activities e.g. industries and agriculture (not from project activities): ∗ Contamination of groundwater and aquifers ∗ Increase treatment cost	▪ Early identification of contaminant sources ▪ Monitoring of groundwater quality based on sensitive receptors identified near the project area and groundwater modeling ▪ Establishment of contingency plan (groundwater and soil remediation)
	▪ Sludge disposal may cause: ∗ Contamination of groundwater and soil at the disposal area	
 Slope Stabilization	Occurrence of slope failures	Slopes are required to be periodically monitored and maintained
 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

Table 6.1 (cont'd) P2M2 for construction of groundwater development project

ENVIRONMENTAL ASPECT	SIGNIFICANT POTENTIAL IMPACTS	POLLUTION PREVENTION AND MITIGATION MEASURES
Project Activity: Operation		
 Waste Management	Generation of solid waste	▪ Adequate bins and disposal sites ▪ Regular disposal services
 Land Subsidence	Safety hazard to affected sensitive receptors	▪ Installation of markers to monitor land subsidence ▪ Controlled abstraction/pumping rate ▪ Reinforcement or removal of any structures affected ▪ Compensation or relocation any structures affected
 Land Contamination	▪ Sludge disposal may cause: * Contamination of soil at the disposal area	▪ Proper management and disposal of sludge ▪ Disposal area to be approved
Project Activity: Abandonment/Decommissioning		
 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
 Groundwater Pollution & Management	Improper closing of abandoned/decommissioned well could contaminate aquifer and groundwater	▪ Proper closure of wells according to State Water Regulatory Body requirements

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 including but not limited to, **SITE CLEARING, LOGGING** or **EARTHWORK**. It refers mainly on the BMPs comprising activities, facilities, measures, planning or procedures used to minimize accelerated erosion and sedimentation as well as other pollutants, and to manage runoff water to protect and maintain the quality of soil, or inland or Malaysia waters, and the existing and designated uses of waters before, during and after land disturbing activities.

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).

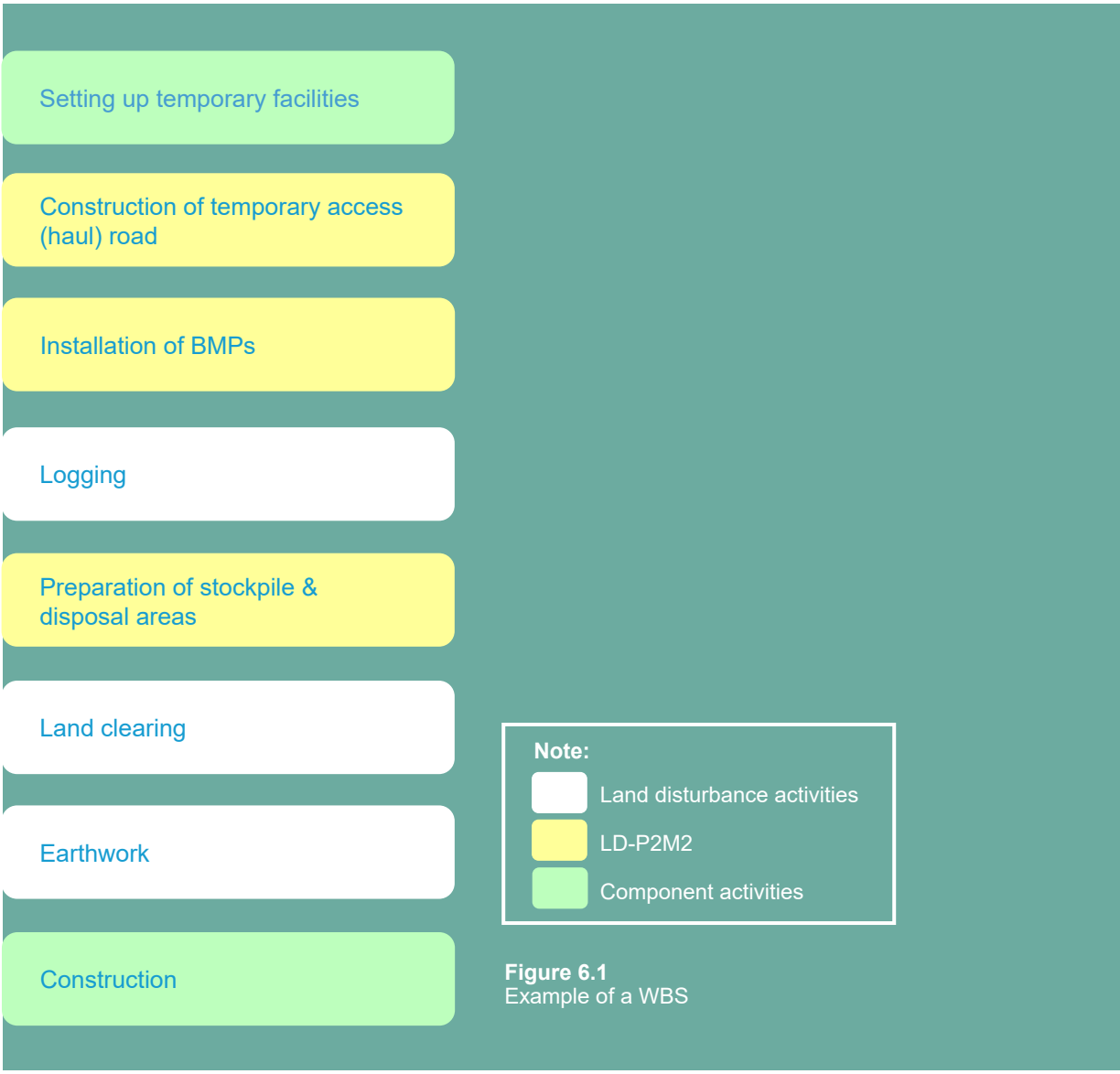


Figure 6.1
Example of a WBS

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 to note 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

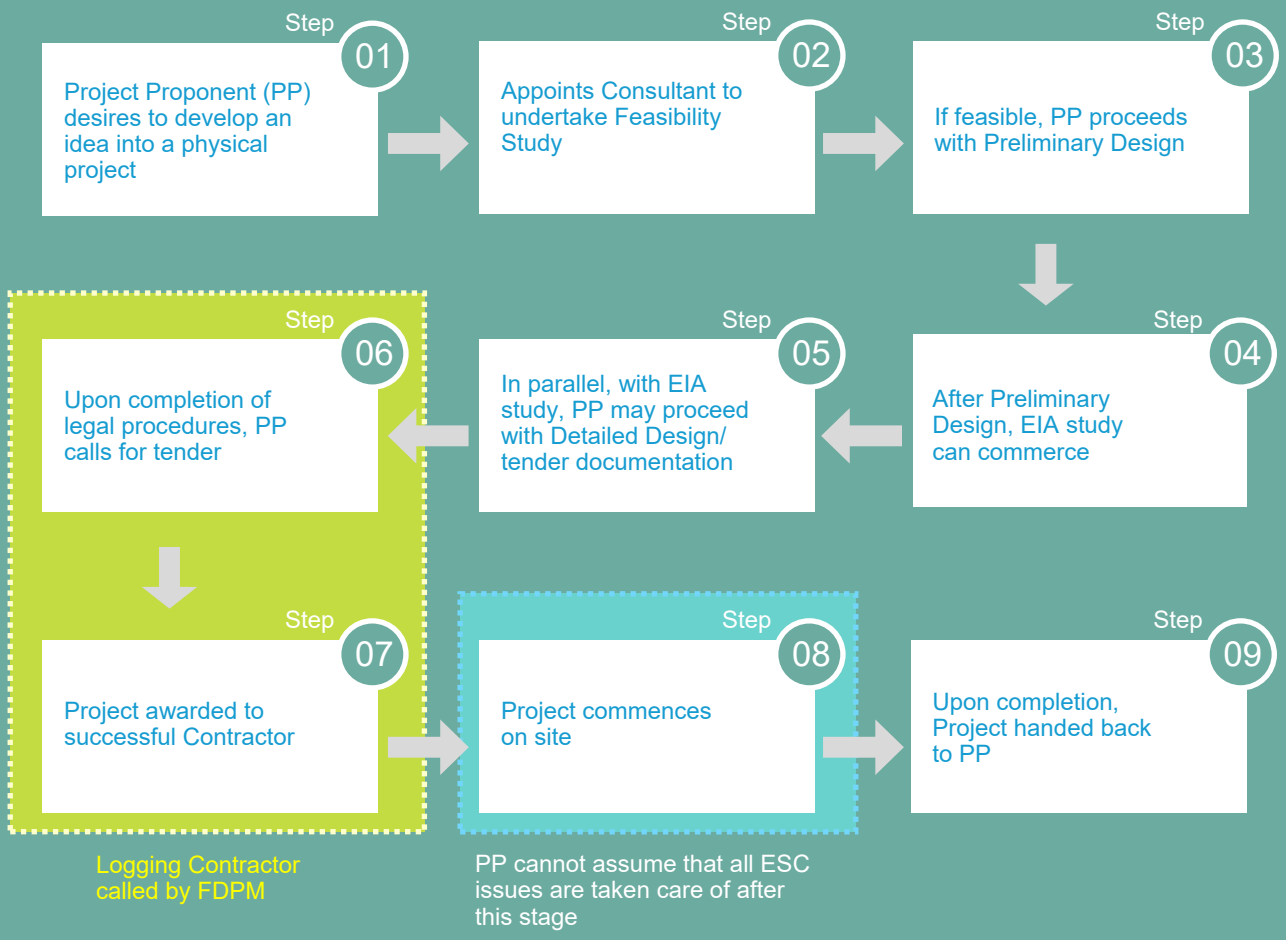
Structural BMPs such as sediment trap, silt fence and Active Treatment System (ATS) can be calculated and engineered. Thus, it can be assumed that all design of structural BMPs will be in accordance to both DOE and DID guidelines.

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 must be executed.

> 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 logging. Logging contractors are appointed by FDPM; 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 logging contractors while actively engaged with FDPM. A coordination committee headed by the State Administration, consist of State DOE, State FDPM, Project Proponent and logging contractor must be established. This can be illustrated in *Figure 6.2* and *Figure 6.3*.



Erosion and Sediment Control (ESC) issues will occur after Step 8, thus a functional and practical Environmental Monitoring Committee (EMC) must be established

Figure 6.2
Obstacle in managing logging contractor under FDPM

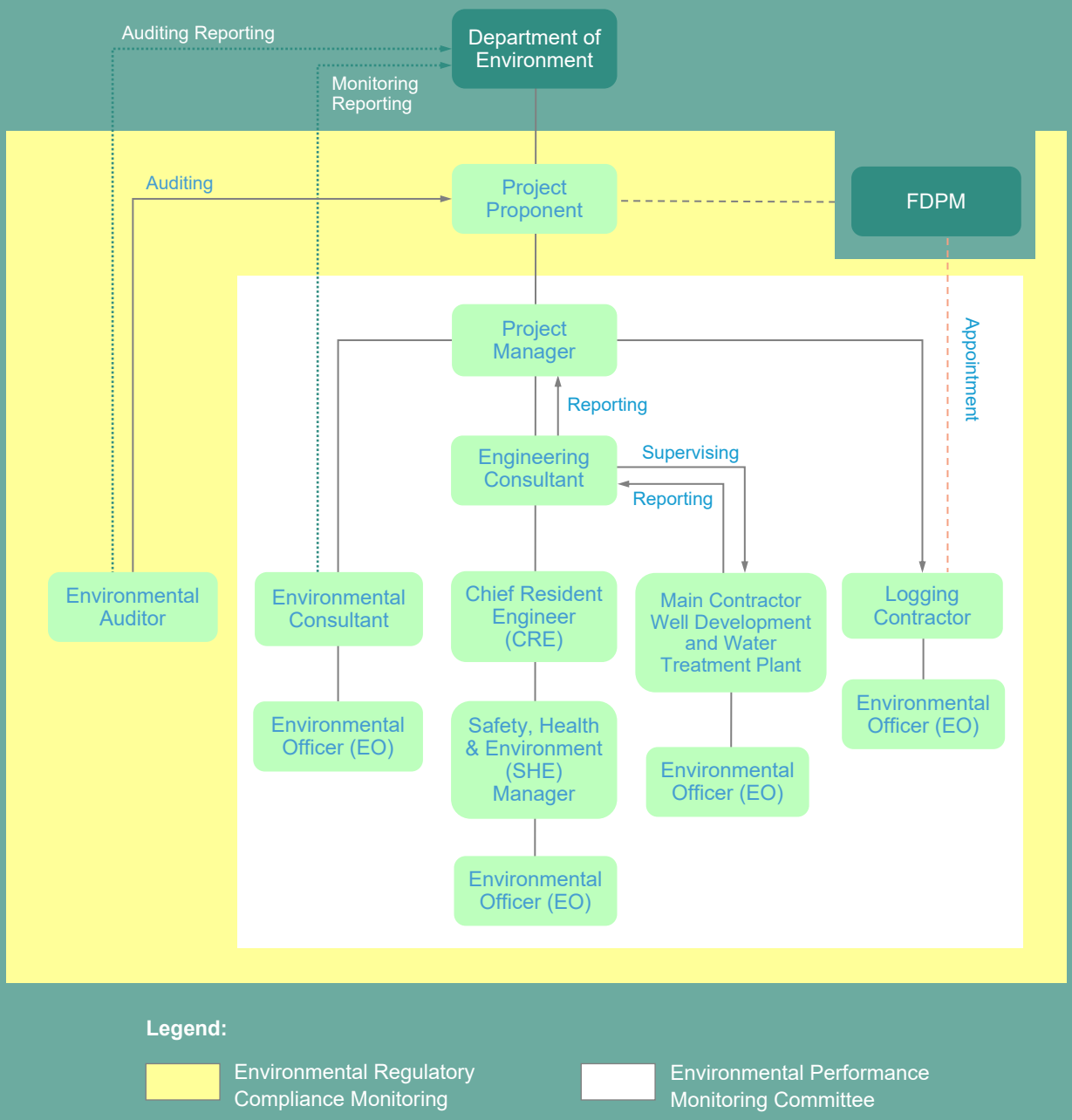


Figure 6.3
Example of an organisation chart of an EMC for projects involving logging activity

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.

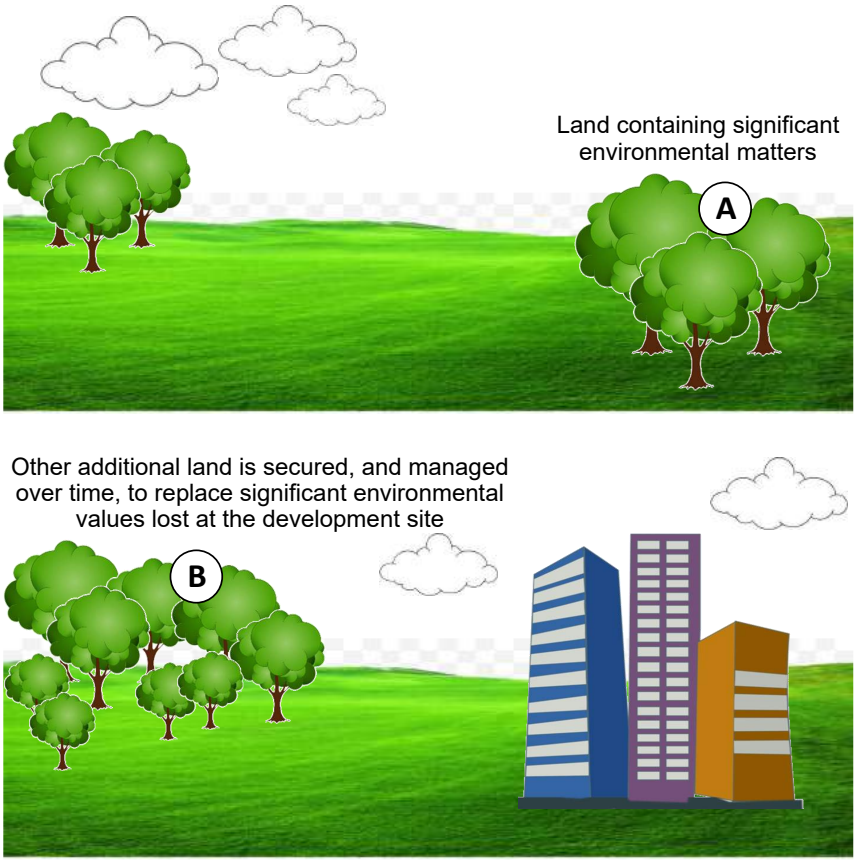


Figure 6.4 Basic concept of providing an environmental offset

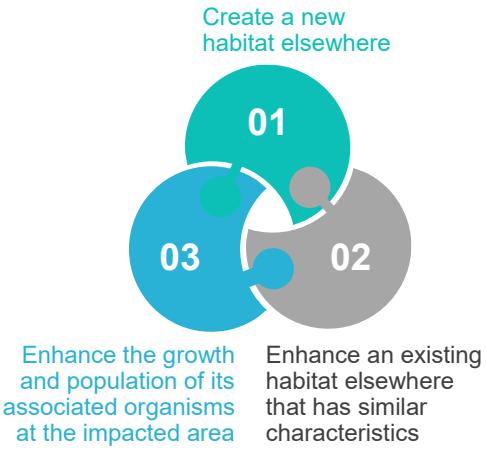
When is an environmental offset required?

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 matter(s). Where appropriate, offsets are considered during the assessment phase of an environmental impact assessment.

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. This 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 stakeholders

Support from stakeholders 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

7

POST-EIA

Laurence on unsplash.com

7.1
Introduction

7.2
Environmental Mainstreaming Agenda and Self-Regulation Culture

7.3
Environmental Mainstreaming Tools

7.4
Roles and Responsibilities during Post-EIA Stage

7.5
Environmental Management Plan

7.6
Environmental Monitoring

7.7
Environmental Audit

7.8
Environmental Sustainability Report

7.9
Environmental Database

Laurence on unsplash.com

Chapter
7

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:

Various means and initiatives can be applied and each stakeholder has a specific role to play in achieving environmental compliance and protection objectives.

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)

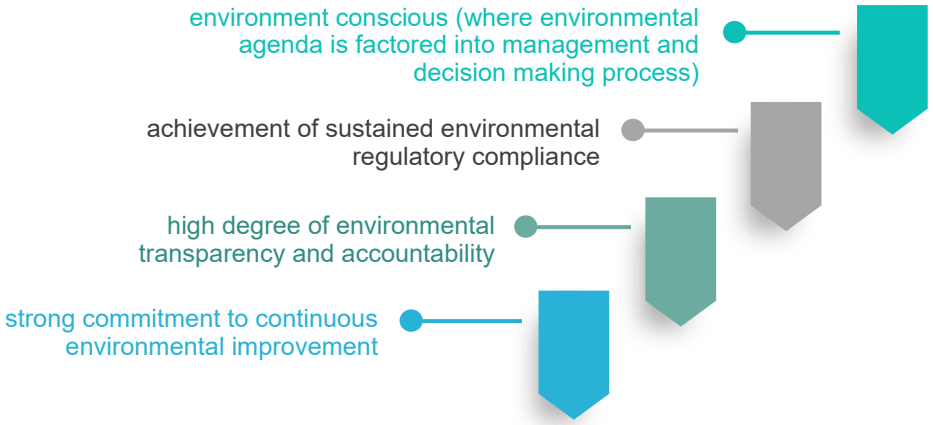
04 Environmental facility (EF)

05 Environmental competency (EC)

06 Environmental reporting and communication (ERC)

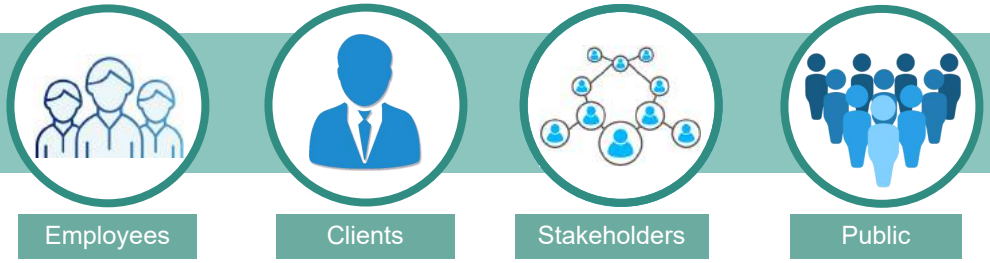
07 Environmental transparency (ET)

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

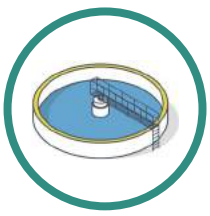
Environmental Performance Monitoring Committee (EPMC)

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

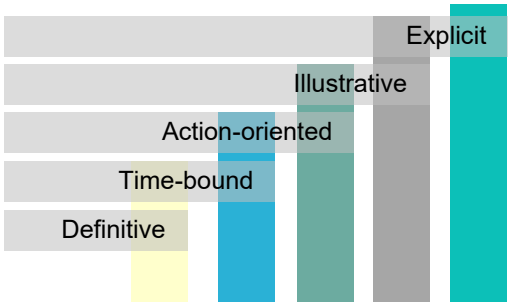
02 Notify the audit visit dates to DOE and the Project Proponent

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.*

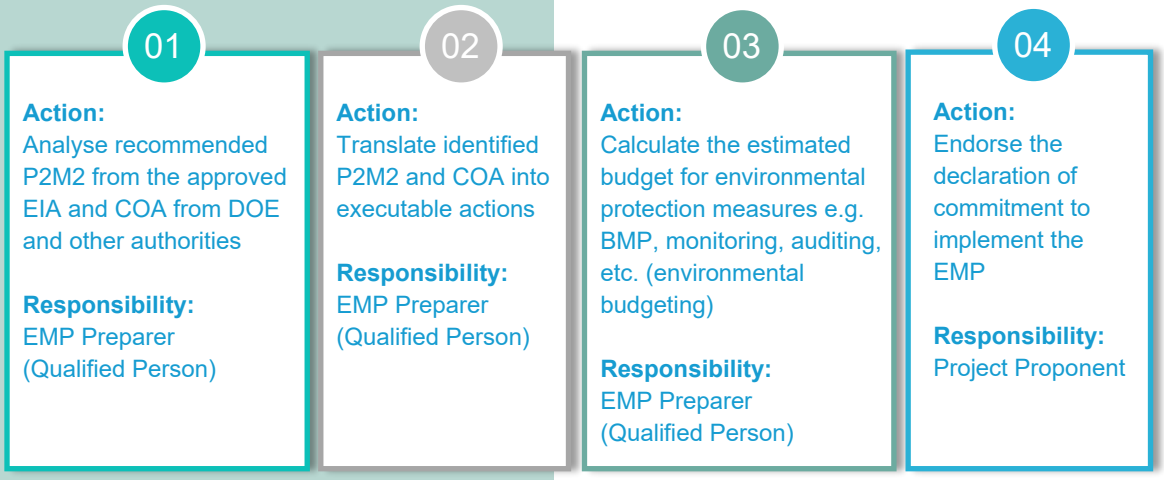


Figure 7.1
Typical steps in EMP preparation

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); and
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. Dept. of Irrigation and Drainage, Dept. of Agriculture, Dept. of Forestry, 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
   - Control P2M2of oil and grease, concrete wash, etc.

f. Control of Air Pollution and Noise
   - Air pollution control 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 is an imperative process during the post-EIA stage. Specifically, 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.

7.6.1.1
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 groundwater 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.


Surface Water Quality


Air Quality


Noise and vibration


Groundwater quality

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.

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 groundwater development 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 for groundwater supply development

CATEGORY	Project Stage		PARAMETER
Sediment Control	During construction		▪ Suspended solids ▪ Turbidity
Ambient Air	During construction		Particulate matter
Noise	During construction		Noise
Vibration	During construction		Vibration (peak particle velocity)
Ambient Surface Water Quality	During construction		As stated in National Water Quality Standards of Malaysia (NWQS)
	During operation		▪ Suspended solids ▪ Turbidity ▪ COD ▪ BOD ▪ Nutrients
Ambient Groundwater Quality	During construction		Major parameters as per Malaysia Groundwater Standard (DOE)
	During operation	Agriculture water supply	Major parameters as per Malaysia Groundwater Standard (DOE)
		Industry water supply	
		Urban (domestic) water supply	All parameters as per Malaysia Groundwater Standard (DOE) and National Standard for Drinking Water Quality
Ambient Groundwater Level	During operation		Groundwater level
Land subsidence	During operation		▪ Ground level survey via establishment of: ∗ Benchmarks and deep datum points (for land surface subsidence) ∗ Installation of borehole extensometer Source: Japan International Cooperation Agency (JICA), 2002 ▪ Shall be in accordance with the relevant JMG's guideline and recommendation.
Hydrology	During operation		River/stream flow rate

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; equal or exceed 12.5 mm)
Boundary of project area	Quarterly
	Quarterly
	Quarterly
Surrounding water bodies	Monthly
Subject to hydrological and hydrogeological assessment (via groundwater modeling) with a minimum of 3 locations: ▪ 1 station - upstream of project area ▪ 2 stations - downstream of project area	Monthly
	Monthly
	Monthly
	Frequency shall vary according to parameters as per MOH's National Standard for Drinking Water Quality (*Attachment 8*)
	Monthly
Shall be in accordance with the relevant JMG's guideline and recommendation.	Yearly
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:

01

Environmental Scanning

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.

02

A Fact Library

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.

03

Financial Viability

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.

8

EIA CHECKLIST

Pahang, Malaysia
Source: Mahmud Ahsan on unsplash.com

Pahang, Malaysia
Source: Mahmud Ahsan on unsplash.com

Chapter
8

EIA Checklist

8.1 Introduction

This chapter provides checklists to assist the Qualified Person in preparing the EIA report.

The checklist must be filled in and incorporated at the front of the EIA report. Besides the Qualified Person, these checklists can also be used by the EIATRC as a reference.

The checklists is as per *Table 8.1*.

Table 8.1 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**				

Table 8.1 Checklists for EIA

ITEM		ADEQUACY CHECK		PAGE	REMARKS
		YES	NO		
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)				
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				

Table 8.1 (cont'd) Checklists for EIA

	ITEM	ADEQUACY CHECK		PAGE	REMARKS
		YES	NO		
7.1	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)				
8.0	**Evaluation of Impacts**				
8.1	Detailed assessment of impacts during:				
	a) Pre-construction Stage				
	i. Hydrogeological/ Geophysics (e.g. 2D resistivity) Survey				
	▪ Clearing of pathways to access project site and proposed testing location				
	▪ Drilling test wells				
	▪ Pumping test				
	ii. Topographical survey				
	▪ Clearing of pathways to access project site				
	▪ Introduction of surveyor at site				
	iii. Land acquisition				
	▪ Acquire land				
	▪ Resettlement of affected occupants				
	iv. Site clearing				
	▪ Construction of temporary access road				
	▪ Installation of BMPs e.g. erosion and sediment control and stockpile area				
	▪ Removal of biomass and top soil				

Table 8.1 (cont'd) Checklists for EIA

	ITEM	ADEQUACY CHECK		PAGE	REMARKS
		YES	NO		
8.1	v. Biomass management				
	▪ Stockpiling of biomass and topsoil				
	▪ Biomass disposal				
	b) Construction Stage				
	i. Temporary Occupation				
	▪ Construction of temporary buildings e.g. workers' quarters, storage facilities and working areas				
	▪ Installation of water supply facility				
	▪ Solid and scheduled waste disposal				
	▪ Sewage disposal				
	▪ Workforce				
	▪ Pest control				
	▪ Machine servicing & maintenance				
	▪ Resources abstraction – logging, mining				
	ii. Well Construction				
	▪ Well drilling				
	▪ Well development and pumping test				
	▪ Operating equipment (drilling rigs, tankers, compressors, generators)				
	iii. Construction of Water Treatment Plant				
	▪ Construction of infrastructure and ancillary facilities				
	▪ Construction of treatment plant modules including reservoir/storage tank				
	iv. Construction of Conveyance System				
	▪ Trenching / Excavation works				
	▪ Overlaying of pipes				
	▪ Realignment with existing services				
	▪ Filling / Compaction				
	▪ Inspection, testing and commissioning of pipelines				
	▪ Connection with existing conveyance systems				
	v. Demobilisation				
	▪ Demobilisation and removal of temporary buildings				
	▪ Waste removal/ disposal including rubbish, equipment and liquid wastes e.g. drilling fluid				
	▪ Rehabilitation of occupied site				
	c) Operational Stage				
	i. Groundwater abstraction, treatment and supply				
	▪ Pumping rate				
	▪ Drawdown				
	▪ Conveyance of water for irrigation/ industry/ domestic usage				

Table 8.1 (cont'd) Checklists for EIA

ITEM		ADEQUACY CHECK		PAGE	REMARKS
		YES	NO		
8.1	ii. Maintenance				
	▪ Well screen test pumping and replacement/reconditioning				
	▪ Pump replacement/reconditioning				
	▪ Treatment system replacement/ reconditioning				
	iii. Effluent disposal				
	▪ Direct discharge/ reuse/ recycle into the system				
	vii. Sludge disposal				
	▪ Transportation of sludge to disposal area				
	v. Decommissioning - Abandonment				
	▪ Well closure or abandonment				
	▪ Disconnection from conveyance system				
	▪ Demolition and removal of structure				
	▪ Transportation and disposal of construction waste				
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 8.1 (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**				

9

EIA REPORT FORMAT

Source: tribune. reloaded.s3.amazonaws.com

Source: tribune. reloaded.s3.amazonaws.com

Chapter
9

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*.

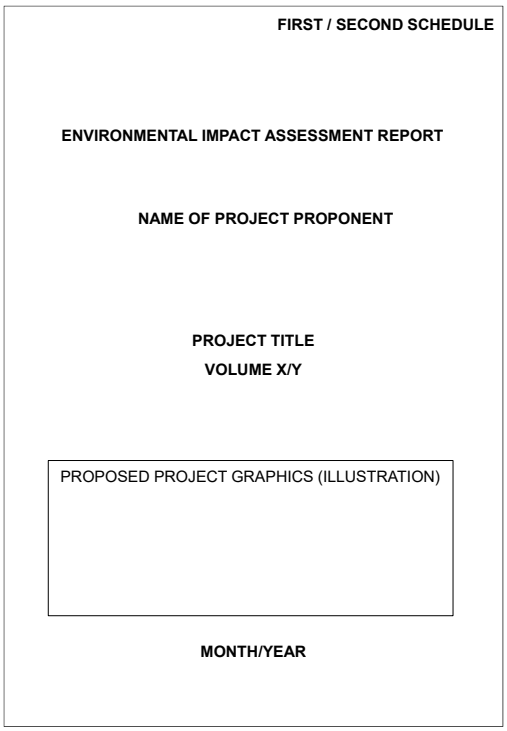


Figure 9.1
Format for EIA report cover

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. Provide Scoping Notes.

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; and
- Relevant public engagement documents such as list of attendance, meeting minutes, photographs, etc.

References

Air Kelantan Sdn. Bhd. (2020, October 1). Retrieved from Proses Rawatan Air: https://airkelantan.com.my/proses-rawatan-air/#/

AusAID. (2008). ASEAN Marine Water Quality Management Guidelines and Monitoring Manual. Australia: Australian Marine Science and Technology Ltd. (AMSAT).

BIS. (2000). Methods for Measurement of Air Pollution, Part 14: Guidelines for Planning the Sampling of Atmosphere. New Delhi: Bureau of Indian Standards.

California Department of Water Resources. (2020, October 3). *California Department of Water Resources*. Retrieved from Urban Water Use Efficiency: https://water.ca.gov/Programs/Water-Use-And-Efficiency/Urban-Water-Use-Efficiency

Centers for Disease Control and Prevention. (2020, October 2). *Centers for Disease Control and Prevention*. Retrieved from Agricultural water: https://www.cdc.gov/healthywater/other/agricultural/index.html

Department of Water Affairs and Forestry. (1996). *South African Water Quality Guidelines.* Retrieved from South African Water Quality Guidelines (SAQW) Volume 3: Industrial Use.

DES. (2018). Monitoring and Sampling Manual: Environmental Protection (Water) Policy. Brisbane: Department of Environment and Science Government.

DID. (2001). Guidelines for Rivers and River Reserves. Department of Irrigation and Drainage Malaysia.

DID. (2012). Urban Stormwater Management Manual for Malaysia Second Edition. Kuala Lumpur: Department of Irrigation and Drainage Malaysia.

DOE. (1993). Buku Panduan Kawasan Sensitif Alam Sekitar Malaysia. Kuala Lumpur: Department of Environment Malaysia.

DOE. (2007). The Planning Guidelines for Environmental Noise Limits and Control. Putrajaya: Department of Environment Malaysia.

DOE. (2007). The Planning Guidelines for Vibration Limits and Control in the Environment. Putrajaya: Department of Environment Malaysia.

DOE. (2016). Environmental Impact Assessment (EIA) Guidelines in Malaysia. Putrajaya: Department of Environment Malaysia.

DOE. (2017). Guidelines On Land Disturbing Pollution Prevention And Mitigation Measures LDP2M2. Putrajaya: Department of Environment Malaysia.

DOE. (2019). Air Quality Standards. Retrieved from Department of Environment Malaysia Web Site: https://www.doe.gov.my/portalv1/en/info-umum/english-air-quality-trend/108

DOE. (2019). Malaysian Marine Water Quality Standards and Index. Putrajaya: Department of Environment Malaysia.

DOE. (2019). National Water Quality Standards for Malaysia. Kuala Lumpur: Department of Environment Malaysia.

DOE. (2019). *Standard dan Indeks Kualiti Air Tanah Malaysia.* Kementerian Tenaga, Teknologi, Sains, Alam Sekitar dan Perubahan Iklim.

https://greensborowellrepair.com/home-inspector/

https://redhoallah.blogspot.com

https://seismicconsolidation.com/wp-content/uploads/2020/02/Lec-9-Week6Water-supply-Components.pdf

http://tjn04.blogspot.com/2016/

https://travelguide.easybook.com/destinations/melaka-sultanate-palace/

https://tribune.com.pk/story/1561387/industrial-effluent-affecting-underground-water-quality-experts-say

https://uk.reuters.com/news/picture/flash-floods-kill-five-in-malaysia-army-idUKKBN1D50TL

https://www.airbnb.com/experiences/1459408modal=PHOTOS&modalItem=949296967

https://www.criver.com/products-services/safety-assessment/toxicology-services/field-trials

https://www.google.com.my/chesapeakebay.net_groundwater_issues_image.jpg

https://www.ppic.org/blog/groundwater-act-locally-think-sustainably/

https://www.ransprings.com/services_category/our-services/page/2/

https://www.runsociety.com/news/coral-bay-run-2015-running-vacay-on-enchanting-pangkor-island-yes-please/

https://www.theguardian.com/environment/gallery/2010/apr/22/new-species-heart-of-borneo

https://www.thestar.com.my/news/nation/2018/03/15/putrajaya-spent-more-than-rm10bil-on-water-in-selangor-says-kettha

https://www.thestar.com.my/news/nation/2020/04/25/thanks-to-mco-sungai-melaka-is-green-and-clean

https://unsplash.com/photos/bI3P6ykNvFc

https://unsplash.com/photos/EHQSYK8nbXY

https://unsplash.com/photos/p748YrXbsug

https://unsplash.com/photos/RwfR1SCFhjo

https://unsplash.com/photos/ZX3GKFAhizQ

https://www.waterlossasia.com/langat-2/

Kementerian Kesihatan Malaysia. (2004). *National Standard for Drinking Water Quality.* Engineering Services Division Ministry of Health Malaysia.

Kementerian Kesihatan Malaysia. (2013). *Garispanduan Permohonan Lesen Punca Air Minuman Berbungkus dan Air Mineral Semulajadi Bagi Maksud Perdagangan atau Perniagaan.*

Lenntech. (2020, October 1). *Water Treatment Solutions*. Retrieved from Process water: https://www.lenntech.com/applications/process/process.htm

Malaysia. (2012). *Environmental Quality Act 1974.*

Malaysia. (2015). *Environmental Quality (Prescribed Activities)(Environmental Impact Assessment) Order 2015.*

Malaysia. (2017). *Town and Country Planning Act 1976.*

PLANMalaysia. (2012). National Physical Coastal Zone Plan. Kuala Lumpur: PLANMalaysia.

PLANMalaysia. (2016). Rancangan Fizikal Negara 3. Kuala Lumpur: PLANMalaysia.

PLANMalaysia. (2017). Manual Penilaian Impak Sosial Bagi Projek Pembangunan Edisi Ke-2. Kuala Lumpur: PLANMalaysia.

Sealand Electric Pumps. (2020, October 3). *Sealand Electric Pumps*. Retrieved from Getting your own borehole well: http://www.sealand.co.za/pumps/getting-your-own-borehole-well/

South African Water Quality Guidelines (SAWQG), Volume 3: Industrial Use

State of Queensland. (2020). *Environmental Offsets Act 2014.*

Survey, U. G. (2018)., General Introduction for the “National Field Manual for the Collection of WaterQuality Data". Virginia: U.S. Geological Survey.

United States Environmental Protection Agency. (2020, October 1). *U.S. Environmental Protection Agency*. Retrieved from Superfund Groundwater Introduction: https://www.epa.gov/superfund/superfund-groundwater-introduction

United States Geological Survey (USGS). (2020, October 2). *U.S. Geological Survey*. Retrieved from Industrial Water Use: https://www.usgs.gov/special-topic/water-science-school/science/industrial-water-use?qt-science_center_objects=0#qt-science_center_objects

United States Geological Survey. (1988). *Definitions of Selected Ground-Water Terms, Revision and Conceptual Refinements.* Washington, D.C.: U.S. Government Printing Office.

United States National Ground Water Association (USNGWA). (2020, October 1). *United States National Ground Water Association (USNGWA)*. Retrieved from Groundwater Fundamentals: https://www.ngwa.org/what-is-groundwater/About-groundwater

This page has been intentionally left blank.

Attachment 1

Malaysia Groundwater Standard and Index (DOE, 2019)

ATTACHMENT 1

Malaysia Groundwater Standard and Index (DOE, 2019)

Standard Kualiti Air Tanah Bagi Rawatan Air Mentah Secara Konvensional

(Air Minuman)

PARAMETER	UNIT	STANDARD
Total Coliform	MPN/100 mL	5,000
E coli	MPN/100 mL	5,000
Kekeruhan	NTU	1,000
Warna	TCU	300
pH	-	5.5 - 9.0
Suhu	°C	Normal ± 2
Konduktiviti	µS/cm	1,000[#]
Jumlah Nilai Ambang	mg/L	1,500
Klorida	mg/L	250
Ammonia	mg/L	1.5
Nitrat	mg/L	10
Besi	mg/L	1.0
Fluorida	mg/L	1.5
Kekerasan	mg/L	500
Mangan	mg/L	0.2
COD	mg/L	10
MBAS	mg/L	1.0
BOD	mg/L	6
Nitrit	mg/L	0.4[#]
Raksa	mg/L	0.001
Kadmium	mg/L	0.003
Arsenic	mg/L	0.01
Sianida	mg/L	0.07
Plumbum	mg/L	0.05
Kromium	mg/L	0.05
Kuprum	mg/L	1.0
Zink	mg/L	3.0
Natrium	mg/L	250
Sulfat	mg/L	250
Selenium	mg/L	0.01
Perak	mg/L	0.05

Note:

* Aldrin / Dieldrin, DDT, Heptachlor, Methoxyclor, Lindane, Chlordane, Endosulfan, hexachlorobenzene, 2,4,5 - T, 2,4 – D, 2,4 - DB, Alachlor, Aldicarb, Carbofuran, MCPA, Permethrin

[#] Diambil dari *Class IIA, National Water Quality Standards*

Standard Kualiti Air Tanah Bagi Rawatan Air Mentah Secara Konvensional
(Air Minuman)

PARAMETER	UNIT	STANDARD
Magnesium	mg/L	150
Minyak	mg/L	0.3
Racun Perosak (Pesticides)	mg/L	0.00003 - 0.03*
Fenol	mg/L	0.002
Nikel	mg/L	0.05
Gross alpha	Bq/L	0.1
Gross beta	Bq/L	1.0

Note:
* Aldrin / Dieldrin, DDT, Heptachlor, Methoxyclor, Lindane, Chlordane, Endosulfan, hexachlorobenzene, 2,4,5 - T, 2,4 – D, 2,4 - DB, Alachlor, Aldicarb, Carbofuran, MCPA, Permethrin
\# Diambil dari *Class IIA, National Water Quality Standards*

Standard Kualiti Air Tanah untuk Kegunaan Pertanian

PARAMETER	UNIT	STANDARD	KEGUNAAN BERFAEDAH
Aluminium	mg/L	5.0	Kegunaan Pertanian
Arsenik	mg/L	0.1	Kegunaan Pertanian
Kadmium	mg/L	0.01	Kegunaan Pertanian
Kromium	mg/L	0.1	Kegunaan Pertanian
Kuprum	mg/L	0.2	Kegunaan Pertanian
Mangan	mg/L	0.2	Kegunaan Pertanian
Nikel	mg/L	0.2	Kegunaan Pertanian
Natrium	me/L	3.0 (SAR^1 < 3)*	Kegunaan Pertanian
Klorida	me/L	4.0	Kegunaan Pertanian
Zink	mg/L	2.0	Kegunaan Pertanian
Boron	mg/L	0.7	Kegunaan Pertanian
Konduktiviti	µS/cm	700	Kegunaan Pertanian
Nitrat & Nitrit	mg/L	100	Ternakan
Sulfida	mg/L	1,000	Ternakan
TDS	mg/L	3,000	Ternakan

Note:
* miliequivalent per litre
[1] Sodium Absorption Ratio
SAR dikira berdasarkan persamaan berikut: SAR = Na/ square root of Ca + Mg/2 (semua di dalam me/L)

Standard Kualiti Air Tanah untuk Kegunaan Industri

PARAMETER	UNIT	STANDARD
Keaklian	mg/L	300
COD	mg/L	30
Klorida	mg/L	100
Besi	mg/L	0.3
Mangan	mg/L	0.2
pH	mg/L	6.5 - 8.0
Silika	mg/L	20.0
Sulfat	mg/L	200
TDS	mg/L	450
SS	mg/L	5
Jumlah Kekerasan	mg/L	250

Kategori Indeks Kualiti Air Tanah Kebangsaan (IKAT)

INDEKS	KATEGORI	POTENSI PENGGUNAAN
0 - 29	Sangat tercemar	Tinjauan diperlukan sebelum kegunaan
30 - 50	Tercemar	Pengairan
51 - 74	Sederhana	Air mentah / Penggunaan industri
75 - 90	Bersih	Berpotensi sebagai air minuman, **TERTAKLUK** kepada pematuhan semua parameter yang disenaraikan dalam piawaian Kualiti Air Minum di bawah Kementerian Kesihatan Malaysia
>90	Sangat bersih	Air berkualiti tinggi bagi semua bentuk penggunaan, **TERTAKLUK** kepada piawaian kualiti air yang ditetapkan untuk setiap bentuk penggunaan

Attachment 2

Project Description

ATTACHMENT 2
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. ▪ Groundwater well. ▪ Water treatment plant. ▪ Sludge disposal area. ▪ Reservoir tank. ▪ Distribution pipeline. ▪ Quarry and construction materials. ▪ Other associated works.
Project concept	▪ Detailed explanation on the selected type of groundwater development, its capacity and purpose. ▪ Process flow diagram. ▪ Lifespan of the groundwater 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. ▪ Sewerage. ▪ 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 3

Procedures for Sampling Practices

ATTACHMENT 3
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
Ex-situ water quality sampling: 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.	**In-situ water quality sampling:** (Refer to surface water column) **Ex-situ water quality sampling:** 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.

This page has been intentionally left blank.

Attachment 4

National Water Quality Standards for Malaysia (DOE, 2019)

ATTACHMENT 4

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 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

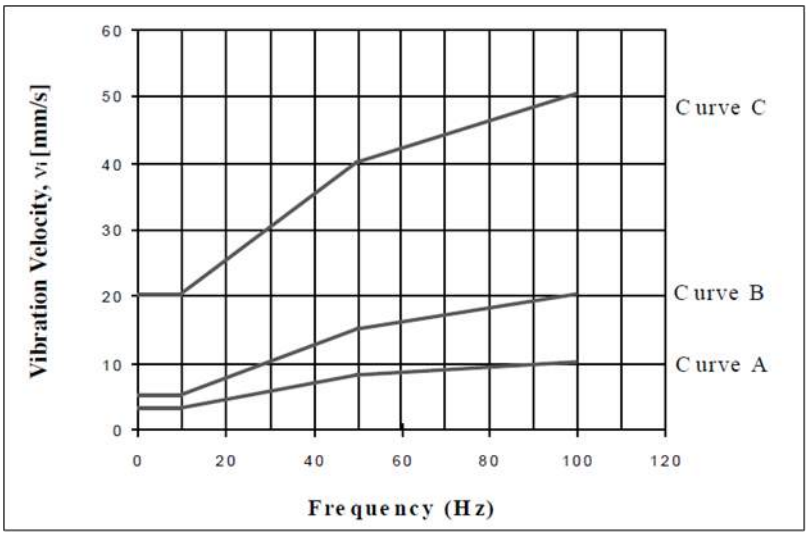


FIGURE 1
Foundation vibration velocity limiting values for vectorial sum of vibration levels in three orthogonal axes

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

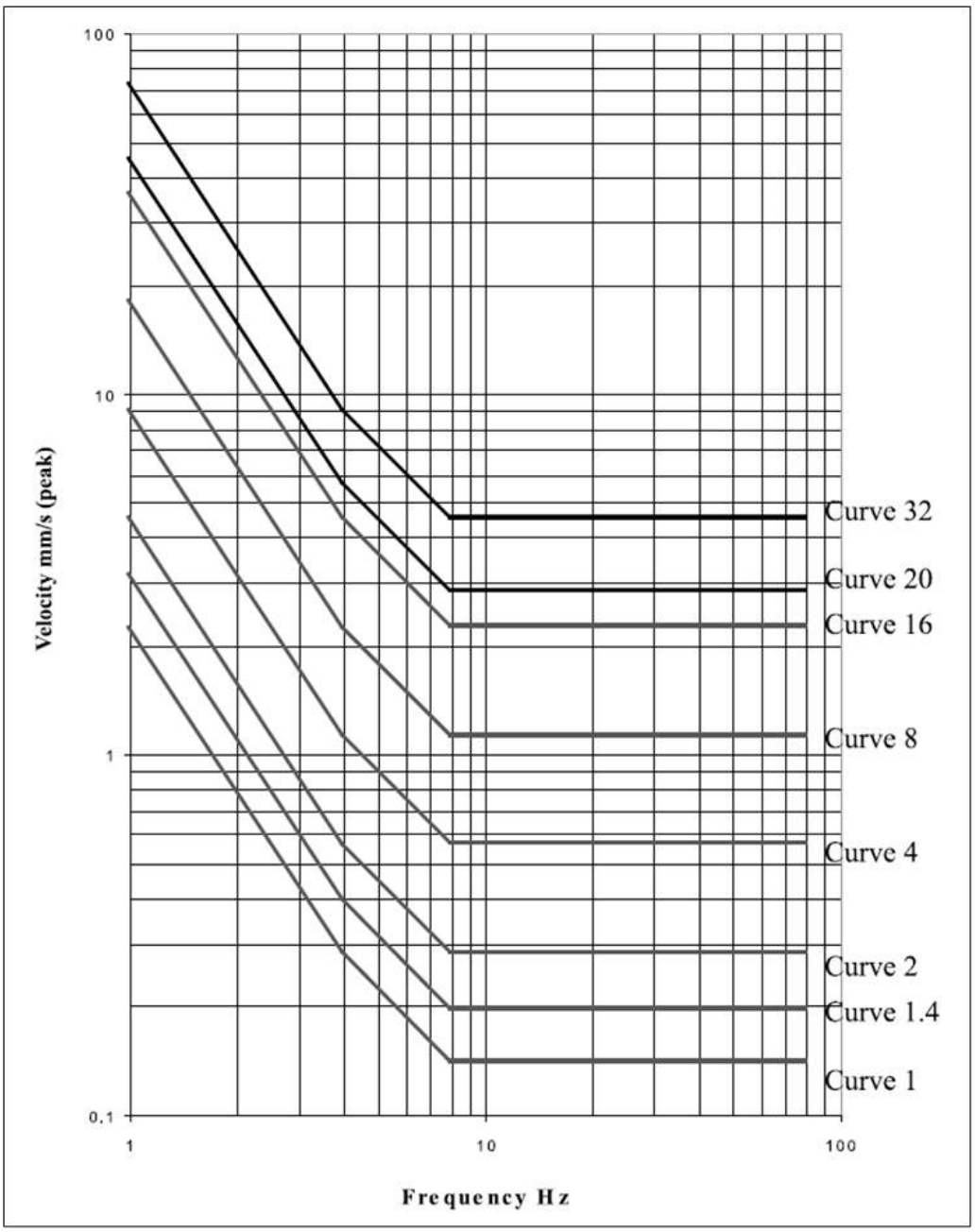


FIGURE 2
Building vibration z-axis curves for peak velocity

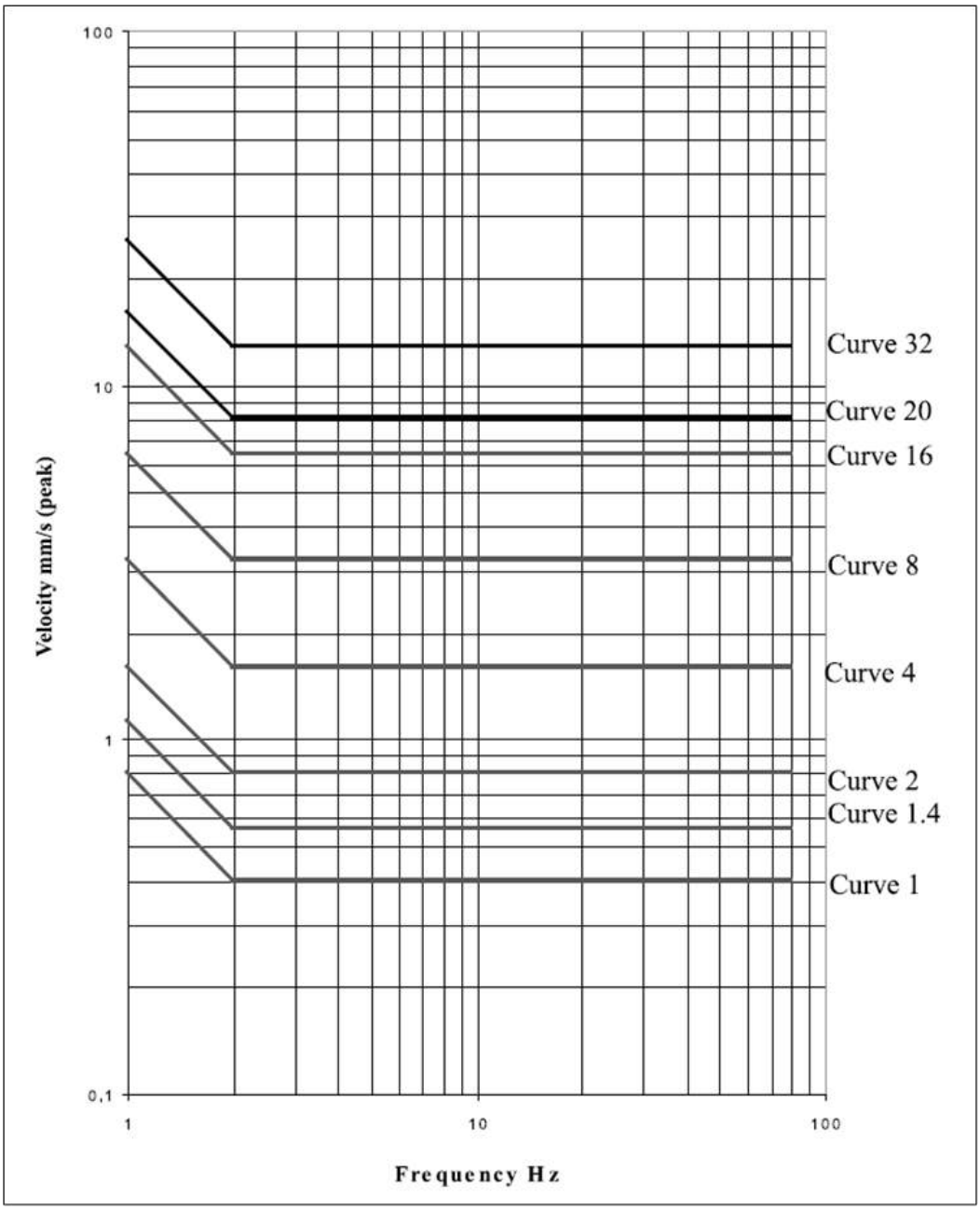


FIGURE 3
Building vibration x and y-axis curves for peak velocity

Attachment 8

National Standard for Drinking Water Quality (MOH, 2004)

ATTACHMENT 8

National Standard for Drinking Water Quality (MOH, 2004)

Recommended Raw Water Quality Criteria
and Frequency of Monitoring

NO	PARAMETERS	COLUMN I	COLUMN II			COLUMN III
		ACCEPTABLE VALUE	FREQUENCY TO BE MONITORED			SOURCE OF REFERENCE
		mg/l (unless otherwise stated)	Surface	Ground	Direct Impounding	
Group I						
1	Total Coliform	5,000 MPN/100 ml or cfu/100ml	W	M	M	WHO1
2	Turbidity	1,000 NTU	W	M	M	WHO2
3	Colour	300 TCU	W	M	M	WHO1
4	pH	5.5 - 9.0	W	M	M	MAL
Group II						
1	Total Dissolved Solids	1,500	M	Y/4	Y/4	WHO1
2	Biological Oxygen Demand	6	M	Y/4	Y/4	WHO1
3	Chemical Oxygen Demand	10	M	Y/4	Y/4	WHO1
4	Chloride	250	M	Y/4	Y/4	MAL
5	Anionic Detergent MBAS	1.0	M	Y/4	Y/4	WHO1
6	Ammonia (as N)	1.5	M	Y/4	Y/4	WHO1
7	Nitrate (as N)	10	M	Y/4	Y/4	MAL
8	Iron (as Fe)	1.0	M	Y/4	Y/4	MAL
9	Fluoride	1.5	M	Y/4	Y/4	WHO1
10	Hardness	500	M	Y/4	Y/4	MAL
11	Manganese	0.2	M	Y/4	Y/4	WHO1
Group III						
1	Mercury	0.001	Y/4	Y/4	Y/4	MAL
2	Cadmium	0.003	Y/4	Y/4	Y/4	MAL
3	Selenium	0.01	Y/4	Y/4	Y/4	WHO1
4	Arsenic	0.01	Y/4	Y/4	Y/4	MAL
5	Cyanide	0.07	Y/4	Y/4	Y/4	MAL
6	Lead	0.05	Y/4	Y/4	Y/4	MAL
7	Chromium	0.05	Y/4	Y/4	Y/4	WHO1
8	Silver	0.005	Y/4	Y/4	Y/4	MAL

W : indicates parameters to be monitored at least once a week
M : indicates parameters to be monitored at least once a month
Y/4 : indicates parameters to be monitored at least once in 3 months
Y : indicates parameters to be monitored at least once a year
WHO1 : Refers to WHO International Standards for Drinking Water 1963
WHO2 : Refers to WHO Guidelines for Drinking Water Quality Vol. 1 & 2 1984
MAL : Refers to values adapted for Malaysian conditions

Notes:
Collection of samples of both raw and treated water for examination for toxic substances should be carried out more frequently if values above the acceptable values are known to be present in the source of supply, or where such potential pollution exists.

Recommended Raw Water Quality Criteria
and Frequency of Monitoring

NO	PARAMETERS	COLUMN I	COLUMN II			COLUMN III
		ACCEPTABLE VALUE	FREQUENCY TO BE MONITORED			SOURCE OF REFERENCE
		mg/l (unless otherwise stated)	Surface	Ground	Direct Impounding	
Group III						
9	Copper	1.0	Y/4	Y/4	Y/4	MAL
10	Magnesium	150	Y/4	Y/4	Y/4	MAL
11	Sodium	200	Y/4	Y/4	Y/4	MAL
12	Zinc	3	Y/4	Y/4	Y/4	MAL
13	Sulphate	250	Y/4	Y/4	Y/4	MAL
14	Mineral Oil	0.3	Y/4	Y/4	Y/4	MAL
15	Phenol	0.002	Y/4	Y/4	Y/4	WHO1
Group IV						
	Organochlorine Pesticides:					
1	Aldrin/Dieldrin	0.00003	Y/4	Y/4	Y/4	MAL
2	DDT	0.002	Y/4	Y/4	Y/4	MAL
3	Heptachlor & Heptachlor Epoxide	0.00003	Y/4	Y/4	Y/4	MAL
4	Methoxychlor	0.02	Y/4	Y/4	Y/4	MAL
	Non-Organochlorine Pesticides:					
5	Hexachlorobenzene	0.001	WN	Y/4	Y/4	MAL
6	Lindane	0.002	Y/4	Y/4	Y/4	MAL
7	Chlordane	0.0002	Y/4	Y/4	Y/4	MAL
	Herbicides:					
8	2,4-D (Dichlorophenoxyacetic Acid)	0.03	WN	Y/4	Y/4	MAL
Group V						
	Radioactivity:					
1	Gross α	0.1 Bq/l	WN	WN	WN	MAL
2	Gross β	1.0 Bq/l	WN	WN	WN	MAL
Total = 40 Parameters						

W : indicates parameters to be monitored at least once a week
M : indicates parameters to be monitored at least once a month
Y/4 : indicates parameters to be monitored at least once in 3 months
Y : indicates parameters to be monitored at least once a year
WHO1 : Refers to WHO International Standards for Drinking Water 1963
WHO2 : Refers to WHO Guidelines for Drinking Water Quality Vol. 1 & 2 1984
MAL : Refers to values adapted for Malaysian conditions

Notes:
Collection of samples of both raw and treated water for examination for toxic substances should be carried out more frequently if values above the acceptable values are known to be present in the source of supply, or where such potential pollution exists.