ENVIRONMENTAL ESSENTIALS FOR SITING OF INDUSTRIES IN MALAYSIA (EESIM)

OCTOBER 2017

Department of Environment, Malaysia
Ministry of Natural Resource and Environment Malaysia

DEPARTMENT OF ENVIRONMENT, MALAYSIA

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Special thanks to the Technical Committee comprising of PLANMalaysia, the DOE management and DOE officers, for their continuous contribution and input for the successful implementation of this guidance document.

"Environmental Conservation, Mutual Responsibility"

PREFACE

The first edition of the *'Guidelines for the Siting and Zoning of Industries'* was developed by the Department of Environment in 1976 for the purpose of providing guidance to industries, when selecting a site, for the setting up of a manufacturing or industrial facility. A revised edition of the guidelines was introduced in 1994 and later in 2012, the Guidelines was given a facelift and reintroduced as *'Guidelines for the Siting and Zoning of Industries and Residential Areas'* with the aim of reinforcing site selection with due consideration of application of the latest process technologies and environmental pollution control technologies.

The **Environmental Essentials for Siting of Industries In Malaysia (EESIM)** is the fourth edition of the documentation in this series developed by the Department of Environment.

The **EESIM** serves as a **guidance document** for Project Developers, when selecting a suitable site for the setting up of a manufacturing or industrial facility. Proposed industrial activity shall be sited within an industrial estate and be developed and managed with environmentally- sound control measures. In considering the suitability of the proposed site, the site of interest is evaluated in terms of its compatibility with respect to the gazetted Structure and Local plans, surrounding land use, provision of set-backs or buffer zones set by PLANMalaysia (Jabatan Perancangan Bandar Dan Desa), the capacity of the area to receive additional pollution load, and waste disposal requirements.

The long-term sustainability of a project is best assured by incorporating the latest developments in process and pollution control technology to ensure cleaner production systems during the life cycle of the industrial facility. The focus of the Department of Environment is now on the industrial facility's adoption of best available technologies for pollution control, once the selected site meets the criteria set by the gazetted structure/local plans.

As the project planning spans over various aspects and legal jurisdictions, it is recommended that EESIM to be read with other planning legislations since EESIM is to assist the relevant planning agencies and Local Authorities in evaluating planning applications from Project Developers for such industrial projects and/or activities.

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

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LIST OF ABBREVIATIONS

APCS	Air Pollution Control Systems
BATs	Best Available Technology
BMP	Best Management Practices
BNM	Bank Negara Malaysia (Central Bank of Malaysia)
CP	Cleaner Production
DID	Department of Irrigation and Drainage (Jabatan Pengairan dan Saliran)
DO	Development Order
DOE	Department of Environment
DOSH	Jabatan Keselamatan dan Kesihatan Pekerjaan / Department of Occupational Safety and Health
EIA	Environmental Impact Assessment
EIP	Eco-Industrial Park
EGIM 2016	Environmental Impact Assessment Guidelines in Malaysia 2016
EMP	Environmental Management Plan
EMT	Environmental Mainstreaming Tools
EO	Environmental Officer
EPMC	Environmental Performance Monitoring Committee
EQA 1974	Environmental Quality Act 1974
ERCMC	Environmental Regulatory Compliance Monitoring Committee
EESIM	Environmental Essentials for Siting of Industries in Malaysia
GOM	Government of Malaysia
GSR	Guided Self-Regulation
HAZOP	Hazard and Operability Study
ICT	Information and Communications Technology
IETS	Industrial Effluent Treatment System
IWK	Indah Water Konsortium
JPBM	Jabatan Perkhidmatan Bomba Malaysia / Fire and Rescue Department of Malaysia
KM	Kebenaran Merancang
LA	Local Authority
m	Meter
MIDA	Malaysian Industrial Development Authority
MOH	Ministry of Health
MRF	Material Recovery Facility
NAHRIM	National Hydraulic Research Institute of Malaysia
n.e.c.	Not elsewhere classified
NPP	National Physical Plan
NPP-3	National Physical Plan-3

NSDC	National SME Development Council
OSC	One Stop Centre
PLANMalaysia	PLANMalaysia (Jabatan Perancang Bandar dan Desa / Department of Town and Country Planning)
P2M2	Pollution Prevention and Mitigation Measures
QRA	Quantitative Risk Assessment
R&D	Research and Development
RM	Ringgit Malaysia
SME	Small and Medium Enterprises
SSP	State Structure Plans
TM	Telekom Malaysia
TNB	Tenaga Nasional Berhad
TOR	Terms of Reference
WN	Written Notification
WQI	Water Quality Index

1 INTRODUCTION

In promoting environmentally sound and sustainable development, the Government of Malaysia has established the necessary legal and institutional arrangements such that environmental factors are considered at the early stages of project planning. A properly sited industrial land or an industrial activity is vital in creating a healthy, safe and sustainable environment. Appropriate attention must be given during the selection of an industrial site to avoid or minimise environmental conflicts which would otherwise arise as a result of incompatibility in land use between the proposed project or activity and its neighbour(s). Before an industrial project is planned, care must be taken in ensuring the proposed site location is suitable for its purpose and any environmental concerns must be addressed either by design and/or planning. Avoidance of conflict(s) through proper siting, and more importantly, with consideration of environmental controls and pollution prevention is important for long-term sustainability of an industrial activity. This would help to reduce unnecessary investment costs that may be required especially on pollution control and to improve public perception of the project or activity.

The '**Environmental Essentials for the Siting of Industries in Malaysia**' (EESIM), is intended as a guidance document, to assist project owners and stakeholders of their planning and decision making, on the suitability of a site for an industrial activity which has potential to impact the environment. The key aspect being emphasized here is during the planning stage of a project, all environmental considerations must be addressed by complying to the requirements of the *Environmental Quality Act 1974* and its accompanying legislations, while focusing on current trends and practices with the provision of processes that minimises pollution generation and/or better technologies for pollution control.

1.1 GUIDANCE DOCUMENT PURPOSE AND COVERAGE

The purpose of the Guidance Document is to assist Project Proponents of industrial projects and activities in determining:

- suitable siting location for their industrial activity,
- placement of industries according to land use planning zones, and
- provision of necessary environmental controls based on existing environmental conditions around the site and pollution potential of the process technology.

This document provides **guidance for an industrial siting with the consideration of environmental criteria**, on par with the economic and social factors. The Guidance Document covers projects applicable under the purview of Department of Environment (DOE), specifically within the jurisdictions of the *Environmental Quality Act 1974* (EQA 1974) and its accompanying legislations.

1.2 APPLICABILITY OF GUIDANCE DOCUMENT

The Guidance Document is applicable for those activities that are defined as “industries”, “manufacturing”, “industrial activities” and activities that have potential to generate pollutant(s) in form of emission release and/or discharges from its activities, that are harmful to the human receptors and surrounding environment.

This Guidance Document is applied to industrial activities listed below:

a. New manufacturing or processing industry to be located within newly designated industrial estates;
b. New manufacturing or processing industry to be located within greenfield areas that has been earmarked or designated for industrial activity;
c. New manufacturing or processing industry located within designated industrial estates or in existing industrial areas or industrial estates; and
d. Expansion of existing manufacturing or processing industry within a designated industrial area or estate.

This Guidance Document can also be applied for development of a new industrial area or estates.

There are some non-industrial activities which are highly polluting (henceforth referred to as “polluting activity”) and shall be covered under this Guidance Document. These non-industrial activities include:

a. Facilities for waste management including waste recovery, recycling, treatment and disposal;
b. Facilities for power generation utilising fossil fuel, liquid and solid fuels, and alternative fuels such as municipal solid waste, scheduled waste, biomass (wood, agriculture wastes, etc.);
c. Facilities for stand-alone and/or centralised treatment of water, wastewater and sewage treatment;
d. Facilities for animal slaughter and/or abattoir (centralised or stand-alone); and
e. Extraction and production of natural resources such as minerals and rocks, sand, limestone, etc.

The key common characteristic of the industrial and non-industrial activities listed above, are their propensity to generate high pollution loads, breaching the immediate environment’s ability to cope, dissipate or absorb this load. The persistently high pollution loads along with the impact of the other sources of pollution from the surrounding will have a significant detrimental impact on the surrounding air, water and soil. As these activities are built to operate for long-protracted periods, high levels of accumulating pollutants can be a serious concern, leading to severe degradation of the environment.

The Guidance Document may also be adopted for special activities, such as industries which have very high likelihood of causing significant loss of life or damage due to

incidents like fire and explosions including the manufacturing or utilisation of highly explosive material or combustible chemicals.

Table 1-1 below summarises the activities that may use EESIM as a guidance document while **Figure 1.1** presents the various classifications of the industries.

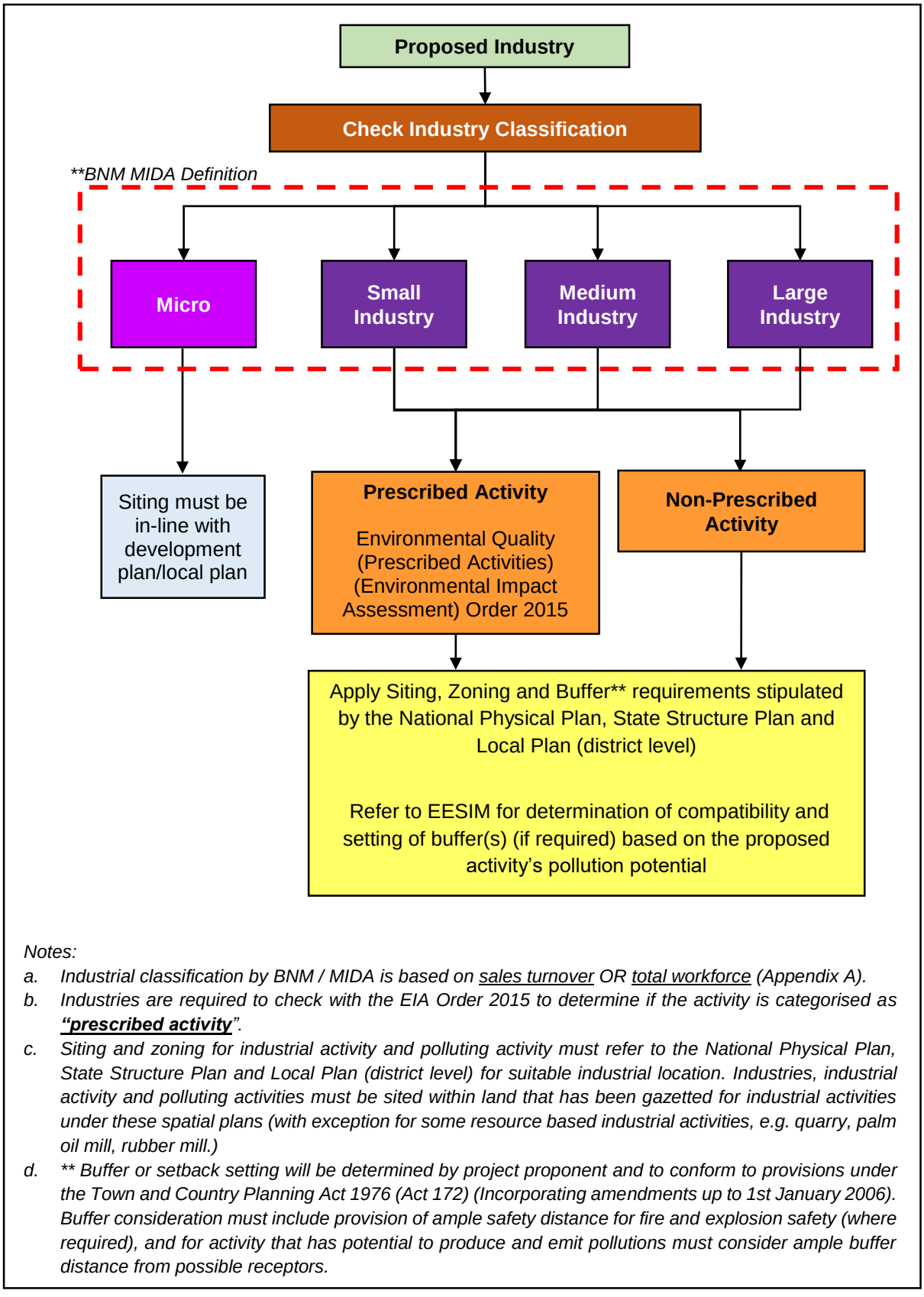
Table 1-1 Industrial Activity and Its Applicability to EESIM

Activities	Applicability
All industrial activities All sizes of industrial activities. e.g.: Small, medium, large industries as defined by Malaysian Investment Development Authority (MIDA) / Bank Negara Malaysia (BNM) (Appendix A)	All industrial projects that are categorised as **prescribed activity** in the *Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015* (EIA Order 2015)
	Non-prescribed activities (not falling under requirement of EIA Order 2015)
Non-industrial activities but potentially polluting and/or high risks	**Non-industrial projects** that are categorised as **prescribed activities** in EIA Order 2015 – e.g. mining, quarry, waste management facilities
	Non-industrial projects that are not categorised as prescribed activities in EIA Order 2015, but has polluting potential and high risks

For investment purposes, the Bank Negara Malaysia (BNM, or Central Bank of Malaysia) issued the "Circular on New Definition of SMEs" for use by financial institutions to define industries based on company's turnover and number of permanent employees (**Appendix A2**). However, **the potential of producing environmental pollutants in the form of emission releases and / or discharges from any industrial activity that may endanger human receptors and the surrounding environment**. The quantum of pollution cannot therefore be directly comparable to the BNM's definition since the polluting potential of industries (in terms of its magnitude and significance) depends on the nature of its activities and other contributing factors (**Section 3**). To substantiate further, analysis of the operations of the proposed industrial activities is necessary to identify and determine the significance of the pollution(s) produced.

Figure 1.1 presents the industry classification according to the definition of BNM and the need for further evaluation of the polluting potential by the industrial activity prior to confirmation of location siting, zoning and buffer needs based on environmental considerations.

Figure 1-1 Industrial Classification and Applicability to EESIM



Notes:

a. *Industrial classification by BNM / MIDA is based on sales turnover OR total workforce (Appendix A).*
b. *Industries are required to check with the EIA Order 2015 to determine if the activity is categorised as **"prescribed activity"**.*
c. *Siting and zoning for industrial activity and polluting activity must refer to the National Physical Plan, State Structure Plan and Local Plan (district level) for suitable industrial location. Industries, industrial activity and polluting activities must be sited within land that has been gazetted for industrial activities under these spatial plans (with exception for some resource based industrial activities, e.g. quarry, palm oil mill, rubber mill.)*
d. *** Buffer or setback setting will be determined by project proponent and to conform to provisions under the Town and Country Planning Act 1976 (Act 172) (Incorporating amendments up to 1st January 2006). Buffer consideration must include provision of ample safety distance for fire and explosion safety (where required), and for activity that has potential to produce and emit pollutions must consider ample buffer distance from possible receptors.*

1.3 USING THIS GUIDANCE DOCUMENT

This Guidance Document shall be actively used by the following stakeholders (but not limited to):

- Project Proponents,
- Investors,
- Industries,
- Department of Environment (DOE),
- Local Authorities that are involved in project planning,
- Department of Town and Country Planning (DTCP),
- Planning consultants and land use planners, and
- Environmental consultants

This Guidance Document provides guidance and directions to the stakeholders in assessing the suitability of a project at a specific site based on its polluting potential and to account for the spatial planning in place. The Guidance Document is not legally binding. However, once the technical evaluation is carried out to determine actual siting or buffer requirements, the resulting recommendations from the evaluation is a legal requirement (i.e. part of Environmental Impact Assessment (EIA) Approval, etc.). The purpose of this Guidance Document is to set the requirements, relating to siting and zoning under jurisdiction of the DOE, and to provide guidance during planning.

2 POLLUTION CONTROL POLICY INSTRUMENTS FOR INDUSTRIES IN MALAYSIA

Firstly, it is essential to understand the relevant **National and State level policies** and related legislations that are mandatory to comply with, for the development of a project. The consent to proceed with the development of the project from approving authorities, relies on the project's ability to comply with the statutory and non-statutory requirements in place; and consequently, determines the success of the project planning approval.

Undertaking an industrial project would require engagement and involvement from various Governmental agencies (either direct or indirectly), and at national, state or local levels; depending on the nature of the project and the licensing requirements. Other project approval requirements are those based on legal requirements under the other agencies. It is interesting to note more frequently projects are being conceptualised based on the policy set in forth by the Federal Government or State level. One key policy adopted requires industry to be sited in land area that have been gazetted and/or identified for industrial activity.

Project Proponent shall implement the **Environmental Mainstreaming Tools** (EMT) into their project by institutionalising them at the early stage of planning and indoctrinate these as part of their corporate culture in achieving environmental excellence. Environmental mainstreaming has been integrated into all regulations under the EQA 1974 as a move towards achieving self-regulations target for companies and projects. The EMT agenda is purely to benefit Project Proponent and Investors in improving environmental image of their organisation/companies, increase public acceptability of projects, optimal operation of pollution control systems, prevention of failures, cost saving in operations, systematic management of performance monitoring data and improved regulatory compliance in the long term. The key consideration in embracing the EMT is to internalise and accept, within the project, the environmental related costs (which is under the responsibility of the Project Proponent and/or Investor) thereby ensuring minimal discharges or environmental impacts to external stakeholders or receptors, especially towards any non-concerned parties.

This section is not intended to provide in detail the policies and project licensing requirements, but as a reminder on the importance of reviewing and adopting these policies at the very onset of project planning. Policies set may be revised or changed based on circumstances or situation at a particular time, therefore it is important that latest policies is being referenced for the project. Also, as the industrial project or activity is a long-term investment, future outlook of the country's economic planning and global interest must be taken into account in order to determine the project viability and lifespan. Awareness and being up-to-date with any foreseeable changes in the laws, especially in the environmental legislations is also an important aspect in project planning.

The following sections briefly explain the requirements under the Environmental Quality Act 1974 for project approval process and the overall project approval process. This is intended to assist the user of this Guidance Document to plan or provide necessary provisions for environmental aspects in the overall project planning process.

2.1 ENVIRONMENTAL MAINSTREAMING TOOLS

The Environmental Mainstreaming Tools (EMT) introduced by the DOE, via an official directive dated June 2017, is aimed to develop an industrial society with intrinsic culture of pride in environmental excellence by adopting the principles of Guided Self-Regulation. Our industries have matured to a level that that they should be taking ownership in protecting our environment and showcasing their environmental stewardship. This will also give the external stakeholders confidence in consenting to new industrial projects. The EMT complements DOE's roles and responsibility in enforcing the EQA 1974 (**Table 2-1**).

Environmental Mainstreaming refers to the integration of environmental concerns, aspects, and considerations in all business processes, at all stages of decision making, at all levels of organizational hierarchy, and at all phases of the operation of a development project or a manufacturing industry. The elements of the EMT are:

- ☐ *Environmental Policy (EP)*
- ☐ *Environmental Budgeting (EB)*
- ☐ *Environmental Monitoring Committee (EMC)*
- ☐ *Environmental Facility (EF)*
- ☐ *Environmental Competency (EC)*
- ☐ *Environmental Reporting and Communication (ERC)*
- ☐ *Environmental Transparency (ET)*

Appendix D presents details of the EMT and **Figure 2-1** presents the EMT elements and sub-components for these elements. Further details can be referred to EMT Directive dated June 2017.

Project Proponents / Investors are encouraged to consult the DOE for full understanding and directions for implementing the EMT. The self-assessment via EMT acts as a filter in identifying genuine investors who will be willing to apportion their investment budget on appropriate pollution control systems that is necessary especially towards internalising external costs on environmental impacts and damages. Project Proponent and Investors must avoid imposing and transferring costs, caused by environmental damage, to be burden the stakeholders and external receptors, especially to the non-concerned parties.

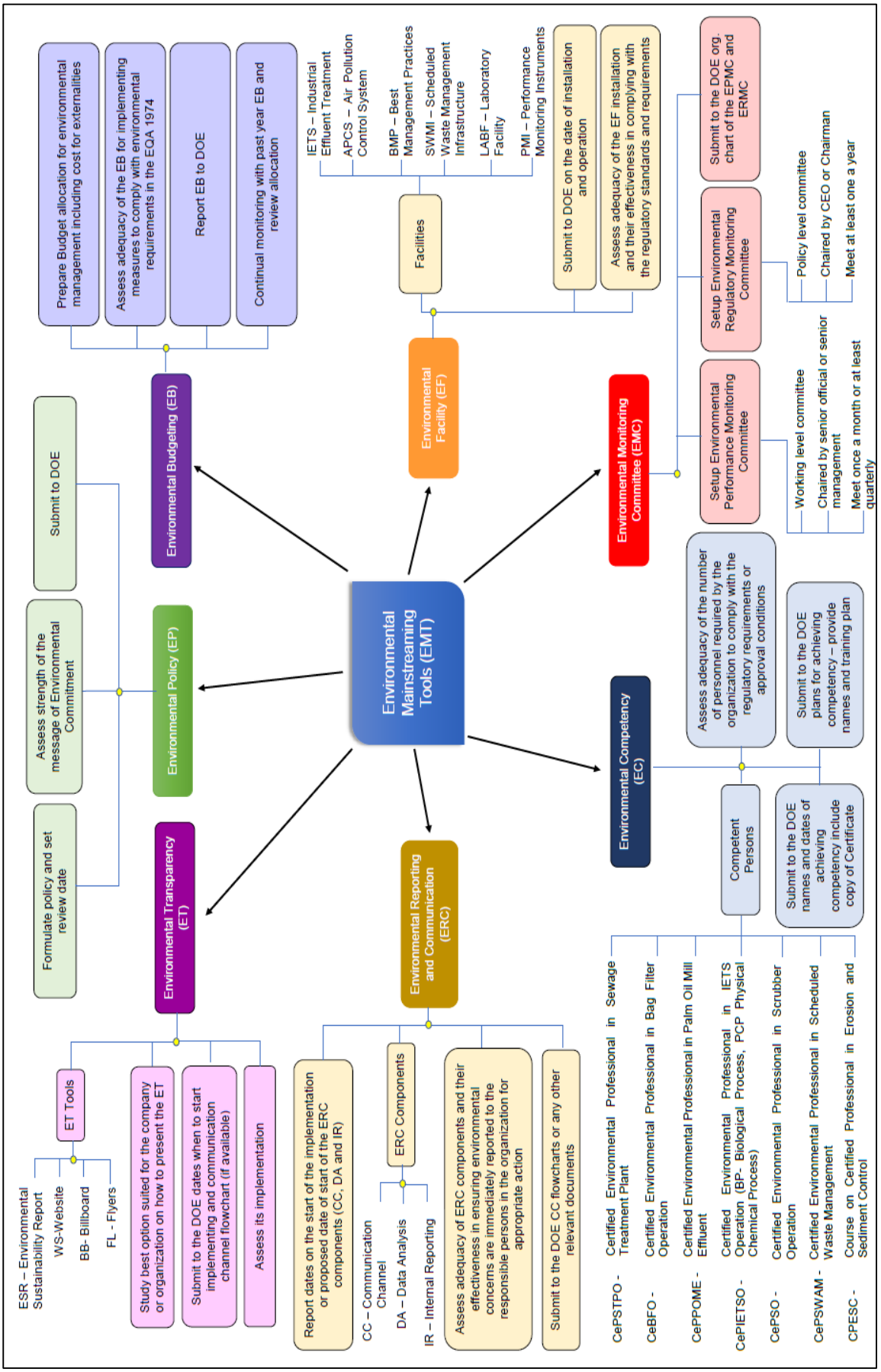
The EMT must be incorporated in the project planning and design at the onset or early stages of planning. The EMT, some of which are designed to be integrated into the project operations and management, are essential to be reviewed, understood and incorporated early in the project planning (preferably at the feasibility stage). The EMT should be implemented throughout the project lifetime with continual improvement as an ongoing process.

It is important that self-assessment and declaration be made to the DOE, to evaluate the project or organisation compliances status. Should there be any shortfalls and needing improvements, proper plans and timeline targets can be formulated to address those elements that requires future attention and/or improvements. This would allow for proper scheduling for implementation, keeping in mind that some projects can be executed over long periods and/or in stages.

Table 2-1 Role & Responsibility of DOE and Project Proponent / Investor in the Implementation of Environmental Mainstreaming Tools

	Department of Environment	Project Proponent / Investor/ Project Developer
ROLE & RESPONSIBILITY	• Enforces EQA 1974 in the prevention, elimination and control of pollution, and safeguarding the environment quality. • Oversees the implementation of industrial project planning and approves EIA for prescribed activity. • Monitors industrial activities on implementation of EMT and their compliance towards statutory standards and limits. • Execute “command and control” on errant industrial activities due to failure of compliance and non-conforming.	• Adopt and implement EMT in project planning, construction and operation. • Continual improvement by incorporation of EMT elements and showcase the stewardship for improvements • Compliance with statutory standards and limits • Safeguarding environmental quality within and beyond project • Accountable, in undertaking remedial actions and costs, for environmental damages (should any incurred).

Figure 2-1 Environmental Mainstreaming Tools



2.2 APPROVALS REQUIREMENT UNDER ENVIRONMENTAL QUALITY ACT 1974

The Environmental Quality Act (EQA), 1974 and its accompanying legislations, enforced by the DOE, stipulates the prevention, abatement, control of pollution and enhancement of the environment in Malaysia and prohibits the emission, discharge or deposit of environmentally hazardous substances, pollutants or wastes into any area, segment or element of the environment. Any discharges produced must be rendered to safe levels meeting the standards or limits set by the EQA 1974. Specific Regulations and Orders were also formulated under the various Sections of the EQA 1974 to specify the standards and limits for compliance of identified pollutants and for management of various environmental aspects.

The EQA 1974 also specifies controls for activities, including industrial activity, that are likely to result in the release or discharge emission of pollutant that would cause detrimental impacts to the environment. As such, any activity that is deemed prescribed under the EIA Order 2015, shall comply with the requirements of Section 34A of EQA 1974, and mandatory to obtain approval from the Director General of Environmental Quality of the Department of Environment (DOE) prior to its development. Alongside this requirement, prescribed premises specified under the respective Regulations must also obtain Written Permission and Licenses prior to start of its operation.

Related consent or approvals from the Department of Environment include:

a. **Environmental Impact Assessment (EIA)** report for prescribed activities under Section 34A of the EQA 1974 and Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015;

b. **Written permission** to construct a prescribed premise under Section 19 of the EQA 1974;

c. **License** (to use and occupy prescribed premises and prescribed conveyances under Section 18 of the EQA 1974, or for contravention of the acceptable conditions specified under Section 21 of the EQA 1974).

Prescribed premise here refers to:

Scheduled wastes treatment and disposal facilities	Environmental Quality (Prescribed Premises) (Scheduled Wastes Treatment and Disposal Facilities) (Amendment) Order, 2006
Crude palm oil mills	Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulations, 1977 Environmental Quality (Prescribed Premises) (Crude Palm Oil) Order, 1977

Raw natural rubber processing mills	Environmental Quality (Prescribed Premises) (Raw Natural Rubber) Regulations, 1978 Environmental Quality (Prescribed Premises) (Raw Natural Rubber) (Amendment) Order, 1978

Apart from the approvals and licensing requirement, **Written Notification** (WN) is a mandatory requirement and needs to be submitted to the DOE upon introduction of new pollutions source(s), or modification of existing pollutants discharge or release. Written Notifications are required under the following Regulations:

☐ Notification for **Sewage** discharge or release to any water bodies under Regulation 4 of Environmental Quality (Sewage) Regulations 2009.
WN shall be made via form specified in First Schedule of the Environmental Quality (Sewage) Regulations 2009. [can be downloaded from DOE's website www.doe.gov.my or refer to DOE State offices]

☐ Notification for **Industrial Effluent** discharge or release to any water bodies under Regulation 4 of Environmental Quality (Industrial Effluent) Regulations 2009.
WN shall be made via form specified in Second Schedule of the Environmental Quality (Industrial Effluent) Regulations 2009. [can be downloaded from DOE's website www.doe.gov.my or refer to DOE State offices]

☐ Notification for **Leachate** discharge or release from solid waste transfer station or landfill under Regulation 4 of Environmental Quality (Control of Pollution from Solid Waste Transfer Station and Landfill) Regulations, 2009.
WN shall be made via form specified in Second Schedule of the Environmental Quality (Control of Pollution from Solid Waste Transfer Station and Landfill) Regulations, 2009. [can be downloaded from DOE's website www.doe.gov.my or refer to DOE State offices]

☐ Notification for **Air Emissions** produced from burning of matter (including wastes) from an industrial activity or for trade purposes, premises or process that produces emission or discharges air pollutants to atmosphere, any industrial facility and fuel burning equipment; under Regulations 5 of Environmental Quality (Clean Air) Regulations 2014.
WN forms can be referred to the DOE website (www.doe.gov.my) [or refer to DOE State offices].

Submission of Written Notification is via WN forms (refer to the specific Regulations) and must include the required information stipulated in the respective Regulations (namely, drawings endorsed by Professional Engineers, design calculations, operational information, catalogues, etc.).

Industrial activities that are not subject to the mandatory EIA requirements (i.e. **non-prescribed activity**) will not require any EIA study to be carried out. However, it is mandatory for submitting the pollution control system that will be installed for the Project as per above via the Written Notification. Reference must be made for compliance with the statutory standards and limits under the respective Regulations under the EQA 1974 especially on the emission release, discharges and waste management. Submission for the WN to the DOE shall be made at the initial stages of project planning and preferably before or alongside the submission for planning approval to the project approving authority. The Project Proponent may consult DOE for advice on the compliance requirements need to obtain for the project.

Figure 2-2 overleaf summarises the requirements for obtaining the respective approvals for the prescribed activity and non-prescribed activity under DOE's jurisdiction.

2.2.1 EIA Requirement for Industrial Activity or Project

"Prescribed activity" refers to an activity that is prescribed by or under the Section 34A of EQA 1974. To determine if the project requires an EIA study, the first review should be made with the prescribed activities listed in the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015. Once confirmed that an EIA study must be carried out, the administrative procedures for undertaking the EIA study as well as the study requirements and format shall strictly follow the **Environmental Impact Assessment Guideline in Malaysia 2016** (EGIM 2016) published by the DOE.

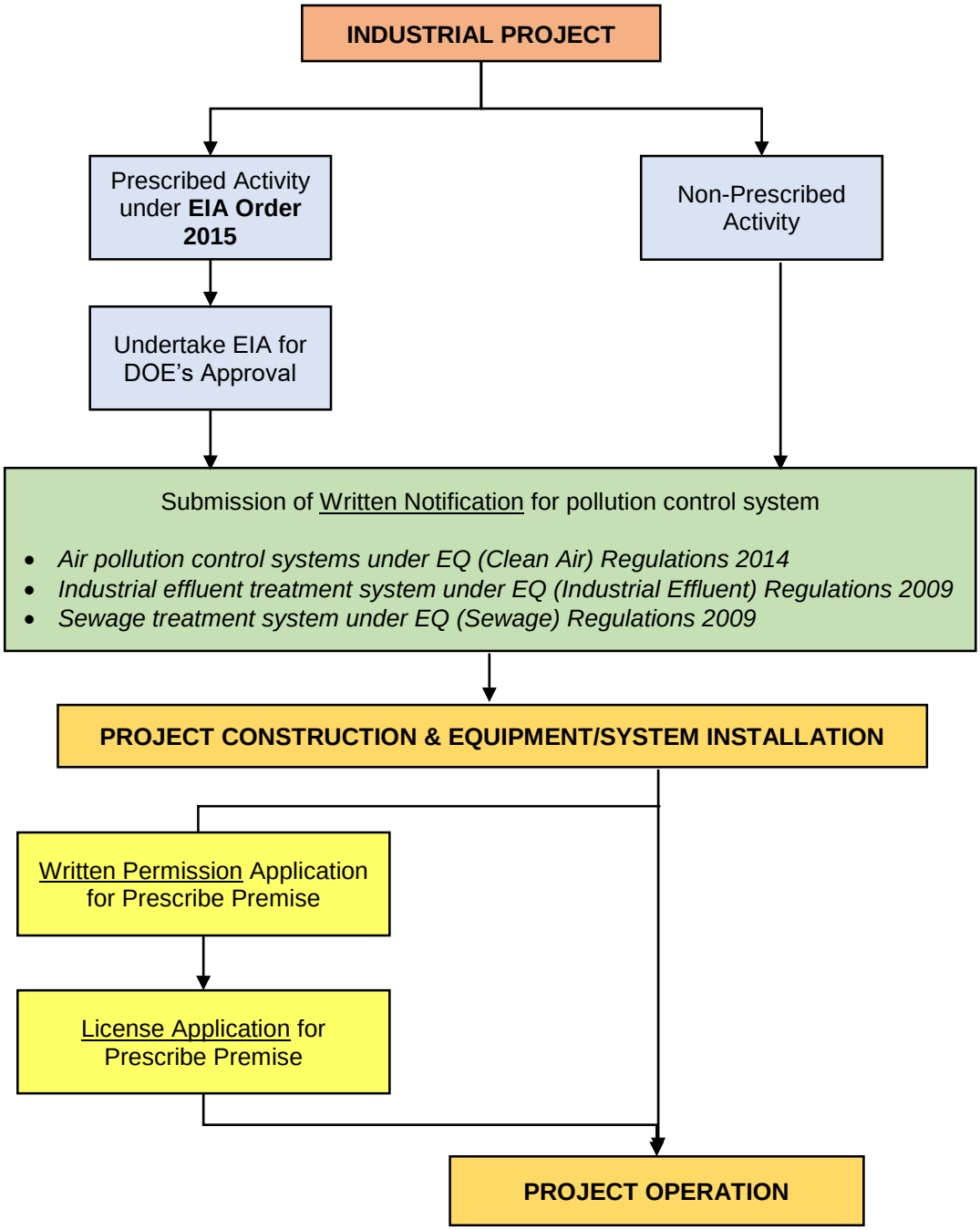
List of prescribed activity extracted from EIA Order 2015 is presented in **Appendix C**.

In essence, the EIA study is an instrument used by the Project Proponent to identify and evaluate the potential environmental impacts of a proposed project, evaluate alternatives and design appropriate mitigation, management and monitoring measures. The main objective of the EIA is to ensure that decisionmakers consider environmental impacts before deciding whether to proceed with the project. While it is within the DOE's jurisdiction for approving the EIA study, the outcome of the study is key input for the overall project approval.

During the preparation of the EIA study, some of the key components mandatory to be put forth in the report are as listed below (**Table 2-2**). Project proponent must refer to the EGIM 2016 for the full details.

Planning and design for pollution control system must be incorporated at earliest possible phase of the project to ensure the compliance to the set standards and limits are addressed early and incorporated into the design. Similarly, for a proper siting identification and selection. Project must have sufficient details for decision-making and the EIA study must include detailed design information on the pollution control system, for the EIA report to be approved by the DOE.

Figure 2-2 Environmental Consent and Approval for Industrial Projects (And Polluting Activities) Under EQA 1974



Note:

a. For crude palm oil mills and natural rubber processing mill (both are prescribed premises), these are governed under Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulations, 1977, and Environmental Quality (Prescribed Premises) (Raw Natural Rubber) Regulations, 1978.
b. Scheduled wastes facilities are prescribed premise under the Environmental Quality (Scheduled Waste) Regulations 2005, Environmental Quality (Scheduled Waste Treatment and Disposal Facilities) Regulations 2006, Environmental Quality (Scheduled Waste Treatment and Disposal Facilities) Order 2006.
c. Appendix C presents the prescribed activities under the EIA Order 2015. For undertaking the EIA for prescribed activity, refer to EGIM 2016.

Table 2-2 Key Components in EIA Study

EIA Components	Information Requirements in EIA Study
Project information	☐ Detailing specific design information and description about the project (relating to process, technology, etc.). Provide the process flow diagrams, mass balances, drawings, calculations, etc. and information on the raw materials, chemicals consumption, utility consumption, products and by-products generated, waste generation (solid, liquid and gaseous). ☐ Planning and design for pollution control system(s) must be incorporated and show proof towards compliance with standards and limits under EQA 1974. Review and assessment of options available for pollution control system(s) and justification on selection made. Information to be incorporated: block diagram, process design calculations, P&ID, engineering drawings, mass balance. ☐ Identify environmental concerns that will be affected by the project development, i.e. planning, construction, operation, and abandonment.
Project siting	☐ Discussion on site(s) identification, options available and selection process. ☐ Justification for the selected site and discussion of its suitability conforming with the spatial planning and planning technical agencies requirement (including DOE's requirement for project siting). ☐ Where buffer or safety distances are required, discussion on the proposed buffer or safety distances with justifications.
Baseline data	☐ Complete baseline data for the affected environmental components identified comprising of new survey data and existing data (via published documents and publicly available information). The existing data must be accurate and recent enough to be used as a baseline. The baseline survey data will be used as benchmark upon which to quantify impacts in the EIA and for the monitoring phase.
Impact evaluation	☐ Evaluation of impact by quantitative and/or qualitative means using recognised methodologies and tools (for predictive modelling). Modelling and assessment must include cumulative impacts from existing surrounding activities, and evaluation towards loading to receiving receptors. ☐ Discussion must include on how the project affected the environmental aspects and level of impact, for both normal operation and worst-case scenario (abnormal operation), and comparison with the statutory standards and limits. Any assumptions made for the assessment must be clearly identified and expressed to avoid misjudge or misinterpretation on the evaluation made. ☐ Identification of residual impacts and assessment towards long term effect(s).
Mitigation measures	☐ Mitigation measures must include means and methods to avoid impacts or minimised impacts evaluated rendering to safe levels. Mitigation measures must address both direct and indirect impacts for both short-term or long-term; and must be incorporated as early possible in project planning and design. Methods for mitigation must be clearly explained and detailed for pollution control system(s) proposed or by means of procedural methods that will be implemented. Elements for monitoring (impact, compliance and performance monitoring) must be identified and recommended. ☐ Where impacts cannot be avoided, clear mitigation techniques, procedures and management & monitoring tools must be detailed out. Important to showcase incorporation of EMT in project.

EIA Components	Information Requirements in EIA Study
Monitoring & Management	☐ Monitoring requirements are mandatory for short-term and long-term predictive assessment made, i.e. to confirm that the project is meeting the predicted levels and conforming to the statutory standards and limits. Monitoring must be assessed based on its impacts towards the receptors identified – covering procedures for compliance monitoring, impact monitoring and performance monitoring. Methodology for monitoring and management of a project must be detailed out in an Environmental Management Plan (EMP). Important to showcase incorporation of EMT in project.

It is recommended that as part of the overall planning, include constitute studying all requirements needed for the project to avoid rework. Changes in design incorporation of the needed mitigation control measure (of which was not identified earlier) at a later stage can be rather costly.

2.2.2 Environmental Assessment for Non-Prescribed Activity

Project Proponents for industrial activities not requiring EIA study and/or non-prescribed activity can undertake their own assessment to evaluate the environmental impacts from the project. It is encouraged that such assessment is carried out in order to justify and support the project, as well as means to substantiate decisions towards environmental controls put in place for the project. Various benefits can be achieved especially for the Project Proponent or Investor including having in hand a proper method of project decision-making instrument, in event that the project requires re-evaluation or being confronted due to non-compliances.

There are various guidance documents and guidelines that can be used to carry out the assessment, including those published by the DOE where references can be made for specific methodologies and assessment evaluation. Output can be documented in form of report similar to EIA.

2.3 OVERVIEW OF PROJECT APPROVAL PROCESS

For all projects, **strategic and early planning** should be encouraged in order to decide on an optimal location of project site while ensuring that key environmental concerns are protected. The laws, procedures and guidelines pertaining to a project development process in Malaysia can be quite extensive, depending on the project siting location, components and design. It also involves various Government agencies, ranging from the planning departments and technical agencies, that imposes their own respective requirements for mandatory compliance for the project to be implemented. Some of the more pertinent laws to be complied with, include the National Land Code (NLC) 1965 (NLC, 2008), the Town and Country Planning Act, 1976 (Act 172), the Government Act 1976 (Act 171), Uniform Building By Law 1984 (UBBL), the Street, Drainage and Building Act 1974 (Act 133) and the Environmental Quality Act 1974.

Land development by planning control is referred to Part IV of the Town and Country Planning Act (TCPA), 1976 and planning guidelines. In Section 19, the TCPA states that "*no person, other than the local authorities, shall, commence, undertake, or carry out any development unless planning permission in respect of the development has been granted to him under Section 22 (treatment of application or extended under Subsection 24 (3) (lapse of planning permission)*" (LOM, 2006). Thus, it is mandatory for a planning approval to be obtained prior to project development, including industrial activity.

The approval for a project lies within the jurisdiction of the **Project Approving Authority**, which is either the federal agency, state agency or local authorities. The project approving authority shall call upon for support from various technical agencies that has been entrusted with respective legislations and powers of enforcement. To facilitate the planning approval process, One-Stop Centres (OSC) which is normally at the Local Authority level, acts as a central agency for receiving, processing and approval of planning submission. **Figure 2-3** presents a typical set-up of the OSC, of which may differ according to the Local Authority.

To ensure effective planning and the project addresses the necessary regulatory requirements from initial conception, Project Proponents must engage with the Local Authority of interest and the relevant technical agencies at earliest stage to determine the actual requirements needed for compliance (**Table 2-3**).

Table 2-3 Role and Interest of Various Group/Agencies in the Project Approval Process

Parties / Group	Role	Interest
Project Proponent, Project Initiator	Plan, develop and/or manage the key sector development project	Mainly economic (case of private sector) but also socio-economic (in case of public sector development)
Project investor (leading agency and purchasers of land)	Investment in key sector projects	How impacts affect the viability of the project and liabilities to be **incurred**.
Department of Environment (DOE)	Decision on EIA report (for prescribed activity)	Extent of impacts in terms of pollution emission and control from the project towards receptor, land use and environment.
JPBD	Zoning and land use planning	Extent of impact the project has on land use and adjacent developments, in accordance with spatial planning – NPP, State Structure Plan, Local Plan
Other Government Agencies (DID, JKR, Fisheries, Agriculture, Health, Sewerage Services, DOSH, etc.)	Relevant inputs in respective areas of expertise	Implications of the proposed project on other projects or activities in which they have interest or wish to promote

Parties / Group	Role	Interest
Approving Authority	Project Approval	Impacts are to be within planning made, acceptable levels with no significant residual effects
Local Authority	Zoning and development control, Public safety and health	Extent of impact the project has on land uses (compatibility) and adjacent development. Safeguarding public interest and health.
Local Communities	Relevant input for protection of local and community interest	Impact of project and how it affects their quality of life

The planning process usually commences with a project concept and a feasibility study that reviews the viability of the particular project in terms of economic aspects as well as taking consideration of related environmental and socio aspects. In the initial stage, on completion of the feasibility study and upon confirming on its viability, the project proponent shall obtain a manufacturing license from the Malaysian Industrial Development Authority (MIDA) for any investment exceeding RM2.5 million. The application for manufacturing licences must be supported with a market study, sources of raw materials, manpower and even financial aspects; to name a few, in justifying the project's viability. MIDA in turn will ensure that the proposed industrial facility is in line with the Malaysian policies and compliance with other investment policies.

In order to guide the project proponent and decision makers in the project planning and during the processing of planning submission, various development plans had been formulated under Part III of the TCPA 1976 (namely the National Physical Plan, State Structure Plan, Local Plan, etc.). These plans form the overall policies for future land development as well as in establishing desired industrial gazettement, zoning and planning standards. Basically, the project layout formulated and for submission must comply with the spatial planning policies and to be approved by the local authorities of the governing state, as the Project Approving Authority. This include compliance with pre-determined zoning requirement, strategic policies and government policies.

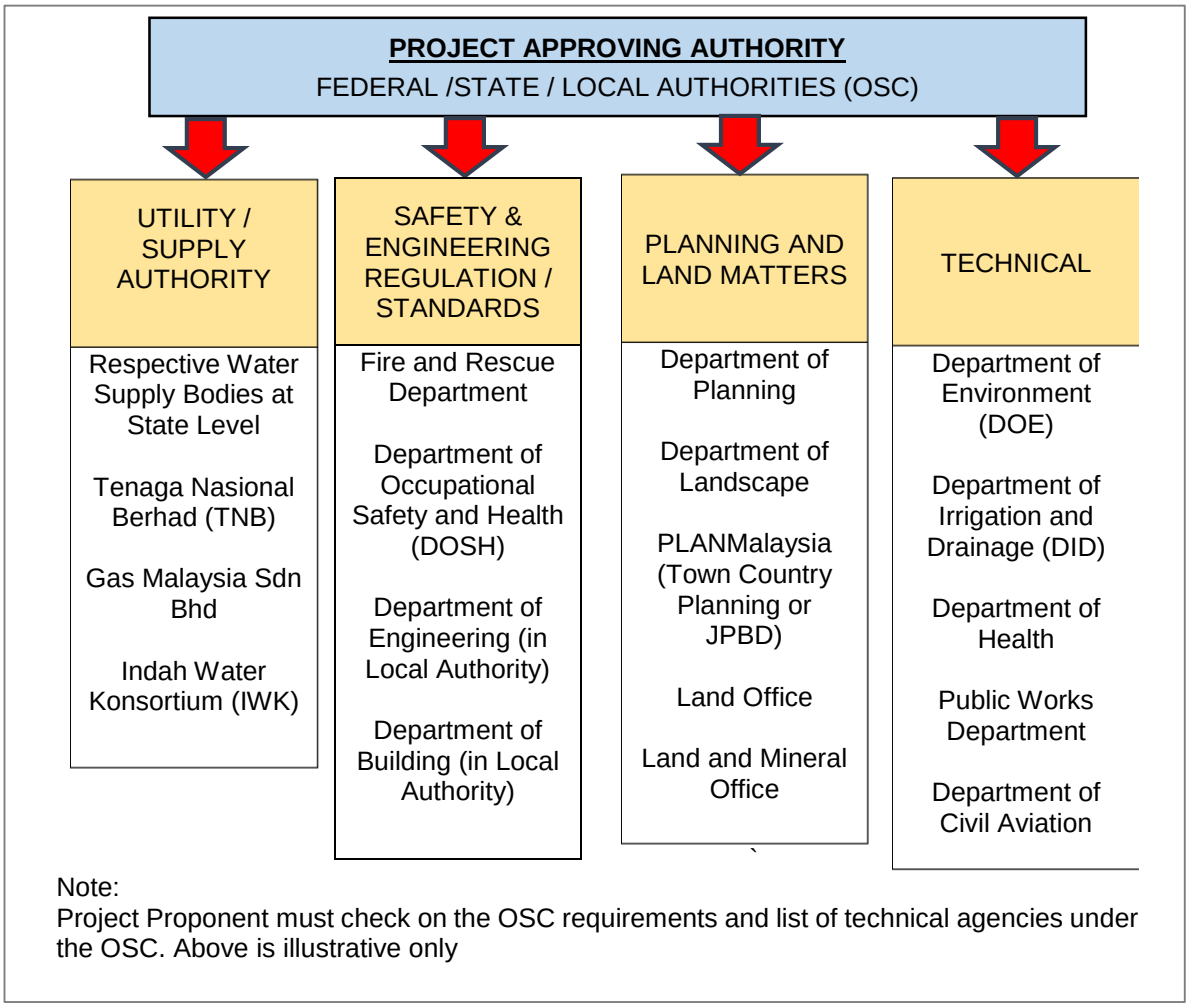
It is also important to incorporate the requirements under the Environmental Quality Act 1974 and its accompanying legislations **as early as possible,** during the project planning stage or at the preparatory phase of the feasibility study. Among the requirements that must be identified early is whether the proposed project is a prescribed activity under the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015. Should the project be classified as a prescribed activity, it is mandatory that the EIA study to be undertaken and the report be submitted for approval to the DOE. The EIA Conditions of Approval, issued by the DOE upon approval of the EIA report, is a mandatory requirement for the final project approval from the Project Approving Authority. Nonetheless, the non-prescribed activity would only require review of the siting based on this guidance document and to incorporate the provisions in the submission to OSC (**Figure 2-4**).

The next step in obtaining the necessary regulatory approvals is at the project implementation stage. At this stage, the engineering designers will need to provide detailed engineering designs and calculations, to obtain engineering aspect approvals. This submission for approval shall constitute of the plans, construction and installation methods and in some cases, the manufacture or fabrication of certain equipment and machinery. The approval of equipment, especially those not manufactured locally shall also be included. The detailed requirements of each regulatory authority are described in the subsequent subsections.

The last phase of approval involves the operating aspect of the industrial facility. These regulatory requirements touch on the number and competency levels of personnel operating pollution control equipment and machinery.

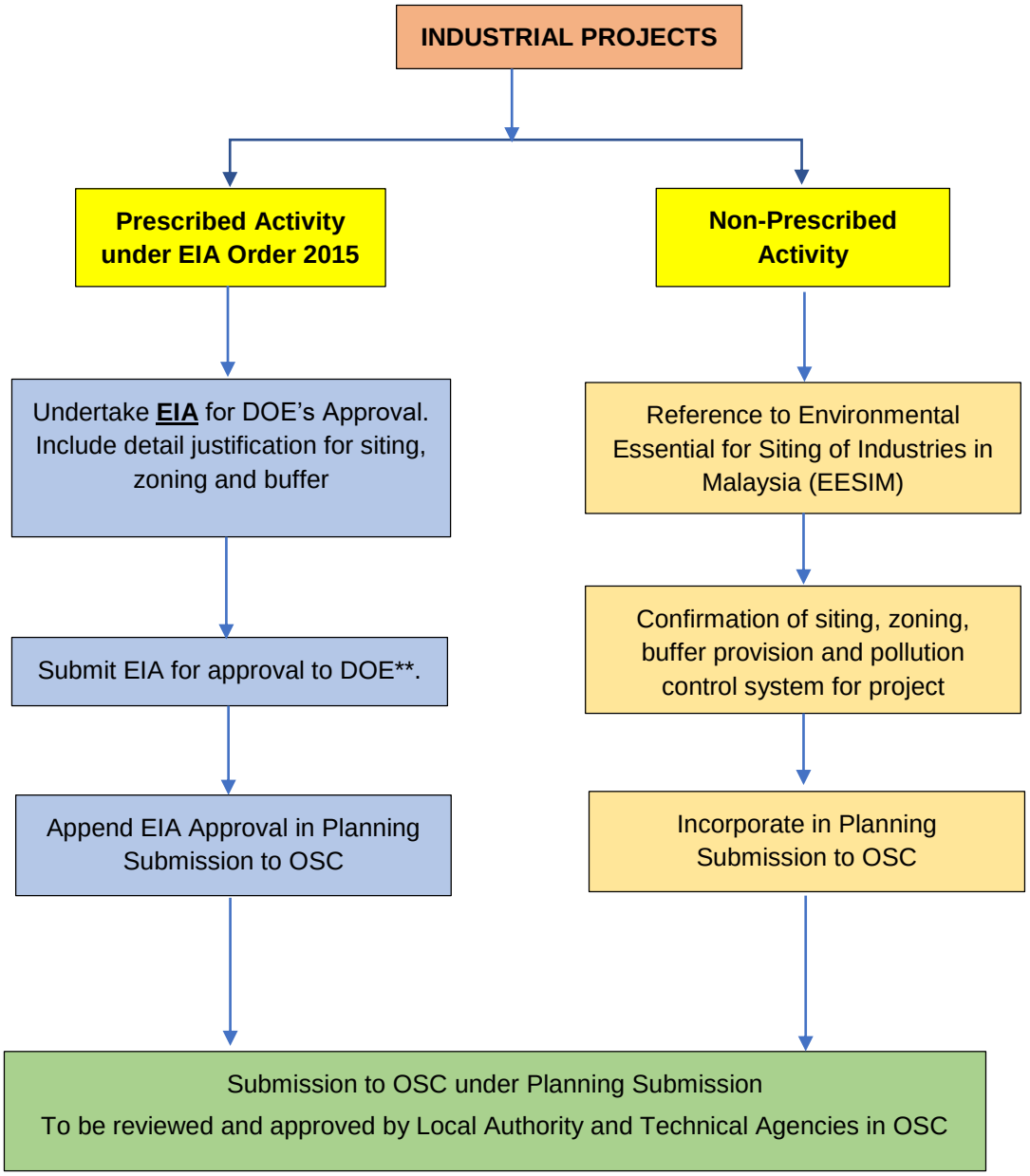
To summarize, under the requirements for regulatory approvals; it is crucial that related information and parties involved to be engaged by the Project Proponent at the early stages of the project implementation. This is to ensure that mandatory requirements are identified and incorporated in the planning which thereafter must be implemented. This is to ensure that its operations will adhere to the approval and conditions granted at all time.

Figure 2-3 Typical Technical Agencies Involved in Project Approval



Note:
Project Proponent must check on the OSC requirements and list of technical agencies under the OSC. Above is illustrative only

Figure 2-4 Submission of Siting, Zoning and Buffer Requirements To OSC



Note:

** DOE only approves the EIA Study as a technical document, and not the "Project Approval Authority". The EIA Study Approval will support the project application for Development Order and input to the OSC for the Project Approval.

2.4 ROLE OF PLANNING AUTHORITY IN PROJECT SITING, ZONING AND BUFFER

Under the current legislative setup, spatial planning in Malaysia is governed by the Town and Country Planning Act 1976 (Act 172) (incorporating amendments up to 1st January 2006) which is enforced by PLANMalaysia (or Department of Town and Country Planning (DCTP) or Jabatan Perancang Bandar dan Desa (JPBD)). The National Development Planning Framework comprises of three (3) levels of planning, namely the National Physical Planning at the Federal level, the State Planning at the State level and the local planning at the Local Authority level (**Table 2-4**).

The National Physical Plan (NPP) sets the overall guidelines and strategies for Federal and State Governments to control development and land administration. The NPP includes measures to tackle climate change and conserve natural resources and biological resources in the country, including establishing carbon sinks for sequestration, establishing sustainable forest and water management, and a Central Forest Spine to link key ecological areas in Peninsular Malaysia. NPP is reviewed in five years interval, complementing the Five Year Economic Development Plan, as it provides the spatial dimension to the sectoral distribution of natural resources in the country. The latest published NPP is the National Physical Plan-3 (NPP-3), which was completed at the end 2016 and launched on 8 June 2017.

With the establishment of the broad framework of the NPP, these policies and plans from the NPP are developed into the State Structure Plan (SSP) so as to provide policies on development and use of land at the State level. The Local Plan is drafted at the local district level, outlining detailed and site specified development facilitation and control. Another form of local level plan is the Special Area Plan, which provides detailed plan of areas, needing special attention.

These planning guidelines, namely the NPP, State Structure Plan and Local Plans establishes the land use gazettement at each of these levels. This includes areas that has been identified and/or gazetted for industrial activities, based on the NPP strategies and main conurbation areas within the Peninsula Malaysia. The NPP also identifies the industrial clusters based on its physical existence and State's economic planning needs. Further detailing and specifications for each industrial area are then carried out at the State and Local levels under the purview of the State government, Local Authority and PLANMalaysia.

PLANMalaysia being the main authority in the spatial planning, has produced specific guidelines for various types of developments, including industrial estates, to detail out requirements of the land use design as well as zoning and buffer specifications. While the primary focus of JPBD's Planning Department, is on the spatial design, the buffer establishment takes into consideration safety and setback, in view of safety distances, between industries and receptors. PLANMalaysia is the lead agency, entrusted to undertake all planning by following set criteria as per their guidelines, to ensure proper infrastructure and provisions are accounted for.

Table 2-4 Provision of Siting and Zoning in Spatial Plans

Spatial Planning Document	Provision Allowed For
National Physical Plan (presently NPP-3 gazetted in 2017)	Industrial estate / area clusters based on the economic viability and growth potential Key points from NPP: • The industrial areas are more likely to be built near urban areas and ports. • Industrial sites near urban areas will further strengthen growth over time and promote the development of industry clusters Strategies recommended: • Upgrading physical environment in terms of landscaping, images and relevant facilities • Upgrading infrastructures and utilities to provide services capable of matching the need of modern industries including ICT and communication • Improving environmental standard for waste management and effluent emission • Expanding the managed industrial park mechanism for all industrial areas
State Structure Plans (at each State level)	Structure planning by the State itself based NPP strategies and the State's economic policies. Focus on area or district of interest and avoiding the creation of "grey areas" for industrial development by provision of "mixed industrial areas" that allow for a variety of industries to be placed within one area which has the tendency to create incompatibility issues. SSP is to assist the Local Authority in their detailed planning by identifying zoning of the areas and to some extend specify the provision for specific areas allocation for heavy industry, medium industries and light industries.
Local Plans (at district level by Local Authority)	Detailed planning by the respective Local Authority and requiring to zoom in to the details and tailored to the area or district of interest. Care is to be taken and observed to prevent creation of "grey areas" for industrial development by provision of "mixed industrial areas" that allows for a variety of industries to be placed within one area which has the tendency to create incompatibility issues. Planning should take care the specifics by identifying proper zoning of the areas and this include provision of specific areas allocation for heavy industry, medium industries and light industries. In the Local Plans, the Local authority with JPBD must provide the necessary setbacks or buffer between the industrial estates or areas to receptors, and to account for future "encroachment" of receptors. The setbacks or buffer provision must account for sufficient safety distances in event of fire or emergencies. Most time the setbacks and buffer areas are utilised in various forms, such as access roads, pipeline reserves, commercial areas, utilities areas, etc.

Apart from PLANMalaysia, there are various authority of concerns may impose respective requirements for siting and zoning of project locations. Project Proponent are required to engaged with the relevant authority to understand the specific compliance requirements, based on the scope and nature of the project and incorporate into the project planning and design. Engagement must be carried out as early possible in project planning stage.

2.5 EVALUATION AND SITE SUITABILITY SETTING

Assessment for site suitability may be conducted at the earliest, during the conception of a project, as part of its project planning, AND it can be carried out for project or process improvements. **This is an important aspect in determining the site suitability, zoning compatibility and safety distance for the project. The requirement for environmental compliance must be carried out by incorporating internal controls for the pollutants generated, and hence allowing for any industry enabling it to be sited at the desired location.**

By virtue, under spatial planning policies in place, any industrial activities must be sited within industrial area gazetted and/or identified by the spatial plans. Provisional exceptions are for resource-based industrial projects such as quarry, mining, palm oil mill and rubber factory (both palm oil mill and natural rubber processing factory are regulated by its respective Regulations).

In the early planning, it is recommended that screening be carried out for identified environmental concerns. There are available screening methods and tools that can be used in assisting the project and eventually for decision making (**Appendix G**).

3 ENVIRONMENTAL CONSIDERATIONS FOR SITING OF INDUSTRY

An immediate bearing on project approval that is based environmental consideration is the suitability of the chosen site for the proposed project. Irrespective of whether the proposed industrial activity is going to be sited within gazetted industrial estate/area or otherwise (i.e. for resource-based industrial activities), it should be developed and managed with environmentally sound control measures. Therefore, all potential industrial sites for the establishment of new industrial activities which are non-prescribed activity (under the EIA Order 2015) are required to adhere to the pollution prevention under the respective Regulations and encouraged to consult the DOE for advice on site suitability, should there be a need to do so.

The first criteria in siting of industrial activity is to locate it within a gazetted industrial area stipulated in the Structure Plans and Local Plans. Compatibility of the site must also be evaluated by ensuring the project does not impose concerns towards the adjacent and surrounding activities as well as land uses, and vice-verse from the surrounding activities or land use. Provision of set-backs or buffer zones as stipulated by the spatial planning made under purview of PLANMalaysia is a necessity for safeguarding public safety.

To complement this, the DOE's role will be evaluating the industries and industrial activities on its pollutant production releases and the capacity of the area (area selected or area of interest) in receiving additional pollution load and waste disposal requirements. With initial adhering to the first rule for industrial activity siting, it can more or less reduces the environmental concerns and impacts to a certain level. Main focus for the industrial activity is to design for internal control of pollution(s) generated and compliance with statutory standards and limits.

Overall, any industrial project(s) must take account of all the requirements set in forth by the related technical agencies in the project planning and implementation.

3.1 SITING CONSIDERATION WITHIN PROJECT PLANNING

In Malaysia, the typical process flow of carrying out an industrial activity consists of several stages; these include project identification, pre-feasibility and feasibility study, detailed design, implementation stage and post-closure. The flow for project planning and development process for a typical prescribed industrial activity is illustrated in **Figure 3-1**, which include tasks and actions to be undertaken by the Project Proponent.

The review for siting of potential project sites ideally **must be** carried out during the project planning phase and must be carried out as early possible to ensure the project planning is on the right track. In many past cases, projects fail to consider the environmental considerations during the planning stage. Incorporating the environmental considerations when the project planning or design have been confirmed, renders it impossible to make further changes without incurring additional costs. Proper planning will ensure cost-effectiveness and minimise any subsequent issues of concerns.

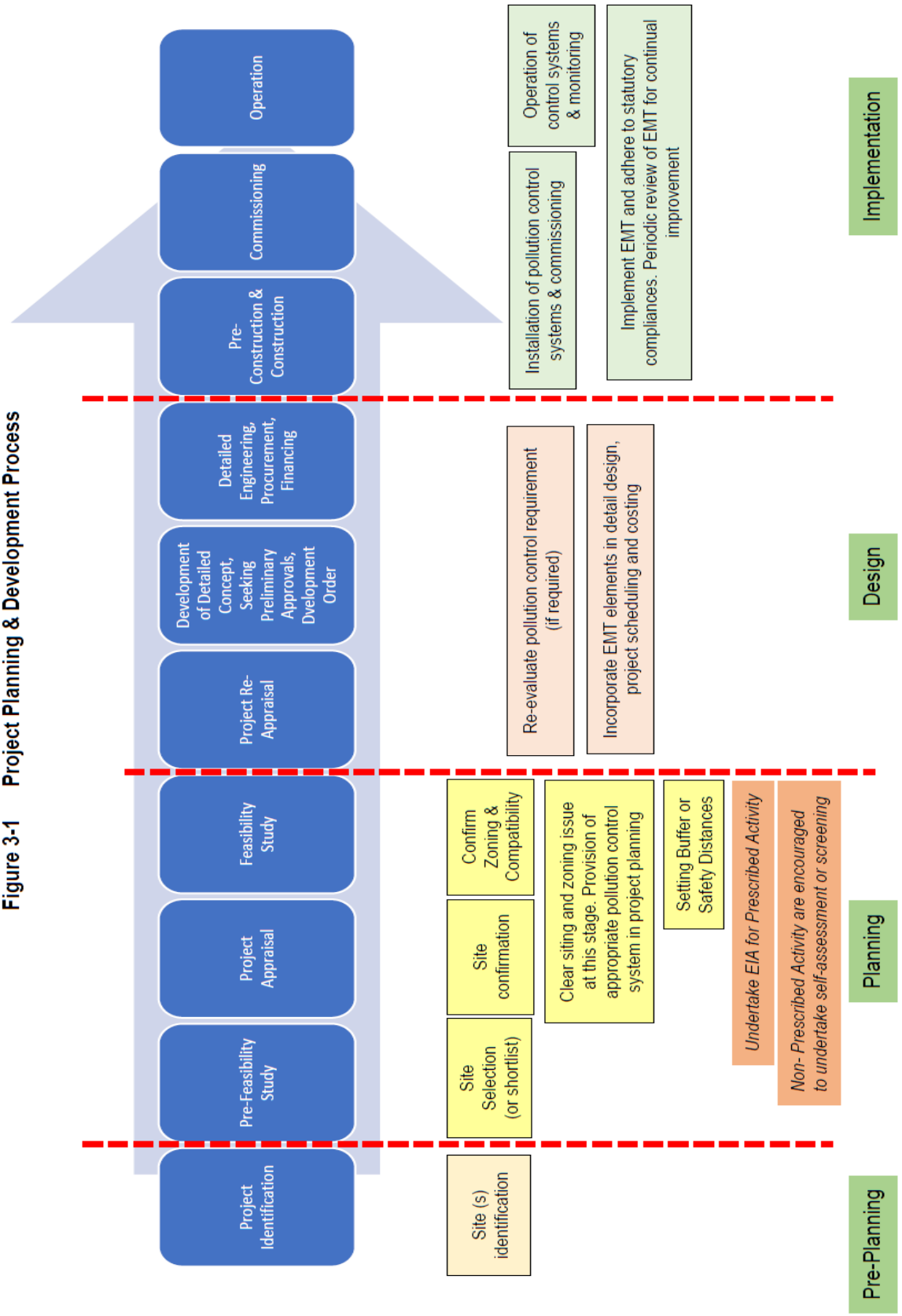


Figure 3-1 Project Planning & Development Process

The most frequent environmental issues that arise due to industrial operations are:

- Stack emissions
- Fugitive emissions
- Odour
- Effluent discharges
- Accidental discharges
- Waste generation
- Risk of fire and explosion (of which probability of occurring at industrial facility is < than at communities)

At the pre-feasibility and feasibility study stages of a project, site screenings shall be carried out to determine suitability of siting location. Environmental criteria such as impacts on air, water and noise quality on receiving receptors will be evaluated in the screening process where the screening assessment shall be carried out either qualitatively or by using modelling tools, where applicable and required. Depending on the nature of the project, more in-depth assessment enables for precise decision-making in lieu of the availability of pre-existing data and information for evaluation purposes. It is recommended that the Project Proponent have in-hand a very good database on the project information to allow for comprehensive assessment.

Once the Planning stage is complete, the project's design and implementation stages will be carried out to further detail out the engineering design aspects. At this stage, technologies that was identified during the feasibility stage, of which comprises of the process technology, pollution control system, etc., will be designed in full detail.

Any changes in siting of the project at project implementation stage, due to improper planning considerations, will be reflected massively in additional cost and time.

3.2 BAT AND BACT IN DESIGN AND TECHNOLOGY CONSIDERATION FOR PROJECT SITING

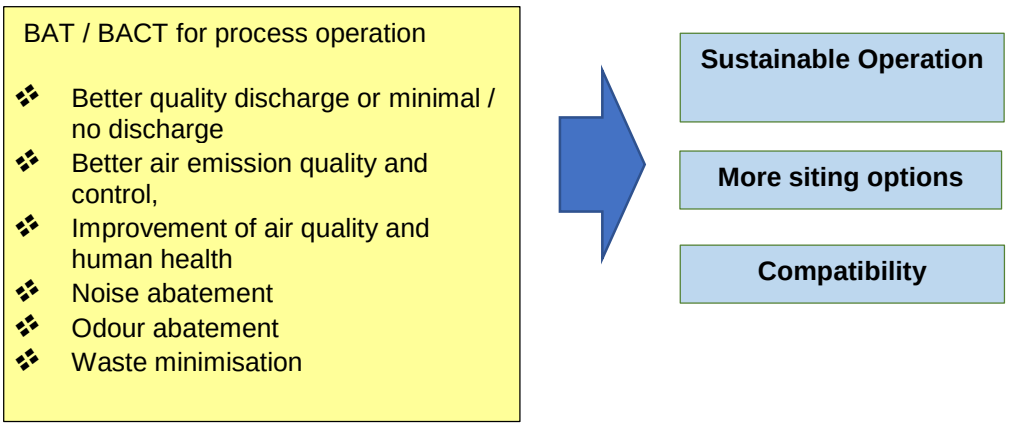
Upon confirming the industry type or project activity, siting of the industry shall be based on selecting areas that have been zoned for this type of land use. In many well planned industrial estates, zoning has been provided for industry type, some of which are specific to certain industry type, and this is to eliminate potential compatibility issues that would arise due to error in planning. The Local Plan of the district where the selected industrial area is sited, must be referred to, to obtain the necessary information.

With the current technology advancement, process operations are being constantly improved and able to operate more efficiently, saving energy and reducing generation of pollutants. Process operation should adopt or be modified with better process input and control mechanism with the use of Best Available Technology (BAT) and Best Available Control Technology (BACT). Improvements, under BAT and BACT, vary from the types of raw material utilised, means of recycling and recovering by-products or waste

materials. Thus, subsequently minimizing or eliminating waste being generated at the end of the process, resulting in **zero waste** or **near zero emissions** (an idealistic situation). These technologies allow the industries to be more competitive, meet and better their environmental compliance requirements and improve the worker's health. In the longer term, industries will gain significantly in terms cost-saving (operational costs) and from the "clean" image it portrays.

In terms of siting potential, incorporation of BAT and BACT allows the industrial activity to co-exist with compatible industries within the same industrial area. BAT and BACT can also increase siting options for the industrial activity when the pollution control is improved within the process and releases of pollutants to the environment are minimised (**Figure 3-2**).

Figure 3-2 BAT & BACT Consideration for Projects



In essence, BAT and BACT are one of the key elements or strategies in Cleaner Production (CP) which allows for an industrial activity or organisation to continuously improve their processes, production, services and consumption in order to help reduce environmental impacts, and with objectives towards ecologically and sustainable development. CP spells out strategies for company-specific environmental protection and pollution prevention initiative by minimising waste and emissions while maximizing product output. By analysing the flow of materials and energy usage in a company, options can be formulated to minimize waste and emissions out of industrial processes through source reduction strategies or by technology change or improvements, of which are what the BAT and BACT intended to achieve. Improvements of operational organisation and technology help to reduce or make better choices in use of materials and energy, and to avoid generation of waste, wastewater, gaseous emissions, waste heat and noise.

Correspondingly, adaptation of BAT and BACT provides the catalyst for the formulation of Eco-Industrial Parks, which is one of the strategic planning stipulated in the NPP-3 as future direction for industries in Malaysia in attaining sustainable industrial operations, of which is desired by the sustainable goals set by Malaysia (**Table 3-1**).

Table 3-1 Malaysia Sustainable Goals

Sustainable Development Goals **Malaysia - Sustainable Development Goals, Voluntary National Review 2017**
Malaysia together with other world leaders adopted the 2030 Agenda for Sustainable Development (2030 Agenda) at the United Nations General Assembly in New York on 25 September 2015. This is a global commitment towards a more sustainable, resilient and inclusive development, with 17 Sustainable Development Goals (SDGs) and 169 targets. The SDGs, officially known as "Transforming our world: the 2030 Agenda for Sustainable Development", include 17 goals designed to achieve a better future for the planet and humanity. Each of the 17 goals has specific targets regarding sustainable development issues. However, SDG 9 was conceived to "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation" and highlights the following opportunities for shared value: ☐ *Collaborate with governments and other companies to create industrial zones which unlock complementary investments in infrastructure, technology and production.* ☐ *Develop more resource efficient machinery that generates less effluent, waste and pollutants.* ☐ *Apply a circular economy mindset when designing products so that there is improved end-of-product lifecycle reuse and recycling.* ☐ *Incorporate innovative technologies, such as 3D printing, into manufacturing processes to reduce waste from long-run production and prototyping.* ☐ *Develop and implement improved processes (e.g. closed loop manufacturing) to reduce, reuse and recycle water, raw materials, non-renewable minerals, other inputs, by-products and waste.* ☐ *Source materials from sustainable sources (e.g. forestry products) and components with lower embedded energy.* ☐ *Increase energy efficiency in industrial manufacturing plants and across distribution networks.* ☐ *Increase the proportion of materials and components that are sourced locally in low and middle-income countries.* ☐ *Build the resilience of suppliers in emerging economies to reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters.*

3.2.1 Cleaner Production Concept in Project Planning and Design

Cleaner Production (CP) can only be conceptualised by changing attitudes and responsibility towards environmental management. At this present time, there are various technology options allowing for eco efficiency and pollution prevention available that are capable to meet the purpose and achieve this goal.

The ideal solution to minimise environmental impacts is for potentially environmental polluting activities to contain their impacts and risks on-site (meaning, within its property boundary). However, some industries by their nature generate a range of emissions (include air emissions, noise, vibration, heat, and other measure of environmental pollution) that cannot be fully mitigated or contained on-site, and their residual emissions

are likely to impact areas that are adjacent to or surrounding it. In general, the degree of residual impacts decreases with increasing distance from the source and the imposition of a buffer between such activities and sensitive receptors.

This may lead to various issues relating to land matters and need for provision of safety distances for proposed activity. As land is very scarce and expensive in most areas, consideration of internal controls can be an alternative consideration by the Project Proponent, which include adoption of high standards of environmental management by those engaged in activities which have potential to impact the environment.

Point to note:
A buffer zone is the area within which sensitive or incompatible land uses are prohibited or special measures are necessary to ameliorate the impacts due to an activity. However, buffer areas are not an alternative to prevention and control at source. Buffer zone should be considered as an added measure to assist in minimising off-site impacts due to residues which remain even with the adoption of preventive and mitigation measures.

Concerns arising from industrial activities that require attention for safety distances includes aspects relating to:

a) their potential to impact the environment, human health and environmental conservation,
b) the industry standard normally applied for pollution control and the relative efficiency of the control system(s),
c) the fugitive dust emission potential from the industry or activity,
d) the potential for odour generation,
e) the risk posed to human health and safety due to exposure to a pollutant, fire and explosion, and
f) the significance of the residual impact taking account of the industry standard for pollution control.

Several complementary CP techniques or practices are possible, ranging from low or even no cost solutions to high investment, advanced clean technologies. and these common elements for CP implementation are described below (**Figure 3-3**).

a) ***Good Housekeeping***: appropriate provisions to prevent leaks and spills and to achieve proper, standardized operation and maintenance procedures and practices;

b) ***Input Material Change***: replacement of hazardous or non-renewable inputs by less hazardous or renewable materials or by materials with a longer service life-time;

c) ***Better Process Control***: modification of the working procedures, machine instructions and process record keeping for operating the processes at higher efficiency and reduce rates of waste and emission generation;

d) ***Equipment Modification***: modification of the production equipment so as to run the processes at higher efficiency and lower rates of waste and emission generation;

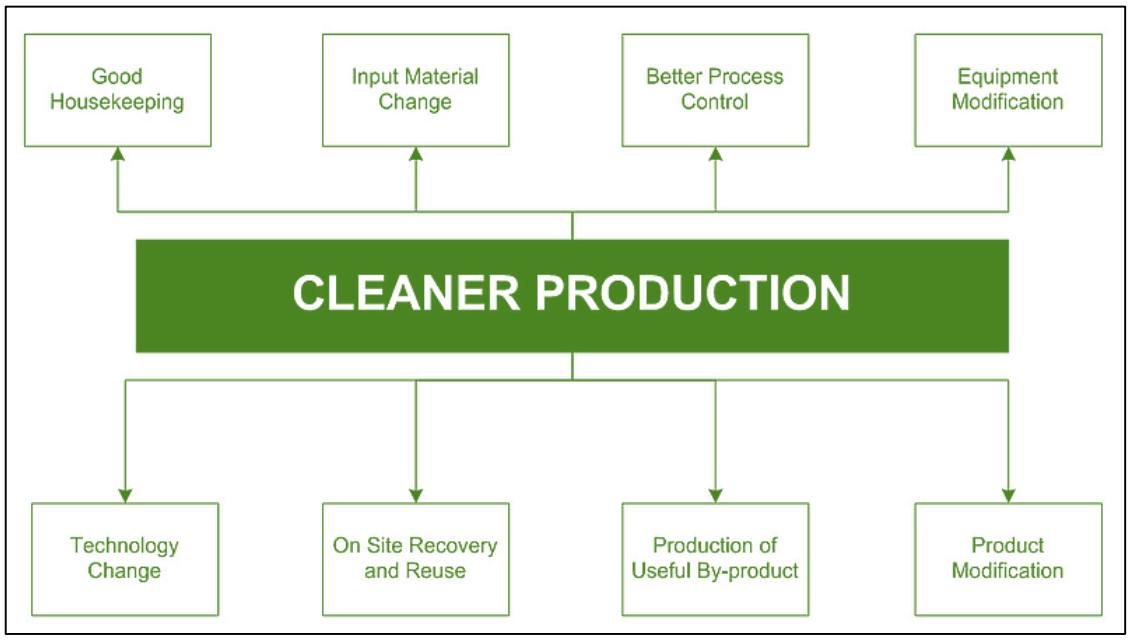
e) ***Technology Change***: replacement of the technology, processing sequence and/or synthesis pathway in order to minimize the rates of waste and emission generation during production;

f) ***On-Site Recovery/Reuse***: reuse of the waste materials in the same process or for other useful application within the company;

g) ***Production of Useful By-Products***: transformation of previously discarded waste into materials that can be reused or recycled for other application outside the company; and

h) ***Product Modification***: modification of product characteristics in order to minimize its environmental impacts during or after its use (disposal) or to minimize the environmental impacts during its production.

Figure 3-3 Cleaner Production Techniques



3.3 SITING, ZONING AND BUFFER JUSTIFICATIONS IN EIA AND SUBMISSION FOR PROJECT APPROVAL

Upon commencing with project planning, the Project Proponent must firstly review all available spatial planning documents to ensure the latest policies and plans are firstly available in hand and being adopted for the design. Early engagements with the Local Authorities and PLANMalaysia are encouraged to avoid any omissions or error in planning. Information related to the siting, zoning and buffer obtained shall be incorporated clearly in the submission for the project approval to the OSC. This submission shall form part of the project planning approval (i.e. under Development Order application, or Kebenaran Merancang, KM) (refer to **Figure 2-4**).

For prescribed activities, submission to the DOE on siting, zoning and buffer projects is mandatory requirement and shall be incorporated in the EIA report. Discussion in the EIA report on the project siting, zoning and any buffer/ setback must be discussed conforming with the Local Plans and in line with the State requirements, and shall be presented following the format in EGIM 2015. Prior the EIA study, the Terms of Reference (TOR) for the EIA study prepared shall also include the discussions on siting, zoning and buffer as required by EGIM 2015.

Once the EIA report is approved, the provision allowed and/or declared for the project siting, zoning and buffer is deemed accepted by the DOE. This shall constitute as legal requirement in the EIA Approval.

For non-prescribed activities, the requirements for siting, zoning and buffer must be carried out at the project planning stage; and to be submitted as part of the Project Planning application (e.g. at the submission for Development Order). Justification on compliance with the siting proposed, zoning compatibility and buffer required (if any) must be clearly indicated and defined within this submission to allow for the OSC to review and approve. The final project approval received would constitute the declaration made for siting and buffer.

Findings from the evaluation or assessment made may lead to recommendation to provide buffer or setbacks to further render the project to acceptable levels. This is needed in lieu of concerned residual impacts of which unable to be mitigated upon consideration and adaptation of all possible control measures. The buffer setting essentially depends on the findings of evaluation and the project must declare the buffer or setback it shall or intended to comply with. Among the possible scenarios (of concerned residual impacts) that may constitute provision of buffer or setback are (not limiting to):

- potential emission concerns in order to safe guard public health of surrounding receptors,
- potential odour issues related to the emission (with and/or without health concerns) that can lead to public complaints,
- potential noise emission and vibrational issues from the activities that can lead to public complaints,

- as safety distance as prevention towards potential hazard risk arising due to fire, explosion and accidental releases from hazardous installations

Some screening tools are presented in **Appendix G** of this Guidance Document for reference purposes, as a guide on available tools to assist in the self-screening or self-assessment. Also, should the project have sufficient information available at the conceptual stage, conducting a detailed modelling exercise is encouraged, as it will benefit the project in long run for the site selection and buffer/ set back provisions.

For industrial activities with potential safety risk concerns, it is mandatory to undertake a risk assessment for the project in order to determine the safety contours due to identified hazardous events. The risk assessment must be incorporated in the EIA report with clear indication of the tolerable limit contour of $1.0x10^{-6}$ fatalities/person per year and extent of the affected area. Thus, it is crucial that all relevant information regarding the process, raw materials and chemical to be used must be evaluated at earliest stage possible to determine any safety or risk concerns.

Guidance on methodologies and procedures for undertaking Risk assessment can be referred to Environmental Impact Assessment Guidelines For Risk Assessment, published by the DOE (2004), as well as other internationally recognised guidelines. Hazardous Industry: Any industry or installation which has the potential for causing injury threat to health, death and damage to property or the environment.

In cases where the setting for such provision requires consultation with the DOE or with other technical agencies that imposes similar requirements for siting, zoning and buffer; it is recommended that early engagement to be carried out to obtain necessary advice and direction. Sharing appropriate information will allow to identify any related concerns with regards to the proposed project location(s). All necessary information that is required for DOE's and the technical agency's understanding of the project must be presented and this information shall be incorporated into the planning submission to the OSC.

Figure 3-4 suggests the timeline for engagement with the DOE and other relevant technical agencies for determining siting, zoning and buffer requirements. Apart from the engagement with DOE and relevant technical agencies, it is recommended to also engage or consult the stakeholders (which also constitute receptors) within the project area or affected receptors to obtain essential information that can be incorporated in the project planning and design.

To assist Project Proponents, a checklist (refer to **Table 3-2)** may be used as a guide on the environmental aspects that needs to be considered in the screening process for site selection and suitability. This table summarises the requirements under EQA 1974 and other related considerations that are applicable. This checklist is not exhaustive and can be modified accordingly to suit the needs of the Project.

Figure 3-4 Project Stages and Engagement Timeline

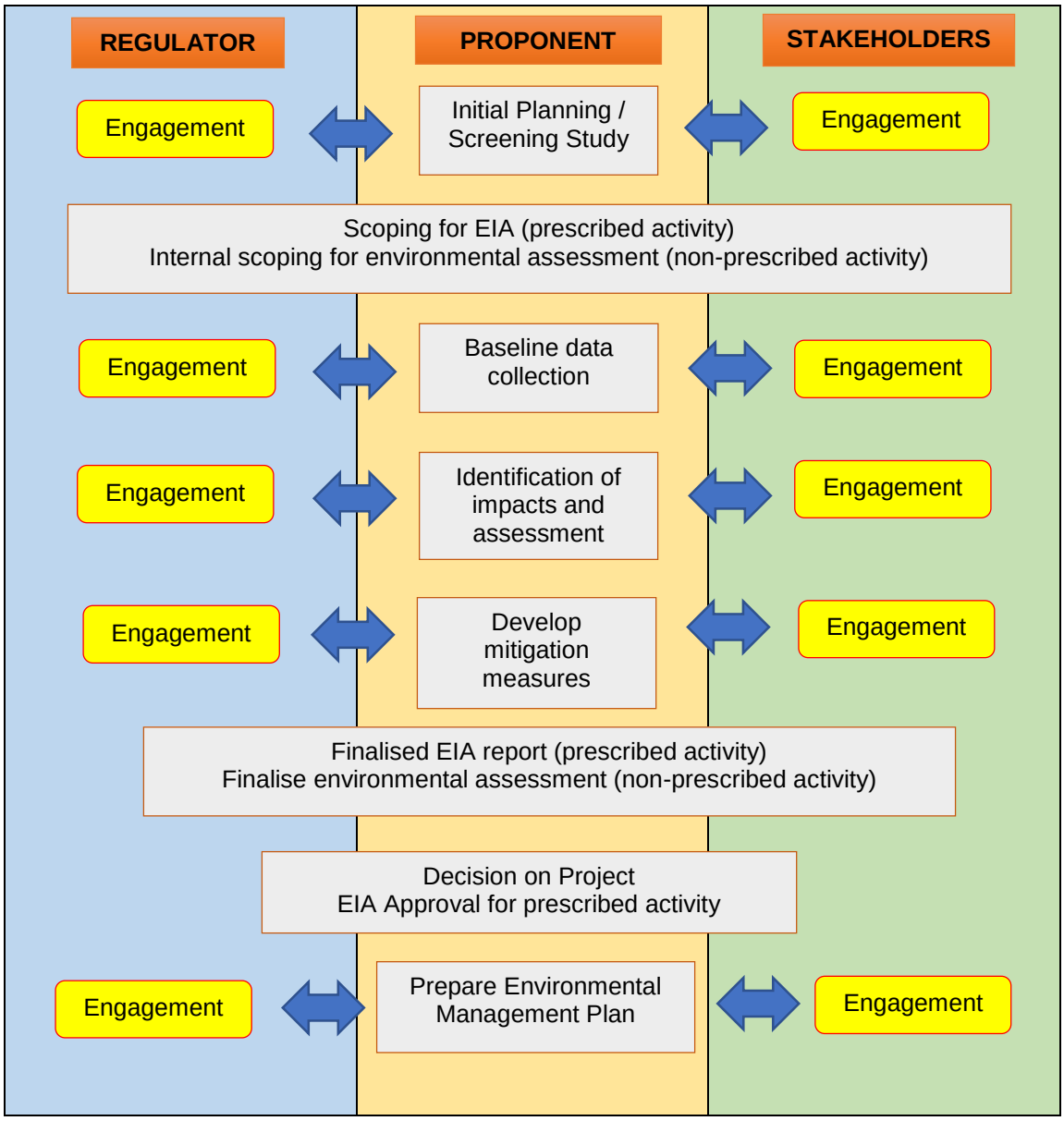


Table 3-2 Checklist During Planning Stage for Site Selection and Suitability for Industries

Generic Checklist During Planning Stage		
1	Evaluate the suitability of the proposed site in terms of its siting and zoning requirements by assessing compatibility with the gazetted structure/local plans, surrounding land use, provision of set-backs or buffer zones, the capacity of the area to receive additional pollution load, and waste disposal requirements.	☐
2	Check if project is listed as a prescribed activity under Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015 and consequently the requirements for undertaking an EIA study. Non-prescribed Activity Prescribed Activity listed under First Schedule Prescribed Activity listed under Second Schedule	 ☐ ☐ ☐
3	Obtain all necessary information about project and its process technologies including • Raw materials and chemicals that will be used (type, amount, characteristics) • Products produced, including by-products (type, amount, characteristics) • On process (if any) and type and amount of pollution and waste that will be generated. Adopt better process input and control mechanism with the use of Best Available Technology (BAT) and Best Available Control Technology (BACT). • On identifying all points emission or discharge and management of these pollution generated. • Utilities requirement, quantity and source of supply	☐
4	Engage an EIA consultant as part of the planning team of the Project to provide review on environment sensitivity and all technical requirement during the pre-feasibility and feasibility stages of project.	☐
5	Identify the human receptors and the environmentally sensitive receptors (i.e. forest reserves, catchment areas, etc.) within the vicinity that may be affected by the industrial activity. Design must incorporate reduction considering potential impacts on these receptors. *It is discouraged to select a site which is located in or directly adjacent to Environmentally Sensitive Areas (ESA), and too near to human receptors that likely to induce concerns and negative impacts.*	
6	Ensure design of site layout provides ample space for all processes and supporting components for efficient operation, among others ample space for warehouse & storage, treatment process (i.e. Industrial Effluent Treatment System, Sewage Treatment Plant), drainage system, waste storage and management, internal road circulation and setbacks, parking space for on-site workers, contractors and visitors, etc. Area space provision to consider future expansion.	☐
All industrial activities that produce pollutions (in terms of air emission or effluent) must provide on-site treatment system comprising of Air Pollution Control System, Industrial Effluent Treatment System, to render these pollutants down to safe levels prior to release.		

Generic Checklist During Planning Stage		
7	Determine the standards and compliance limits of all the pollutants under the EQA 1974 that will be generated during construction phase of the project and ensure discharges will meet with the compliance limits under the Environmental Quality (Industrial Effluent) Regulations 2009. *Facilities discharging treated effluent into rivers, upstream of a Water Treatment Facility and within water-supply catchment areas must comply to Standard A of the Environmental Quality (Industrial Effluent) Regulations 2009. Loading of treated and untreated to receiving rivers and water bodies must be considered and evaluated to assess compliance towards quality levels stipulated by the National Water Quality Standards For Malaysia. Determine if river is tidal and any impact of tidal towards discharge. Should the discharge enter the sea, evaluation to include the quality levels stipulated by the Malaysia Marine Water Quality Criteria and Standard.*	☐
8	Determine the standards and compliance limits of all the pollutants under the EQA 1974 that will be generated during construction phase of the project and ensure discharges will meet with the compliance limits under the Environmental Quality (Industrial Effluent) Regulations 2009. If Yes, proceed to Item 9 If No, proceed to Item 11	 ☐ ☐
9	Check if process wastewater from site can be discharged to a centralised treatment plant and if the treatment plant is able to receive this type of influent. Obtain the necessary approvals from relevant authority for this purpose.	☐
10	Determine the standards and compliance limits of all the pollutants under the EQA 1974 that will be generated during operational phase of the project and ensure discharges will meet with the compliance limits under the Environmental Quality (Industrial Effluent) Regulations 2009. Consider undertaking screening procedures water quality assessment as presented in Appendix G. *Design of the Industrial Effluent Treatment System must be in line with specific guidelines issued by the DOE and to submit Written Notification as per Regulation 4 of Environmental Quality (Industrial Effluent) Regulations 2009 to the DOE prior to installation. Written Declaration with As-built drawings submission must be done within 30 days after plant commence operation.*	☐
11	Ensure the industrial facility is be connected to a centralised sewage treatment plant (STP) within the industrial area/estate. Should there be no centralised STP available, a proper treatment plant must be constructed within their premise/ site for treatment of sewage generated. *Design of the Sewage Treatment System must be in line with specific guidelines issued by the Suruhanjaya Perkhidmatan Air Negara and submit Written Notification as per Regulation 4 of Environmental Quality (Sewage) Regulations 2009 to the DOE prior to installation. Loading of treated and untreated to receiving rivers and water bodies must be considered and evaluated to assess compliance towards river water quality quality levels stipulated by the National Water Quality Standards For Malaysia. Determine if river is tidal and any impact of tidal towards discharge. Should the discharge enter the sea, evaluation to include the quality levels stipulated by the Malaysia Marine Water Quality Criteria and Standard.*	☐

Generic Checklist During Planning Stage		
12	Identity the expected locations in the facility for point sources emissions from all industrial process. Consider undertaking screening procedures for air quality assessment as presented in Appendix G. Review cumulative impacts is mandatory for expansion projects and for its suitability for locating within the existing industrial area. *Point sources emissions shall be treated with proper Air Pollution Control Systems suited for its purposes and must be adequately designed to meet the Environmental Quality (Clean Air) Regulations 2014. Loading of pollution into the atmosphere must be assessed against the recommended ambient air limits stipulated by the Malaysia Ambient Air Quality Standard 2015.*	☐
13	Identity the expected fugitive air emissions from all industrial process in the facility. *Fugitive emissions generated from raw material, product storage and production processes must incorporate proper controls to minimise generation of fugitive emissions and must comply to the requirement of the Malaysia Ambient Air Quality Standard 2015.*	☐
14	Identify potential sources of possible odour generating locations *Odour may be generated from process operations and must be contained/treated to mitigate impacting receiving receptors. Odour controls by treatment systems to be considered, where possible, or mitigate by reviewing the raw materials and/or chemicals used, or generated by the process, by-products and wastes.*	☐
15	Determine all noise and vibration generating equipment during the construction phase and operations phase. *Noise abatement must be incorporated during the design stage to prevent nuisance to receiving receptors. Recommended limits for noise controls and permissible sound level can be referred to The Planning Guidelines for Environmental Noise Limits and Control, Guidelines For Noise Labelling and Emission Limits of Outdoor Sources, and The Planning Guidelines For Vibration Limits and Control in the Environment published by the DOE.*	☐
16	Undertake risk assessment for industrial activities that utilises chemicals, hazardous fuels and/or carrying out operation that are likely to impose health and safety concerns to the surrounding areas. Safety distance between facility and receptors must be incorporated in planning and address mitigation proposed for risk reduction. Recommended screening procedures (or equivalent) for risk assessment as presented in Appendix G and can also refer to the Environmental Impact Assessment Guidelines for Risk Assessment published by the DOE. *Risk contours generated will form the safety distance required for the industry, hence to be assessed in the buffer provision planning.*	☐
17	Identify all the type of wastes that will be generated in the facility including municipal solid wastes, liquid wastes, non-scheduled industrial wastes and scheduled wastes. *Waste generation and management planning should include waste minimisation, recycling and recovery concept. Scheduled wastes management (including disposal) must comply with the Environmental Quality (Scheduled Waste) Regulations 2005, and industries are recommended to understand and aware of latest policies by the DOE*	☐

Generic Checklist During Planning Stage		
	with regards to scheduled waste management (i.e. design and plan in line with the "cradle-to-cradle" policy by the DOE). Each industrial activity must be designed to minimize all wastes generated within the premise. On-site treatment of waste at the planning stage is encouraged (especially if large quantities of waste is generated).	
18	Incorporate Environmental Mainstreaming Tools (EMT) in the early stage of planning to ensure that requirements for self-regulations is designed and budgeted for. These requirements for EMT include: • Provision of competent persons within the process operation and sufficient number of competent persons. • To include mini-laboratory on-site for testing and analysing environmental parameters prior to discharge. The mini-laboratory requirement must match the process operations, type of pollution/emission generated and equipped with proper analysers and test kits. • Provision of ample budget inclusive of cost of externality • Set up environmental committees – for performance monitoring and compliance monitoring.	☐ ☐
19	Identify the human receptors and the environmentally sensitive receptors (i.e. forest reserves, catchment areas, etc.) within the vicinity that may be affected by the industrial activity. Design must incorporate reduction considering potential impacts and residual impacts on these receptors. Where possible, review and address cumulative impacts within the vicinity and long terms effects towards receptors.	☐

Note:

This checklist is only used as a guide during the planning stages of the project. This list will need to be updated and incorporate the prevailing legislations. Projects may propose or provide own checklist and self-assessment methods.

3.4 SITE SUITABILITY AND SELECTION CRITERIA

The selection of a site for an industry or similar activity is normally based on the primary concern of availability of suitable land that meets all or most of its operational needs. Following are general influencing factors for an optimum that are normally being assessed by investor for determining a project location:

a) accessibility to customers, suppliers (of raw materials and supporting services), & work force;

b) availability of transportation infrastructure (roads, rail, port and/or other transit facilities) for raw materials and product movements;

c) availability of adequate utilities (water, power and energy supplies, gas supply);

d) affordability of land, rent and other costs associated with the use of the land and its services;

e) market conditions include ease of access for selling products, to customers and future market potential; and

f) compatibility with surrounding land uses and activities and absence of restrictions for future expansion.

The above criteria being considered by investors and project proponents are based on economic and social factors with some and/or little consideration on environmental concerns and compatibility. Proximity to utility supplies, road networks, manpower resources, markets for products and raw material resources are usually desired in view of production and operation economics. Nonetheless, in the context for environmental protection and compliance with statutory standards and limits, most times these criteria are “non-ideal” and would perceived the site location as “unsuitable”. Thus, it is important to have a good balance between the economic, social and environment factors for the site location to be suitable and sustainable in the long run.

3.4.1 ACCEPTANCE CRITERIA FOR SITE SUITABILITY

The acceptance criteria to assess the suitability of a Site shall take account of the following considerations:

a) The land use of the proposed project is suitable and **not in conflict** with that designated or proposed for the site as detailed in the gazetted Structure or Local plan, or other such approved land use plans prescribed by the relevant authority;

b) The land use of the proposed project is generally **compatible** with the surrounding land use that is designated in the gazetted Structure or Local Plans or such other approved land use plans prescribed by the relevant authority;

c) The site generally has provisions for **buffer zone** or **setback distances** to nearest receptors that has been designed for and incorporated in the State Structure Plans and Local Plans;

d) The impact of the **added pollutant load** on the surrounding environment and its capacity to receive it without compromising on national ambient air and water quality goals; and

e) **Appropriateness** of process technology, pollution prevention and control measures proposed to be adopted.

Land use compatibility and buffer adequacy between proposed industry activity with that of its neighbours is an important criterion in selecting a Project Site. The spatial planning provision in Local Plans or industrial estate development plan may provide (to some extent) buffer and setback which addresses nuisance and fire safety concerns. Nonetheless, industrial project should undertake its own evaluation to determine the appropriateness of siting location of interest and compatibility concern to avoid potential conflicts. Evaluation will need to cover all aspects including the proposed pollution control systems and its appropriateness in meeting compliance requirements (which include review on potential pollution loading into atmosphere and water bodies).

The types of sensitive receptors and the principal criteria for site selection described here as a general understanding and to assist industrial project in its planning for buffer and setback in terms of environmental protection. The nature, character and response of the sensitive receptor towards an impact are important considerations in determining the appropriate buffer between the source and the receptor.

3.4.2 Siting Consideration For An Industry

During the project planning, it is important to consider the process operations that will be carried out, technologies to be installed and hazardous nature of raw materials, products produced or chemicals utilised. Each industry can be further classified in accordance to its polluting potential depending on the scale of their operations. Among the information needed are pollution generation information, raw materials utilised, chemical usage, waste generation and cooling requirement.

Following **Table 3-3** presents the description of the industries based on its polluting potential. To a certain degree, the polluting potential of the industrial process is not aligned with the industrial classification by BNM/MIDA since the polluting potential of an industrial process dependent on the factors described in **Section 3.4.3**. During the planning stage, it is recommended that these factors that are capable to influence the degree or magnitude of pollution release and discharge to be studied and confirmed in order it can properly guide the industrial activity on the determination of its design and site location selection.

Table 3-3 Classification of Industries and Potentially Polluting Hazardous Activities

Description of Nature of Industry/ Activity
High risk industries, installations or activities are characterized by: • Very high risk due to high probability of fire, explosion, radiation, and release of highly toxic and hazardous chemicals • Raw material used in production or products/by-products and wastes may include those classified as 'highly hazardous' • Emit significant levels of residual particulate and/or gaseous air pollutants • Discharge very large quantities wastewater containing significant levels of residual contaminants • Generate large quantities of scheduled wastes some of which are very difficult to treat • Generate noise and/or vibration exceeding safe limits concerns that are difficult to control • Generate odour concerns that are difficult to control
Heavy polluting type industries or activities are characterized by: • High pollution potential and risk due to fire, explosion, radiation, and/or highly hazardous chemicals • High air pollution potential (including odour) from residual pollutants in air emissions (fugitive and source emissions) • High potential for emission of greenhouse gases and/or ozone depleting substances • Generate excessive noise and/or vibration exceeding safe limits • Generate large quantities of wastewater containing significant levels of residual contaminants • Use large quantities of raw material(s) with potential to cause significant fugitive emissions during handling, transfer and storage • Generate significant amounts of scheduled wastes some of which are difficult to treat or managed
Medium polluting type industries or activities are characterized by: • Moderate pollution potential and risk due to fire, explosion, and/or hazardous chemicals • Moderate air pollution potential (including odour) from low levels of residual air pollutants • Moderate potential for emission of greenhouse gases and/or ozone depleting substances • Moderate noise and/or vibration with no significant residual impact • Generate significant quantities of wastewater containing low levels of residual pollutants • Generate scheduled wastes which are mostly readily treated or managed within prescribed facilities
Light polluting type industries or activities are characterized by: • None or very low pollution potential for air pollution, noise, vibration, odour, fire or explosion • Does not involve the use hazardous raw materials or production of hazardous products • Use of renewal or low greenhouse gas emission sources of energy • Generate no or very low amounts of wastewater with potential to contribute to water pollution • Generate mostly non-hazardous solid waste and no significant amount of scheduled wastes • Industries are small scale and mostly compatible with each other

3.4.3 Environmental Concerns Of Industrial Activities

Industries can generate a range of environmental concerns including air pollution, noise, fumes, smoke, vibration, odour, water pollution, risk of death or injury due to fire and explosion, or risk to health due to toxic and hazardous wastes release. The scale of the problem depends on various factors including:

a) the type of raw materials used in the process,
b) the type of process technology adopted,
c) the type of equipment or machinery used in the production process,
d) the type of control system applied,
e) the operational and management practices adopted for the facility, and
f) the skill level of workers and the type of training provided.

The environmental concerns are often more severe for large and heavy industries as compared to medium-scale and light industries. This is due to the scale of the operation are usually are much bigger, entails the use of large quantities of raw materials and utilities including water, intensive use of heat and energy sources, production of large quantities of pollutants and wastes, need for large transportation network, need for significant labour and associated facilities for housing workers, and need for large area for the processing facilities, storage, and other manufacturing units.

To assist in understanding the likely environmental concerns from industrial activities, the information shared in **Appendix E** for general overview of likely environmental concerns from a particular industrial activity. This list is not exhaustive and only to provide as a guidance for general understanding. Further details of the industrial activities operation must be obtained from the project proponent or project team to assess and justify the environmental concerns identified. **To assist the relevant project approving authority in their processing of application made, the project information must be provided in sufficient details for the decision-making.**

Criteria For Site Selection

The environmental criteria for siting of industrial activity are governed to a large extent by the type of industry and the likely environmental concerns expected from the industry. Nevertheless, there are common criteria in the selection of a site that can be used as a guide and these are outlined as follows:

a) **Preference is for siting within designated and approved industrial estates or areas designated for industrial use (must refer to NPP, State Structure Plan and Local Plans)**,

b) Adjacent industry types are to be generally compatible with one another;

c) Avoid areas where an operation has a strong likelihood to impact, either directly or indirectly, environmentally sensitive areas located downstream or in adjacent areas (refer to environmental sensitive areas as presented in NPP);

d) Avoid siting of industrial activities, upstream of the water intake points and water catchment areas (List of water intake points are appended in **Appendix F**);

e) Select sites which have flat terrain or large flat terraces. Avoid hill slope and sensitive and/or unstable terrain areas;

f) Select areas with good air dispersion capacities and where existing pollution levels are low;

g) Avoid siting too close to coastal areas that are affected by high tide, and/or within flood prone area;

h) Select areas with good road infrastructure which allows easy access to the site and avoids directly passing through residential areas or sensitive receptors such as hospitals and schools, and reasonably good access to other industrial estates to strengthen industrial linkages;

i) Select areas serviced by good public transportation services for ease of movement for workers;

j) Select areas that can cater for ample parking spaces for heavy vehicles parking within the site premise or common parking area (by industrial estate developer);

k) Select areas with access to utility supplies and proper waste management services and facilities, and proper drainage for storm water conveyance,

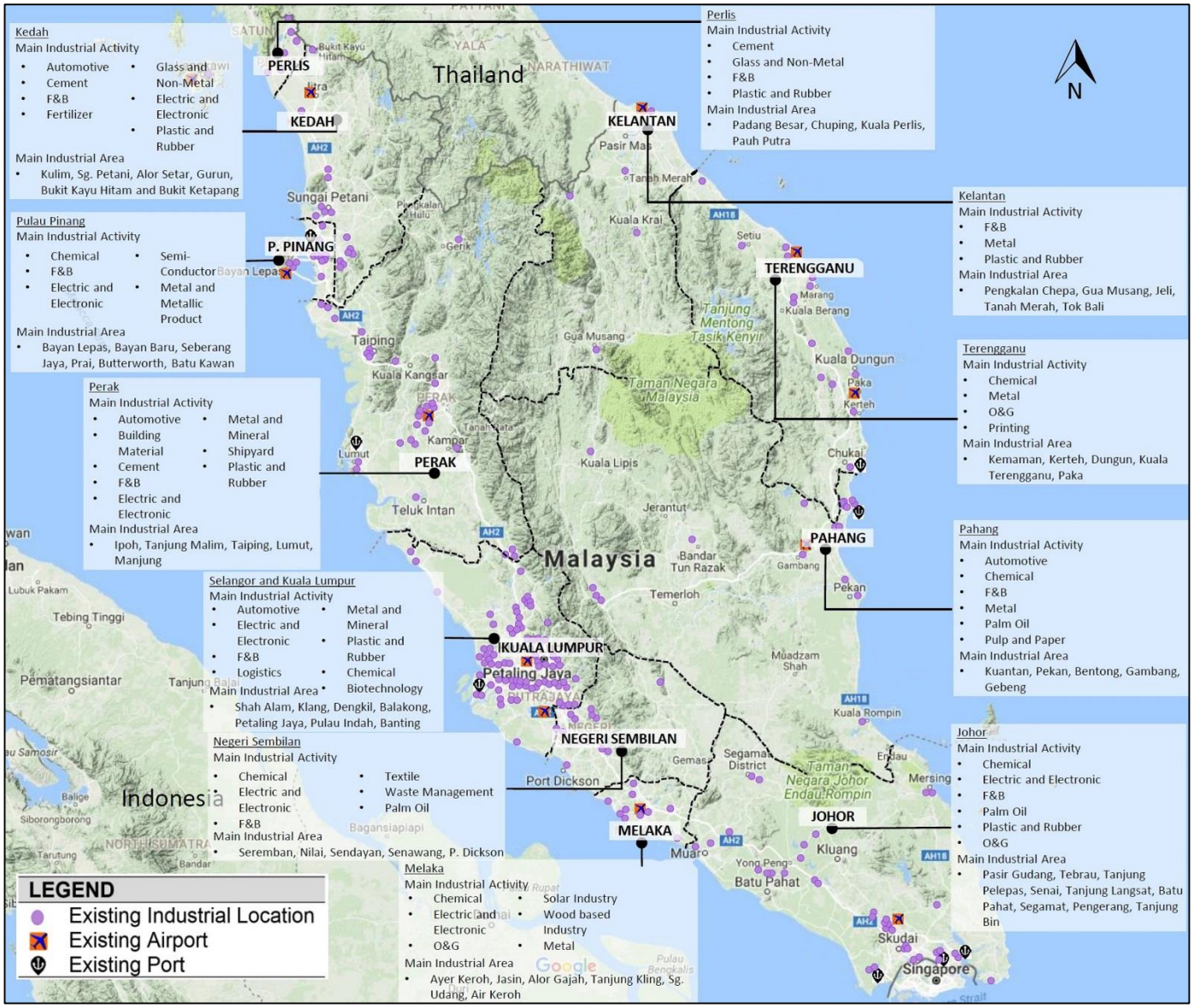
l) Select areas equipped with and served by centralised treatment plant for sewage and process effluent (if possible); and

m) Select areas planned with adequate buffer and setback provisions made under the spatial planning requirements to mitigate environmental concerns, best managed by separating buffer from sensitive receptor (such as residual noise, odour, etc.).

There are many industrial areas that have been developed in Malaysia. Some of these industrial areas were developed by agglomerating similar industries or industrial clusters. **Figure 3-5** and **Figure 3-6** presents the current industrial areas that has been mapped within each State, of which some industrial clusters have been gazetted to assist and ease selection of suitable location. The information provided may not exhaustive and with the advent of new industrial areas. It is recommended to refer the full listing of the industrial areas and industrial clusters identified in the Local Plans or the Local Authority.

For an existing industry that desire to expand its operation and facility, it is also recommended to initiate check and discussion with the Local Authority in terms of the direction and future planning for the area. Important information to note will be the future planning of the surrounding areas and if these plans may impact the proposed expansion program.

Figure 3-5 Industrial Areas And Activities in Peninsula Malaysia



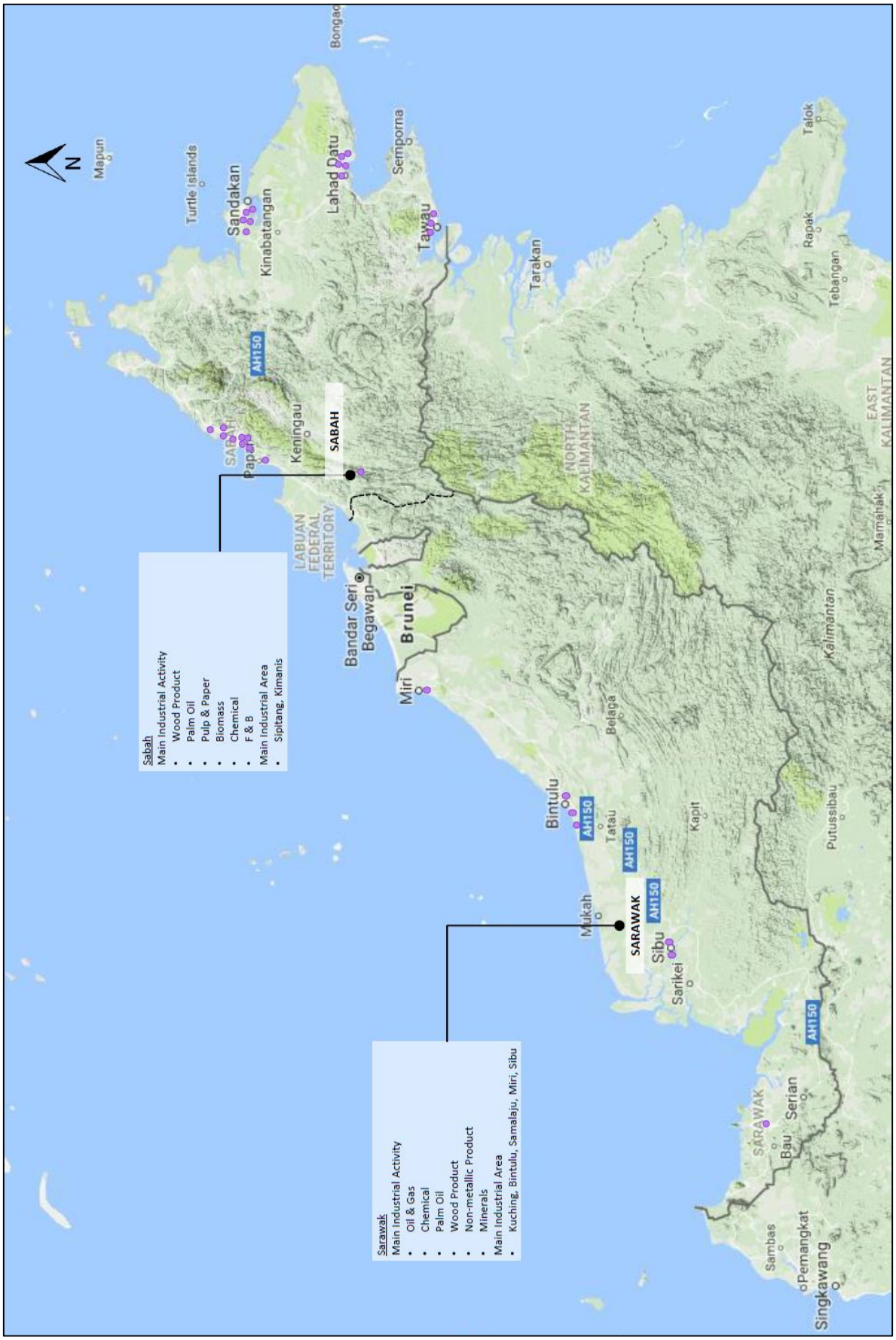


Figure 3-6 Industrial Areas and Activities in Sabah & Sarawak

3.5 SITING CONSIDERATION FOR RESOURCE BASED INDUSTRY

Resource-based industries refer to *"industries that are based on primarily using resources (natural or 'man-made') for their operations"*. Hence, proximity to the resource to which they depend on, is the main consideration for selecting a site for their location. In most situation, resource based industry is sited at the location of its resource(s). Example of locational dependent industries and activities are:

a) Those engaged in mineral extraction and/or processing such as, iron, bauxite, gold, oil and gas, etc.,
b) Those engaged in the quarrying or mining for raw materials such as, stone, rock, sand, clay etc.,
c) Those that are associated with harvesting and processing the produce of agriculture such as, rubber, oil palm, cocoa etc.,
d) Those that are associated with harvesting and processing of coastal and marine produce such as, fish, prawns, seaweed, etc.,
e) Those supporting industries or activities described in (a) and (d), such as, marine facilities for the construction, repair and maintenance of vessels, crafts etc., and
f) Those that use water to convert to energy or abstract water to supply to various beneficial uses such as, hydro-power generation, water supply, etc.

Environmental impacts due to resource-based industries and activities are generally significant and irreversible as many of their operations are based on unsustainable practices. In general, extractive industries such as, mineral extraction, surface mining and quarrying are unsustainable since they deplete the resources on which they depend and incur significant damage to the natural environment of the area concerned. Often the ecological integrity of the area is damaged beyond its ability to support normal life systems or revert to its original state without human intervention.

However, there are those that are based on sustainable practices which exploit the resources but maintain the natural environment for resource regeneration and harvesting such as, resource exploitation of coastal and marine resources, and run-of-river schemes for water supply and power generation. To some extent this may be true for agro-based industries (for long-term crops) which follow sustainable agricultural practices.

Criteria For Site Selection

While locational dependent industries require them to be generally close to their resource, the siting of such industry or activity shall take into consideration the following:

a) Avoid ecologically sensitive areas or sites,
b) Avoid water pollution affecting downstream uses of water. These uses include public water supply, irrigation, power generation and conservation of sensitive aquatic ecological resources,

c) Avoid human related activities, structures and systems in environmentally sensitive areas, and
d) Conform to the landscape of the area without affecting the scenic features of that place or causing major ecological damage such as soil and groundwater contamination.

3.6 APPLICATION OF BUFFER UNDER LOCAL PLANS

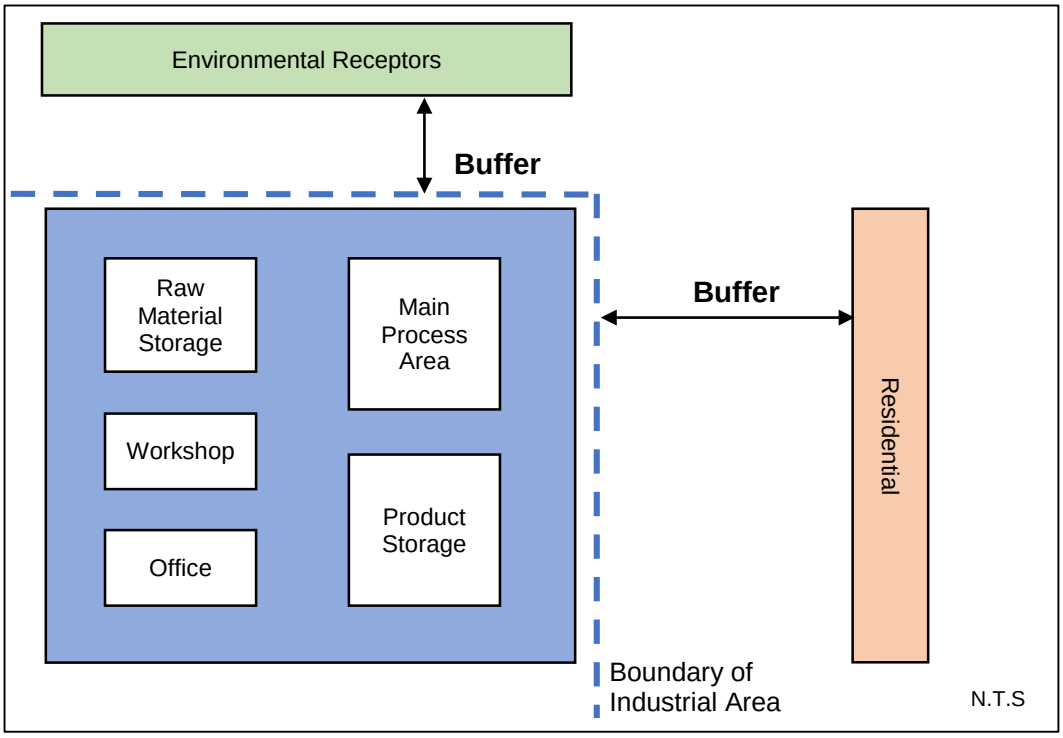
Within the Local Plan, industrial areas are planned with adequate buffer provisions which is mainly for safety and emergency controls. Ample buffer or setback is important to avoid mishaps and emergencies as fire or accidental releases from reaching the surrounding receptors.

Within the buffer zones, there are various applications for controlled developments that can be carried out. Examples of such applications for controlled development would be presented in each Local Plan or advice sought from the Local Authority of the district. Below are some examples which is applied within the buffer area:

a) roads and road reserves,
b) car parks,
c) drains and drain reserves,
d) rivers and riparian reserves,
e) areas designated for soil conservation and slope protection,
f) lakes and other natural open water systems,
g) parks and open spaces,
h) playing field, open spaces and sporting facilities,
i) agriculture involving the planting of commercial crops and flowers,
j) commercial activities,
k) office and associated staff facilities and amenities (including canteen, gym, rest rooms, etc.
l) other downstream activities (which may include packing, packaging, or other preparation processes) which do not generate significant noise, vibration, odour or air emissions which cannot be contained within the project boundary,
m) warehouses not involved in the storage of hazardous or dangerous goods, and
n) workshops and service centres

For illustration purposes, the application of buffer is shown in **Figure 3-7** and **Figure 3-8.**

Figure 3-7 Application of Buffer For Industrial Area



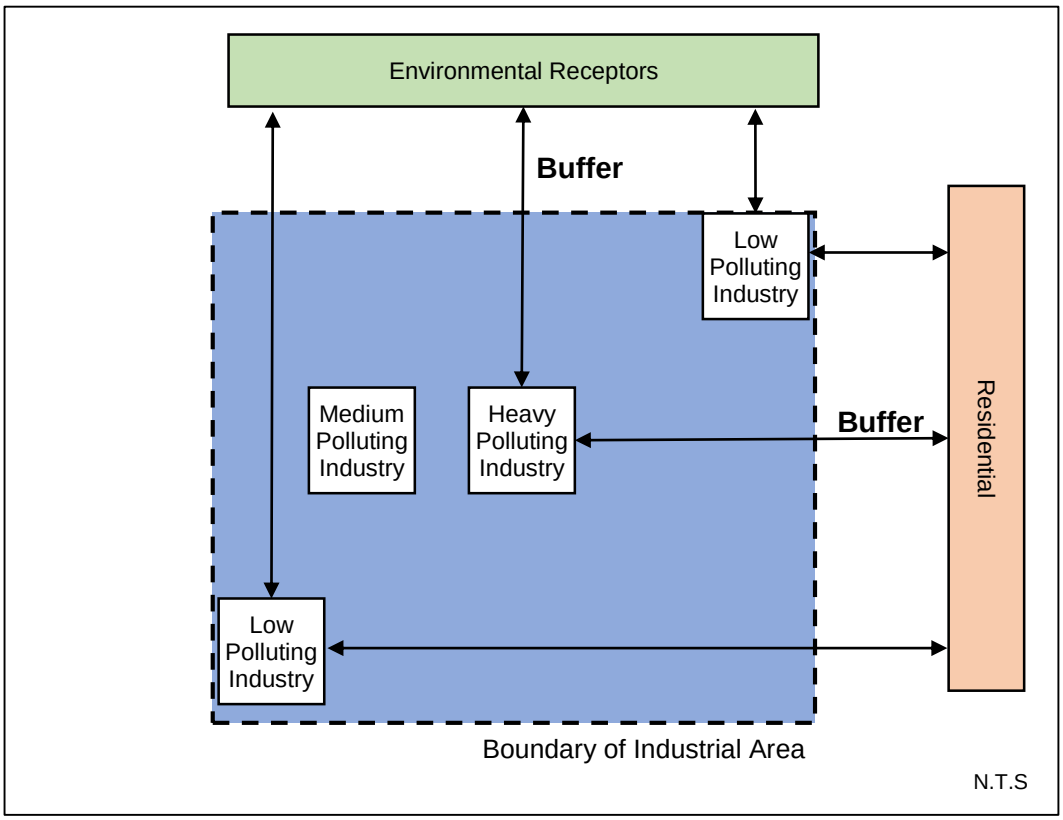
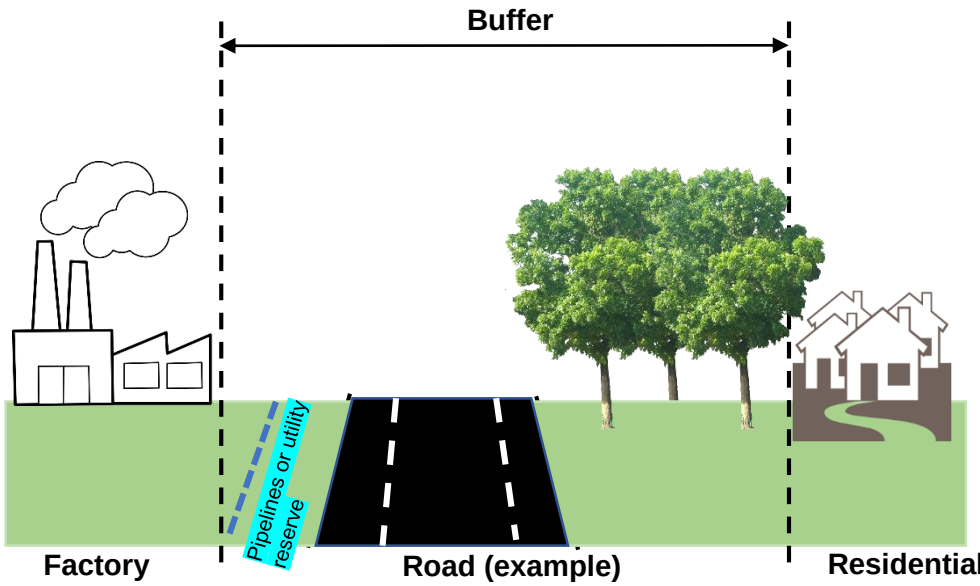
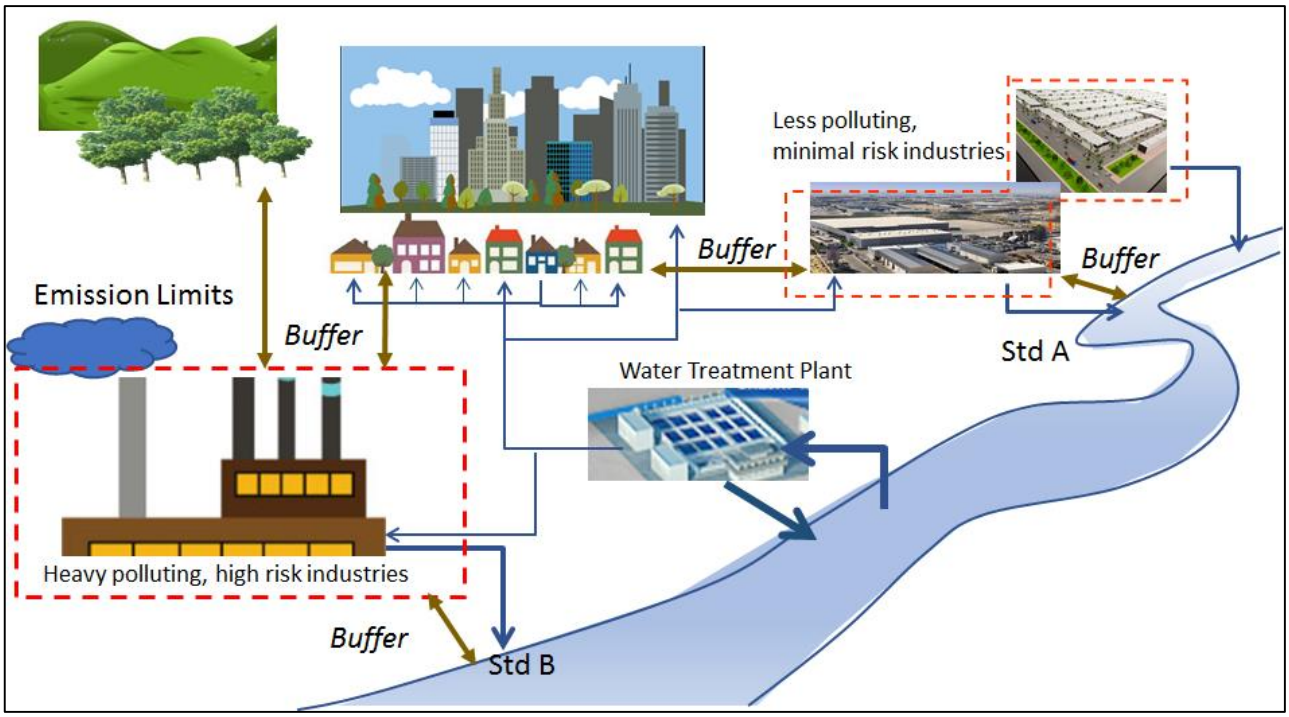


Figure 3-8 Application of Buffer (Sectional View)



Notes: "Buffer" is safety distance for fire and explosion potential. Buffer areas not necessarily left empty but can be planned for suitable activities and facilities.

Figure 3-8 Example of Siting, Zoning and Buffer



3.7 ECO-INDUSTRIAL PARK

The Action PD1.4C: Promoting the Planning of New Integrated Industrial Areas in the NPP-3 promotes the establishment of Eco-Industrial Park (EIP) as new way forward to promote sustainable development. While it is stated that the EIP to be promoted for new industrial areas, the existing industrial areas can be planned to integrate this concept with proper planning.

3.7.1 EIP IN MALAYSIA

In Malaysia, EIP is a new way forward as promoted for eco-friendly industries under the NPP-3. At present, there is no proper EIP being set-up or planned. Nonetheless, there are limited "Industrial symbiosis", which is a related but more limited concept in which companies in a region collaborate to utilize each other's by-products and otherwise share resources, does exist among the industries and within the existing industrial areas/ complexes. The drivers for such practice is mainly the economics.

Waste generators are always in the lookout for measures to reduce costs and find means to resell instead of disposal of their wastes of which will financially benefits their operation. As such it is encouraged that such established to be planned for and considered by among the industries as to enable for sustainable development.

There are various design and concepts that can be considered for the EIP. Some of which can be conceptualised on resource-based and more commonly are the waste-based as illustrated in **Figure 3-9** and **Figure 3-10**. The concept will be mainly for ensuring the key or anchor industry/industrial activities and integration of other related or downstream activities.

Action PD1.4C: Promoting the Planning of New Integrated Industrial Areas

Under this Action plan, planning for new industrial area should take into account new technology resulting from innovation and research as well as to look at world market demand. These shifts in planning considerations will alter the processing method and operations of many industries, especially in manufacturing. Therefore, addition of sustainable, high-tech and eco-friendly infrastructures, utilities and facilities must be prepared in new industrial area to cater to the global transformation trends. Such additions include:

- Shifting of complex manufacturing towards fast engineering and advanced manufacturing techniques
- Innovations and new technologies
- Sustainable manufacturing and circular economy
- Human-centric manufacturing processes

Development of Eco-Industrial Park (EIP), an industrial park which promotes business cooperation between industries and local public for efforts involving pollution reduction and improvement of resource-sharing efficiency, shall be promoted for new industrial areas. These efforts will lead towards sustainable development, stimulate economic growth while improving environmental quality. When planning the Eco-industrial parks, importance is given to prioritising environmental management, promoting high value-chain industries and developing technology for green and clean industries.

Figure 3-9 Illustration of Resource Based Eco-Park

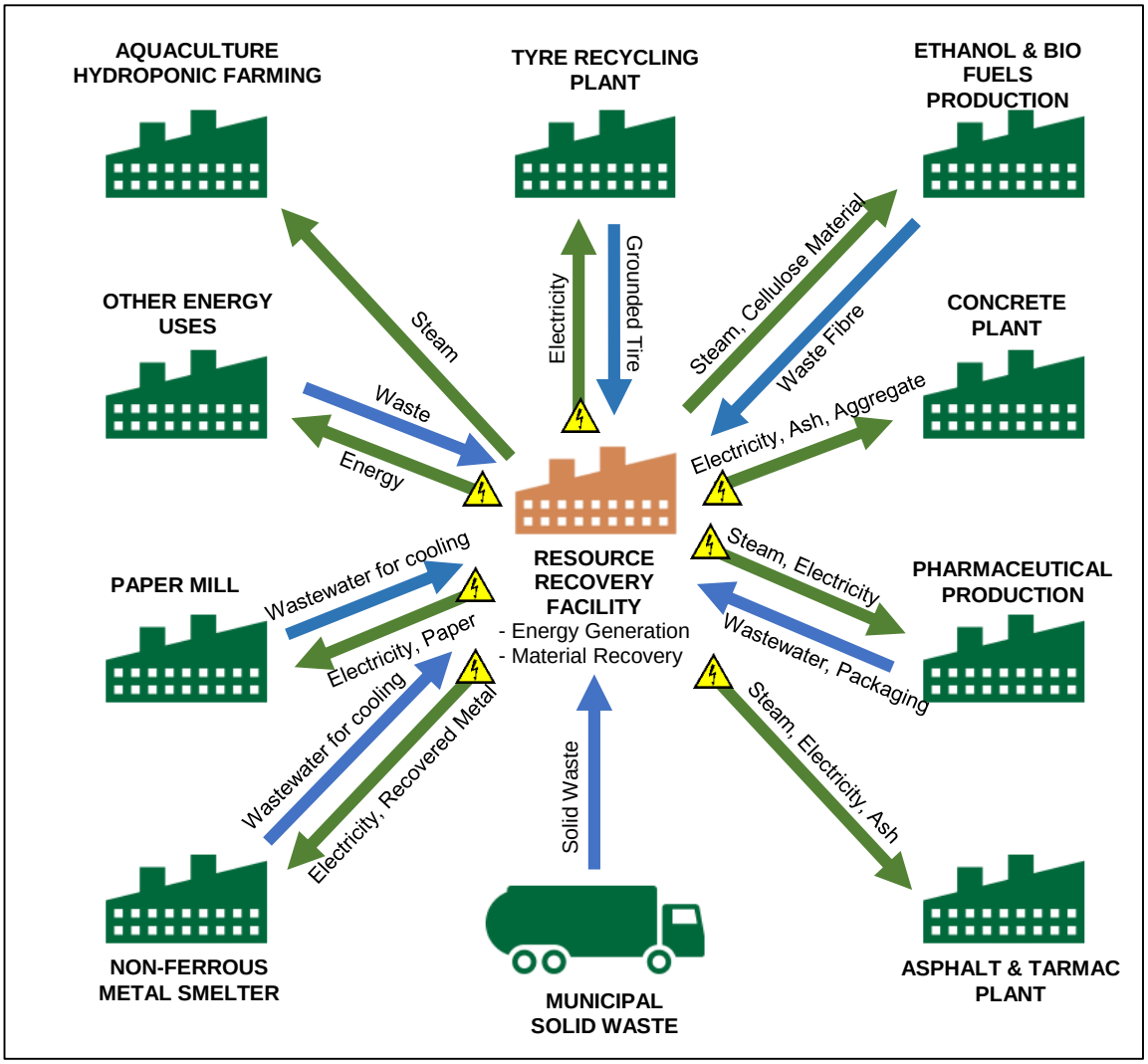
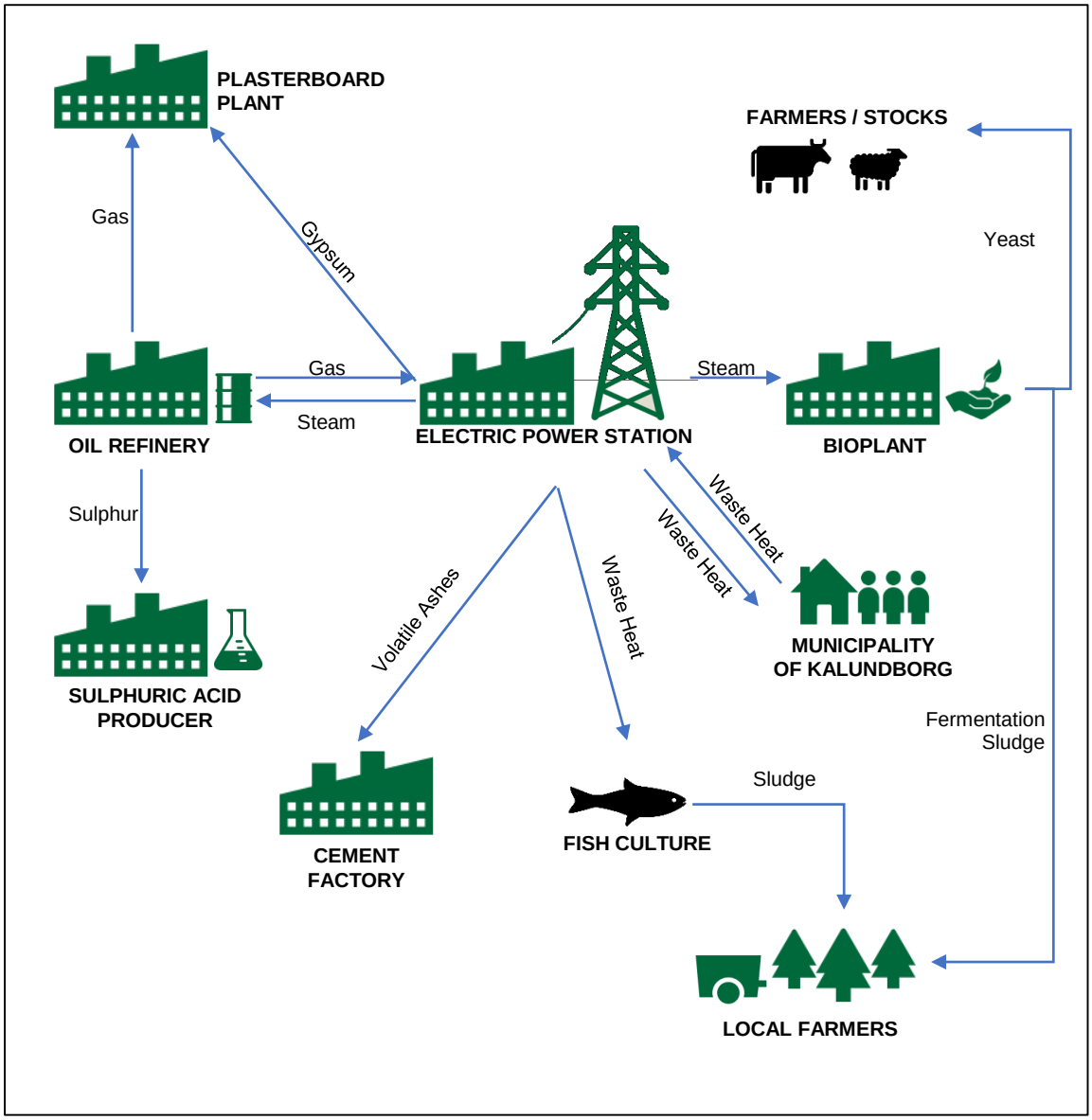


Figure 3-10 Illustration of Waste Based Recovery Practiced in Kalundorg EIP, Denmark



Source: Adapted from Kalundorg EIP, Denmark

Table 3-4 Strategies for EIP Design

STRATEGIES FOR DESIGNING AN ECO-INDUSTRIAL PARK (EIP)
Several basic strategies are fundamental to developing an EIP. Individually, each adds value; together they form a whole greater than the sum of its parts. **Integration into Natural Systems** • Select site using an assessment of ecological carrying capacity and design within the limits it defines. • Minimize local environmental impacts by integrating the EIP into the local landscape, hydrologic setting, and ecosystem. • Minimize contributions to global environmental impacts, i.e. greenhouse gas emissions. **Energy Systems** • Maximize energy efficiency through facility design or rehabilitation, co-generation,[1] energy cascading,[2] and other means. • Achieve higher efficiency through inter-plant energy flows. • Use renewable sources extensively. **Materials Flows and 'Waste' Management for the Whole Site** • Emphasize cleaner production and pollution prevention, especially with toxic substances. • Seek maximum re-use and recycling of materials among EIP businesses. • Reduce toxic materials risks through materials substitutions and integrated site-level waste treatment. • Link the EIP tenants to companies in the surrounding region as consumers and generators of usable by-products via resource exchanges and recycling networks. **Water** • Design water flows to conserve resources and reduce pollution through strategies similar to those described for energy and materials – cascading through uses at different quality levels. **EFFECTIVE EIP MANAGEMENT** In addition to standard park service, recruitment, and maintenance functions, park management also: • Maintains the mix of companies needed to use each other's by-products as companies change over time; • Supports improvement in environmental performance for individual companies and the park as a whole;

[1] Co-generation is the capturing and using of otherwise "wasted" heat from the electrical generating process.

[2] Energy cascading is using residual heat in liquids or steam from a primary process to provide heating or cooling to a later process. For example, excess steam from a power plant or refinery may be used in a food processing plant or greenhouse.

STRATEGIES FOR DESIGNING AN ECO-INDUSTRIAL PARK (EIP)

- Operates a site-wide information system that supports inter-company communications, informs members of local environmental conditions, and provides feedback on EIP performance.

Construction/Rehabilitation

- With new construction or rehabilitation of existing buildings, follow best environmental practices in materials selection and building technology. These include recycling or reuse of materials and considering lifecycle environmental implications of materials and technologies.

Integration into the Host Community

- Seeking to benefit the local economy and social systems through training and education programs, community business development, building of employee housing, and collaborative urban planning.

PRINCIPLES OF INDUSTRIAL ECOLOGY

- Connect individual firms into industrial ecosystems
  - ☐ Close loops through reuse and recycling.
  - ☐ Maximize efficiency of materials and energy use.
  - ☐ Minimize waste generation.
  - ☐ Define all wastes as potential products and seek markets for them.

- Balance inputs and outputs to natural ecosystem capacities
  - ☐ Reduce environmental burden created by releases of energy and material into the natural environment.
  - ☐ Design the industrial interface with the natural world in terms of the characteristics and sensitivity of the natural receiving environment.
  - ☐ Avoid or minimize creating and transporting toxic and hazardous materials (when needed; synthesize locally).

- Re-engineer industrial use of energy and materials.
  - ☐ Redesign processes to reduce energy usage.
  - ☐ Substitute technologies and product design to reduce use of materials that disperses them beyond possibility of recapture.
  - ☐ Do more with less (technically called dematerialization).

- Align policy with a long-term perspective of industrial system evolution.

- Design industrial systems with awareness of the social and economic needs of local communities.
  - ☐ Optimize local business and job development opportunities.
  - ☐ Offset impacts of industrial development on regional systems through investments in community programs, as needed.

  The objectives for these are:
  - *Preserving the ecological viability of natural systems.*
  - *Ensuring acceptable quality of life for people;*

STRATEGIES FOR DESIGNING AN ECO-INDUSTRIAL PARK (EIP)

- *Maintaining the economic viability of systems for industry, trade and commerce*.

STRATEGIC PLANNING

One effective form of strategic planning is to use the project vision and performance objectives your team has developed as the desired future state for the park or region. Chart the present state you have defined through the surveys and audits. This entire process is known as "idealized planning", developed by Systems scientist Russell Ackoff (Ackoff 1981) which is incorporated into various management teams and staff experts of many larger corporations.

The strategic plan will need to include public sector initiatives, actions among the community of companies, and support for innovations in each facility participating in the project. It also must integrate these three realms of change. As with any planning process, build in excellent feedback loops and means for course correction as you move into implementation.

Guidelines For Team Integration

Case studies of integrative design suggest several basic guidelines:

- Assembling the full team early in the process, even before site-selection, to ensure that all points of view help to guide the design process.
- Briefing the team on the design of the whole system, with a focus on the benefits and needs of the ultimate users/residents.
- Establishing incentives that reward teamwork and cost savings that derive from integrative planning.
- Encouraging input from specialists on all aspects of the project. When contributing outside of their area of expertise they may conceive innovative design solutions more readily than those directly responsible.
- Keeping channels open for input throughout the project; a project intranet and other electronic tools to keep the whole system in view, to keep the team informed, and to encourage communication across disciplines and interests.
- Being sure the general contractor participates from the beginning to help designers understand implications of their choices for cutting cost, minimizing waste, and reducing environmental impact in the actual construction.

Infrastructure Design

- Infrastructure is the foundation on which the whole EIP will be built. Everything depends upon it, therefore it must be reliable, attractive (where visible), unobtrusive, easy to maintain and economic to operate.
- Involving regulatory and other permitting agencies early when considering any innovative technologies and negotiate exceptions to present codes that could block some of them.
- Emphasizing the ease of maintenance as well as ease of redesign and reconstruction to accommodate continuing cost savings and technical innovation. (For instance, common underground utilities for water, gas, communications flows could be in easily opened sub-surface channels, not requiring breaking up and repaving streets.)

STRATEGIES FOR DESIGNING AN ECO-INDUSTRIAL PARK (EIP)
• Seeking infrastructure technologies that can operate in a modular and/or decentralized fashion, whenever this is economically and technically feasible. (Energy co-generation units, for instance, can be installed where needed over time, in contrast to a large centralized power plant.) • Designing installation of infrastructure to maintain natural characteristics of the site, including landforms, slopes, water and wind flows, trees, and plants.