SITE SUITABILITY STUDY FOR RECYCLING PLASTIC PLANT

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FACULTY OF ENGINEERING
UNIVERSITY OF MALAYA
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THESIS SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE MASTER OF SAFETY, HEALTH & ENVIRONMENT ENGINEERING

FACULTY OF ENGINEERING
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SITE SUITABILITY STUDY FOR RECYLING PLASTIC PLANT

ABSTRACT

Important site selection criteria include compatibility of land use and the adequacy of recycling of industrial plastics is a major industry in the country. Site suitability depends on the project's compatibility with local plans and gazette structures, as well as the surrounding land use and setbacks. The site was gazette for industry activity because of its topography and proximity to rubber plantations. Kota Trading, a manufacturer of natural rubber in 1960, owns the land. Important site selection criteria include the compatibility of land use and the adequacy of the buffer between the proposed industry and activity and its neighbours, as these factors allow the selection of environmental management options that avoid unnecessary investments in pollution control beyond what is normally required. Identifying the types of receptors that are sensitive and the primary criteria for site selection are principal factors in determining the best buffer for recycling plastic industries. If you want to choose the best buffer between a source and a receptor, you need to consider its nature, character, and response to an impact, among other factors. Buffer distances are prescribed based on the potential to affect the environment and the significance of the impacts on human health and environmental conservation, and the industry standard used for pollution control.

PENILAIAN AWAL TAPAK UNTUK KILANG KITAR SEMULA PLASTIK

ABSTRAK

Kriteria pemilihan tapak penting termasuk keserasian penggunaan tanah dan kecukupan kitar semula plastik industri adalah industri utama di negara ini. Kesesuaian tapak bergantung kepada keserasian projek dengan rancangan tempatan dan struktur pewartaan, serta penggunaan dan halangan tanah di sekelilingnya. Tapak ini telah diwartakan untuk aktiviti industri kerana topografinya dan berhampiran dengan ladang getah. Kota Trading, pengeluar getah asli pada tahun 1960, memiliki tanah itu. Kriteria pemilihan tapak penting termasuk keserasian penggunaan tanah dan kecukupan penampan antara industri dan aktiviti yang dicadangkan dan jiran-jirannya, kerana faktor-faktor ini membolehkan pemilihan pilihan pengurusan alam sekitar yang mengelakkan pelaburan yang tidak perlu dalam kawalan pencemaran melebihi apa yang biasanya diperlukan. Mengenal pasti jenis reseptor yang sensitif dan kriteria utama untuk pemilihan tapak adalah faktor utama dalam menentukan penampan terbaik untuk industri plastik kitar semula. Jika anda ingin memilih penampan terbaik antara sumber dan penerima, anda perlu mempertimbangkan sifat, watak, dan tindak balas terhadap kesan, antara faktor lain. Jarak penampan ditetapkan berdasarkan potensi untuk menjejaskan alam sekitar dan kepentingan kesan terhadap kesihatan manusia dan pemuliharaan alam sekitar, dan standard industri yang digunakan untuk kawalan pencemaran.

ACKNOWLEDGEMENTS

I would not have been able to achieve my current level of success without the assistance of a committed support group. Primarily, I want to express my gratitude to my parents for their love and understanding. Second, Dr. Mohamad Fairus B. Rabuni, my supervisor, and each of whom has provided patient advice and guidance throughout the research process. Thank you for your unwavering support. This re-creation was inspired by, I would not have been able to achieve my current level of success without the assistance of a committed support group. Finally, to each of whom has provided patient advice and guidance throughout the research process. Thank you for your steadfast support.

I hope you enjoy your reading.

Hasbullah Bin Hashim

Kuala Lumpur, July 16, 2021

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LIST OF SYMBOLS AND ABBREVIATIONS

AELB	Atomic Energy Licencing Board
DOE	Department of Environment
EIA	Environmental Impact Assessment
ESA	Environmentally Sensitive Area
NRE	Ministry of Natural Resources and Environment
NMC	National Mineral Council
PPHRA	Potentially Polluting and/or High Risk Activities
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
NPP	National Physical Plan
NPP-3	National Physical Plan-3
SMIDEC	Small and Medium Industries Development Corporation

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APPENDICES

CHAPTER 1: INTRODUCTION

1.1 Background of Study

Selection of an industry's best-suited location begins with a search for suitable land that fits the industry's requirements, which may include the following factors:

i. Suppliers of raw materials and support services, and workers infrastructure for transportation (roads, rail, ports, and/or other modes of transportation) and utilities (water, power, and energy supplies);
ii. land affordability, rent, and other costs associated with land use and services; and
iii. compatibility with surrounding land uses and activities and absence of restrictions for future expansion.

Among the most important site selection criteria are compatibility with existing land use and an adequate distance from nearby neighbours. These factors allow for the selection of environmental management options that avoid unnecessary investments in pollution control beyond what is normally required for the project. For recycling plastic businesses, finding the optimal buffer means identifying the receptor types that are sensitive and the key criteria for site selection It's important to consider the buffer's type, character and response to an impact when deciding the one to use as a buffer between a source and a receptor

In order to create a healthy, safe, and sustainable environment, an industrial site or activity must be located appropriately. When choosing an industrial location, take care to avoid or reduce environmental issues that would otherwise occur owing to land use incompatibilities between the proposed project or activity and the neighbouring land use (s). Ensure that the proposed site is fit for its purpose and

that any environmental concerns are handled either by plan or design prior to industrial development.

The long-term viability of an industrial facility depends on avoiding disputes through appropriate site selection and consideration of environmental controls and pollution prevention. Environmental controls and pollution prevention are critical to the long-term viability of an industrial activity. Thus, unnecessary investment costs, particularly in pollution control, could be reduced while the project's or activity's public perception would be improved. The long-term viability of an industrial facility depends on avoiding disputes through appropriate site selection and consideration of environmental controls and pollution prevention. Environmental controls and pollution prevention are critical to the long-term viability of an industrial activity. Thus, unnecessary investment costs, particularly in pollution control, could be reduced while the project's or activity's public perception would be improved.

In addition, this would help reduce any unnecessary investment costs, particularly for pollution control, while also improving the community's perception of the project or activity. Thus, unnecessary investment costs, such as pollution control costs, could be minimised, and public opinion of the project or activity could be improved.

1.2 Problem Statement

The most common and serious concern about recycling facility is that it has the potential to harm public health due to the presence of microbes and contaminants that can cause illness, which are frequently present as a result of contamination of food, water, and soil. As a result, the primary goal of managing such wastes is to treat them in such a way that their potential to harm public health is eliminated or significantly

reduced. Other concerns include the potential emission of foul odors caused by the natural breakdown or fermentation of organic waste fractions by bacteria and other microbes, as well as the waste's visual and aesthetic impact if not properly treated or disposed of.

Industrial and medical wastes pose another problem as they may have toxic and hazardous properties that can potentially affect human health and Environmental Quality. Management of such wastes therefore aims at treatment and proper disposal to render these wastes harmless. This can be done through incineration, physical, chemical, and biological treatment, and disposal in safe landfills.

1.2.1 Environmental Concern

The primary environmental concern recycling plastic industries is the negative impact on a receptor. The ‘receptor' can be represented by various natural system components such as animals (including humans), plants, soil, water, and physical elements. The receptor could also be man-made, with areas, structures, and institutional facilities devoted to human well-being as well as social, cultural, and religious activities. These are frequently referred to as 'environmentally sensitive areas' or ‘receptors' an Environmentally Sensitive Area (ESA), is defined as "a special area that is extremely sensitive to any type of change in the ecosystem caused by natural processes."

Consideration of project siting alternatives is one of the most important preventative maintenance or mitigation measures for many industrial projects. The nature and scope of the resulting environmental and social impacts are determined by the site and project selection. The consideration of alternatives, which should be undertaken at the preliminary study stage via site selection and project phasing, design, or process option, is an important aspect of any site suitability.

Natural life systems or ecological systems are among the most vulnerable to environmental changes brought about by human activities. Some of these changes could have a direct impact on plants and animals, while others could have an indirect impact by altering their habitats and life support systems. ESAs are natural systems that have been identified in the National Physical PLAN (NPP) 2 (2010) or NPP-2, as well as other state conservation strategies or plans. Peninsular Malaysia's NPP-2 identified the following ESAs as being of Rank one sensitivity:

i. Protection Areas (PA) include gazette National and State parks, Wildlife Reserves/Sanctuaries, Marine Parks, and
ii. Protection Forests identified within Permanent Forest Estates, Biosphere Reserve, and
iii. Other areas designated for statutory protection, catchments of existing and proposed dams and reservoirs for water supply, irrigation, and hydro-power generation, and
iv. Land above 1000 m contour (except for the aforementioned areas) (refer to Figure 1:1).

Table 1:1: Area Gazette as protection area

Area	State
Ulu Muda	Kedah
Gunung Jerai	Kedah
Sungai Merbok mangroves	Kedah
Bintang range	Kedah and Perak
Temengor	Perak
Pondok Tanjung freshwater swamp forest	Perak
Fraser’s Hill	Pahang
South-East Pahang peat swamp forest	Pahang
Gunung Panti	Johor
Sg Sedili Kecil & Sedili Besar wetlands	Johor
Setiu wetlands	Terengganu
Kenyir and Tembat	Terengganu

Area	State
Terengganu Hills	Terengganu
Upper Nenggiri/ Perias basin	Kelantan
Pergau and Gunung Basor	Kelantan
Gunung Chamah	Kelantan
Gunung Jaya, Gua Panjang	Kelantan
Serdam, Gelanggi, Jebak Puyoh	Pahang
Gunung Datuk, Rapat, Lanno, Kantan	Perak
Batu caves	Selangor
Segari Melintang, Teluk Muroh	Perak
Bukit Labohan	Terengganu

Ecologically sensitive areas in NPP2 must be protected because of their importance to the ecosystem.

1

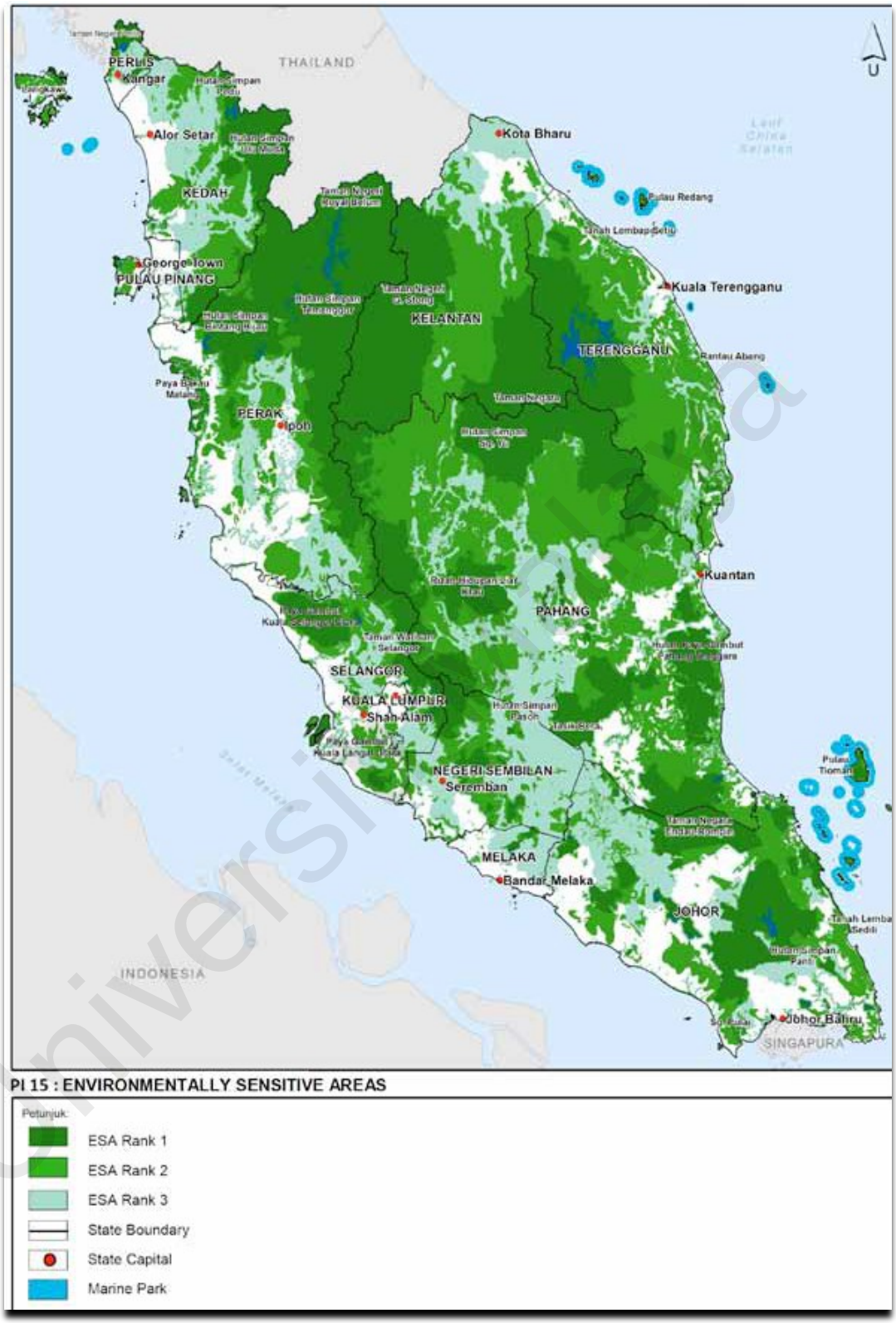

Figure 1:1: Environmental Sensitive Area in Malaysia

[1] Sources from National Physical Plan 2 (2010)

1.2.2 Human Concern

Human-related activities, structures, and systems may qualify as 'environmentally sensitive areas' if they contribute to human well-being and health, enhance social or human understanding, and assist in education and development. Human systems that use ESA include:

i. National and international heritage-listed land, places, buildings, and structures,
ii. National, historical, cultural, religious, social, and tourism-related sites that have been gazette or,
iii. Designated as such aboriginal traditional or "reserved" land and "Native Land",
iv. cemeteries, burial grounds, traditional religious and cultural sites (other than those which are gazette), hospitals, schools, and other educational centers,
v. Zones designated for recreation and sports, such as parks and green spaces, are gazette.

1.3 The Research Objective

i. To identify suitable locations for recycling plastic facilities, placement of industries according to zoning districts,
ii. To establish environmental controls based on the site's existing environmental conditions and the pollution potential of the process technology.

CHAPTER 2: LITERATURE REVIEW

2.1 Site Assessment for Malaysia Industries

Assessment for site suitability can be performed as early as project conception as part of Project Planning, and it can be performed for project or process improvements. This is a critical factor in determining the project's site suitability, zoning compatibility, and safe distance. Environmental compliance must be carried out by incorporating internal controls for the pollutants generated, allowing any industry to be sited at the desired location. Land assessment is a tool for forecasting land performance in terms of expected profits, constraints, and environmental issues resulting from productive land use (Rossiter, 1996). Therefore, for land to be selected for a specific purpose, it must address issues such as productivity, suitability, and potential degradation that may result from land management. As a result, evaluating land suitability in a way that minimises bias in land value judgement is unavoidable to address issues related to productivity, suitability, and potential degradation of land management (De la Rosa et al., 2004).

As a result of the existing spatial planning policies, any industrial activities must be located within an industrial area gazette and/or identified by the spatial plans. Provisional exemptions are granted for resource-based industrial projects such as quarrying, mining, palm oil milling, and rubber manufacturing (both palm oil mill and natural rubber processing factory are regulated by its respective Regulations). It is recommended that screening for identified environmental concerns be carried out early in the planning process. There are screening methods and tools available that can be used to aid the project and, eventually, decision-making

The Environmental Impact Assessment (EIA) study is a tool 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 primary goal of the EIA is to ensure that decisionmakers consider environmental impacts before proceeding with the project. While the DOE is responsible for approving the EIA study, the results of the study are critical input for overall project approval. During the preparation of the EIA study, some of the key components that must be included in the report are as follows:

Table 2:1 :Key Components Mandatory

EIA Components	Information Requirements In EIA Study
Project siting	• Providing specific design information as well as a project description (relating to process, technology, etc.). provide process flow diagrams, mass balances, drawings, calculations, and other data, as well as information on raw materials, chemical consumption, utility consumption, products and by-products generated, and waste generation (solid, liquid, and gaseous). • Planning and design for pollution control system(s) must be incorporated, as well as proof of compliance with eqa 1974 standards and limits. • Determine the environmental issues that will be impacted by the project's development, including planning, construction, and operation.
	• Discussion of site(s) identification, available options, and

	the selection process. • Justification for the chosen site and discussion of its suitability in accordance with the requirements of the spatial planning and planning technical agencies (including the doe's requirement for project siting). • Discussion on proposed buffer or safety distances with justifications is required where buffer or safety distances are required.
Baseline data	• Complete baseline data for the identified affected environmental components, including new survey data as well as existing data (via published documents and publicly available information). existing data must be precise and recent enough to serve as a baseline. the baseline survey data will be used as a benchmark in the eia and monitoring phase to quantify impacts.
Impact evaluation	• Impact assessment using quantitative and/or qualitative methods and tools that are well-known (for predictive modelling). the discussion must include how the project affected the environmental aspects and level of impact, for both normal operation and the worst-case scenario (abnormal operation), as well as comparisons to statutory standards and limits. to avoid misjudgement or misinterpretation of the evaluation, any assumptions made for the assessment must be clearly identified and

	expressed.
Mitigation measures	• Mitigation measures should 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. • 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.
Monitoring & Management	• Monitoring requirements are required for short-term and long-term predictive assessments, i.e., to confirm that the project is meeting the predicted levels and conforming to the statutory standards and limits. monitoring must be evaluated based on its effects on the identified receptors. an environmental management plan must detail the methodology for project monitoring and management (emp). it is critical to demonstrate the incorporation of emt into the project.

Planning and design for pollution control systems should begin as early as possible in the project to ensure that compliance with the established standards and limits is addressed and incorporated into the design. Similarly, proper siting identification and selection are required. For the EIA report to be approved by the DOE, the project must have sufficient details for decision-making, and the EIA study must include detailed design information on the pollution control system..

Project proponents for industrial operations that do not necessitate an EIA study and/or are not mandated by law might conduct their own evaluation to analyse the project's environmental consequences. It is suggested that such an evaluation be conducted to justify and support the project, as well as to validate judgements about environmental controls implemented for the project. Several advantages may be realized, particularly for the Project Proponent or Investor, such as having a suitable technique of project decision-making tool on hand if the project has to be re-evaluated or is challenged due to non-compliances.

2.2 Previous Suitability Studies in Malaysia

Planning and design for pollution control systems should begin as early as feasible in the project to ensure that compliance with the established standards and limitations is addressed and included into the design. Similarly, accurate siting identification and selection are required. For the EIA report to be authorised by the DOE, the project must have adequate details for decision-making, and the EIA research must include thorough design information on the pollution control system.

Project proponents for industrial operations that do not require an EIA study and/or are not mandated can conduct their own evaluation to evaluate the project's environmental consequences. It is suggested that such an evaluation be conducted to explain and support the project, as well as to validate decisions about environmental

controls put in place for the project. Several advantages may be realized, particularly for the Project Proponent or Investor, such as having a suitable way of project decision-making tool on hand if the project requires re-evaluation or being faced owing to non-compliances.

2.3 Environmental Consideration for Siting of Industry

Before beginning Project Planning, the Project Proponent must first evaluate all accessible spatial planning papers to ensure that the most recent policies and plans are in hand and being used in the design. To avoid omissions or errors in planning, early involvement with the Local Authorities and Plan Malaysia is recommended. The information acquired about the siting, zoning, and buffer must be explicitly included in the project approval submission to the One Stop Center (OSC).

Submission to the DOE on siting, zoning, and buffer projects is required for prescribed activities and must be included in the EIA report. Discussion in the EIA report on project siting, zoning, and any buffer/ setback must be in accordance with the Local Plans and State Regulations, and should be provided in the following manner in EGIM 2015. The Terms of Reference (TOR) for the EIA study developed prior to the EIA study should include contain talks 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. Once the EIA report is finalized, the DOE considers the provisions authorised and/or declared for project siting, zoning, and buffer to be acceptable. This will be a legal requirement in the EIA Approval.

The requirements for siting, zoning, and buffering for non-prescribed activities must be completed at the Project Planning stage and submitted as part of the Project Planning

application (e.g., at the submission for Development Order). To allow the OSC to examine and accept this application, justification for compliance with the planned siting, zoning compatibility, and buffer necessary (if any) must be clearly specified and described. The final project approval would serve as the declaration for siting and buffer.

The results of the evaluation or assessment may result in a suggestion to create a buffer or setback to further reduce the project to acceptable levels. This is required in lieu of the concerned residual effects, which cannot be reduced despite the consideration and adaptation of all feasible control methods. The buffer setting is mostly determined by the evaluation findings, and the project must specify the buffer or setback with which it will comply. Among the potential situations (of worried residual consequences) that may form buffer or setback provision are (but are not limited to):

i. Potential emission concerns to safeguard public health of surrounding receptors,
ii. Potential odor issues related to the emission (with and/or without health concerns) that can lead to public complaints,
iii. Potential noise emission and vibrational issues from the activities that can lead to public complaints,
iv. As safety distance as prevention towards potential hazard risk arising due to fire, explosion, and accidental releases from hazardous installations.

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 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 1.6x10-6 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.

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.

2.4 Siting Consideration Within Project Planning

Overall, during project design and execution, every industrial project(s) must consider all of the requirements specified by the necessary technical organisations.

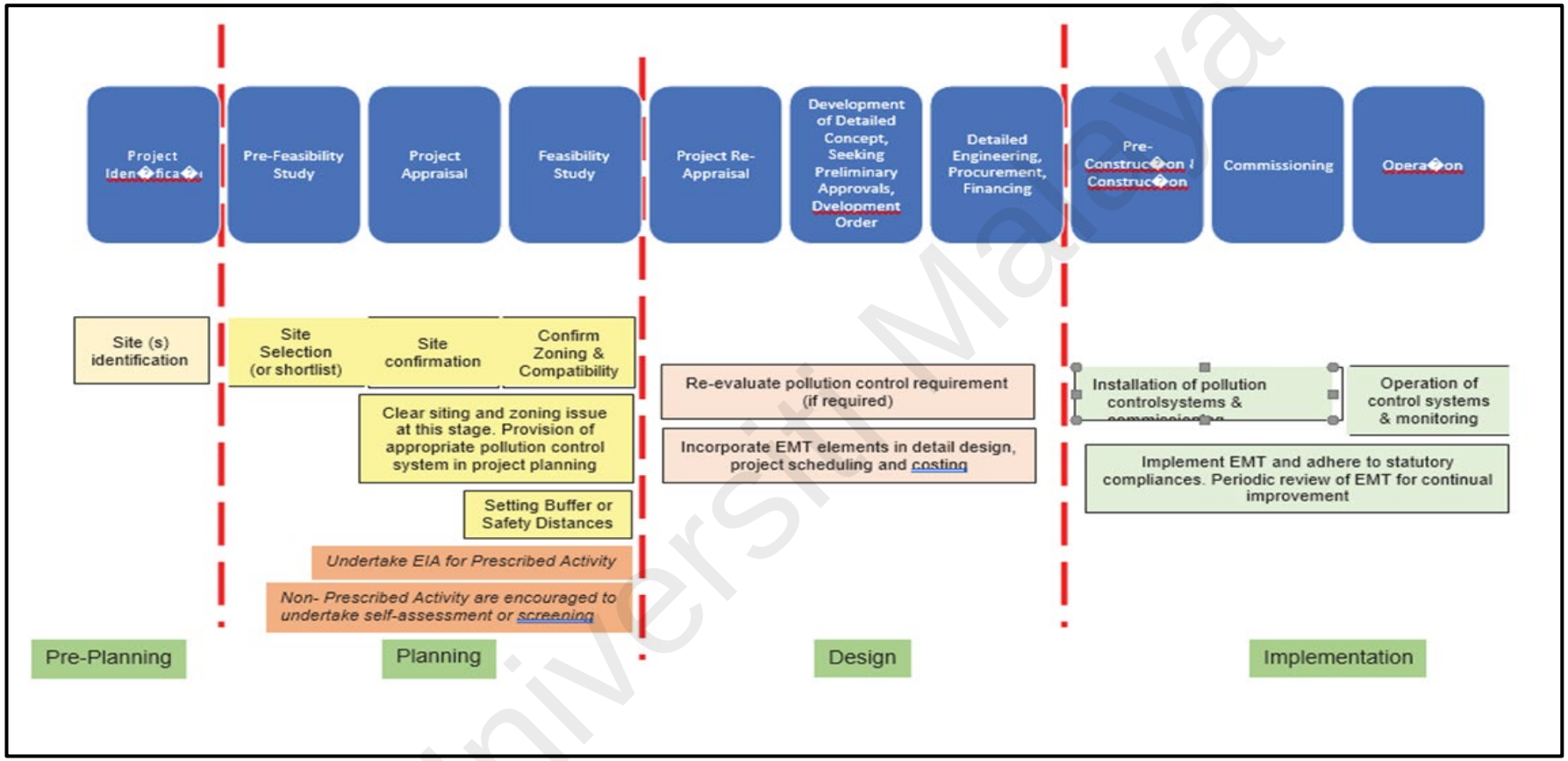

Figure 2:1 :Flow of Project Planning and Development Process For A Typical Prescribed Industrial Activity

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

i. Stack emissions
ii. Fugitive emissions
iii. Odor
iv. Effluent discharges
v. Accidental discharges
vi. Waste generation
vii. Risk of fire and explosion (of which probability of occurring at industrial facility is < than at communities)

Screenings must be performed at the pre-feasibility and feasibility study stages of a project to determine the suitability of a site area. Environmental factors such as impacts on air, water, and noise quality on receiving receptors will be examined throughout the screening process, which will be carried out either subjectively or quantitatively, as relevant, and necessary. Depending on the nature of the project, a more in-depth assessment allows for more precise decision-making in the absence of adequate data and information for evaluation reasons.. It is recommended that the Project Proponent have a robust database of project information on hand to enable for complete evaluation and decision-making. Following the completion of the planning stage, the project's design and implementation phases will be carried out to further figure out the engineering design components. 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.

2.5 Siting, Zoning and Buffer Justifications in EIA

Screenings must be performed at the pre-feasibility and feasibility study stages of a project to determine the suitability of a site area. Environmental factors such as impacts on air, water, and noise quality on receiving receptors will be examined throughout the screening process, which will be carried out either subjectively or quantitatively, as relevant and necessary. Depending on the nature of the project, a more in-depth assessment allows for more precise decision-making in the absence of adequate data and information for evaluation reasons.. It is recommended that the Project Proponent have a robust database of project information on hand to enable for complete evaluation and decision-making.

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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.The requirements for siting, zoning, and buffering for non-prescribed activities must be completed during the Project Planning stage and submitted as part of the Project Planning application (e.g., at the submission for Development Order). To allow the OSC to review and approve this submission, justification for compliance with the proposed siting, zoning compatibility, and buffer required (if any) must be clearly indicated and defined. The final project approval received (KM) Once the EIA report is

approved, the DOE considers the provisions allowed and/or declared for project siting, zoning, and buffer to be accepted. This will be a legal requirement in the EIA Approval.

The requirements for siting, zoning, and buffering for non-prescribed activities must be completed during the Project Planning stage and submitted as part of the Project Planning application (e.g., at the submission for Development Order). To allow the OSC to review and approve this submission, justification for compliance with the proposed siting, zoning compatibility, and buffer required (if any) must be clearly indicated and defined. The final project approval was obtained.

The results of the evaluation or assessment may result in a recommendation to provide a buffer or setback to further reduce the project to acceptable levels. This is required in lieu of the concerned residual effects, which cannot be mitigated despite the consideration and adaptation of all possible control measures. The buffer setting is primarily determined by the evaluation findings, and the project must declare the buffer or setback with which it will comply. Among the possible scenarios (of concerned residual impacts) that may constitute buffer or setback provision are (but are not limited to)

i. Potential emission concerns to safeguard public health of surrounding receptors,
ii. Potential odor issues related to the emission (with and/or without health concerns) that can lead to public complaints,
iii. Potential noise emission and vibrational issues from the activities that can lead to public complaints,
iv. As safety distance as prevention towards potential hazard risk arising due to fire, explosion, and accidental releases from hazardous installations.

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 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 1.6x10-6 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.

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.

2.6 Site Suitability and Selection Criteria

The primary concern in selecting a site for an industry or similar activity is the availability of suitable land that meets all or most of its operational needs. Influencing factors include the following:

i. Customers, suppliers (of raw materials and supporting services), and employees can all be reached.
ii. Infrastructure for raw material and product movement (roads, rail, ports, and/or other transit facilities).
iii. accessibility to adequate utilities (water, power and energy supplies, gas supply).
iv. Affordability of land, rent, and other costs associated with land use and services
v. Market conditions include the ease with which products can be sold to customers.
vi. Compatibility with surrounding land uses and activities and absence of restrictions for future expansion.

The sections that follow will provide an understanding of the basic requirements in the site selection process as well as the suitability criteria for the project site. The criteria for site selection are frequently based on economic and social factors, with some or little consideration given to environmental concerns and compatibility. The proximity of utility supplies, road networks, manpower resources, product markets, and raw material resources is desired for an ideal industrial site location for the economy of production. Nonetheless, in terms of environmental protection, all of the above must be

kept at a safe distance. Thus, it is important to have a balance between the economic, social and environment.

2.7 Acceptance Criteria for Site Suitability

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

i. 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 gazette Structure or Local plan, or other such approved land use plans prescribed by the relevant authority.
ii. The land use of the proposed project is generally compatible with the surrounding land use that is designated in the gazette Structure or Local Plans, or such other approved land use plans prescribed by the relevant authority.
iii. 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.
iv. 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
v. Appropriateness of process technology, pollution prevention and control measures proposed to be adopted.

Land use compatibility and buffer adequacy between proposed industry and activity with that of its neighbours is also an important criterion in selecting a project site. This provides opportunities for selecting options for proper and adequate pollution control, meeting the compliance requirements of the selected location.

The following considerations must be included in the acceptance criteria used to assess the suitability of a site:

The proposed project's land use is appropriate and does not conflict with that designated or proposed for the site in the gazette Structure or Local plan, or other such approved land use plans prescribed by the relevant authority.

The proposed project's land use is generally compatible with the surrounding land use designated in the gazette Structure or Local Plans, or such other approved land use plans prescribed by the relevant authority.

The site typically has provisions for buffer zones or setback distances to the nearest receptors that have been established.

The following information is intended as guidance for site selection taking account of the sensitive receptor that is likely to be impacted by the development or the activity. The types of sensitive receptors and the principal criteria for site selection are described here to provide a background, to understand and enable project to determine its safety zones in terms of environmental protection. The nature, character, and response of the sensitive receptor to an impact are important considerations in determining the appropriate buffer between the source and the receptor.

2.8 Siting Consideration for Industry

During the Project Planning, it is important to consider the process operations involved, technologies to be installed and hazardous nature of raw materials, product or chemicals utilized. Each industry can be further classified in accordance with its polluting potential depending on the scale of their operations. The pollution potential of an activity depends on parameters which include pollution loads, raw materials utilized, chemical usage, waste generated, cooling requirement, etc.

Following table 2:2 presents the description of the industries based on it polluting potential. During the planning stage, it is recommended that these factors 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 2:2 Description of Nature of Industry/ Activity

Description of nature of industry/ activity
High risk industries, installations or activities are characterised by: i. Very high risk due to fire, explosion, radiation, and highly hazardous chemicals ii. Raw material used in production or products may include those classified as highly hazardous. iii. Emit significant levels of residual particulate and/or gaseous air pollutants. iv. Discharge very large quantities wastewater containing significant levels of residual contaminants. v. Generate large quantities of scheduled wastes some of which are very difficult to treat
Heavy polluting type industries or activities are characterised by: i. High pollution potential and risk due to fire, explosion, radiation, and/or highly hazardous chemicals ii. High air pollution potential (including odor) from residual pollutants in air emissions (fugitive and source emissions) iii. High potential for emission of greenhouse gases and/or ozone depleting substances iv. Generate excessive noise and/or vibration exceeding safe limits. v. Generate large quantities of wastewater containing significant levels of residual contaminants. vi. Use large quantities of raw material(s) with potential to cause significant fugitive emissions during handling, transfer, and storage. vii. Generate significant amounts of scheduled wastes some of which are difficult to treat or managed
Medium polluting type industries or activities are characterised by: i. Moderate pollution potential and risk due to fire, explosion, and/or hazardous

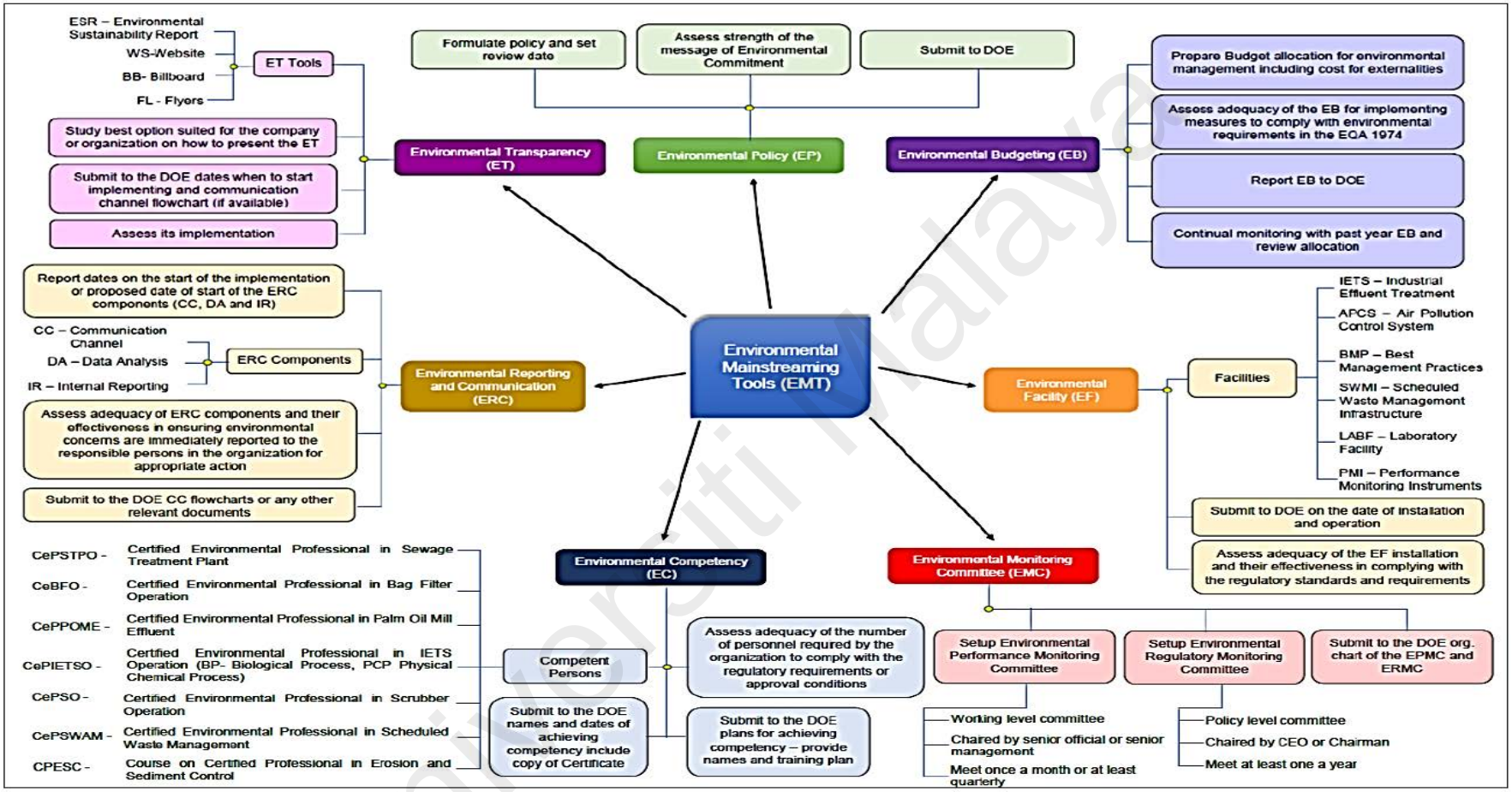
Description of nature of industry/ activity
chemicals ii. Moderate air pollution potential (including odor) from low levels of residual air pollutants. iii. Moderate potential for emission of greenhouse gases and/or ozone depleting substances iv. Moderate noise and/or vibration with no significant residual impact v. Generate significant quantities of wastewater containing low levels of residual pollutants. vi. Generate scheduled wastes which are mostly readily treated or managed within prescribed facilities
Light polluting type industries or activities are characterised by: i. None or very low pollution potential for air pollution, noise, vibration, odor, fire, or explosion ii. Does not involve the use hazardous raw materials or production of hazardous products. iii. Use of renewal or low greenhouse gas emission sources of energy. iv. Generate no or very low amounts of wastewater with potential to contribute to water pollution. v. Generate mostly non-hazardous solid waste and no significant number of scheduled wastes. vi. Industries are small scale and mostly compatible with each other [2]

2.9 Role of Planning Authority in Project Siting, Zoning and Buffer

The Town and Country planning Act 1976 (Act 172) (incorporating amendments up to 1st January 2006) governs spatial planning in Malaysia and is enforced by the Plan Malaysia or Department of Town and Country Planning (DCTP) or Jabatan Perancangan Bandar dan Desa) (JPBD). The National Development Planning Framework is divided into 3 (3) levels of planning: National Physical planning at the

[2] Sources from MIDA

Federal level, State planning at the State level, and Local Authority planning at the Local Authority level (Table 2:4).



[3]

Figure 2:2:Environmental Mainstreaming Tool

[3] Sources from DOE

Table 2:3: National Development Planning

Spatial planning Document	Provision Allowed for
National Physical Plan (presently NPP-3 gazette in 2017)	• Clusters of industrial estates or areas based on economic viability and growth potential NPP's main points are as follows: • Industrial zones are more likely to be built near cities and ports • Industrial sites near urban areas will boost growth and promote the development of industry clusters over time • Strategies suggested: • Enhancing the physical Environment through landscaping, images, and relevant facilities • Improving infrastructures and utilities to provide services capable of meeting the demands of modern industries such as ICT and communication • Improving environmental standards for waste disposal and effluent emissions • Mechanism for expanding the managed industrial park
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.

Spatial planning Document	Provision Allowed for
Local plans (At district level by Local Authority)	Detailed planning by the respective Local Authority, requiring zooming in to the details and tailored to the area or district of interest. Care must be taken and observed to avoid the creation of "grey areas" for industrial development through the provision of "mixed industrial areas," which allow for a variety of industries to be placed within one area, which has the potential to create incompatibility issues. Planning should take care of the specifics by identifying proper zoning of the areas, which includes the allocation of specific areas for heavy industry, medium industry, and light industry. The Local Authority with JPBD must include the necessary setbacks or buffers in the Local Plans.

The National Physical PLAN (NPP) establishes the overall guidelines and strategies for the Federal and State Governments to control development and land administration. The NPP includes measures to combat climate change and conserve the country's natural and biological resources, such as establishing carbon sinks for sequestration, establishing sustainable forest and water management, and establishing a Central Forest Spine to connect key ecological areas in Peninsular Malaysia. The NPP is reviewed every 5 years, complementing the Five-Year Economic Development Plan by adding a spatial dimension to the sectoral distribution of natural resources. 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 NPP's broad framework, the NPP's policies and plans are developed into the SSP, which provides policies on land development and use at the state level. The Local Plan is developed at the local district level, outlining detailed development facilitation and control at the site level. The Special Area Plan is another

type of local level plan that provides a detailed plan of areas that require 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 gazette for industrial activities

2.10 Policy and Legal Framework

2.10.1 National Policy on the Environment

In 2002, the National Policy on the Environment was formulated and approved, integrating the three elements of sustainable development: economic, social, and cultural development, and environmental conservation. The Policy aims for continued economic, social, and cultural progress, as well as an improvement in Malaysians' quality of life, through environmentally sound and sustainable development. It is founded on interconnected and mutually reinforcing principles designed to balance economic development objectives with environmental imperatives:

a. Environmental Stewardship
b. Conservation of the Nature’s Vitality and Diversity
c. Continuous Improvement in the Quality of the Environment
d. Sustainable Use of Natura

The National Policy on the Environment is an important guide for all stakeholders in ensuring that the Environment is clean, safe, healthy, and productive in order to keep up with the country's rapid economic development and to meet the nation's aspiration for a better quality of life. The National Policy on the Environment serves as an important guide for all stakeholders in ensuring a clean, safe, and healthy environment. Healthy and productive in order to keep up with the country's rapid economic development and to meet the nation's aspiration for an improved quality of life.

2.10.2 The Environmental Quality Act, 1974 (Act 127)

The Act is concerned with the prevention, abatement, and control of pollution, as well as the enhancement of the Environment, which are likely to result from various industrial and non-industrial activities that may produce waste or pollutants that affect Environmental Quality. The Act defines terms like "industrial plant" and "prescribed premises" as follows; 'Industrial plant' refers to any plant used for the generation of power or for any industrial use, such as the operation of ships, dredges, locomotives, cranes, or other machines; and 'prescribed premise' refers to any premise, which includes messuages, buildings, lands, and hereditaments of any tenure, as well as any machinery or plant, prescribed.

2.10.3 The National Land Code, 1965 (Act 56)

The National Land Code, 1965 categories land based on its intended type of use. Section 117 of the Act refers to land that is used for the purposes of 'Industry', which is interpreted in the following. The category of land as 'Industry' shall apply thereto – That it shall be used only for industrial purposes, that is for the purpose of the erection or maintenance of factories, workshops, foundries, warehouses, docks, jetties, railways or other buildings or installations for use for on in connection with one or more of the following purposes:

i. manufacture;
ii. smelting;
iii. the production or distribution of power;
iv. the assembling, processing, storage, transport or distribution of goods, or other commodities.
v. such other purposes as the State Authority may prescribe for the purposes of this section by rules under section 14 of the Act.

2.10.4 The Industrial Coordination Act, 1975 (Act 156)

The Act provides for the coordination and orderly development of manufacturing activities in the country and defines ‘manufacturing activity' with its grammatical variations and cognate expressions as "the making, altering, blending, ornamenting, finishing, or otherwise treating or adapting any article or substance with a view to its use, sale, transport, delivery, or disposal, and includes the

CHAPTER 3: METHODOLOGY

The method and criteria described are applicable to site selection in general. In practice, project options and site selection are frequently considered concurrently, as are the impact assessment scoping exercise and the prefeasibility study, because specific sites may necessitate greater environmental controls, which affect project costs and thus shift the balance in favor of alternative sites.

3.1 Data Requirements

i. Data requirements will primarily consist of information gathered for, or currently being gathered for, the feasibility study, which will include: project description, as known, including the size and scale of the project and the major activities envisaged, including raw material requirements, transportation and utilities required, discharges to air water, and land hazardous materials handling, labour and market requirements

ii. Project constraints in terms of cost, technology, engineering, and location, as well as details of any opportunities considered.

iii. The regulatory Environment (federal, set forth, and local).

iv. Topography, hydrology, geology, climate, and meteorology are all disciplines.

v. Infrastructure, land use, and zoning are all important considerations.

3.2 Site Selection

The criteria for site selection, which typically include engineering, environmental, and economic considerations. These sites were further investigated for suitability through site visits and analysis of existing data. The following stages are included in the site selection process:

i. Identifying a suitable location

ii. Site identification

3.2.1 Identification of Suitable Sitting Areas

Table 3:1: Activity identification

Activity	Sub-activity
Determine site requirement	• Size including potential development area. • Access requirements (road, rail, river, sea). • Utilities. • Socio-economic requirements.
Determine regulatory constraints to project	• Industrial Classification • Established required buffer zone
Determine environmental constraints	• Past, current, zoned, or potential land uses that are incompatible, such as urban areas, areas of incompatible industrial classification, and areas with high amenity values (tourism potential, gazetted beaches, national parks, marine parks) • Other areas unsuitable for receiving pollution loads include air sheds, water catchment areas, and so on. • Monitoring at the start.
Determine engineering and economic constraints	• Areas with unsuitable site characteristics such as inappropriate slopes, undesirable geology, soil or ground or surface water conditions

Activity	Sub-activity
	• Are requiring excessive investment in infrastructure such as distance from existing roads, difficulties in access, expensive or difficult site information, etc
Established suitable siting areas	• Areas Zoning for industry.

3.2.2 Identification of Sites

With unsuitable areas excluded, we can simply select potential sites based on remaining areas. It can select these on a preference basis on availability and economic grounds.

Table 3:2: Activity of sites identification

Activity	Sub-Activity
Identify potential sites	• Investigate pasts site use. • Investigate land ownerships. • Study Maps. • Traverse roads in probability areas for sale of lease potential of sites.

3.2.3 Siting Criteria for Recycling Plastic Plant Facilities

Waste transfer stations are locations where municipal solid waste is unloaded from collection vehicles and temporarily held before being reloaded onto larger long-distance transport vehicles for delivery to landfills or other treatment or disposal facilities. They may also collaborate with a transfer station to assist in the recovery of useful material and to reduce the Volume of material that must be transported out for disposal or treatment.

a) Although the overall goal of transfer stations is to reduce the number of

vehicular trips to and from the disposal site, they can cause an increase in traffic in the immediate area where they are located.

b) The site is situated far from residential or populated areas, as well as other sensitive receptors such as hospitals and schools.

c) Site is readily accessible and is served with good road infrastructure which allows easy access to the site and avoids directly passing through sensitive receptors such as residential housing, hospitals and schools.

d) Site shall not be subject to flooding nor prone to landslip or slope failure.

e) It served site with adequate and appropriate utility supplied.

3.2.4 Baseline Environmental Monitoring

3.2.4.1 Description of Monitoring Stations for Noise and Ambient Air

Table 3:3 :Monitoring location description

Station	Description
1	Open space in Taman Sri Kota
2	Open space in Tabika Kemas
3	Open space in Kg. Kota
4	Open space in Sek.Keb.Kota
5	Open space at, Recycling Facility Boundary

3.2.5 Environmental Noise

i. Noise levels must be measured for any of the following reasons:

   a. assessing the current noise Environment

   b. evaluating noise limit compliance for noise source (s) and/or project development

ii. evaluating the environmental impact and potential community response

iii. Noise measurements should typically include the following:

a. Baseline (ambient) sound pressure levels at the location(s) of a receptor and/or the actual property boundary of a noise source (s). These may be carried out at a location (s) prior to the development of a project. They could also do it without the noise source(s) and afterward (example with a plant or facility not operating).

b. Noise assessment is typically performed at the nearest noise-sensitive receptors, with the preferred monitoring location (s) being outdoors at the receptor's actual property boundary. Measurements of industrial noise may also be taken at the industrial premises' property boundary. This does not, however, imply that the monitoring locus

3.2.6 Air Quality Monitoring

The New Ambient Air Quality Standard was created to replace the older Malaysia Ambient Air Quality Guideline, which had been in use since 1989. The new Ambient Air Quality Standard includes five existing air pollutants, particulate matter with a size of less than ten microns (PM_{10}), Sulphur dioxide (SO^2), carbon monoxide (CO), nitrogen dioxide (NO^2), and ground level ozone (O^3), as well as one additional parameter, particulate matter with a size of less than 2.5 microns ($PM_{2.5}$).The air pollution concentration limit will be gradually increased until 2020. There are three interim targets set, the first of which is interim target 1 (IT-1) in 2015, IT-2 in 2018 and Standard in 2020.

Table 3:4 New Malaysia Ambient Air Quality Standard

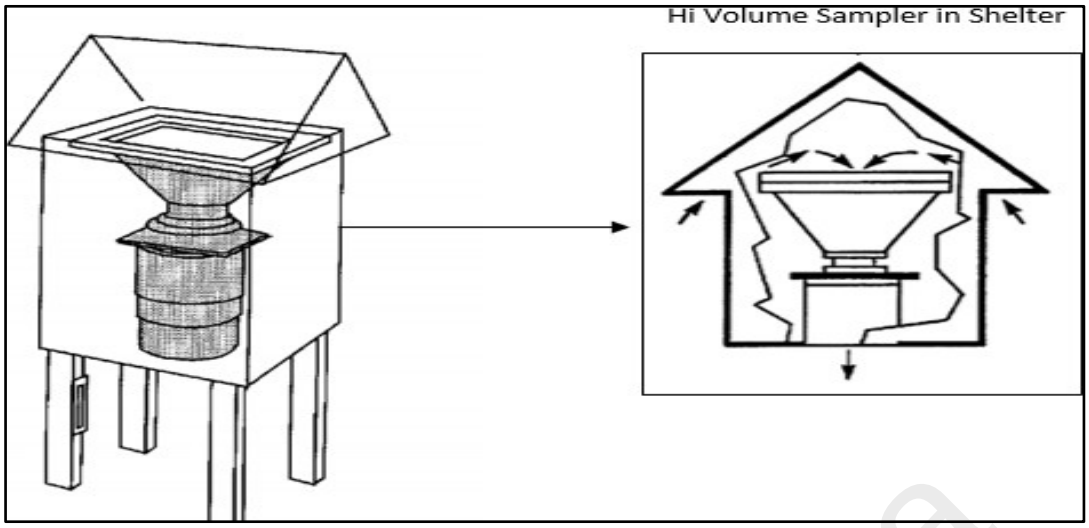
Pollutants	Averaging	Ambient Air Quality Standard

	Time	IT-1 (2015)	IT-2 (2018)	Standard (2020)
		µg/m^3	µg/m^3	µg/m^3
Particulate Matter with the size of lessthan ten micron (PM10)	1 Year	50	45	**40**
	24 Hour	150	120	**100**
Sulfur Dioxide (SO^2)	1 Hour	350	300	**250**
	24 Hour	105	90	**80**
Nitrogen Dioxide (NO^2)	1 Hour	320	300	**280**
	24 Hour	75	75	**70**
Ground Level Ozone (O_3)	1 Hour	200	200	**180**
	8 Hour	120	120	**100**
***Carbon Monoxide (CO)**	1 Hour	35	35	**30**
	8 Hour	**10**	**10**	**10**

3.2.6.1 High Volume Sampler for PM_{10}

Figure 3 depicts a High Volume Sampler (HVS) with the essential features of a typical non-size specific Total Suspended Solid (TSP The HVS is a small unit that consists of a protective housing, an electric motor-driven high-speed, high volume blower, a filter holder that can hold a 203 x 254-mm (8 in. x 10 in.) filter, and a flow-controller that controls the air-flow rate through the instrument at 40-60 ft3/min.

It replaced the traditional gable roof of the TSP sampler with an impactor design size select inlet for PM10 measurement, as shown in Figure 3:1. In the impaction design, an air sample is deflected upward into a buffer chamber after entering a symmetrical (thus wind direction insensitive) hood. The buffer chamber is evacuated at a rate of 68 m^3/h (40 cfm) through multiple circular nozzles. Particles are sped up as they pass through the nozzles to an impaction chamber. Because of their momentum, particles having diameters larger than the inlet's 10-µm cut design impact the surface of the impaction chamber. Smaller particles rise through the impaction chamber at speeds slow enough to mi



[4]

Figure 3:1: HVS Sampling Mechanism

i. Sampling Method

a. It should calibrate sampler before use. Do not make any change or change on the sampler flow indicator after calibrating. Remove the calibrating orifice. The filters may be packed into a box with sheets of glassine between the filters, or it may individually pack them in self-sealing plastic bags for transportation to the field.

b. Mount the filter sheet in the filter holder, taking care not to waste any of the fibre. Clamp it in place by means provided. Seal into place easier by facing the smooth side into the housing if there is a difference in texture. If the filter holder is separate from the sampler, mount the holder on the intake port, making sure that the coupling gasket.

c. Start the sampler motor and record the time and date. Read the flow rate indicator and record this reading and the corresponding flow rate as read from the calibration curve. Note also the temperature and barometric pressure. It should connect an electric clock to the same

[4] Sources from EPA

line as the motor to detect any loss of test time due to power interruption. The use of a continuous pressure (or flow rate) recorder can obtain a continuous record of the sampling flow rate and sampling time.

Allow the sample to run for the specified length of time, which is commonly 24 h, ±1 h. During this period, several readings of flow rate, temperatures, barometric pressure, and time should be taken if this is workable. It took a final set of reading at the point of the test period. It made if only initial and final readings, assume that change of readings is linear over the period of test. Intermediate readings will improve the Volume measurement precision

Record all final readings at the end of the sampling period. Remove the filter from the mount with care so that no fibre material or particulate matter is wasted. Fold the filter in half, enclosing the collected material within. Place the folded filter in a clean, tight envelope and label it with your name. In some cases, it may be preferable to store the used filter in a tightly sealed metal container to prevent loss or damage to the filter.

Remove the filter from its container in the laboratory. Tap the container to knock any loose fibres or particulate matter onto the folded filters inside surface.

3.2.7 River Quality

The river status can be classified into five main classes from I to V. 2. Class II, III, and IV was further sub-divided into three classes (A, B and C), where each class will have the range of ten values. This is proposed to control and monitor the river water quality in a more protective manner. A wide range of the class will result in loose monitoring and control of the river water quality. Most of the time the 28 polluters may like to satisfy the minimum quality or standard to belong to any target class.

The Water Quality Index introduced by the DOE is being practiced in Malaysia for about 25 years. The index considers six parameters. The Malaysian WQI is an opinion-poll formula. A panel of experts was consulted on the choice of WQI Quality of water 91-100 Excellent 71-90 Good 51-70 Medium or average 26-50 Fair 0-25 Poor 15 the parameters and the weightage was assigned to each parameter. The parameters which have been chosen are dissolved oxygen (DO), biological oxygen demand (BOD), chemical oxygen demand (COD), suspended solid (SS), pH value (pH), and AN (Khuan et. al, 2002)

Volume measurement precision, Record all final readings at the end of the sampling period. Remove the filter from the mount with care so that no fibre material or particulate matter is wasted. Fold the filter in half, enclosing the collected material within. Place the folded filter in a clean, tight envelope and label it with your name. In some cases, it may be preferable to store the used filter in a tightly sealed metal container to prevent loss or damage to the filter.

Remove the filter from its container in the laboratory. Tap the container to knock any loose fibres or particulate matter onto the folded filters inside surface. However, a few limitations were discovered while reviewing the Malaysian Water Quality Index procedure and the long-term data collected in various Malaysian river basins. These are as follows (Mamun et al., 2007):

Because pH is not a problem in most Malaysian rivers, it can be removed from the existing WQI equations. However, pH should be monitored to determine whether water is suitable for other uses, as required by the National Water Quality Standards – NWQS.

No nutrient (phosphorus, nitrogen, etc.) is considered in the existing WQI equation; Aesthetically the river water should be attractive to the citizen. There are suspended

solids (SS) in the existing WQI procedure but a few limitations were discovered while reviewing the Malaysian Water Quality Index procedure and long-term data collected in various Malaysian river basins. These are listed below (Mamun et al., 2007):

Because pH is not a problem in the majority of Malaysian rivers, it can be removed from the existing WQI equations. However, pH should be monitored to determine the suitability of water for other uses, as required by the National Water Quality Standards – NWQS.

The existing WQI equation takes no nutrient (phosphorus, nitrogen, etc.) into account; the river water should be visually appealing to the citizen. The existing WQI procedure contains suspended solids (SS), but SS do not data. Similarly, WQI equations practiced in overseas countries were not suitable due to lack of certain data required for the specific WQI procedures.

Table 3:5 :Water Class and Uses

PARAMETER	UNIT	CLASS				
		I	II	III	IV	V
Ammoniacal Nitrogen	mg/l	< 0.1	0.1 – 0.3	0.3 – 0.9	0.9 – 2.7	**> 2.7**
Biochemical Oxygen Demand	mg/l	< 1	1 – 3	3 – 6	6 – 12	**> 12**
Chemical Oxygen Demand	mg/l	< 10	10 – 25	25 – 50	50 – 100	**> 100**
Dissolved Oxygen	mg/l	> 7	5 – 7	3 – 5	1 – 3	**< 1**
pH	-	> 7	6 – 7	5 – 6	< 5	**> 5**
Total Suspended Solid	mg/l	< 25	25 – 50	50 – 150	150 – 300	**> 300**
Water Quality Index (WQI)		**< 92.7**	**76.5 – 92.7**	**51.9 – 76.5**	**31.0 – 51.9**	**< 31.0**

Table 3:6 :DOE Water Quality Index Classification

CLASS	USES
Class I	Conservation of natural environment. Water Supply I – Practically no treatment necessary. Fishery I – Very sensitive aquatic species.
Class IIA Class IIB	Water Supply II – Conventional treatment required. Fishery II – Sensitive aquatic species. Recreational use with body contact.
Class III	Water Supply III – Extensive treatment required. Fishery III – Common, of economic value and tolerant species; livestock drinking.
Class IV	Irrigation
Class V	None of the above.

Table 3:7:DOE Water Quality Classification

SUB INDEX & WATER QUALITY INDEX	INDEX RANGE		
	CLEAN	SLIGHTLY POLLUTED	POLLUTED
Biochemical Oxygen Demand (BOD)	91 - 100	80 - 90	**0 - 79**
Ammoniacal Nitrogen (NH_3-N)	92 - 100	71 - 91	**0 - 70**
Suspended Solids (SS)	76 - 100	70 - 75	**0 - 69**
Water Quality Index (WQI)	**81 - 100**	**60 - 80**	**0 - 59**

CHAPTER 4: FINDING & DISCUSSION

4.1 Site Physical Characteristic

The Recycling Plant is located at Lots706, Mukim Gadong, Kota, Rembau, Negeri Sembilan. Because it was specifically designed for rubber industries and was strategically located based on topography and close to rubber plantations, the chosen site was gazetted for industry activity. The land is owned by Kota Trading, a manufacturer of natural rubber since 1960. The total land area of the county is approximately 6.0905 hectares.

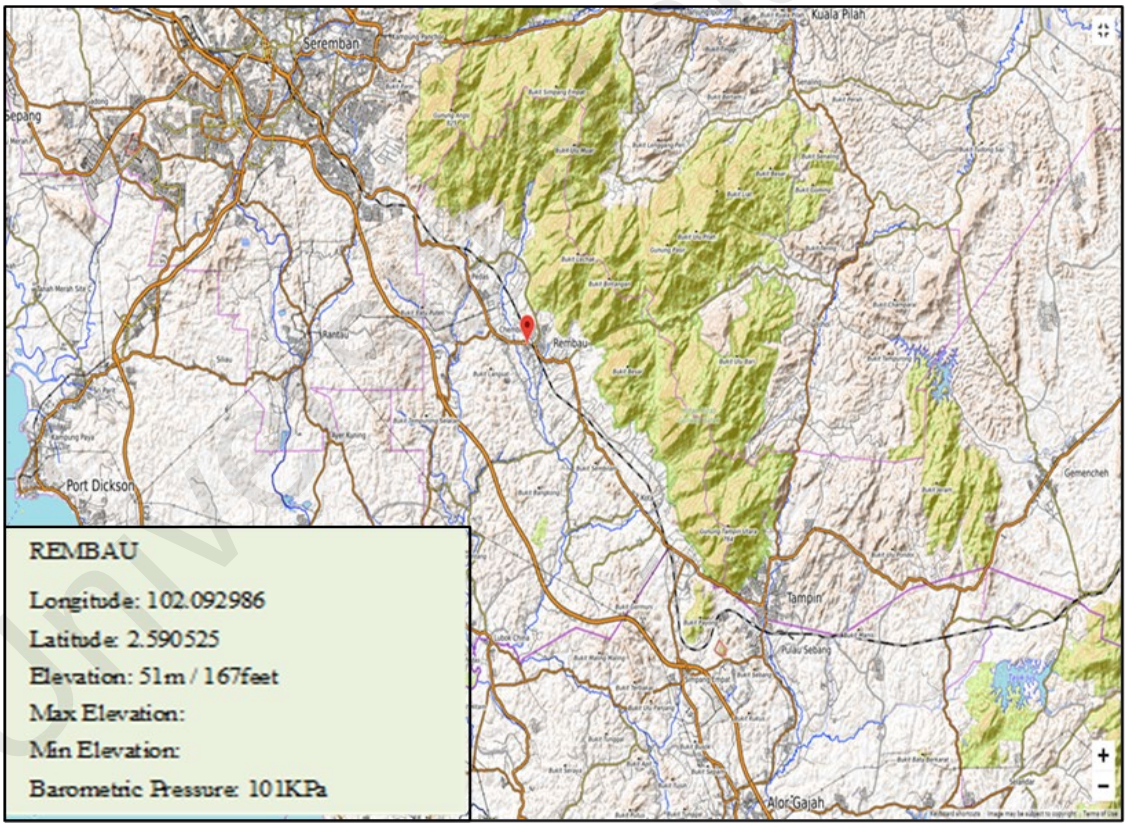


Figure 4:1:Topography Map

The site's general topography is flat, and the ground elevation does not exceed 51 meters above mean sea level. The area's geology is sedimentary rock. A network has drained Kota.

4.2 Meteorological

The following meteorological conditions have been referenced for conducting consequence analysis based on DOE risk criteria. Because wind speed influences radiation distances, different wind speeds have been identified for use in consequence modelling. Based on the wind direction data 2020 obtained from the Meteorological Station, the following wind data were applied in the model.

The site experiences a warm, humid, typically equatorial climate with seasonal variations where rainfall varies between 2,015 mm to 2,735 mm between 2011 to 2015. Heavy rainfall occurs during the months of March to May and September to October and low during June to July and December 2020 to January 2021.

:

Table 4:1 Meteorological Data 2020

Percentage frequencies of occurrence for concurrent wind direction (degrees) and speed (m/s) within specified ranges [%]								
	Wind speed range							
Direction	0.3-1.5	1.6-3.3	3.4-5.4	5.5-7.9	8.0-10.7	>10.7	Total	Mean Speed
Calm							20.2	
Variable	0	0	0	0	0	0	0	
N	7.8	3.8	1.6	0.2	0	0	13.5	1.7
NE	11.2	8.9	5.8	1	0	0	26.9	2.3
E	5.2	1.9	0.3	0	0	0	7.5	1.3
SE	2	1.7	0.3	0	0	0	4	1.8
S	2	4.4	1.6	0	0	0	8	2.4
SW	1.6	4.2	2.6	0.1	0	0	8.5	2.7
W	2	2.9	2	0.2	0	0	7.1	2.6

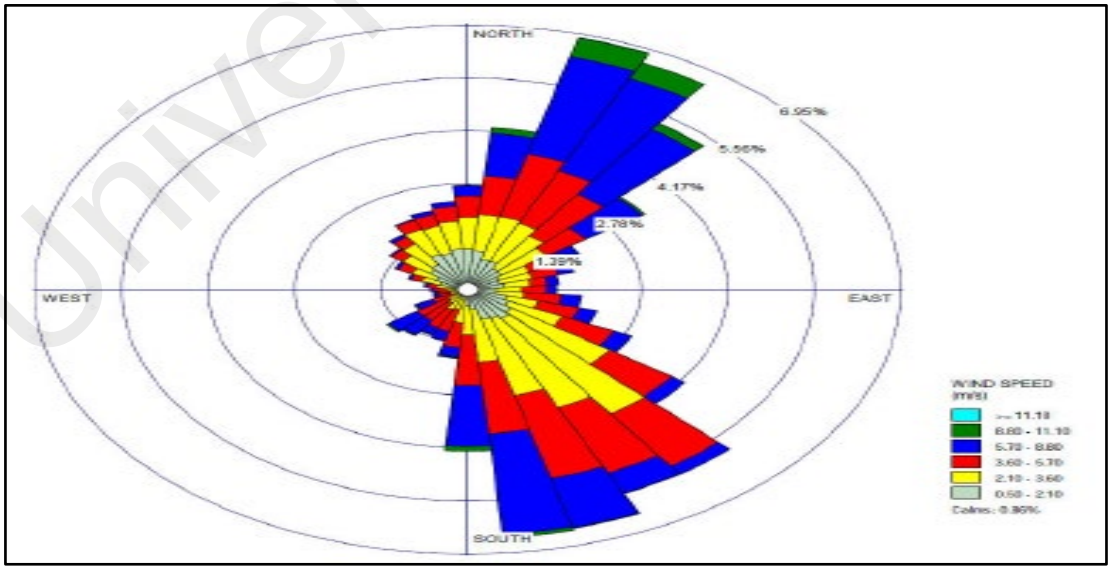


Figure 4:2: Windrose for wind speed direction

4.3 Zoning and Land Used

The area's industrial activities are a mix of light, medium, and heavy industries. Within a three-kilometers radius of the project site, land use includes industrial, residential, commercial, and agricultural uses. The land was classified as industrial activity used and specifically for natural rubber plant. Based on existing the land permit, Kota Trading was landowner and the land gazette as industrial use. The general criteria for selection.

Site is located far away from residential or populated areas and other sensitive receptors such as hospitals and schools. Site is readily accessible and is served with good road infrastructure which allows easy access to the site.

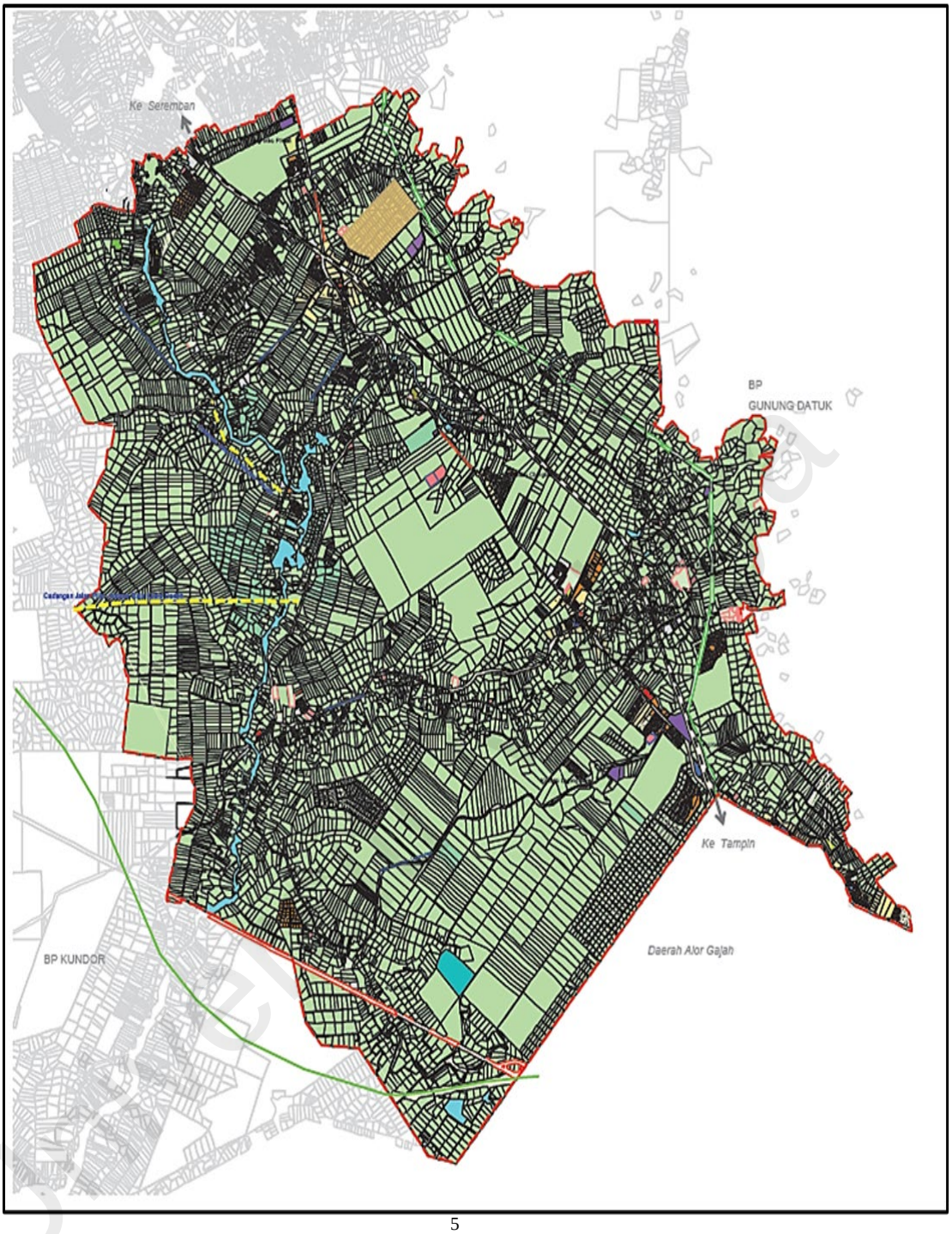


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Figure 4:3 Rembau Land Used Layout

[5] Source Majlis Daerah Rembau

4.4 Infrastructure

Syarikat Air Negeri Sembilan Sdn. Bhd. provides water to the Rembau district via a few treatment plants. The water is supplied by Sungai Linggi. Tenaga National Berhad provides power to the site as well as the surrounding areas. The National Grid generates and distributes electricity via the existing 132 KV transmission line. The site and its surrounding area have an excellent road network, which includes Federal Routes, State Routes, and the North South Expressway. Telekom Malaysia Berhad is a telecommunications company. Modern, efficient, and cost-effective communication services are available throughout the country.

4.5 Population and Receptor

Information	**Ethnic Group**	
• **43,011 Population** • **406.0 km² Area** • **105.9/km² Population Density** • **1.2% Annual Population Change**	Malay & other indigenous (Bumiputera)	34,562
	Chinese	2,184
	Indian	3,531
	Other group	72

The nearest residential area is Taman Sri Kota, which is 0.70 kilometers to the north of the project site. Aside from these residential areas, other residential areas are more than 300 meters away from the Recycling Facility. Premised is located 100 meters away from small residential or populated areas. Premised is readily accessible and is served with good road infrastructure which allows easy access to the site and avoids directly passing through sensitive receptors such as residential housing, hospitals, and schools. There are few sensitive receptors nearby the proposed project site, which listed as below;

Table 4:2 Receptor near to Recycling Facility

Receptors	Distance
Tabika Kemas Kota	600 meters
SK Kota	1400 meter
Taman Sri Kota	300 meters
Kg.Kota	150 meters
Gunung Dato	350 meters

4.5.1 National Park Gunung Datuk

Mount Datuk is the name of a mountain in Malaysia. Dipterocarp Forest on a Hill At 350 meters, hill dipterocarp forest is the most extensive forest type. Shorea curtisii (Meranti seraya), Dipterocarpus (Keruing), and other Meranti species are the most common. The highest point is approximately 2900 feet (885m). Mount Datuk is a popular weekend destination for nature lovers and adventure seekers looking to get some exercise or unwind. It is home to many natural tropical rainforest treasures. As you can see in the picture, there's a formation of big rocks at the summit. 10 km from Tampin Town through Tampin–Seremban Road and 35 km from Seremban Town. Gunung Datuk Amenity Forest is in the Tampin Forest Reserve which isMount Datuk is the name of a mountain in Malaysia. Dipterocarp Forest on a Hill At 350 meters, hill dipterocarp forest is the most extensive forest type. Shorea curtisii (Meranti seraya), Dipterocarpus (Keruing), and other Meranti species are the most common. The highest point is approximately 2900 feet (885m). Mount Datuk is a popular weekend destination for nature lovers and adventure seekers looking to get some exercise or unwind. It is home to many natural tropical rainforest treasures. Tampin Town is ten kilometers away via the Tampin–Seremban Road, and Seremban Town is 35 kilometers away. Gunung Datuk Amenity Forest is located within the Tampin Forest Reserve.

4.6 Industry Classification

Malaysian Industry Development Association (MIDA) has been classified as Category 4 under the classification of industries and potentially polluting hazardous activities, as detailed below:

Table 4:3 Classification of industries

Category	Nature of Industries	Indicative Primary Buffer
4	Light type industries or activities are characterised by: • None or very low pollution potential for air pollution, noise, vibration, odor, 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	• Minimum of 50 m or more • Buffer distance for specific processes or polluting sources which are difficult to control effectively may require greater buffer distances • Where needed, modelling study is to be undertaken to determine actual buffer for these processes

4.7 Recycling Plant Operation.

The recycling process, like that of other industrial plastics, begins with proper collection. Recycling companies require the material to be compacted into bales for easy collection and maximum market value. Because FIBCs are collected in massive quantities, recycling is usually only feasible for businesses with a large output or those that can store the bags over time. fertilizer and chemicals. All zips and buttons have been removed as well.

Next, the bags are resized into small flakes, making them easier to handle for further processing. The plastic is fed through shredders and granulators with industrial blades that cut rotationally to chop it down. After cutting, the plastic regrinds go through a separation process to differentiate contaminants from the plastic polymers. With today's advanced technology, machines can separate plastic by size, shape, colour, melting point, and even the ability to absorb light. The final phase is compounding, which involves putting the regrinds through an extruder, where they are melted down at 240 degrees Celsius into uniform beads, also referred to as pellets or granules. The mixture is strengthened through the addition of virgin Polypropylene.

As the bulk bag recycling process completes, the pellets can be used to make a variety of new products. Because Polypropylene can be safely recycled multiple times, this loop can be repeated indefinitely. These bags are an environmentally friendly option for many businesses that need to store and transport large amounts of goods.

4.7.1 Raw Material

Most FIBCs are made from virgin Polypropylene, a common plastic that can be repurposed into other plastic products, such as battery cables, brooms, brushes, trays,

bins, and auto parts. The types of super sacks that are suitable for recycling include those used to grains, construction materials, pigments, and plastics. Bags for recycling are classified by different grades:

i. Grade A (clean, bright white; coloured stitching and handles allowed);
ii. Grade B (not as clean, white with minimal colouring); and
iii. Grade C (dirty or coloured bags).

Figure 4:5 Flexible Intermediate Bulk Containers

4.7.2 Machinery

4.7.2.1 Shredder

Bale To break down larger waste plastic containers into pieces small enough to enter the shredder, a large aperture shredder must be inserted in the line. Smaller quantities of large items can be sawn into smaller sections with a band saw to fit the shredder intake. Recycling received a large number of valuable crates for recycling but had no way of reducing them to a size small enough to feed through the shredder.

They took up valuable space and hampered other operations. Large aperture shredder for pre-shredding large plastic items, as seen here shredding.

Figure 4:6 Shredder Machine

4.7.2.2 Extrusion and Palletizing

The shredded baled plastic is passed through a heated extruder to melt it and produce plastic in the form of "spaghetti," which is then chopped with a rotating knife to produce new pellets.

4.7.3 Product

Plastic manufactures high-quality recycled PP pellets in the form of tiny disc-shaped granules. They are very small granules, measuring only a few millimeters in length. PE pellets are commonly used in industrial raw materials for a wide range of applications. These PE pellets can be melted and remolded into a variety of shapes and functions, allowing them to be used in a variety of applications. These final recycled PE pellets are high-quality recycled plastic materials that are ready for production. Because of the cosmos Plastic manufactures high-quality recycled PP pellets in the form of tiny disc-shaped granules. They are very small granules, measuring only a few millimeters in length. PE pellets are commonly used in industrial raw materials for a wide range of applications. These PE pellets can be melted and remolded into a variety of shapes and functions, allowing them to be used in a variety of applications. These final recycled PE

pellets are high-quality recycled plastic materials that are ready for production. Because of the cosmos

Figure 4:7: Pellet (Product) From Recycling Plastic

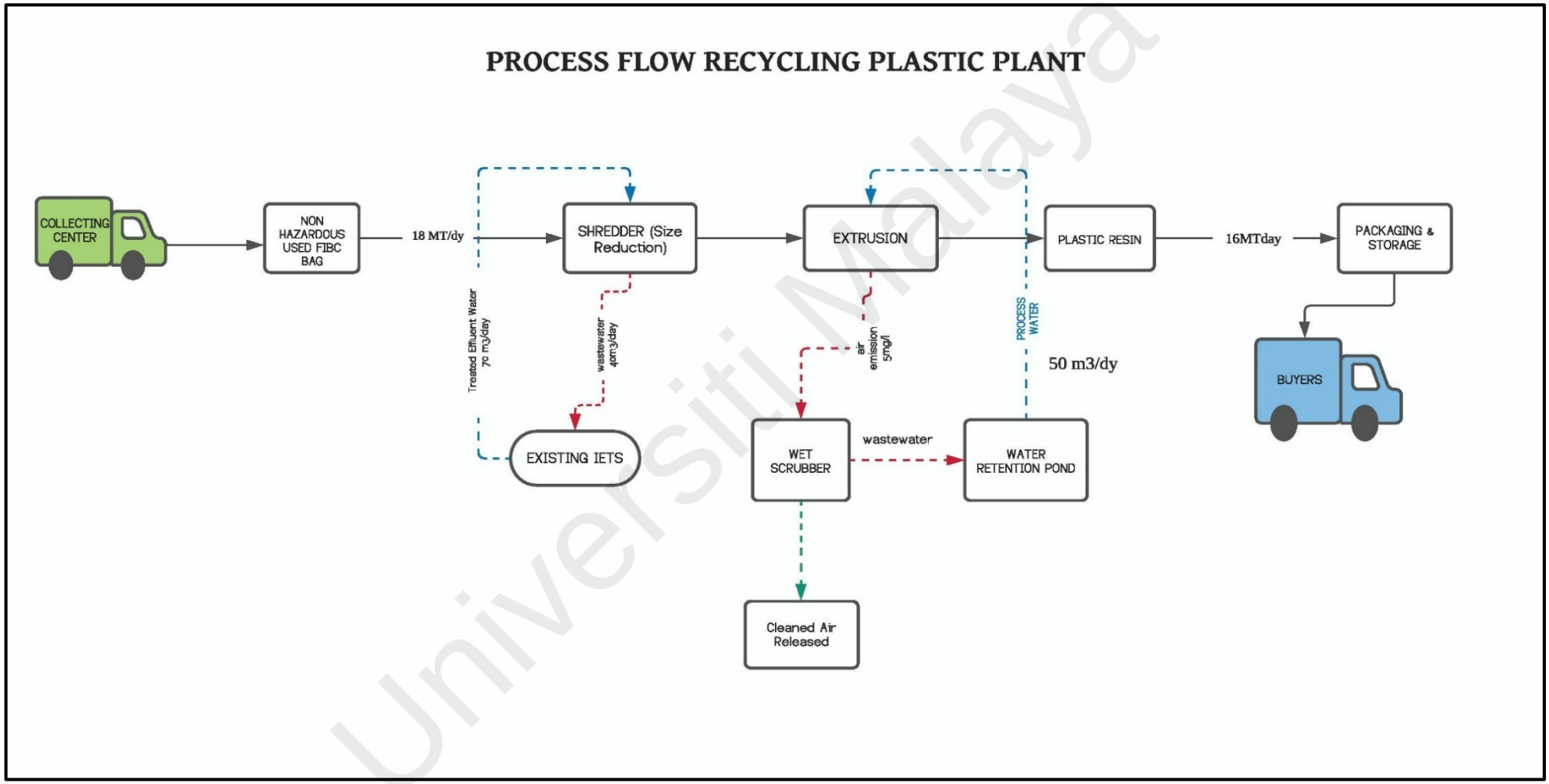

Figure 4:8:Process Flow Recycling Plastic Plant

4.8 Environmental Statutes and Requirements

The legislations and their related standards relevant to the Recovery Facility are listed below:

i. Environmental Quality Act 1974;
ii. Environmental Quality (Scheduled Wastes) Regulations 2005;
iii. Environmental Quality (Industrial Effluent) Regulations 2009;
iv. Environmental Quality (Clean Air) Regulations 2014;
v. Factory and Machinery Act 1967 and its subsidiary legislations.
vi. Occupational Safety and Health Act 1994 and its subsidiary legislations.

4.9 Baseline Environment Quality

4.9.1 River Water Quality

Water samples from Sungai Linggi are collected in 2019 and 2020 to demonstrate the river's current water quality, as it is the final receiving water body for stormwater and wastewater discharged from the Recovery Facility. Pollutants in terms of physical, chemical, and biological content were found to be relatively low in the samples and can be compared to the NWQS for 2019 and 2020. According to the Water Quality Index, Sungai Linggi can be classified as a clean river for the samples obtained in 2019 and 2020.

Table 4:4: River Water Quality obtain from JPS Report

River Basin	River	No of Station	2019			2020		
			Category	WQI	Class	Category	WQI	Class
Sungai Linggi	Sg.Batang Penar	1	Clean	89	II	Clean	82	II
	Sg.Kundur Besar	1	Clean	86	II	Clean	86	II
	Sg. Pedas	1	Clean	87	II	Clean	84	II
	Sg. Rembau.	2	Clean	86	II	Clean	85	II
	Sg Chembong	1	Clean	83	II	Clean	82	II

4.9.2 Ambient Air

Table 4:5: Result of Ambient Air

Location	A1 µg/Nm3	A2 µg/Nm3	A3 µg/Nm3	A4 µg/Nm3	A5 µg/Nm3	MR AG µg/Nm3
PM10	5	15	10	5	7	100
Carbon Monoxide	ND	ND	5	3	7	35
Nitrogen Dioxide	ND	ND	ND	ND	4	70
Ozone	ND	ND	4	ND	ND	100
Sulfur Dioxide	ND	ND	5	ND	ND	80

Sampling of the ambient air quality is carried out at five locations. Five locations are located at the nearest sensitive receptors to the north and south of the project site in the downwind and upwind of the prevailing wind direction respectively and one station at the boundary of the Recovery Facility. The air quality data obtained indicated that levels for all parameter below the ambient air quality standards.

4.9.3 Ambient Noise

Table 4:6: Result of Ambient Noise

Location	Day dB (A)	Night dB(A)
N1	60	45
N_2	63	52
N3	55	50
N4	58	48
N5	63	50

During the study, ambient noise levels are monitored during the day and night at the proposed site's boundary in accordance with the planning Guidelines for Environmental Noise Limits and Control. The noise levels at the project site's boundary are found to be within the limits of 65 dB(A) Leq (daytime) and 55 dB(A) Leq (nighttime) (nighttime). The noise levels at the nearest receptors to the north and south are within the recommended guidelines of 55 dB(A) Leq (daytime) and 45 dB (A) Leq (nighttime) (nighttime). The Shredder Machine, which is used in the recycling process, is the source of the noise. The noise range for this equipment is 65 to 85 dB(A) measured 15 meters away from the source

CHAPTER 5: POTENTIAL IMPACT AND MITIGATION

5.1 Impact Evaluation

The discussion begins with a description of all of the activities involved, including the additional recycling processes and their impact on various environmental segments. In the discussion, a table is provided to summarise the significance of the impact on the various environmental components. The impacts associated with the operations of the Recycling Facility as in table 5.1.

The operations of the Recycling Facility may induce various impacts to the Environment and mitigation measures will have to be integrated in the design of the additional recovery process to address these issues. The following provides a summary of the impacts associated with the operations of the Recycling Facility in the discussion begins with a description of all of the activities involved, including the additional recycling processes and their impact on various environmental segments. In the discussion, a table is provided to summarise the significance of the impact on the various environmental components. The consequences of the Recycling Facility's operations, as shown in table

The Recycling Facility's operations may have a variety of environmental impacts, and mitigation measures must be incorporated into the design of the additional recovery process to address these issues. The following is a summary of the impacts associated with the Recycling Facility's operations;

Table 5:1:Potential Impacts and Mitigation Action for Recycling Facility

Activity	Potential Significant Impact	Mitigation Measures	
Air Emission	i. Low emission generated from this process.	i. The emission pollutant can be treated by scrubber treatment system. ii. Continuous improvement on the effectiveness of the scrubber system by adopting a proper maintenance programmed to minimise failure; iii. Planting more trees (as dust screening barriers) at the project site boundary; iv. Good housekeeping shall be practiced, such as internal roads and storage areas should be regularly cleaned to minimise dust entrainment due to vehicular movement or wind action; v. An effective emergency response plan (ERP) with	Residual impact is minimal provided recommended mitigation measures are implemented

		a built-in alarm and shutdown system of the critical operations should be adopted. This is to ensure that a response to control the release of air pollutants due to accidental events will be quick response system is to minimise the impact of uncontrolled emissions to the atmosphere; vi. Annual monitoring for air emission needs to be conducted.	
i. Waste Management ii. Residual process materials ii. Scheduled wastes	i. Generation of Waste ii. Management of scheduled waste iii. Management of solid waste and recyclables	i. Scheduled wastes (i.e. WWTP sludge, used activated carbon filter, used oil, etc.) shall be handled, stored and managed appropriately (i.e. durable containers, sheltered area, internal drainage system to prevent contamination to stormwater drains, etc.) in accordance with the	Residual impact is minimal provided the mitigation measures proposed are implemented

v. Domestic waste		Environmental Quality (Scheduled Waste) Regulations, 2005. ii. Clean up kit for accidental spillage to be set up at strategic and appropriate locations within the project site. iii. Domestic waste shall be segregated to recyclables and non-recyclables. iv. Solid waste shall be stored properly (i.e. lidded bins) and sufficient provision at designated areas. v. Adoption of good housekeeping is required.	
i. Operation of noise emitting equipment and	i. Elevated noise level from equipment's and components	i. To perform noise control measures based on appropriate controls of substitution, isolation, engineering control, administrative control and	Residual impact is minimal provided recommended mitigation measures are implemented.

components		PPE	
i. Occupational Safety and Health	i. Potential safety hazard and health hazard	i. Safety procedures in training or induction programmed for competency shall be continuously maintained. ii. Apply precautions for use and safe handling of raw material found in MSDS and make the relevant information available to all personnel. iii. PPE such as gloves, safety goggles, mask for workers when working in the plant particularly during handling or raw materials products. iv. Regular monitoring of working areas for indoor air quality and personnel exposure to raw materials.	Residual impact is minimal provided recommended mitigation measures are implemented

		v. Proposed mitigating measures and comprehensive ERP (i.e. emergency, safe evacuation, public notification, etc.) shall be implemented accordingly by the Project Proponent.	

CHAPTER 6: BUFFER APPLICATION

Buffer distances are prescribed based on the recycling activity, taking into account the following factors:

i. the potential to impact the Environment and the significance of the impacts to human health and environmental conservation,

ii. the industry standard normally used for pollution control and the relative efficiency of the control system(s), and the potential for fugitive dust emission from the industry or activity.

iii. the significance of the residual impact when the industry standard for pollution control is taken into account

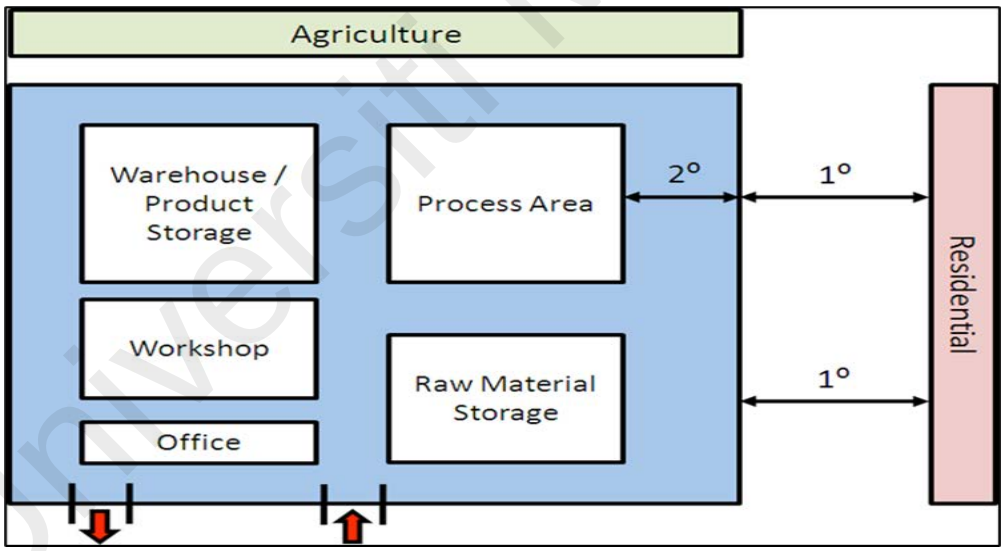

Figure 6:1:Application of Overall Buffer

The overall buffer distances for each of the recycling activities are shown in the table below.

Table 6:1: Overall Buffer Distance

Description	Details	Category	Buffer (in meters)	
			Overall	Primary (1^0)
Small recycling Plat	i. Processing of scrap as raw materials, usually involving a mechanical or chemical transformation process ii. Recovery of materials from waste streams in the form of: separating and sorting of commingled plastics wastes iii. Examples of the mechanical or chemical transformation processes that are undertaken are: a. shredding of plastic wastes or other methods of mechanical treatment as cutting, pressingto reduce the volume sorting and pelleting of plastics to produce secondary raw material for pallets and the like processing (cleaning, melting, grinding) of plastic waste to granulates	4	250	50

6.1 Primary Buffer Zone

The presence of an adequate buffer zone is the primary means of determining whether a site is suitable for Recycling Plant activity, taking into account the immediate and adjacent land use, as well as the receptor characteristics surrounding the chosen site. Monsoon Drain, Road, and Tree as existing buffers that must be met at all times between the property boundary of the intended activity and the property boundary of

the adjacent residential area'. The 'Primary buffer zone' is an area or distance found outside of the project's or proposed activity's property boundary. The use of land within such buffer zones is specified in land use plans.

Figure 6:2:50-Meter Buffer Application

Figure 6:3: 250-Meter Buffer Application

The ‘Secondary Buffer Zone' is defined as ‘the additional buffer (Car Park and Fencing Wall) area or distance found within the property boundary of the project or activity measured from the source of pollution to the property boundary of the activity, which, when combined with the buffer area between the two adjacent properties, allows the Overall Buffer Zone requirement to be met.'

i. The secondary buffer zone concept is to achieve the overall buffer distance by revising the project layout to achieve a ‘extended' buffer zone, relocating polluting facilities or activities away from sensitive receptors, and introducing barriers or physical measures to lessen pollution
ii. Process areas that are major sources of residual air pollutants or odors
iii. Process areas where there is a high risk of fire and explosion
iv. Raw material handling, transfer, and storage that is likely to result in significant fugitive emission(s).

v. Product handling, transportation, and storage that may result in significant fugitive emissions (s)

vi. Stacks and other air emission point sources

vii. Areas from which residual noise is expected to be significant.

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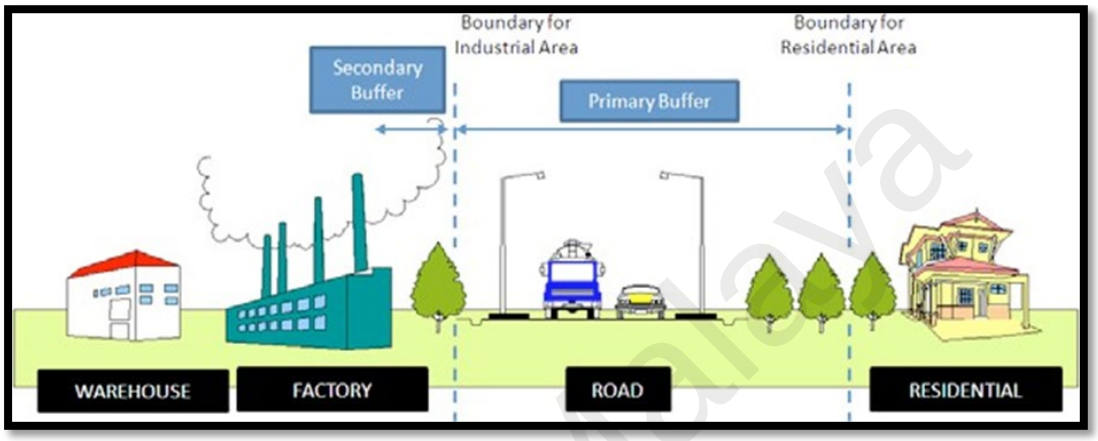

Figure 6:4: Sectional Image of Buffer application

[6] Sources from DOE

CHAPTER 7: RECOMMNEDATION

7.1 Execution of Environment Site Assessment Phase 1

The Environmental Site Assessment is a procedure for determining a real estate asset's environmental responsibility. Environmental Site Assessment, or "ESA," is the process of doing "all relevant investigation" into a property's history or present usage to determine if it is influenced by a "recogniged environmental condition. The ESA process entails a site examination, a study of the property's historical documents, and investigation of records accessible at government organisations. This information is recorded and analysed in the Phase I Environmental Site Assessment Report, and a judgement is formed as to whether previous or current actions may have resulted in the release of halocline.

A Phase I Environmental Site Assessment is conducted as part of a commercial real estate transaction to investigate the present and historical usage of a site. The purpose of the study is to determine if current or previous property usage have had an influence on the soil or groundwater underneath the property, potentially posing a hazard to the environment and/or human health. If these problems are discovered, the lender and/or owner may face responsibility, and the property's value may suffer as a result. A Phase I ESA typically includes the following:

i. A site visit to observe the current and previous conditions and usage of the property and nearby properties;
ii. A review of federal, state, tribal, and local regulatory databases, including but not limited to underground storage tanks (USTs), aboveground storage tanks (ASTs), known or suspected release cases, hazardous substance storage and

disposal, including petroleum products, as well as institutional and engineering controls;

iii. Historical aerial pictures, fire insurance maps (Sanborn maps), historical city directories, and historical topographic maps are all examples of historical documents

iv. A study of documents from state and municipal authorities, including state environmental agencies, building departments, fire departments, and health departments, among others.

v. Interviews with current and former property owners, operators, and inhabitants, as well as individuals with knowledge of the facility.

vi. Interviews with the Report User to obtain title or judicial records for environmental liens and activity and use restrictions, specialised knowledge or experience; actual knowledge; commonly known or reasonably ascertainable information; the reason for a significantly lower purchase price; and the reason for the Phase I ESA preparation. The User must provide these information in order to be qualified for the innocent landowner defense.

After completing a Phase I ESA, the Environmental Professional will describe the concerns identified on the site and make recommendations on what steps, if any, should be done to remedy these issues. A recognised environmental condition (REC) implies known pollution or the risk of subsurface contamination (either from the subject property or possibly from an offsite source). A controlled recognised environmental condition (CREC) implies that the property has been damaged by pollution that has been investigated and repaired; nonetheless, contamination remains and would need more work if the site were rebuilt.

CHAPTER 8: CONCLUSION

When choosing an industrial location, take care to avoid or reduce environmental issues that would otherwise occur owing to land use incompatibilities between the proposed project or activity and the neighbouring land use (s). Ensure that the proposed site is fit for its purpose and that any environmental concerns are handled either by plan or design prior to industrial development. The long-term viability of an industrial facility depends on avoiding disputes through appropriate site selection and consideration of environmental controls and pollution prevention. Environmental controls and pollution prevention are critical to the long-term viability of an industrial activity. The buffer must be established with the help of appropriate modelling software that is acceptable to the DOE and commitment. Several authorities and agencies have issued recommended buffer guidelines for use in the design and construction of several types of buildings, facilities, and structures.

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