

1. SCREENING PROCEDURES FOR PRESCRIBED ACTIVITIES – AIR QUALITY

1.1 Introduction

This document serves as a guide for Investors and Project Proponents to screen, and to a certain degree, assess potential environmental impacts from a proposed development towards surrounding air quality. It discusses steps and measures that should be given attention to when considering the likely impacts from the air emissions at the siting location of interest.

1.2 Regulations and Standards

For activities that generating air pollution, the Project Proponent must aware of prevailing regulations under the Environmental Quality Act, 1974 that governs standards and limits for air pollution emission released to the atmosphere. These Regulations are:

- Environmental Quality (Clean Air) Regulations, 2014
- Environmental Quality (Prohibition on the Use of Chlorofluorocarbons and Other Gases as Propellants and Blowing Agents) Order, 1993
- Environmental Quality (Halon Management) Regulations, 1999
- Environmental Quality (Prescribed Activities) (Open Burning) Rules, 2000
- Environmental Quality (Dioxin and Furan) Regulations, 2004

The DOE has also established ambient air quality standards as a measure to safeguard the ambient air quality. The set of standard limits can be referred at the DOE's website: www.doe.gov.my.

New Malaysia Ambient Air Quality Standard

New Ambient Air Quality Standard was established in order to replace the older Malaysia Ambient Air Quality Guideline that has been used since 1989.

The New Ambient Air Quality Standard adopts 6 air pollutants criteria that include 5 existing air pollutants which are particulate matter with the size of less than 10 micron (PM₁₀), sulfur dioxide (SO₂), carbon monoxide (CO), nitrogen dioxide (NO₂), and ground level ozone (O₃) as well as 1 additional parameter which is particulate matter with the size of less than 2.5 micron (PM_{2.5}).

The air pollutants concentration limit will be strengthen in stages until 2020. There are 3 interim targets set which include interim target 1 (IT-1) in 2015, interim target 2 (IT-2) in 2018 and the full implementation of the standard in 2020.

Table 1 : New Malaysia Ambient Air Quality Standard

Pollutants	Averaging Time	Ambient Air Quality Standard		
		IT-1 (2015)	IT-2 (2018)	Standard (2020)
		µg/m ³	µg/m ³	µg/m ³
Particulate Matter with the size of less than 10 micron (PM ₁₀)	1 Year	50	45	40
	24 Hour	150	120	100
Particulate Matter with the size of less than 2.5 micron (PM _{2.5})	1 Year	35	25	15
	24 Hour	75	50	35
Sulfur Dioxide (SO ₂)	1 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

*mg/m³

1.3 Identification of Nature of Emission and Data Needs

Air pollutants are usually classified into suspended particulate matter (dusts, fumes, mists, smokes), gaseous pollutants (gases and vapours) and odours. Examples of typical pollutants are presented below:

Air Pollutant Type	Typical Pollutant
Suspended particulate matter (SPM, PM-10)	diesel exhaust, coal fly-ash, mineral dusts (e.g., coal, asbestos, limestone, cement), metal dusts and fumes (e.g., zinc, copper, iron, lead) and acid mists (e.g., sulphuric acid), fluorides, paint pigments, pesticide mists, carbon black and oil smoke
Gaseous pollutants	sulphur compounds (e.g., sulphur dioxide (SO ₂) and sulphur trioxide (SO ₃)), carbon monoxide, nitrogen compounds (e.g., nitric oxide (NO), nitrogen dioxide (NO ₂), ammonia), organic compounds (e.g., hydrocarbons (HC), volatile organic compounds (VOC), polycyclic aromatic hydrocarbons (PAH), aldehydes), halogen compounds and halogen derivatives (e.g., HF and HCl), hydrogen sulphide, carbon disulphide and mercaptans.
Odours	Nitrogen derivatives (e.g. ammonia, trimethylamine), sulphur compounds (e.g. hydrogen sulphide (H ₂ S), carbon disulphide (CS ₂) and mercaptans (R-SH or R ₁ -S-R ₂)), selenium derivatives, tellurium derivatives, pyridine and other foul-smelling chemicals (sometimes chemically undefined)

The above pollutants are known as “primary pollutants” of which is pollutants that are emitted directly from source (or process). “Secondary pollutants” are generated when other pollutants (primary pollutants) react in the atmosphere by thermal, chemical or photochemical reactions. For example, by thermal action sulphur dioxide can oxidize to sulphur trioxide which, dissolved in water, gives rise to the formation of sulphuric acid mist (catalysed by manganese and iron oxides). Photochemical reactions between nitrogen oxides and reactive hydrocarbons can produce ozone (O₃), formaldehyde and peroxyacetyl nitrate (PAN); reactions between HCl and formaldehyde can form bis-chloromethyl ether.

An activity that generates air pollution and emission should not deteriorate the quality of air surrounding the establishment of said activity. In order to effectively assess the impact of carrying out a prescribed activity on air quality, identification of air emission characteristics must be determined. The tasks include estimating the *type of gaseous emission* to be released from the activity, *its concentration and volume*, and also very importantly how it is released – *via a single point emission (stacks, exhaust) or fugitively*.

The estimation of type, concentration and volume of the air pollutant can be carried out by analysing processes utilised, raw materials fed into the processes and chemicals used, sub-processes, products, and/or internal treatment and supporting/auxiliary activities. To ensure an effective assessment, Project Proponent must have in hand all possible information required.

Typical information required for undertaking evaluation and assessment:

- All raw materials used and its properties (e.g. amount, composition, characteristics)
- All chemical used and its properties (e.g. amount, composition, characteristics)
- All products and by-products produced (e.g. amount, composition, characteristics)
- Conceptual design, process flow for main processes, sub-processes, supporting and auxiliary processes, treatment system
- Storage method(s) for each material identified
- Sources of emission from Project – point sources and fugitive sources
- Surrounding industrial activities (existing) types
- Nearest receptors locations

At the planning stage, ample information ideally should be available for Project Proponent to conduct their internal assessment. It is an advantage to collate all information needed as early possible especially for prescribed activity project since this information will be required in the preparation of environmental impact assessment submission to the DOE.

Information required for Terms of Reference (TOR) for EIA Study and EIA Study report submission for prescribed activity project:

- *Block diagram (overall) for the air pollution control system*
- *Process calculations (detailed) for the treatment component(s)*
- *P&ID (piping and instrumentation diagram)*
- *Engineering drawings of all treatment components*
- *Mass balance*
- *Performance monitoring procedure*

Other information that are required are the meteorological information and surrounding land uses terrain profile as well as receptor locations. Meteorological parameters have great influences on pollutant dispersion in terms of wind speed and direction and vertical thermal stratification. The meteorological data collected must be representative of the considered site locality (must reflect the local characteristics). As for the land uses information, it is crucial to understand the surrounding terrain profile and understand the surrounding activities and sources (if any) that includes receptors locations, should the Project be allocated within existing industrial area or near to areas with already established industrial / other activities.

1.4 Establishing a Baseline

Baseline study is to document the environmental status of the surrounding area of interest before the activity is developed. In relation to air quality, it is aimed to provide descriptive information of the background air quality status prior to the activity development and of that will also form the background basis in the consequent screening processes and detailed assessment (should this be required).

The baseline study may involve field studies (i.e. collection of data directly from project site or primary data collection) and/or desktop studies (i.e. review of secondary sources data obtained from published records, project documents and maps). Research of secondary data and information is encouraged since this can present long-term profile of the air quality status of the subject area. Past data records can be sourced from other project's environmental studies and reports done for the area (those of which are publicly available documents).

Primary data collection usually comprises of air quality sampling to obtain direct measurement of the air quality. Project Proponent is encouraged to prepare a "sampling plan" which will state among others:

- objective of measurement/sampling exercise,
- parameters of interest to be measured and sampling devices to be used (parameters to include all those that will be used by the activity's main processes, sub-process and sub-activities and known output pollutants that is derived from process reaction),
- duration of measurement (24 hours, 16 hours, 8 hours)
- area and locations of sampling (ensure sufficient area coverage based on land profile),
- analytical methods (analysis methods)
- responsible parties
- quality protocols.

In the sampling measurement, the data collection should include existing conditions of relevant parameters which typically parameters comprise of particulate matter, sulphur dioxide, oxide of nitrogen and carbon monoxide. It is appropriate to include sampling for parameters of interest (in addition to the above) based on the chemicals that will be utilised and generated from the activities. This is to ascertain the presence of these parameters prior to project implementation and amount of contribution (loading) from the project in the future.

The sampling station(s) must be consider receptors locations within the project vicinity that is likely will be impacted. Other information to be assessed are the surrounding topography (of which can be conducted using GIS and mapping software), as geographical features surrounding project site can impact the dispersion effect of gaseous emissions.

1.5 Impact Screening by Modelling

It is desirable for Project Proponent to assess the suitability of the site locations in terms of its process emission impacts on surrounding air quality at the early stages of project planning. There are various methods that can be used for the assessment, depending on the level of information in hand and data availability at the time of assessment. For preliminary or initial screening process, this can be achieved using screening modelling tools such as SCREEN3 (or SCREEN View), AERMOD View, AERSCREEN View, TSCREEN and CTSCREEN. **Table G1-1** presents the comparison between each tool based on features, input and output.

Information and data for input into the modelling tools varies by the software used. Nonetheless, the most common required data are emission parameters (concentration and volume) and site location (for large site, must consider proposed stack locations). These data must be available by the Project Proponent during the project concept planning stage. For project/ activity that generates fugitive emission, the screening should be carried out as well as ‘area source’ to determine extend of dispersion.

Other information that can vastly influenced the modelling output is the land terrain profile. For project/activity to be sited in a terrain area condition, absence of the land terrain information may not reflect the desired true output, of which the modelling output can present either a positive or negative impact with the project or activity being developed.

The Project Proponent must practice great caution at this stage when making decision relating to project siting location based on the result or output with limited information. It can be costly for the Project Proponent when the modelling output does not reflect the “true output condition” and may present high probability for the Project Proponent to designed out the concerns at the later stage. Thus, it is important that as much information is made available at earliest stage possible and for used by the screening/modelling exercise.

*For sensitive proposed project/activity, e.g. incineration activity, power generation, refineries and those project/activity that will contribute significantly towards deterioration of the air quality if uncontrolled or not mitigation, **detailed air quality study** is encouraged to be carried out as early possible. For the detailed air quality study, appropriate advanced models must be used (screening models are insufficient).*

Output of the modelling tools usually entails the relationship between the concentrations of emission vs the distance from emission source. By assessing the output and assessment of compliance with the statutory standards and limits, Project Proponent can make a decision on suitability of proposed site, and/or the need for stricter mitigation controls that will be required for project to be located within the desired location.

Table G1-1 Modelling Software Comparison

Tools	SCREEN View	AERMOD View	AERSCREEN View	TSCREEN	CTSCREEN
Description	<ul style="list-style-type: none"> • User friendly interface for SCREEN3. • Preliminary modelling with SCREEN View can remove the need for more complicated modelling, saving time and resources. 	<ul style="list-style-type: none"> • Complete and powerful air dispersion modelling package used extensively to assess pollution concentration and deposition from a wide variety of sources. • Incorporates building downwash algorithms, advanced depositional parameters, local terrain effects, and advanced meteorological calculations. 	<ul style="list-style-type: none"> • User friendly interface for AERSCREEN screening-level air quality model and associated modelling programs. • Estimate worst-case impacts of ground level concentrations for a single source by interfacing with the screening mode of the AERMOD model. 	<ul style="list-style-type: none"> • Toxics Screening Model (TSCREEN) is a Gaussian model that implements the procedures to correctly analyse toxic emissions and their subsequent dispersion from one of many different types of possible releases for superfund sites. 	<ul style="list-style-type: none"> • CTSCREEN is a Gaussian plume dispersion model designed as a screening technique for regulatory application to plume impaction assessments in complex terrain. CTSCREEN is a screening version of the CTDMPPLUS model.
Input Data	<ul style="list-style-type: none"> • Source type • Source parameters (emission rate, stack height and diameter, stack gas exit velocity and temperature, ambient air temperature) • Dispersion coefficient 	<ul style="list-style-type: none"> • Source type • Source parameters (GPS coordinate, emission rate, stack height and diameter, stack gas exit velocity and temperature) 	<ul style="list-style-type: none"> • Source type • Source parameters (emission rate, stack height and diameter, stack gas exit velocity and temperature, air temperature) • Building data • Meteorological data • Terrain data 	<ul style="list-style-type: none"> • Particulate matter emission type • Source parameters (emission rate, stack height and diameter, stack gas exit velocity and temperature) • Building parameters • Terrain type • Averaging time 	<ul style="list-style-type: none"> • Terrain data • Wind speed • Terrain height • Wind directions

Tools	SCREEN View	AERMOD View	AERSCREEN View	TSCREEN	CTSCREEN
	<ul style="list-style-type: none"> • Receptor data (height above ground) 		<ul style="list-style-type: none"> • Receptors' distances 		
Output	<ul style="list-style-type: none"> • Distance vs concentration graph 	<ul style="list-style-type: none"> • Maximum concentration by distances • 3D visualization of emission concentration 	<ul style="list-style-type: none"> • Final maximum concentration and maximum concentration at the minimum ambient distance • Fumigation results • Maximum concentrations by distance • Meteorology associated with the maximum concentration 	<ul style="list-style-type: none"> • Maximum concentration and the distance to the maximum • Dispersion characteristics and pollutant • Concentrations of the resulting plume 	<ul style="list-style-type: none"> • Worst-case 1hour concentration

1.6 Pollution Control Technologies

In general, air pollution control is aimed at elimination or reduction of airborne pollutants to acceptable levels, of which its uncontrolled presence in the atmosphere can cause adverse effects and damage towards human health, animal and/or plant life as well as environment overall (in terms of climate change). There are many available air pollution control technologies and mostly involve a combination of several control techniques. It is norm for pollution control design to combine technological controls and administrative controls, and in larger or more complex sources there may be more than one type of technological control.

The selection of the appropriate controls depends on the air pollution concerns to be solved. Among the consideration made are towards:

- What is being emitted, in what concentration and volume?
- What are the target standards and limits for compliance?
- What is the most susceptible target, receptors?
- What are acceptable short-term exposure levels and long-term exposure levels?
- What combination of controls must be selected to ensure that the short-term and long-term exposure levels are not exceeded?

Application of pollution control methods has to demonstrate considerable effectiveness in controlling pollution(s). Application of appropriate technologies is based on a systematic analysis of the source and nature of the emission or discharge in question, of its interaction with the ecosystem and the ambient pollution problem to be addressed, and the development of appropriate technologies to mitigate and monitor pollution impacts. Below present the general steps in selection of pollution control system.

<p>Step 1 Define Emission</p>	<p>Determine what will be released from the stack and all potentially harmful emissions must be listed. Estimate also how much of each material will be released</p>
<p>Step 2: Define target groups</p>	<p>All susceptible receptors should be identified (human, animals, plants and materials). In each case, the most susceptible member of each group must be identified</p>
<p>Step 3: Determine acceptable exposure levels</p>	<p>An acceptable level of exposure for the most sensitive target group must be established. If the pollutant is a material that has cumulative effects, such as a carcinogen, then long-term exposure levels (annual) must be set. If the pollutant has short-term effects, such as an irritant or a sensitizer, a short-term or perhaps peak exposure level must be set</p>
<p>Step 4: Select controls</p>	<p>Each pollutant is checked to ensure that it does not exceed the acceptable level. If it exceeds the acceptable level, additional controls must be added, and the exposure levels checked again. This process continues until all exposures are at or below the acceptable level. Dispersion modelling can be used to estimate exposures for new plants or to test alternative solutions for existing facilities</p>

The following **Table G1-2** presents a summary of the types of air pollution control devices and its applications.

Table G1-2 Common control devices for Pollutant Types and its Application,

Pollutants Types	Common Control Devices	Examples Where Used
Gases, vapours, sulphur oxides, corrosive acidic or basic gas streams, solid particles, liquid droplets Examples are obnoxious fumes such as silicon tetrafluoride, HNO ₃ , HCl, NH ₃ , Phosphoric acid, super phosphate & Fluorine	Packed towers, spray chambers, venturi scrubbers	Asphalt and concrete batch plants; coal-burning power plants; facilities that emit sulphur oxides, hydrogen sulphide, hydrogen chloride, ammonia, and other gases that can be absorbed into water and neutralized with the appropriate reagent
Vapor-phase volatile organic compounds (VOCs), hazardous air pollutants (HAPs)	Carbon adsorbers	Soil remediation facilities, oil refineries, steel mills, printers, wastewater treatment plants
Particulate matter (PM)	Fabric filters or bag houses	Asphalt batch plants, concrete batch kilns, steel mills, foundries, fertilizer plants, and other industrial processes
VOCs, gases	Catalytic reactors, catalysts	Landfills, oil refineries, printing or paint shops
Large PM	Cyclones	Woodworking shops, pharmaceutical manufacturers, cotton gins, rock crushers, cement plants
PM	Electrostatic precipitators (ESPs)	Power plants, steel and paper mills, smelters, cement plants, oil refineries
VOCs, gases, fumes, hazardous organics, odors, PM	Incinerators, thermal oxidizers, afterburners	Soil contaminated with gasoline, landfills, crematories, inks from graphic arts production and printing, can and coil plants, hazardous waste disposal
VOCs, odours, hydrogen sulphide (H ₂ S), mercaptans (organic sulphides)	Biofilters	Wastewater treatment plants, industrial processes

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