PT PLN (PERSERO)

ENERGY TRANSITION AND SUSTAINABILITY DIVISION

Noise and Vibration Control MANAGEMENT GUIDELINE

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Key Abbreviation

AOI : Area of Influence
E&S : Environmental and Social
EHS : Environmental, Health and Safety

ESMP	:	Environmental and Social Management Plan
ESMS	:	Environmental and Social Management System
ESS	:	Environmental and Social Standard
GHG	:	Greenhouse Gas
IA	:	Impact Assessment
IFC	:	International Finance Corporation
ISO	:	International Standard Organization
OHS	:	Occupational Health and Safety
PPE	:	Personal Protective Equipment
PS	:	Performance Standard
PV	:	Photovoltaic
WBG	:	World Bank Group

1 Introduction

PLN is committed to avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from the project activities, including noise and vibration. This guideline is developed in order to manage the impacts of noise and vibration resulted by PLN's Projects and facilities, whether for a new project development, expansion of an ongoing project or there are changes in the operation of PLN's facilities. This guideline is developed to be consistent with the E&S principles as described in the ESMS Manual and based on international good practice including the World Bank's Environmental and Social Standard (ESS) 3, WBG Environmental, Health, and Safety (EHS) Guideline, IFC EHS Guideline and other documents as listed in **Section 13** of this management guideline.

This guideline is developed to provide some guidance in managing noise and vibration impacts from a project so that the noise and vibration level at the site boundary and beyond do not exceed standards or reach nuisance levels at sensitive receptors. By implementing the management of noise and vibration control, the following objectives could be achieved:

- When avoidance is not feasible, noise and vibration level can be reduced;
- Noise and vibration can be controlled by number of means;
- Noise and vibration level do not exceed applicable standards at sensitive receptors;
- Noise and vibration level do not reach nuisance levels for receptors; and
- No grievances arise from the community regarding noise and vibration from the project.

2 Disclaimer

This guideline should not be taken as a standard, regulation, or manual and is not described to the detail level of a work instruction. If a more relevant or updated standard, regulation, or manual is available and requires revision of this guideline, then such revision is permitted. If any revision is made; references, rationales and amended sections should be clearly defined.

To be able to serve its purpose, this guideline should be reviewed, implemented, and enforced by PLN staff with relevant authorities and competencies specified in the ESMS Manual Section 3. Any changes to this guideline may potentially trigger the need to revise the associated procedures and other guidelines that connected with this guideline. Any update, deviation, or suggestion Will be followed up in alignment with the provision of Chapter 9 of the ESMS Manual (Management of Change).

3 Management Approach

The management of noise and vibration impact is a risk-based approach, which means that the management activities will be proportional to risk or impact. The base activities of a risk-based approach are identifying potential impact due to noise and vibration and assessing the significance level of those impact, and based this identification – assessment process, the management effort and activities will be determined proportional with the significance level of the impacts.

For example, during operation stage of a small-scale solar PV power plant, no potential significant impact of noise and vibration identified, thus a sound barrier (as part of noise mitigation measure and noise management) will not be applied.

The main principle of noise and vibration control should be reducing noise and vibration at the source, followed by the application of noise and vibration mitigation measures at the receptors. In managing the risk and impact of noise and vibration, it shall be managed following sequential approach of the mitigation hierarchy: avoid – minimize – compensate/restore.

4 Process Overview

In order to achieve the objectives of each step of the E&S safeguard process, the management of noise and vibration impacts will implement the following process:

- Identification of potential risks and impacts of noise and vibration;
- Assessment of the significance of identified risks and impacts;
- Planning mitigation measures; and
- Monitoring and review of the implementation of mitigation measures.

All the processes above are conducted within the Impact Assessment (IA) process as regulated in the ESMS manual, which includes the screening process and categorization, scoping, baseline study, analysing and assessing impact and management and monitoring strategies. In every step of the IA process, the mitigation hierarchy will be taken into consideration.

5 Screening and Categorization

5.1 Screening of potential noise and vibration impact

The screening stage is a key step for an initial identification of impacts related to noise and vibration from a project, which conducted at an early stage of a project's lifecycle. The objective of screening in the context of noise and vibration management is to identify major noise and vibration sources of a proposed project or activity. Screening of potential noise and vibration impact serves as the basis for scoping (see **Section 6**) and will contribute in calculating the likely E&S effect of a project when determining project category (see ESMS Manual Chapter 5.3).

Screening is based on professional judgement and the information available at the time. Project screening and categorization process is conducted at the earliest possible stage in

every project lifecycle; therefore, it is probable that the data used for identification may not be widely available and not very detailed. Whenever possible the data collection and the initial identification of impact is conducted concurrently with or part of the pre-feasibility and feasibility studies, and in collaboration with preparers of the feasibility assessments.

The identification of impacts on noise and vibration will include of the following information:

- The sources of impact.
  The sources of impact are activities of the project that potentially cause noise and vibration levels to exceed the standards or reach nuisance level at receptors, among others, such sources include:
  - Earthmoving and excavation equipment
  - Drilling, pile driving, tunnelling, and related activities
  - Concrete mixers, cranes, and other heavy equipment
  - Dumping and moving materials
  - Traffic associated with transportation of equipment, materials and people
  - Blasting
  - Signals and sirens
  - Engines, generators and other machinery
  - Turbines and other machinery of power plant
  - Transformers and power lines (tones and humming sounds or hisses)
  - Vehicles, etc.
- Characteristic nature of the noise and vibration (e.g., strength, frequency, time, timespan, etc.); and
- The receptors of the impact
  The receptor of impact may include the workers within the boundary of project area and the environment within and beyond the project fence. Exposure of noise and vibration upon workers should be included in OHS management. The environment receptors are including communities, plants and animals, etc, especially sensitive receptors are schools, hospitals and places of worship.

Initial identification of the potential impact of noise and vibration will be based on information of the project type and its nature, the activities planned in general, and the proposed location in general. Information that needs to be obtained are the following but not limited to:

- Type of project (e.g., transmission line, types of power plant, distribution line, etc.)
- Technology used in general (e.g., types of propellers for hydropower, etc.)
- Project phases (e.g., pre-construction, construction, operation, decommissioning)
- Location characteristic in general (e.g., administrative boundaries, biome or land cover, presence of villages/communities, etc.) and locations of sensitive receptors.

Types of projects and technology that will be applied in each project phases will give information on the typical sources of noise and vibration likely to be generated. The location characteristics can provide information on natural barriers for noise propagation, receptors of noise and vibration impact and their sensitivity, etc. All of this information and impact identification will then be used for the preliminary assessment below.

5.2 Preliminary assessment of noise and vibration impact

Once relevant information and potential noise and vibration impacts has been assembled, a preliminary assessment will be conducted to assess the significance of the identified potential impacts. The significance of the potential noise and vibration impacts is measured by assessing the probability and the consequence level, using reference criteria for probability and consequence as provided in Appendix 4 of the ESMS Manual, criteria for Resource Efficiency, Pollution and Emissions of Greenhouse Gases (GHG).

The significance of noise and vibration impacts will contribute into calculating the likely E&S effect of a project when determining the project's category. The potential noise and vibration impacts assessed may consist of several impacts, such as vibration impact from heavy equipment operation, noise impact from land clearing activity, noise impact production process, etc., where each of these impacts will have its own impact significance. However, in context of determining project E&S category, the risk category will follow the highest risk significance.

The results of screening and categorization process are preliminary in nature and will be expanded and revisited as part of the Impact Assessment, when more information about the nature and the scope of a project becomes available or when project definition and circumstances change (e.g., screening of subprojects identified during project implementation, change of project design or components, etc.). This is in line with the adaptive risk management approach.

6 Scoping of Noise and Vibration Impact

Scoping aims to deepen the understanding of the potential noise and vibration impacts (in condition that they have been identified during Project Screening and Categorization), to clearly define what is within the scope of the assessment (activities, risks/impacts, affected area), and develop a suitable methodology and sampling strategy for the noise and vibration Impact Assessment that ensues.

At the scoping stage, the identification of impacts of noise and vibration will be further broadened and deepened. Identification of the potential impacts of noise and vibration are still derived based on the project's description. However, more information about the project is usually available, detailed and more defined, compared to the information available during the project screening & categorization stage. All impacts that are identified from the project screening and categorization stage will be included in the list of project's potential impacts.

The scoping will include, but is not limited to:

a. Understanding project activities, project description and project alternatives.

   At this stage of the project, information regarding the project is available in a more comprehensive manner, such as the project's phases, the technology to be applied, the site design, etc., including some alternatives of project components design. Understanding of the project activities and description will be needed to identify potential interaction between the project and resources/receptors in the Area of Influence (see point c). It is important to clearly define the receptor fields, which can be quire complex.

b. Identify potential noise and vibration impact

Identification of potential noise and vibration impact in the scoping stage is an iteration of identifying potential impact at the screening stage. However, usually more information about the project is available, detailed and more defined (although some alternatives of design and/or project locations may still exist, but not in a broad range of selection), compared to the information available during the project screening and categorization process. Therefore, the identification of impacts of noise and vibration is further broadened and deepened in this scoping process.

Identification of noise and vibration impacts is derived based on the project's description, activities where noise and vibration are generated and how it interacts with the receptors.

During the identification of potential impact, permit or licensing requirements related with activities that produce noise and vibration shall be also identified. Identification of permits and licenses requirements will provide information on management actions that may need to be conducted when developing mitigation measures plan.

c. Identify area of influence (AOI) for noise and vibration impact.

The project activities will impact spatial (area) and temporal (time) dimension. Based on the potential noise and vibration impact that has been identified (both in the screening process and deepened in this scoping process), the area of influence for noise and vibration impacts will be determined. The extent of AOI for noise and vibration impact will consider the extent of the direct and indirect impact of noise and vibration impact and location characteristics. The extent of the direct impact may be determined based on reference to similar projects or activities, standards related with noise and vibration (e.g., distance for noise monitoring, etc.) or other justified studies. Location characteristics may limit noise propagation, for example noise source within a dense forest may have limited impact when compared to a low-crop plantation area local community but a more significant impacts endangered mammal.

It should be noted that the AOI determined in the scoping process may be revised and adjusted when new information gathered throughout impact assessment process (e.g., new information on existing baseline condition from the baseline survey result) or circumstances change (e.g., changes in project's design).

d. Identify sensitive receptors

Noise and vibration impact that related to or may affect sensitive receptors need to be identified in order to determine which noise and vibration impacts that need to be focused on and analysed in more depth. Sensitive receptors include community (e.g., children, elders, etc.), animal, plant, ecological sensitive (e.g., national parks). Environmental noise standards refer to the noise and vibration measured at the receptor.

e. Identify existing environmental condition and social issues related to noise and vibration

The existing environment condition and social issues related to noise and vibration that can exacerbated by the project will be identified. For example, if the community along the access road to the project location, which is a public road that use distribute goods, already complained the noise and vibration caused by trucks passing by from other activities;

additional transportation fleets for project's construction may increase the noise and vibration frequency. The presence of environmental condition and/or social issue related to noise and vibration need to be considered when analysing the impacts, also as a basis for planning appropriate noise and vibration impact management. Schools, hospitals and clinics and places of worship are particularly sensitive receptors.

f. Define methodology for impact analysis

In analysing the potential noise and vibration impacts, there are methods that can be used, including quantitative and semi-quantitative methods. As much as feasible, the noise and vibration impact assessment is carried out quantitatively. In general, the methodology for noise and vibration impact assessment consists of, but not limited to:

- Primary and secondary data collection

  The primary and secondary data collection will be conducted as part of the baseline study (see **Section 7**).

- Modelling

  In order to have a reliable quantitative data, in some cases, the noise produced from project's activity that potentially has significant impact need to be modelled to demonstrate the noise propagation. This particularly applies to steady state operations with constant noise generation. The output of noise modelling will become an input for calculating the consequence of noise impact during impact significance assessment (see **Section 8.2**). The modelling will be conducted using an appropriate software program.

g. Identify baseline data requirement

Baseline data that needs to be collected will be identified, based on the previous activities, i.e., the potential impact identified, the AOI defined, and methodology for impact analysis that has been defined (including the requirements to conduct modelling), etc. Particular attention needs to be paid to the location of nearby (within 500m) residential or sensitive community receptors, whose baseline conditions may vary. Input from stakeholder engagement that has been conducted as part of the impact assessment process as a whole, especially related to noise and vibration, will be taken into consideration in determining baseline data that may require to be collected.

7 Baseline Study

A baseline study will include collection of primary and secondary data collection and analysis of data collected. The primary and secondary data that shall be collected is utilized to understand the project location conditions in the Project's AOI before the implementation of the Project and as input for modelling process.

The data to be collected will consider the source of noise and vibration impact that has been identified, the location characteristic (including the potential receptors), and data required to conduct modelling that has been defined. Noise baseline data collection method may refer to ISO 1996 or other equivalent standard as applicable. Primary data collection consists of field observation, noise measurement and sampling and interviews. Secondary data collection

includes available noise and vibration studies that have been conducted earlier in the AOI and supporting data to analyse the project location condition, especially related to potential receptors.

7.1 Primary data collection

In designing noise and vibration measurement and sampling program for primary data collection, the methodology used considers the following:

- Type of sources of potential noise and vibration impacts that have been identified through the scoping process;
- Data collection, methods, equipment are valid, reliable and consistent, i.e., will be conducted in accordance with applicable national law and regulation or the international standard[1], whichever is more stringent and technically feasible to be applied. Additionally, the standards to be referred to, including the parameters planned to be sampled and the associated threshold will be identified based on scoping result, by taking into account the potential significance of the impacts. Reference of international standard on ambient noise level threshold is shown in **Table 7-1** ;
- Sampling represents the daily condition (noon-night time) and/or paying attention to times of receptors activity (e.g., nocturnal animals) in accordance with ISO 1996 or equivalent standard; Locations of sensitive receptors.

Table 7-1 Noise Level Guidelines *(WBG EHS Guideline, 2007)*

Receptor	**One Hour L_{Aeq} (dBA)**	
	Daytime (07:00 – 22:00)	**Nighttime (22:00 – 07:00)**
Residential, Institutional, Educational	55	45
Industrial, Commercial	70	70
Note: Maximum increase in background levels of 3 dBA at the nearest receptor location off-site		

Baseline calculation will also be required for monitoring purposes, where noise and vibration measurement should be undertaken to assess background levels of noise and vibration, in order to differentiate between existing ambient conditions and project-related impacts. It should be noted that when baseline noise already exceeds the limits of the standard at a given receptor, project limits are set at 3dBA above that baseline during implementation.

For the effectiveness of the project development process, determination of the sampling locations in each sampling location should be developed where it can serve the purposes of baseline study. The sampling locations should consider these factors, but not limited to:

- Location of the source of noise and vibration;
- The wind direction;

[1] Reference of international standard: WBG General EHS Guidelines: Environmental. Noise Management. 2007; Compendium of WHO and other UN guidance on health and environment, Chapter 11 Environmental Noise (https://www.who.int/tools/compendium-on-health-and-environment/environmental-noise/)

- Location of the receptor (community, flora and fauna, water bodies, etc.), including sensitive receptors, and the distance from the source. A cluster of sensitive receptors is usually represented by the nearest receptor to the source;
- The project's boundaries and AOI.

7.2 Secondary data collection

As previously described, secondary data collection includes noise and vibration studies that have been conducted earlier in the AOI, especially related to the characteristic of the source, and supporting data to analyse the project location condition, especially related to potential receptors. Information on noise and vibration that is characteristic of the source can be obtained from the manufacturer or other accountable information from another project, case studies, research regarding the source of noise and vibration. Supporting data includes, but not limited to, wind speed and direction, land covers, etc., and other data required to conduct modelling (if needed).

8 Analyse and Assess Noise and Vibration Impact

8.1 Prediction of impact and impact mapping

All available information and data collected during the scoping process and from the result of baseline study will be analysed to determine what could potentially happen at receptors as a consequence of the project and its associated activities. From the potentially significant interactions identified in scoping process, impacts to the various receptors are defined and evaluated. It is to be noted that impact assessment is not an isolated process, there may be additional information obtained which indicate that an impact will occur, where this impact has not previously identified during the scoping process. This may include an impact on one receptor that can further impact other receptors which requires an assessment of interaction of impacts that may intensify the scale and significance.

Once all the impacts that have been collated, they will be grouped based on phases of the project where they will potentially occur and the correlation between impacts (including impacts other than noise and vibration) will be mapped. This will give a clear picture on impacts that may influence other impacts and any interaction amongst the identified impacts that will enable identification of possible indirect and cumulative impacts.

8.2 Significance of impact

After the identified potential impact are defined and mapped, they will be assessed for their significance using the same method as in the preliminary assessment stage using a risk matrix method. However, at this stage more reliable data is available, possibly including noise modelling that will give more quantitative and reliable information, specifically related to the significance of the impact and other impact consequence factors (if available). The significance of impact will be assessed based on the probability of the impact to occur and the extent of its consequences if it occurs. The consequence of the impact will take into account the following factors:

- Type of impact (direct, indirect, and cumulative)
- Duration of impact (short, medium, or long term)

- Extent or size of the affected area.
- Reversibility of impact (reversible or permanent)
- Sensitivity of receptors (vulnerability)

It is important to note that in determining the impact significance, embedded controls (i.e., physical or procedural controls that are included in Project Description) are taken into account. Example of mitigation measures that embedded in the project's design: soundproof turbine room design so that the noise that propagates out of the room can be reduced.

Once the significance of an impact has been defined, the next step is to evaluate what mitigation and enhancement measures are warranted (see **Section 9**). The main objective of developing mitigation measures is to reduce the significance of an impact by reducing the consequence and/or lowering the likelihood that it will occur. Re-evaluation of impact significance value needs to be conducted, once mitigation measures are developed. The significance of the residual impact will be assessed with the same risk matrix, taking into account the application of mitigation measures.

All the impacts that have been assessed will be managed, through mitigation measures (See **Section 9** that have been defined and will be monitored (see **Section 10**). Management and monitoring strategies will need to be developed to reduce the impact significance, prevent an impact from escalating, and to improve the E&S performance of a project. The management and monitoring strategies will be conducted through developing a Noise and Vibration Management Plan (See **Section 11**).

9 Mitigation Measures

Where possible, facilities and projects should avoid, minimize, and control adverse impacts to human health, safety, and the environment due to noise and vibration from the project activities. Mitigation measures for noise and vibration impact to workers is covered in the Occupational Health and Safety (OHS) considerations and should be included in the OHS Management Plan.

For the potential impacts of noise and vibration at or beyond the boundary of project or facilities, the prevention and mitigation measures should be applied where predicted or measured noise impacts from a project facility or operations exceed the applicable noise level guideline at the most sensitive point of reception (sensitive receptors). The preferred method for controlling noise from stationary sources is to implement noise control measures at source. Methods for prevention and control of sources of noise emissions depend on the source and proximity of receptors.

The selection of mitigation measures will be proportionate to the significance of impact assessed. The following are several noise reduction options that can be considered, whichever applicable and proportionate with the impact significance, but not limited to:

- Selecting equipment with lower sound power levels.
- Using noise control devices, such as silencers for fans, exhaust muffling devices for combustion engines, acoustic enclosures for equipment casing radiating noise, etc.
- Installing acoustic barriers without gaps and with a continuous minimum surface density of 10 kg/m^2 in order to minimize the transmission of sound through the barrier.

Barriers should be located as close to the source or to the receptor location to be effective.
- Locating noise sources in less sensitive areas to take advantage of distance and shielding.
- Taking advantage of the natural topography and terrain as a noise buffer during facility design.
- Installing vibration isolation for mechanical equipment.
- Limiting the operation hours of specific pieces of equipment or operations, especially mobile sources operating through community areas considering sensitive receptors such as schools or places of worship.
- Conduct consultation with local communities prior planning activities, so activities with the greatest potential to generate noise and/or vibration could be managed with result in least disturbance.

Any equipment or technology uses that serves as a mitigation measure will be maintained in accordance with manufacturer's specifications. The maintenance activity shall be part of the emission control measures.

Mitigation measures that are planned are arranged in the management plan for noise and vibration. The management plan can be part of the Project's ESMP, or to be a stand-alone document.

10 Monitoring

Monitoring will serve as a tool to improve the E&S performance. As part of the noise and vibration control management, monitoring consists of periodical monitoring as part of management activities (i.e., mitigation measures planned) and review of the overall management plan.

10.1 Management activity monitoring

Each of the mitigation measures that are planned should be monitored to ensure they are carried out according to plan and ensure that project activities do not violate the provisions that have been regulated and determined. The monitoring plan will be developed based on the mitigation measures that has been set, and will be commensurate with the significance level of impact based on the impact analysis and assessment result. In developing a monitoring plan for activities planned in the management plan, the following items should be taken into account, but not limited to:

- Parameters to be monitored.
  Parameters to be monitored are the performance indicator that have been determined when developing management plan. This is usually the noise level at the receptor compared to established baselines. As previously discussed, the parameters are based on specific noise and vibration standard that are regulated in applicable national law and or the international standard (see footnote 1 and **Table 7-1**), whichever is more stringent and technically feasible to be implemented. Additionally, the standards to be referred to, including the parameters planned to be monitored and the associated threshold will be based on impact analysis and assessment result, by taking into

account the significance of the impacts. The parameters to be monitored may also include parameters that are stated in the permits, if any. The level of grievance related with noise and vibration can also be used as management indicator

- Baseline
  Before a project is developed, baseline noise level at and in the vicinity of the site and also at the defined sensitive receptors should be undertaken to assess background of noise level, in order to differentiate between existing ambient conditions and project-related impacts. Data should be compared to applicable standard, compliance to regulatory and/or international standards[2], whichever is more stringent. The result of monitoring should also be compared to the baseline condition prior the project commencement in order to analyse the project impact to the ambient noise level. It should be noted, some standard determines increment threshold of project's contribution to the baseline noise level if the baseline level already exceeds the maximum standard[3].

- Monitoring location
  For noise and vibration monitoring, monitoring is carried out at the receptor area. If noise at the receptor is greater than expected, it may be necessary to measure at noise sources, but this is not straightforward.

- Frequency of inspection and monitoring.
  The frequency of monitoring will depend various factors, which includes the duration of impact, magnitude of impact, the sensitivity or limit of the receptor, etc. Longer period of impact, larger magnitude of impact, and more sensitive receptor will require more intense monitoring, likewise. The frequency of several parameters that are required to be monitored in the permit, if any, must comply with the provisions in the permit, at minimum. Additionally, it may be necessary to undertake a special monitoring if there is a community grievance related to noise.

- Sampling and analysis method
  Monitoring programs should apply national or international methods for sample collection and analysis, baseline data should be collected in accordance with ISO 1996 or equivalent standard. Sampling should be conducted by, or under, the supervision of suitably qualified individuals. Analysis should be conducted by entities permitted or certified for this purpose. Sampling and analysis Quality Assurance/Quality Control (QA/QC) plans should be applied and documented to ensure that data quality is adequate for the intended data use (e.g., method detection limits are below levels of concern). Monitoring reports should include QA/QC documentation, including instrument calibration dates and data.

- Instruments that will be used for monitoring, including calibration requirements.

[2] Noise level threshold based on WBG General EHS Guidelines (2007) that applies for residential are currently at 55 dBA during the day and 45 dBA at night.

[3] Based on WBG General EHS Guidelines (2007) that applies for residential, the additional contribution from the project may not exceed 3 dBA.

The method and instrument to be used will comply with applicable regulation (if any) and will follow the best practice as technically feasible. The instrument shall be calibrated in accordance with manufacturer's specifications.

- The resources
  The monitoring will determine the minimum required qualifications of persons who will conduct the monitoring and inspection. In some cases, public participation in monitoring can be a requirement or a strategy in a management. If public monitoring determined to be applied, then it should be regulated and the requirement of the public that will participate should be determined.

10.2 Management plan review

The Noise and Vibration Management Plan is a living document and have to be has to be referred to every stage along project cycle. it's the target and approach established in the plan should be reviewed, modified, or renewed from time to time as deemed necessary to find the best possible result.

The following are items that need to be determined related to management plan review:

- Schedule for regular review. The management plan should be reviewed regularly, depend on the length of the phase where the management plan implemented. If the phase will be more than one year, then the regular review shall be conducted annually in minimum.
- Special reviews may be necessary if performance standards are not met or if community grievances cannot be resolved.
- The parties that responsible for conducting the review, making an amendment, and the party approving the result of the review.

11 Noise and Vibration Management Plan

The management plan should be developed before commencement of construction activities and will be implemented throughout each project phase. For operational stage, the management plan should be incorporated in the facilities design which should meet any requirements based on the impact assessment process. The impact assessment process is conducted concurrently with development of DED, therefor the result and requirement from the impact assessment process should be incorporated in the DED.

Management plan for construction or other activities at existing facilities will initially be based on a due diligence assessment that evaluates the existing potential impact of noise and vibration. All Plans will also be informed by and based upon the best judgement of qualified professionals and the experience gained from ongoing activities.

The components of Noise and Vibration Management Plan are described below.

11.1 Component 1: *Objective*

The management plan should state the objectives of implementing noise and vibration control measures. The main objective is to keep the noise and vibration level in compliance with applicable national laws and regulations or the international standard, whichever is more

stringent and technically feasible to be applied. These standards apply to noise and vibration as measured at sensitive receptors.

11.2 Component 2: Source of impact and impact receptors

Sources of impact are the project's activities that have been identified and assessed in the impact assessment process, where the activities that cause noise and vibration level exceed the standards or reach nuisance level of receptors. Thus, control measures are required to be implemented. In the management plan, the source of impact should be stated, along with characteristic nature of the noise and vibration at the receptors.

11.3 Component 3: *Activities*

For each area that has been identified and assessed that may be susceptible to noise and vibration impacts, the management plan should describe in detail the specific control measures that are used at the project and the relevant maintenance activities.

For a specific project activity that requires a permit for its implementation, any requirements of the permit that related with management effort for the impact cause should be included in the management plan.

The activities planned should also consider other plans that are related (if any), for examples Occupational Health Safety Management Plan, Biodiversity Management Plan, Community Health Safety and Security Management Plan, Stakeholder Management Plan, etc.

The Noise and Vibration Management Plan should also require that stakeholders that may be impacted to be consulted. The Plan must provide for timely handling of complaints/concerns received through the formal grievance mechanism or otherwise, including identifying the person or persons responsible for dealing with such issues

11.4 Component 4: Performance Indicator

Every mitigation measure or management activity planned should have a measurable indicator of success as a tool to determine achievement targets and control the implementation of the management activity. Management indicators are determined shall be measurable, wherever possible to be quantitative in nature and can be measured with applicable tools. In most cases the indicators of success are based on specific noise and vibration standards that are regulated in applicable national laws and/or the international standards, whichever is more stringent and technically feasible to be implemented. Moreover, number or level of grievances related with noise and vibration can also be used as management indicator.

11.5 Component 5: Institutional Responsibility

The management plan must identify and describe the responsibilities of all parties (PLN, contractor or other relevant third parties) and competent authorities. The Plan must identify the roles and responsibilities of individual positions within these organization. It should also make provision for relevant training and induction for nominated personnel.

The management plan should also identify the person or persons that are responsible to following up and take action upon grievance related noise and vibration that submitted through formal grievance mechanism. Example: HSE officer of Project Construction Organization

11.6 Component 6: Implementation Schedule

The management plan should detail an implementation schedule of management activities, taking into account the planned timing of construction and other project activities, including any permits or licenses that should be obtain prior to their commencement.

11.7 Component 7: Cost Estimates

The management plan should include cost estimates for each of activity or set of activities implementation, including up-front investment costs and long-term recurrent costs.

11.8 Component 8: Monitoring, Recordkeeping and Reporting

The management plan must call for inspection/monitoring of noise and vibration control. The Plan should specify:

- The noise and vibration control activities and locations.
- Parameters to be monitored;
- The frequency of inspection and monitoring;
- Regulatory criteria and any specific requirement imposed on the project by government (as applicable);
- Sampling and analysis method;
- Instruments that will be used for monitoring, including calibration requirements;
- The required qualifications of persons who will conduct the monitoring and inspection, and of any members of the public who may participate in monitoring;
- Records that must be kept and the person responsible for keeping the records;
- Wherever possible noise monitoring should take place at the locations where baseline data was collected.
- Reports that will be prepared, to whom the reports are to be submitted for review, and the length of time records will be kept. This will include summary reports at intervals and to which institutional should be submitted.

For Project activity or management activities that require a permit in their implementation, the monitoring implementation must also include the requirements in the permit, for examples parameters to be monitored, the frequency, etc. The monitoring component is further defined in **Section 10** of this guideline.

11.9 Component 9: Management Plan Review

The management plan should determine and state the schedule of management plan review (see Section 8). Regular review of the management plan and the party responsible for conducting a review, making an amendment and the party approving the results of the review and the changes made (if any) must be stated in the management plan.

12 Procedure

In carrying out the noise and vibration control management program/activities, procedures can be developed as necessary, e.g., procedure of operating specific equipment with limitation of operational hours to reduce the impact of noise and vibration, procedures to monitor noise and vibration level, etc. The procedures required are highly dependent on the nature of the

project and the impact and mitigation measures determined, although some procedures may be more general thus can be used for various projects (e.g., noise measurement procedure).

In general, there are several key items that need to be included in the procedures to be developed are, but not limited to:

- Procedure Information, which includes procedure title, identification number, number of pages.
- Purpose. The procedure should provide information on the objective of the procedure.
- Scope. The procedure should inform the boundary of the procedure, aspects or parties that are covered under the procedure, and limitation to the procedure.
- Definition. The procedure should define the terms used in the procedure.
- Responsibilities. The procedure should identify and state the parties that will be responsible to follow the procedure, supervise the implementation of the procedure, provide training of the procedure, and parties that will regularly review and update the procedure.
- Work instructions. The procedure should list, in a simple and clear manners, the specific steps that will be taken to implement the procedure.
- Reference documents. The procedure should list the relevant documents that support, utilized as the basis or provide additional information for the procedure, including rules and regulation that to be complied.
- Records. The procedure should provide information of the required documented outcomes of the procedures. Format for required records will be provided under the procedure, as necessary.
- Approving authority. The procedure should provide information on party that is responsible for approving the procedures.
- Issue date. The procedure should provide information on time of procedure issuance.
- Revision date. The procedure should provide information on time of procedure reviewed and revised (Procedures should be continually updated and improved).
- Other Environmental & Social components, if applicable. The procedure should include other environmental and social component, if applicable, related with the activities in the procedure. Example: PPE required for the activities must be clearly stated in the procedure.

13 References

- Minister of Environment Decree No.48 Year 1996 on Noise Level Standard
- Minister of Manpower and Transmigration Regulation No. 5 Year 2018 on Threshold Value of Physical Factors and Chemical Factors in The Workplace
- Minister of Environment Decree No.49 Year 1996 on Vibration Level Standard
- World Bank Environmental and Social Framework (ESF), Environmental and Social Standard (ESS) 3: Resource Efficiency and Pollution Prevention and Management
- World Bank Environmental and Social Framework (ESF) Guidance Note, Environmental and Social Standard (ESS) 3: Resource Efficiency and Pollution Prevention and Management
- WBG Environmental, Health, and Safety (EHS) Guidelines, 2007

- IFC PS 3: Resource Efficiency and Pollution Prevention, 2012
- IFC Guidance Note 3: Resource Efficiency and Pollution Prevention, 2012