Determination of Critical Environmental, Social, Infrastructure, and Economic Indicators as Evaluation Checklist for Pre-Project Abandonment Plan Assessment in-line with Sustainable Development Goal Plan

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Determination of Critical Environmental, Social, Infrastructure, and Economic Indicators as Evaluation Checklist for Pre-Project Abandonment Plan Assessment in-line with Sustainable Development Goal Plan

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Abstract. The increasing number of project abandonment because of the Novel Coronavirus pandemic 2019 (Covid-19) calls for better management of abandonment projects. The outbreak of Covid-19 has affected the environment, economy, and society aspects globally. In a developed country like Malaysia, the requirement to submit an abandonment plan is stipulated under the Environmental Guidelines in Malaysia (EGIM) 2016. Therefore, this study aimed to develop a Sustainable Pre-Project Abandonment Plan Assessment Checklist in Malaysia that is in line with the Sustainable Development Goal (SDG) 2030 aspirations. This new Sustainable Pre-Project Abandonment Plan Assessment Checklist in Malaysia is comprehensively structured; is expected to minimise the negative impact of the abandonment process towards the environment, socio-economy, and efficient management of infrastructure; and complies with the related legislation in Malaysia. In this study, data was collected and analysed using NVivo12. It consisted of findings from documents reviewed such as legislations, journals, and books. From the NVivo12 analysis, the results showed 28 critical indicators for abandonment plan assessment and related legislation that synchronises with SDG 2030 is required to develop the Proposed Sustainable Pre-Project Abandonment Plan Assessment Checklist in Malaysia.

1. Introduction

The outbreak of Covid-19 has really impacted the economy. Various sectors were affected including agriculture, trade, tourism, textile, electronics, automobile, iron and steel mineral processing, real estate, and software companies [1]. The Project Proponent intends to abandon the Environmental Impact Assessment (EIA) project due to various reasons. In Malaysia, if the project proponent intends to implement a project abandonment, they need to send a report to the Department of Environment (DOE). In this case, the abandonment plan report submitted must be evaluated and approved by the DOE. The

requirement for submission is stipulated in the Environmental Guidelines in Malaysia (EGIM), 2016 [2]. Nevertheless, the limitation of a clear framework in driving towards proper project abandonment will cause the report to be disapproved, which will affect the management of the EIA project abandonment plan. The abandonment management of imperfect EIA projects will contribute to various environmental problems. According to Sommer et al. [3], there are two major impacts on environmental problems: the impact of noise and contamination from end-point like waste. Moreover, some of the challenges, including inexperience in carrying out EIA project abandonment and unclear frameworks, will further complicate the management of the project. Under Section 34A, Environmental Quality Act 1974 [4], the Project Proponent is bound by law and will be subjected to legal action for non-compliance with that section. Furthermore, unplanned demolition collapse would lead to incidents that cause loss of life. This view is supported by Zhang [5], who mentioned that uncontrolled demolition causes deaths and injuries.

Therefore, this study is significant because it contributes to the gap due to limited information regarding the project abandonment framework. This research will also improve the Environmental Management Plan as stipulated in the EGIM [2]. This research focuses on the abandonment of the EIA project under the jurisdiction of DOE. It identifies the crucial indicators for project abandonment and clusters them through their main items of assessment that synchronise with Sustainable Development Goal (SDG) 2030 aspirations. It also outlines the related legislation for the abandonment of the project. Subsequently, this research framework is in accordance with the requirements of Section 34A (2C) of the EQA1974 (Act 127) [4] to provide an understanding of the EIA procedures, preparation, and submission of the EIA report for review and approval. In addition, compliance with the requirements will fulfil the Project Proponent's obligation stated under Section 34A (2C) of the EQA. Eventually, a framework is developed to serve as a reference in addressing project abandonment plan assessment in Malaysia.

2. Methodology

The research techniques used for the data collection process in this study involved two main approaches:

2.1. Review of documents by using NVivo12 analysis

During this phase, document review was used to triangulate the collected data. The relevant documents on existing policy or legislation, journals, and books were reviewed and further discussed. As quoted by O'Neill et al. in 2018, there are eight steps to conduct a literature review using NVivo12, divided into three modules, namely Module 1 (Preparation), Module 2 (Analysis), and Module 3 (Writing a Literature Review). Module 1 (Preparation) consists of setting up an NVivo12 Project, searching the literature, sorting literature, preparing EndNote, and importing it into NVivo12. Module 2 (Analysis) consists of classifying literature, visualisation, and topic coding of literature for themes. Finally, Module 3 (Writing a Literature Review) consists of NVivo12 Project summarisation.

3. Results and Discussion

3.1. Summary of source classifications sheet for literature captured via NVivo12

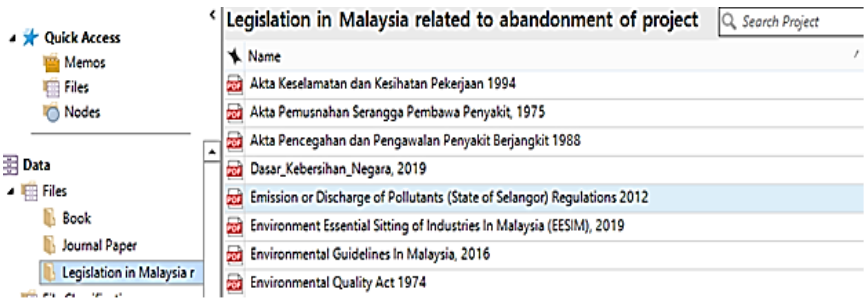

Figure 1. Summary of legislations in Malaysia related to project abandonment

3.2. Summary of cases for matrices

The cases for framework matrices were divided into four items which are topic, issues, rules, and penalty that will be imposed for non-compliance with the legislation or policy, as shown in Figure 2. For legislation, the most important point to gain was the topic or title of the Act, legislation, policy or guidelines, and penalty. In addition, the information assisted in gaining the critical indicators for the development of the Sustainable Pre-Project Abandonment Plan Assessment Checklist in Malaysia.

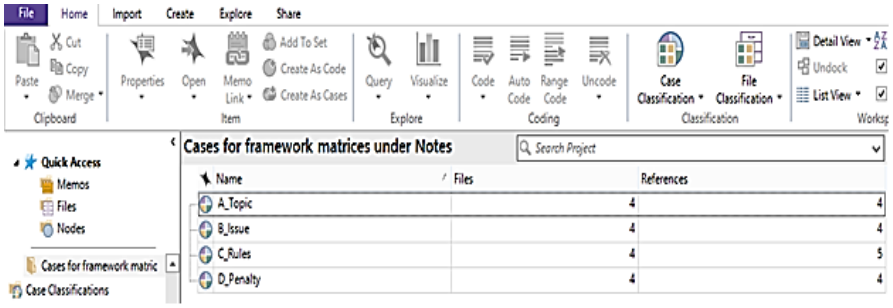

Figure 2. Summary of cases for framework matrices under notes

3.3. Literature review matrix summary

The matrix table analysis was carried out based on the list of literature review matrix summary. Figure 3 shows the detailed method for the literature matrix summary for legislation, as an example. Data gathered from this technique would provide better results because all the data were converged. This process helped the researchers scrutinise the document transcript towards finding emerging patterns. The results of the analysis assisted in identifying a theme for indicators for the development of the Proposed Sustainable Pre-Project Abandonment Plan Assessment Checklist in Malaysia

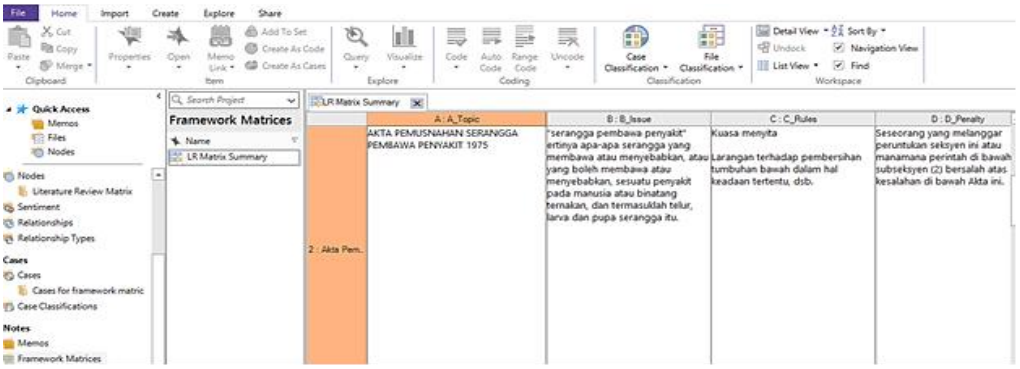

Figure 3. Example of literature matrix summary for Legislation

3.4. Content analysis based on literature matrix summary

Cross-sectional analysis was carried out based on the results obtained from the literature matrix summary. This process also helped the researchers scrutinise the transcript towards finding emerging patterns. Then, the listed free nodes before the related child nodes (sub-nodes) were clustered to the main nodes (main themes). The analysis results were presented using a cognitive mapping diagram that served to identify the initial Proposed Sustainable Pre-Project Abandonment Plan Assessment Checklist in Malaysia. As an example, the detailed method for Theme 1, which is Environmental Indicators, is shown in Figure 4. This table shows the summary of the analysis done to determine the critical indicators based on the literature review matrix summary. The indicators were clustered into four (4) main assessments: Theme 1 (Environmental Indicators), Theme 2 (Economic Indicators), Theme 3 (Social Indicators), and Theme 4 (Infrastructure Management).

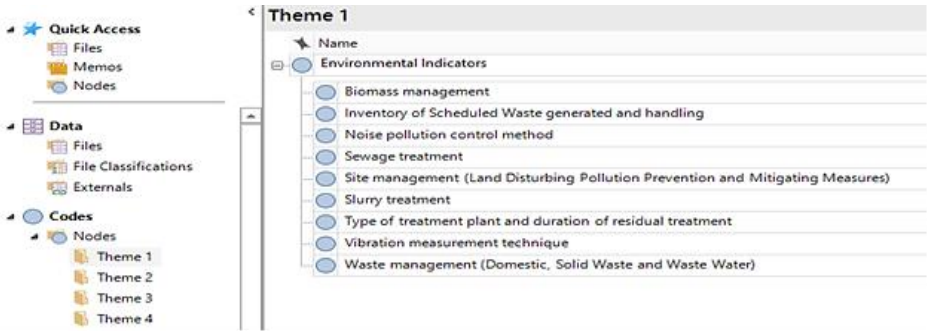

Figure 4: Summary of analysis done using NVivo12 for Theme 1

3.5. Cognitive mapping using NVivo12

The detailed content analysis resulted in the derivation of cognitive mapping, as shown in Figure 5. This was to show the summary of analysis on the illustrated figures. The cognitive mapping developments were based on each theme identified from this study.

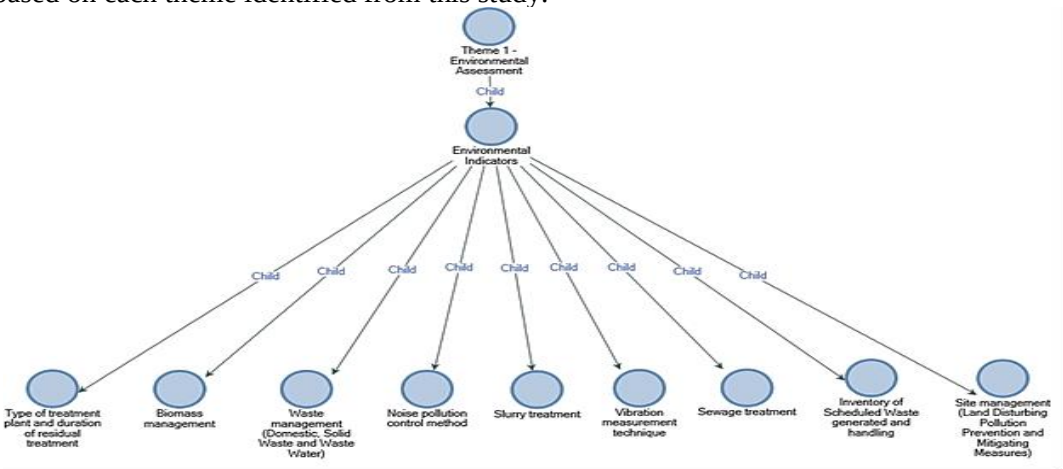

Figure 5: Cognitive mapping developed using NVivo12 for Theme 1

During the final analysis stage, the results obtained from the cross-sectional contents of all the cases were summarised. The summary of the results is presented in Tables 1, 2, 3, and 4, grouped under the related themes.

Table 1. A matrix for generating a summary of cross-sectional content analysis (Theme 1)

Theme 1 – Environmental assessment	
Environmental indicators	Inventory of scheduled waste generated and handling Slurry management and treatment Noise pollution control method Vibration measurement technique Sewage management Waste management (domestic/solid waste and wastewater) Site management (Land Disturbing Pollution Prevention and Mitigation Measures) Type of treatment plant and duration of residual treatment Biomass management

Table 2. A matrix for generating a summary of cross-sectional content analysis (Theme 2)

Theme 2 – Economic assessment

Economic Indicators	Circular economy concept (Reduce, Reuse, Recycle) Inventory of domestic waste generated Disposal of scheduled waste cost Assumption cost of residue treatment Rehabilitation cost Sustainable consumption of energy and workers

Table 3. A matrix for generating a summary of cross-sectional content analysis (Theme 3)

Theme 3 – Social assessment	
Social indicators	Safety & health of workers Site housekeeping Vermin control Heritage project special management Disease management control

Table 4. A matrix for generating a summary of cross-sectional content analysis (Theme 4)

Theme 4 – Infrastructure assessment	
Infrastructure indicators	Information on stream diversion once project abandonment occurs Method of blasting Method of demolition Dilapidation survey Buffer zone Drainage management system Type of noise barrier

3.6. Proposed Sustainable Pre-Project Abandonment Plan Assessment Checklist in Malaysia

Sustainable Development Goals 2030 has become a target for peace and prosperity for people and the planet, now and in the future. Therefore, to achieve a sustainable abandonment of the project, agencies in Malaysia play a crucial role in managing project abandonment; it requires cooperation between all relevant stakeholders. Thus, the Sustainable Pre-Project Abandonment Plan Assessment Checklist in Malaysia from this research consists of the main assessment types: environmental, economic, social, and infrastructure management that synchronise with their respective indicators and related Sustainable Development Goal 2030, as shown in Table 5. These indicators need to be considered during the report preparation and evaluation by both project proponents and related agencies before the approval of the project abandonment report.

Table 5 shows that for Environmental Assessment, there are nine types of critical indicators which are inventory of scheduled waste generated and handling, slurry management and treatment, noise pollution control method, vibration measurement technique, sewage management, waste management that comprise of domestic or solid waste and wastewater, site management, type of treatment plant and duration of residual treatment, and biomass management. The most important aspect to be considered for scheduled waste management is the inventory of scheduled waste management as stipulated in the Scheduled Waste Regulation 2005 [4]. The inventory will provide information regarding the amount of scheduled waste generated, information on the transporter, and final disposal of scheduled waste location. Thus, the track record can be used for future reference by either the project proponent or reviewer of the report. Good management of this indicator will support SDG 13, which is Climate Change.

In addition, abandonment work that generates slurry must also be managed as stipulated in the Standard Specifications for Building Works, Jabatan Kerja Raya (material generated from construction/ excavation work) [6]. This indicator must also be managed well as it can deteriorate our water quality

and must be treated before disposal to any landfill approved by the local authority. A well-managed indicator will support SDG 14 and 15, which are Life Below Water and Life on Land.

If the abandonment activities involve heavy machinery produce noise pollution, an effective control method is important to control the pollution. For EIA project abandonment, noise pollution control as stipulated in the Guidelines for Environment Noise Limit and Control 2017 [7] is under the jurisdiction of the Department of Environment (DOE). This guideline provides noise acceptance criteria for quantitative assessment of noise to define disturbance or otherwise, which are useful to project proponents and decision-makers to reduce the potential impact of noise affecting public health or causing annoyance or disturbance.

Meanwhile, the vibration measurement technique is very important to measure impact assessment. The vibration limits may be set based on certain vibration parameters, such as an absolute limit based on the vibration in a particular designated direction which should not be exceeded. The governing limits depend on the repetitive nature and duration of the vibration (continuous, short term or single event). For human response and annoyance evaluation, limits may be set for different periods of the day (day and night). The management of this indicator shall fulfil the requirement as stipulated in The Planning Guidelines for Vibration Limits and Control in The Environment 2007 [8]. Proper management of noise and vibration indicators will support SDG 3, which is Good Health.

In addition, sewage management is also important to prevent a river from being polluted, as stated in Sewage Regulation 2009 [4]. The implementation of these indicators will support SDG 6, which is Clean Water and Sanitation, and ensure availability and sustainable management of water and sanitation for the workers and nearby residents and ecosystem.

Waste management is very important in order to minimise the amount of waste generated from the site and ensure proper collection, storage, and disposal of the different types of waste generated from the abandonment activities. In Malaysia, for solid waste management, the related legislation for the management of solid waste generated from construction area is Solid Waste and Public Cleansing Management (Licensing) (Undertaking of Provision) of collection services for Construction Solid Waste Regulations 2018, Solid Waste and Public Cleansing Management (Scheme for Construction Solid Waste) 2018, and Solid Waste and Public Cleansing Management (Scheme for Commercial, Industrial, Institutional Solid Waste) 2018 [9]. Meanwhile, for wastewater management, the indicator must comply with Environmental Quality Act 1974 requirement, which is Industrial Effluent Regulation 2015 or related legislation. This regulation prevents pollution in rivers and waterways within the site project and surrounding area. This is to maintain water quality at baseline conditions or better within the DOE prescribed limits.

Land disturbing refers to any project abandonment that can possibly involve activities such as clearing of trees or vegetation, excavating, raising or sloping of ground, stripping, grading grubbing, trenching, excavating, filling, logging, storing of materials, and blasting. At the site, the Project Proponent is responsible to ensure the abandonment site is well managed, including physical effects such as management of aquatic areas, private, and public lands; obstruction of stream channels and navigable rivers; and flood area management as stipulated in the Guidelines on Land Disturbing Pollution Prevention and Mitigation Measures 2017 [10].

On the other hand, the types of treatment plant and duration of residual treatment are very important due to contamination that will affect the surrounding environment. The final discharge effluent limitation from industries is under the jurisdiction of DOE Malaysia as stipulated in the Environmental Quality (Industrial Effluent) Regulations 2009, Environmental Quality Act 1974 [4]. In these regulations, industrial effluent means any waste in the form of liquid or wastewater generated from the manufacturing process, including the treatment of water for water supply or any activity occurring at any industrial premises.

Furthermore, the Project Proponent needs to identify whether the biomass generated is categorised as wood, garbage, crops, landfill gas, or alcohol fuels as stipulated in the Solid Waste and Public Cleansing Management (Scheme for Construction Solid Waste) Regulations 2018 [9]. Thus, the management of waste, project site, treatment plant, and biomass will support SDG 14 and SDG 15 to protect the life below water and life on land.

In terms of economic assessment, there are seven important indicators for project abandonment. These include the circular economy concept (reduce, reuse and recycle), inventory of domestic waste generated, disposal of scheduled waste cost, assumption cost of residue treatment, rehabilitation cost, sustainable consumption of energy and workers, and allocation of environmental conservation budgeting. In this case, for legal compliance, the implementation of circular economy and inventory of domestic waste was stipulated on the Solid Waste and Public Waste Management Act 2007[9]. Meanwhile, the circular economy concept would also support Cluster 3, National Cleanliness Act 2019 [11]. In addition, a well-managed cost related to disposal purposes of scheduled waste, residue treatment, and rehabilitation costs must be allocated as stipulated in the Guided Self-Regulation (GSR), Department of Environment (DOE) Malaysia [12]. GSR is a mainstreaming tool that can be used for project abandonment purposes that also consists of an allocation of environmental conservation and budgeting as a tool. The Project Proponent also needs to assess the impact of the project abandonment on the economy of the resident nearby the project area and ecosystem.

Sustainable consumption of energy and workers must comply with Part XI, Demolition, Factories and Machinery (Building Operations and Works of Engineering Construction (Safety) Regulations 1986) [13]. Thus, the management of the circular economy concept, inventory of domestic waste generated, disposal of scheduled waste cost, assumption cost of residue treatment, rehabilitation cost, and allocation of environmental conservation budgeting will support SDG 7 and SDG 8, providing good jobs and enhancing economic growth.

From the social assessment perspective, there are five critical indicators which are safety and health of workers, site housekeeping, vermin control, heritage project special management, and disease management control. For safety and health indicators, the related legislation is Occupational Safety and Health Act 1994 [14]. This legislation emphasises a safe and healthy approach for working at the site to avoid accidents and health problems. Furthermore, site housekeeping is also important because it will affect the cleanliness and tidiness of the site project that would affect the lives of workers and nearby residents of the project area. Solid waste management is stipulated in the Solid Waste and Public Cleansing Management Act 2007 [9]. On the other hand, vermin control is also important to avoid disease as stipulated in the Destruction of Disease-Bearing Insects Act 1975 (Act 154) and Prevention and Control of Infectious Disease Act 1988 (Act 342) [15].

In addition, heritage project management is also important to ensure that the abandonment of projects classified as heritage project is abandoned according to the National Heritage Act 2005 [16]. Meanwhile, the Covid-19 pandemic is affecting workers' movement on site projects. To control the outbreak, project proponents need to comply with the Prevention and Control of Infectious Disease Act 1988 with the implementation of Standard Operating Procedure (SOP) at the site project. Moreover, these indicators will support SDG 3, ensuring the health and promoting well-being for workers and nearby residential areas. It is because safety and health are very precious.

For infrastructure assessment, there are seven critical indicators: information on stream diversion once project abandonment occurs, method of blasting, method of demolition, dilapidation survey, buffer zone, drainage management system, and noise barrier. Each indicator is important and ensures well-managed project abandonment activities related to infrastructure. For information on stream diversion, once project abandonment occurs, the project proponent needs to ensure that the implementation of these activities comply with Chapter 5, Erosion and Sediment Control Facilities, Diversion Channel, Guideline for Erosion and Sediment Control in Malaysia, 2010 [17]. This guideline also emphasises a structured drainage layout plan to avoid floods at the project site. Blasting work is one of the critical indicators for the abandonment of project activities. Referring to the Malaysian Standard (MS) 2318:2012, Demolition Code of Practice [18], the blasting work must obtain permission or approval from Polis Diraja Malaysia (PDRM) before being carried out. In addition, the project proponent is responsible for appointing a competent person for the blasting work as stipulated in the standard. Demolition activities include dismantling, razing, destroying, or wrecking any building, structure, or part thereof by pre-planned and controlled methods. In addition, before executing the demolition work, the project proponent needs to prepare a demolition plan to do demolition work without creating risks and execute it in a safe and orderly manner with careful planning for each stage of demolition.

A dilapidation survey is an inspection carried on the structural conditions of the existing surrounding buildings before the commencement of demolition, construction, or development as stipulated in Subchapter 4.1.4, Dilapidation Survey, Malaysian Standard, (MS) 2318:2012 [18]. This survey is important to check the layout arrangement of structural elements, the state of maintenance and deterioration, and any structural implication that may affect the demolition work. The buffer zone is also a critical indicator for project abandonment, known as setbacks (EESIM, 2018) [19]. In addition, buffer zones may act as filter strips. As stipulated in Chapter 5.2, Erosion Control Facilities, Guideline for Erosion and Sediment Control in Malaysia, 2010 [17], the example of types of Best Management Practices (BMPs) used at buffer zone can be divided into several types such as vegetated swales, steep, rocky slopes, and stream banks. Besides that, to ensure good management of project abandonment, one of the important abandonment of project indicators is a drainage management system. In addition, as stipulated in Subchapter 4.3.4, Drainage Control/Runoff Management, Guideline for Erosion and Sediment Control In Malaysia, 2010 [17], the main principle of the drainage management system is to ensure that a drainage system is in sites to direct runoff water so that it does not run across disturbed and unstable areas. Thus, the drainage system's hydraulic characteristics, including overall drainage pattern, dimension and flow of any rivers and streams, springs and well including flow and well logs, subsurface conditions including aquifer type and capacity, and well maintenance work, are important elements to be considered by the project proponent.

Moreover, project abandonment requires comprehensive management, including noise management at the project site. There are a few aspects to be considered in managing the noise: identification of sensitive receptors, establishing noise acceptance criteria, baseline noise monitoring, noise modelling, noise impact assessment, and noise mitigation. Therefore, as stipulated in the Guidance on noise control, Guidelines for Environment Noise Limit and Control 2019 [7], to control noise during the abandonment of the project, several types of noise barriers should be installed at the project site such as permanent noise barriers, movable and/or temporary barriers, partial enclosures, full enclosures, silencers and mufflers, and external lagging.

Thus, well management of the infrastructure assessment indicators that consist of green innovation of machinery and equipment used, sustainable drainage system, and noise barrier for the abandonment of work will support SDG 9 (Innovation and Infrastructure). In addition, well management of these critical indicators will affect life around the project site and support SDG 15 (Life on Land).

Table 5. Proposed Sustainable Pre-Project Abandonment Plan Assessment Checklist in Malaysia

Environmental Assessment		
Environmental indicators	Legislation/Policy	Related Sustainable Development Goal, 2030 (SDG)
Inventory of scheduled waste generated and handling	Scheduled Waste Regulation 2005, Environmental Quality Act 1974 [4].	SDG 13 (Climate Action)
Slurry management and treatment	Standard Specifications for Building Works, Jabatan Kerja Raya (Material generated from construction/ excavation work) [6]	SDG 14 (Life below water) SDG 15 (Life on land)
Noise pollution control method	Guidelines for Environment Noise Limit and Control 2017 [7]	SDG 3 (Good Health)
Vibration measurement technique	The Planning Guidelines for Vibration Limits and Control In The Environment 2007 [8]	SDG 3 (Good Health)
Sewage management	Sewage Regulation 2015, Environmental Quality Act 1974 [4]	SDG 6 (Clean Water and Sanitation)
Waste management (Domestic or solid waste and	Solid Waste and Public Cleansing Management (Scheme for Construction Solid Waste) 2018[9]	SDG 14 (Life below water) SDG 15 (Life on land)
Wastewater	Industrial Effluent Regulation 2015, Environment Quality Act 1974 [4]	SDG 14 (Life below water) SDG 15 (Life on land)
Site management (LD-P2M2)	Guidelines on Land Disturbing Pollution Prevention and Mitigation Measures, 2017[10]	SDG 14 (Life below water) SDG 15 (Life on land)
Type of treatment plant and duration of residual treatment	Industrial Effluent Regulation 2015, Environment Quality Act 1974[4]	SDG 14 (Life below water) SDG 15 (Life on land)

Biomass management	Solid Waste and Public Cleansing Management (Scheme for Construction Solid Waste) 2018[9]	SDG 14 (Life below water) SDG 15 (Life on land)
Economic Assessment		
Economic Indicators	Legislation/Policy	Related Sustainable Development Goal, 2030 (SDG)
Circular economy concept (Reduce, reuse, recycle)	Cluster 3, National Cleanliness Policy 2019 [11], Solid Waste and Public Waste Management Act 2007 [9]	SDG 7 (Renewable Energy)
Inventory of domestic waste generated	Solid Waste and Public Waste Management Act 2007 [9]	SDG 7 (Renewable Energy)
Disposal of scheduled waste cost Assumption cost of residue treatment Rehabilitation cost	Guided Self-Regulation (GSR), Department of Environment Malaysia [12]	SDG 7 (Renewable Energy) SDG 8 (Good Jobs and Economic Growth)
Sustainable consumption of energy and workers	Part XI, Demolition, Factories and Machinery (Building Operations and Works Of Engineering Construction (Safety) Regulations 1986) [13]	SDG 8 (Good Jobs and Economic Growth)
Allocation of environmental conservation budgeting	Guided Self-Regulation (GSR), Department of Environment Malaysia [12]	SDG 7 (Renewable Energy) SDG 8 (Good Jobs and Economic Growth)
Social assessment		
Social indicators	Legislation/Policy	Related Sustainable Development Goal, 2030 (SDG)
Safety and health of workers	Department of Occupational Safety and Health Act 1994 [14]	SDG 3 (Good Health)
Site housekeeping	Solid Waste and Public Waste Management Act 2007 [9]	SDG 3 (Good Health)
Vermin control	Destruction of Disease-Bearing Insects Act 1975 (Act 154) & Prevention and Control of Infectious Diseases Act 1988 (Act 342) [15]	SDG 3 (Good Health)
Heritage project special management	National Heritage Act 2005 [16]	SDG 3 (Good Health)
Disease management control	Prevention and Control of Infectious Diseases Act 1988 (Act 342) [15]	SDG 3 (Good Health)
Infrastructure assessment		
Infrastructure management indicators	Legislation/Policy	Related Sustainable Development Goal, 2030 (SDG)
Information on stream diversion once project abandonment occurs	Chapter 5.0 Erosion and Sediment Control Facilities, Diversion channel, Guideline for Erosion and Sediment Control In Malaysia, 2010 [17]	SDG 9 (Innovation and Infrastructure) SDG 15 (Life on Land)
Method of blasting	Subchapter 6.6.1, Pre blast consideration, Malaysian Standard, (MS) 2318:2012 [18]	
Method of demolition	Chapter 6, Methods of demolition, Malaysian Standard (MS) 2318:2012 [18]	
Dilapidation survey	Subchapter 4.1.4, Dilapidation Survey, Malaysian Standard, (MS) 2318:2012[18]	
Buffer zone	Chapter 5.2, Erosion Control Facilities, Guideline for Erosion and Sediment Control In Malaysia, 2010 [17]	
Drainage management system	Subchapter 4.3.4, Drainage Control/Runoff Management, Guideline for Erosion and Sediment Control In Malaysia, 2010 [17]	
Type of noise barrier	Annexe E, Guidance on noise control, Guidelines for Environment Noise Limit and Control 2019 [7]	

4. Conclusion

This study has followed a rigorous research process using multiple embedded techniques to gain in-depth information on critical indicators based on legislation or policy that are also synchronised with Sustainable Development Goal (SDG) 2030. These 28 indicators that were selected will be used to develop a Sustainable Framework for Abandonment Plan Assessment. Moreover, these indicators are supported by related legislations, and the project proponents must comply with the requirements. Further research can also examine other factors like risk assessment, type of project, and best technology practices that can further refine the framework for pre-abandonment projects in Malaysia.

Acknowledgement

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