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Evaluation of The Implementation of Environmental Management System Based on ISO 14001:2015 at PT X, Batam City

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Abstract
In the era of globalization, industrial and business activities significantly contribute to environmental impacts, making systematic environmental management crucial. This study analyzes the implementation of an Environmental Management System (EMS) at PT "X" based on ISO 14001:2015, evaluates its performance, and identifies its impact on environmental sustainability. A qualitative approach was employed, with data collected through in-depth interviews, field observations, and document analysis. Informants consisted of five representatives from key functional areas, including top management, accounting, HSES (Health, Safety, Environment & Security), and Quality Assurance as the internal auditor. The interview guidelines were designed according to ISO 14001:2015 clauses to ensure comprehensive coverage. The findings indicate strong top management commitment in supporting EMS implementation through policies that encompass planning, execution, and monitoring. The organizational structure effectively facilitates the environmental management cycle, including identifying, addressing, and resolving findings categorized as major non-conformities, minor non-conformities, and opportunities for improvement. These serve as the basis for performance evaluation and continuous improvement. In conclusion, PT "X" has effectively implemented EMS in line with ISO 14001:2015 and complies with Indonesia's Law No. 32/2009 on Environmental Protection and Management. The company demonstrates environmental responsibility, and continuous improvement is recommended to strengthen sustainability and stakeholder trust.

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Introduction

In the era of globalization, technological advances have had a significant impact on various sectors of life, including increasing productivity (Afriyadi et al., 2024). However, if the application of technology does not consider environmental aspects, it can lead to widespread environmental pollution and damage (Mubasyir, Susilowati, & Saputra, 2021). Globalization itself, although encouraging environmentally friendly practices, actually contributes to a great pressure on the environment, even greater than the impact of the conventional industrial sector. Mitigation efforts through environmental regulations and policies will not be effective without awareness and behavioral changes from individuals. Therefore, it is important to build environmental awareness at the individual level to reduce the negative impacts of globalization in a sustainable manner (Satrio & Safitri, 2024)

Population growth and industrial expansion have also contributed to the increase in environmental pollution. Some industry players often neglect good waste management, resulting in wastes that have the potential to damage the ecosystem (Haifa, Oktaviana, & Kamal, 2024). Environmental pollution is defined as the entry of living things, substances, energy, or other components due to human activities into the environment to exceed a predetermined quality standard threshold (Rofik & Mokhtar, 2021); (LISMAID, 2023); (Hidayat, Rasyid, & Muminah, 2022). The standard of environmental damage shows the maximum limit of physical, chemical, and biological changes that can still be tolerated so that the environment is still able to carry out its functions. Waste is the residue of an activity, while Hazardous and Toxic Materials (B3) refers to substances or energy that can directly or indirectly pollute, damage, or threaten the health and survival of living beings, depending on their type, concentration, and amount (Susilawati, Budiani, Paramita, & Puspitasiwi, 2023)

Environmental Management Systems (SMLs) are an integral part of an organization's management structure designed to manage the short-term and long-term impacts of products, services, and processes on the environment (Ramadan, Hapsari, Pramesti, & Ikhlas, 2019). Organizations that implement SML effectively tend to have better environmental performance. According to the Law of the Republic of Indonesia Number 32 of 2009, environmental protection and management includes systematic and integrated efforts such as planning, utilization, control, maintenance, supervision, and law enforcement (Indonesia, 2009)

One of the main references in the implementation of SML is SNI ISO 14001:2015, an international standard that helps organizations improve environmental performance through resource use efficiency and waste reduction (Diana & Sisdianto, 2025). The implementation of these standards not only supports environmental sustainability, but also increases stakeholder trust and provides a competitive advantage (Agustiana & Elvania, 2024). SML is designed to facilitate integration with other management systems from ISO, such as quality management systems and occupational safety and health, because it uses a consistent High Level Structure (Suminto, 2005).

SML can be applied by various types and sizes of organizations, both private, government, and non-profit. These standards encourage organizations to consider environmental issues such as air pollution, water and liquid waste management, solid waste management, soil contamination, climate change, and resource efficiency. The SNI ISO 14001:2015 update emphasizes the importance of integrating environmental management in organizational strategic planning as well as a strong commitment from top leaders, so that SML becomes more effective and relevant (Atik Kurnianto, 2019).

Steps in implementing SML include: setting clear and measurable goals and targets according to the organizational context; explanation of the benefits of implementing SML such as increased efficiency, reduction of environmental impact, and regulatory compliance; the acquisition of commitments from the top management to ensure the availability of resources; a thorough understanding of the processes and systems that are already in place; and identification of gaps for system improvement and improvement (Natasaputra & Yudi Chadirin, 2015).

At PT "X", the environmental policy has been adjusted to the requirements of ISO 14001:2015, showing the company's commitment to running its business sustainably by paying attention to environmental aspects. The Company applies principles to minimize negative impacts and continuously make continuous improvements to the environmental management system and occupational safety and health performance (Eriady & Rahardjo, 2023). PT "X" proactively identifies environmental aspects, hazards, and risks, and provides facilities, infrastructure, and training for each department according to their respective roles and responsibilities.

PT "X" is an offshore installation design company that has been in operation for almost 50 years and supports the oil and gas industry globally. The company has obtained ISO 9002 certification as proof of its commitment to quality management. Its headquarters are located in the United States, with engineering offices in New York, New Orleans, and various countries such as Singapore, Jakarta, Perth, Mumbai, and Batam. Originally named IC Indonesia (founded around 1969–1970), the company was acquired by JRM and changed its name to PT "X", becoming one of the largest oil contractors in Indonesia with a focus on engineering, fabrication, installation, procurement, manufacturing, environmental systems, and project management. The company has designed a variety of offshore oil and gas drilling and production facilities, with the main fabrication location in the Batu Ampar Industrial Estate, Batam Island, Jalan Bawal No. 1. The 120-hectare area consists of a closed fabrication area (2.2 hectares), a closed assembly unit (3 hectares), an open assembly area (50 hectares), a blasting and painting area (1.5 hectares), warehousing (15 hectares), and supporting facilities such as offices, canteens, messes, and green spaces (29.8 hectares).

Departments that support PT "X's operations include: Safety, Health, and Environment (HSE), Construction Engineering, Procurement, Quality Control (QC), Welding, Blasting & Painting, Scaffolding, Rigging, Estimating & Planning, and Human Resources (HRD). The services provided include Pipe Mill, Pressure Vessel Fabrication Shop, Fabrication Shop, Pile and Brace Racks, Pipe Spool Fabrication Shop, and Deck Assembly Building. The company's vision is to be a trusted global partner that provides innovative solutions to maximize the potential of natural resources, while its mission is to achieve operational excellence and growth that benefits shareholders, customers, employees, and society.

Based on this background, the researcher is interested in studying the implementation of the Environmental Management System in PT "X". The focus of the research includes the implementation and effectiveness of SML based on ISO 14001:2015, whether there have been improvements in environmental structures and policies, and the extent of top management's commitment in providing human resources, budgets, and infrastructure facilities to support the achievement of optimal environmental performance.

Method

This study uses a qualitative approach with a descriptive-analytical method to examine the implementation of the Environmental Management System in PT "X". This approach was chosen to describe in depth the phenomena that occur in the field, as well as to analyze the trends and patterns that emerge from the implementation of the system. The research location is at PT "X" which is located on Jalan Batu Ampar Number 1, Batu Merah District, Riau Islands Province.

Data was collected through in-depth interview techniques and the distribution of questionnaires to relevant parties in the organization. Interviews were conducted to obtain rich and contextual qualitative information on the implementation of environmental policies, management commitments, as well as challenges and support in the implementation of the system. Meanwhile, the questionnaire was used to systematically obtain respondents' perceptions and responses, which were then statistically analyzed to complete the qualitative findings.

Data analysis is carried out qualitatively with thematic analysis techniques, namely identifying, organizing, and presenting patterns or themes that emerge from field data. This research focuses on the relationship between the implementation of Environmental Management System (X) on the company's (Y) environmental performance, including effectiveness evaluation, policy improvement, and top management involvement. The results of the analysis are then explained narratively to provide a comprehensive picture of the actual conditions at PT "X" (Ummah & Setiawan, 2021).

Results and Discussion

1. Results

Table 1
Frequently Asked Questions

INFORMANT QUESTIONS AND ANSWERS	OBSERVATION RESULTS	RESULTS OF DOCUMENT REVIEW
Has the organization identified external and internal factors that are relevant to the company's objectives as well as influencing its ability to achieve the expected outcomes of its environmental management system?	Yes, organizations have identified various internal and external factors that are related to the company's goals and can affect the effectiveness of the implementation of the environmental management system. These factors are analyzed periodically and used as a basis for planning and decision-making related to environmental management.	Documentation related to the identification of these factors is stored in a structured manner in the Safety department. This information is routinely disseminated to all employees through the company's internal email and discussed in discussion forums in each work unit, to ensure understanding and involvement of all parties.
Informant 1: The company is very responsive to environmental issues, especially those directly related to its operations and business activities. Informant 2: In financial planning, it is important to consider all internal and external factors so that there is no budget waste or unplanned expenses.		

Informant 3: The company actively monitors regulatory changes, especially revised or newly issued government regulations in the field of environmental management.	
Informant 4: As environmental health workers, we always provide information and overview of environmental conditions in the work environment on a regular basis to ensure safety and compliance with applicable standards.	
Informant 5: Internal and external factors are always part of the scope of the planned environmental audit, so they can be evaluated systematically and periodically.	

Table 2
Frequently Asked Questions

INFORMANT QUESTIONS AND ANSWERS		**OBSERVATIN RESULTS**	**RESULTS OF DOCUMENT REVIEW**
2. Has the organization defined the organization's activities, products, and services when determining the scope?		Each Department has set a one-year work activity in the work plan	There are documents that work plans in every department and project.
Informant 1	*"Yes. Of course, from the very beginning The project has been carried out*		
Informant 2	*"Yes, it must be, the budget must be prepared if all activities have been arranged from start to finish"*		
Informant 3	*"Yes, it is in the composition of the work plan in one period"*		
Informant 4	*"Yes, deep Depatemen safety, the activity is arranged in the work plan"*		
Informant 5	*"Yes, it can be prepared by each department and audited according to the work plan"*		
3. Whether organization has considered his authority and ability to exercise control when determining space range?		The organization has considered its authority and ability to exercise control when determining the scope	Documents are well documented in each work plan and control plan.
Informant 1	*"Yes, definitely."*		
Informant 2	*"Yes, I should."*		
Informant 3	*"Yes, the control matrix has been prepared"*		
Informant 4	*"Yes, there is, arranged in Risk Control"*		
Informant 5	*"Yes, this is an important part of the ISO 14001 audit; 2025*		

The organization has identified various external and internal factors that are relevant to the company's goals and have an impact on the achievement of the results of its environmental management system. Each department has prepared an annual work

plan that covers all operational activities. In determining the scope of the management system, the company carefully considers its authority and ability to carry out control.

Overall, both at the company level and ongoing projects in the fabrication area, there is serious attention to environmental issues that have the potential to affect the planning and implementation of activities. All activities have been designed in a structured manner, equipped with appropriate control measures, and documented in detail and systematically. Access to such documents is restricted and can only be opened after obtaining the approval of the head of the relevant department.

Table 3
Frequently Asked Questions

INFORMANT QUESTIONS AND ANSWERS	OBSERVATION RESULTS	STUDY RESULTS DOCUMENT
1. Has the top management demonstrated leadership and commitment by taking responsibility for the effectiveness of the management system Environment? Informant 1 *"Yes."* Informant 2 *"Yes, always."* Informant 3 *"Yes."* Informant 4 *"Yes, that's for sure* Informant 5 *"Yes."*	Top management has shown leadership and commitment by taking responsibility for the effectiveness of its environmental management system.	Related documents can be viewed and updated in the company's internal application system.
2. Has top management established, implemented and maintained Environmental policies that are appropriate to the organization's goals and context, including the nature, scale and environmental impact of its activities, products and services? Informant 1 *"Yes, it has been determined"* Informant 2 *"Yes."* Informant 3 *"Yes, environmental policies have been set and implemented in the company"* Informant 4 *"Yes, the company's environmental policy is the framework for environmental management systems*	Top management has established, implemented and maintained Environmental policies that are appropriate to the organization's goals and context, including the nature, scale and environmental impact of its activities, products and services. This policy is prepared as a basic framework for the implementation of the environmental management system in the company.	Related documents can be viewed and updated in the company's internal application system

Table 4
Frequently Asked Questions

INFORMANT QUESTIONS AND ANSWERS	OBSERVATION RESULTS	STUDY RESULTS DOCUMENT
1. Has the top management demonstrated leadership and commitment by taking responsibility for the effectiveness of the management system Environment?	Top management has shown leadership and commitment by taking responsibility for the effectiveness of its environmental management system.	Related documents can be viewed and updated in the company's internal application system.
Informant 1 *"Yes."*		
Informant 2 *"Yes, always."*		
Informant 3 *"Yes."*		
Informant 4 *"Yes, that's for sure*		
Informant 5 *"Yes."*		
2. Has top management established, implemented and maintained Environmental policies that are appropriate to the organization's goals and context, including the nature, scale and environmental impact of its activities, products and services?	Top management has established, implemented, and maintained Environmental policies that are appropriate to the organization's goals and context, including the nature, scale, and environmental impact of the activities, products and services. This policy compiled as a basic framework for applicators Environmental Management System in the company.	Related documents can be viewed and updated in the company's internal application system
Informant 1 *"Yes, it has been determined"*		
Informant 2 *"Yes."*		
Informant 3 *"Yes, environmental policies have been set and implemented in the company"*		
Informant 4 *"Yes, the company's environmental policy is a framework for the environmental management system*		

Table 5
Frequently Asked Questions

QUESTION	AND THE INFORMANT'S ANSWER	OBSERVATION RESULTS	RESULTS OF DOCUMENT REVIEW
Informant 5	*"Yes, it's mandatory"*		
3. Does top management ensure that the resources needed for SML are available?		Top management Ensure that the resources required for SML are available	Related documents can be viewed and updated in the company's internal application system and organizational structure can be viewed in the documented documents.
Informant 1	*"Yes, there must be"*		
Informant 2	*"Yes, there is a head account."*		
Informant 3	*"Yes, there is, I'm the officer*		
Informant 4	*" Yes enter in the HSES department"*		
Informant 5	*"Yes, there is."*		

PT "X" – Strategic Policy and Commitment in Quality, Health, Safety, Environment, and Security (QHSES). PT "X" is committed to developing and implementing policies, strategies, and guidelines that support the achievement of overall goals in the fields of quality, health, safety, environment, and safety. This policy is the foundation for running all company operations comprehensively and sustainably.

PT "X" will carry out every business activity in accordance with the company's vision and values that have been set. We are committed to meeting all applicable legal obligations, regulations, and customer expectations. In addition, we encourage a culture of continuous improvement across the organization's lines for continuous performance

improvement. (President & CEO). This commitment is realized through the following principles:

1. Integrate values such as integrity, collaborative work, spirit of excellence, employee well-being, and dedication to providing high-quality solutions into daily work practices.
2. Meet and exceed customer needs and expectations by providing products and services in accordance with contractual terms, quality standards, and relevant legal and regulatory obligations.
3. Ensuring human safety, environmental protection, and maintaining the health, safety, and security of all personnel and company assets.
4. Supporting environmental sustainability through efforts to prevent pollution, reduce waste, use resource efficiency, and assist customers in utilizing natural resources optimally and responsibly.
5. Provide a safe working environment free from the abuse of illicit substances or hazardous substances.
6. To contribute meaningful value to customers, shareholders, and all other stakeholders.

Achievement of Commitment through Operational Strategy

To realize its commitment to quality, health, safety, environment, and security, PT "X" implements a number of strategies as follows:

1. Encourage two-way communication between management and staff, as well as build a work culture that reflects commitment, active participation, personal responsibility, and accountability across organizational improvement.
2. Consistent operational management based on a predetermined management system, with compliance with all applicable procedures, processes, and work standards.
3. Set specific, measurable, and relevant performance goals, and conduct periodic monitoring to achieve progress and drive optimal outcomes.
4. Reduce potential losses due to quality mismatches with prevention approaches, performance evaluation, and the implementation of superior practices that support cost efficiency and financial desire.
5. Provide training that focuses on improving employee competencies, to ensure that human resources have the skills and knowledge that are in accordance with job demands and safety standards.
6. Demonstrate the application of the company's core values in its day-to-day activities through tangible actions that support reliable and responsible operations.
7. Drive continuous improvement across business processes by implementing process-based approaches and risk management to improve overall efficiency and performance. Publication and Development of Management Systems

This policy has been officially issued and distributed to all stakeholders since 2023. The results of document analysis since the beginning of the company's establishment show that there has been progressive progress in the implementation of environmental management systems. These developments include increasing human resource capacity, as well as sharpening the focus on aspects of safety, occupational health, and environmental protection. Organizational Structure of the Environmental Management System (2023–2025) In the period 2023 to 2025, the organizational structure for environmental management is systematically designed to support more effective policy

implementation, strengthen coordination between divisions, and ensure clear ownership of environmental responsibilities across all lines of operations.

Frequency Distribution

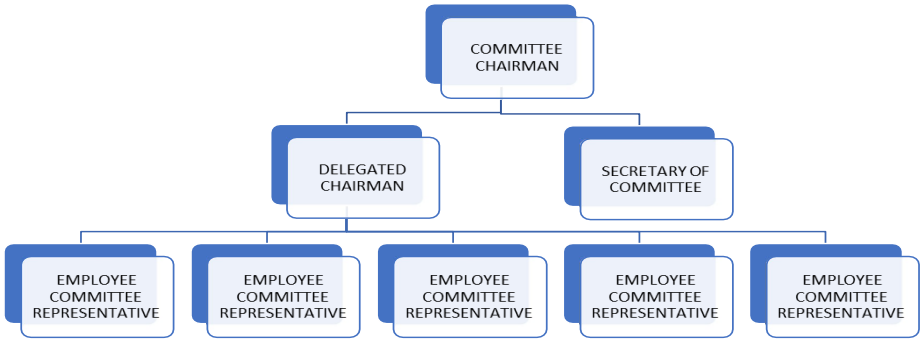

Figure 1. Frequency Distribution

Table 6
Frequency Distribution

No	Name	Position	Department
1	Mr. AP	Committee Chairman	Director of fabrication ops
2	YSP	Delegated Chairman	Marine Ops Principal
3	AFJ	Secretary of Committee	HSE
4	ABS	Employee Comm Rep	Rigging
5	KBS	Employee Comm Rep	Warehouse
6	MNB	Employee Comm Rep	Facility
7	KLH	Employee Comm Rep	E&M
8	HGD	Employee Comm Rep	Welding
9	ASD	Employee Comm Rep	Scaffolding
10	DFG	Employee Comm Rep	E & I
11	SRT	Employee Comm Rep	HR
12	GJK	Employee Comm Rep	Medical
13	THJ	Employee Comm Rep	Marine
14	BNM	Employee Comm Rep	Str Fitter
15	HJK	Employee Comm Rep	Blasting & Painting
16	QWE	Employee Comm Rep	Pipe Fitter
17	DFG	Employee Comm Rep	Planner
18	WER	Employee Comm Rep	Security
19	EET	Employee Comm Rep	QA/QC

Of the 64 respondents studied, as many as 35 people (54.7%) had a good workload, while 29 others (45.3%) experienced a poor workload.

Input

Table 7
Human Resources

INFORMANT QUESTIONS AND ANSWERS	OBSERVATION RESULTS	RESULT DOCUMENT REVIEW
1. Has the organization identified and provided the resources allocated for the establishment, implementation, maintenance, and continuous improvement of SML?	The organization has Determine and provide resources that are allocated for the formation, implementation, maintenance, and continuous improvement of SML	Documents can be viewed in organizational structure included in the HSES department
Informant 1 *"Yes, there is."*		
Informant 2 *"Yes, there is."*		
Informant 3 *"Yes Enter the Safety department"*		
Informant 4 *"Yes Enter the department Safety"*		
Informant 5 *"Yes, there is"*		
2. Whether the organization determines the competencies required of the people who perform the work under its control that affect its performance and ability to fulfill Its obedience obligations?	The organization determines the competencies required of the people who perform the work under its control that affect its performance and ability to fulfill its compliance obligations.	The certificate of competency of each officer is facilitated by the company and scheduled before the expiration date Enactment.
Informant 1 *"Yes, that's for sure, they must train according to their competence"*		
Informant 2 *"Yes, please go to arrange*		
Informant 3 "Yes, we need training to be able to become Competent		
Informant 4 "Yes, we need training to be competent		
Informant 5 "Yes, it must be in plan"		

The results of the interviews conducted by the researcher showed that the management of the Environmental Management System at PT "X" was handled by two staff members who were members of the environmental team, which was structurally under the HSES (Health, Safety, Environmental & Security) division. In addition, each department also appoints a representative to support the implementation of environmental activities at the operational level. For each project, the company assigns a special officer for the environment who is in charge of monitoring all activities in the field. They are responsible for overseeing projects as well as assessing potential risks that could lead to contamination or environmental damage. Currently, several ongoing projects have been equipped with environmental officers. Details of these types of projects are presented in the following table:

Table 8
Project Type

No	Project Name	Project Type	Human Resources Case. Stuttgart
1	BP Tortue	Platform	1 Person
2	Marjan	Platform	1 Person
3	ShellCrux	Jacket (Platform Leg)	1 Person
4	Scarborough	Platform	1 Person
5	Inpex	Platform	1 Person

Financing

Based on the results of in-depth interviews, field observations, and studies of related documents, information on financing aspects in the implementation of the Environmental Management System was obtained from Informant 2 who served as the company's accounting staff. The financing data used is adjusted to the elements in the ISO 14001:2015 standard checklist.

Table 9
Financing

QUESTIONS AND ANSWERS INFORMANT	RESULT OBSERVATION	RESULT STUDY DOCUMENT
Has the organization taken into account technology choices, financial, operational and business needs?	The organization has Determine and provide resources for formation, implementation, maintenance, and improvement sustainable SML	The document can be seen in the organizational structure included in the HSES department, the Cooperation Agreement in the handling of B3 Waste.
Informant 2 "Yes, there is."		
2. How does the organization address the environmental requirements for the procurement of products and services?	Every Project and the yard has a department of product and service handling, the financing is the responsibility of the company	Financial documents can be reviewed and made official documents during audits and also with management approval.
Informant 2 "Yes, there is a separate department that takes care of the procurement of products and services, the billing of bars to part Accounting "		

Based on an in-depth interview conducted by the researcher with the Financial Manager, the allocation of funds for environmental health activities is regulated through a cooperation agreement agreed upon by both parties. The agreement covers the management of B3 waste, including the transportation and destruction process of all departments, as well as reporting obligations to the Environment Agency (DLH). Funding details for the activity are presented as follows:

Table 10
Types of Activity Financing

No	Types of Monitoring	Schedule	Financing
1	B3 Waste (Solid & Liquid)	Every Month	Invoice
2	Drinking Water	Every Month	Invoice
3	Air	Every Month	Invoice
4	Seawater Quality & Marine Biota	Per 6 months	Invoice

The budget for environmental health activities is prepared annually by the environment (Environment) team, which is structurally under the Safety (Safety) department, and administratively managed by the Finance department. Cooperation between PT "X" and external parties in the implementation of environmental inspections outlined in a Cooperation Agreement (PKS) with a previously agreed tariff.
If there are inspection activities that are not included in the scope of the PKS, the relevant department will submit a Purchasing Requisition (PR) application. After the inspection is completed and the results are received, supporting documents are sent to the finance department for the payment process, which is preceded by the issuance of a Purchase Order (PO). The selection of vendors is carried out through a selection process that refers to the following work guidelines:

Hazardous waste management and disposal guidelines (B3)
Legal Provisions: B3 Waste Producer, The transporter is required to meet all regulatory requirements, including:

a) Deed of Incorporation of a Company
b) Business Identification Number (NIB) registered in the OSS (Online Single Submission) system
c) Environmental Permits listed in the OSS
    1) Official recommendation from the Ministry of Environment and Forestry (MoEF) for the transport of B3 waste (land and/or sea), registered in the OSS
    2) B3 Waste Transport Permits that are still active from the Directorate General of Land Transportation (DJPD), integrated into the OSS
    3) The vehicle used must meet the B3 waste technical standard
    4) Surveillance Card from the DGT that is still valid for each transport vehicle
    5) Proof of vehicle ownership or official power of attorney
    6) Equipped with supporting equipment: loading tools, handling tools and emergency equipment
    7) Equipped with a GPS tracking system registered with the Ministry and connected to the Silacak system
    8) Displays the appropriate B3 waste symbol and label on the side of the vehicle
    9) Clearly include the carrier's company name and contact number on the vehicle
    10) Have environmental pollution liability insurance or pollution control fund with a minimum value of IDR 5 billion
    11) Have official cooperation with the collector, utilizer, processor, or hoarder of B3 waste
    12) Include a statement letter of never being involved in an environmental pollution case
    13) Attach the latest Festronik records (B3 waste shipment recap) for the last 3 months; PROPER certification (optional) at least Blue predicate
    14) Copy of the latest RKL-RPL or UKL-UPL realization report

15) NIK (Customs Identification Number) or customs identity if B3 waste is sent out of the FTZ (Free Trade Zone) area

B3 Waste Recipients (Collectors, Utilizers, Processors, Stockpilers) The recipient is required to meet legal requirements, including:

1) Deed of Incorporation of a Company
2) NIB registered in the OSS system
3) Environmental Permits listed in the OSS
4) Have a valid B3 waste management service business license
5) Valid operational permit (Collector/Utilizer/Processor/Hoarder) from the Ministry of Environment and Forestry, registered with OSS
6) Environmental liability insurance or pollution prevention fund of at least IDR 5 billion
7) Have cooperation with B3 waste carriers or other waste management parties
8) Statement letter of no problems in environmental management
9) Have adequate B3 waste management facilities, including temporary storage facilities in accordance with the Regulation of the Minister of Environment No. 12 of 2020
10) Equipped with laboratory or analysis equipment according to the permit conditions
11) Attach a Festronic record of the last 3 months or a minimum of Blue PROPER certification
12) Have a relevant Certificate of Operational Fitness (SLO)
13) Copy of the latest RKL-RPL or UKL-UPL realization report
14) NIK or customs identity if B3 waste is removed from the FTZ area

Service Coverage: Required services include: collection and packaging of B3 waste, management of B3 Waste Temporary Storage Site (TPS LB3), transportation, processing to final handling, and official reporting of B3 waste. All vendor activities must always be coordinated with the HSE Department and other related units at PT "X".

1) B3 Waste Collection and Packaging Vendors are obliged to provide B3 waste packaging services from PT "X", which include: B3 Waste Collection Vendors are required to conduct daily inspections and collect all B3 waste generated from operational activities in the fabrication area, including from barges and ships, and transfer it to PT "X"'s LB3 TPS in a regular and documented manner.
2) Preparation of Packaging Containers
   The vendor must provide suitable and in good condition, such as drums, jumbo bags, boxes, or other containers as required, upon request by the representative of PT "X". All containers must meet safety standards and applicable regulations.

Table 11
Scope of Service

No	Name	Unit	Unit Rate (IDR)
1	*Contaminated Rag*		
2	*Contaminated Rag*		
3	*Contaminated Soil*		
4	*Contaminated Soil*		
5	*Surplus Sand/ Silica Sand*		
6	*ABC Dry Chemicals*		
7	*Coolant Waste*		
8	*G 135 Developer*		
9	*Sludge oil*		
10	*Paint Sludge*		
12	*Paint Sludge*		
13	*Steel Shot Steel Grit*		
14	*Used Grease*		
15	*Used Grease*		
16	*Used Battery Water*		
17	*Used Battery Water*		
18	*Used Chemicals Waste*		
19	*Used Chemicals Waste*		
20	*Used Foam Chemicals*		
21	*Used oil Filter*		
22	*Used Filter*		
23	*Used Filter*		
24	*Used Asphalt*		
25	*Silica Gel*		
26	*Expired Paint*		
27	*Expired Paint*		
28	*Expired Chemicals*		
29	*Expired Sika*		
30	*Waste Water*		
31	*Waste Water*		
32	*Used Lamp*		
33	*Name*	Unit	
34	*Asbestos*		
35	*Sand Vick*		
36	*Silica sand*		
37	*Soda Sorbs*		
38	*Soda Sorbs*		
39	*Caustic Soda*		
40	*Used Gamet + Gravel (Not packed in jumbo bag by PT "X")*		
41	*Used Gamet + Gravel (Packedin jumbo bag by PT "X")*		
42	*Used Gamet (not Packed injumbo bag by PT "X")*		
43	*Used Gamet (Packed in jumbo bag by PT "X")*		
44	*Glass Wool/ Insulation Waste*		
45	*Box Packaging (210cm X 110cmX 110cm)*		
46	*Negative Used Roll Film*		
47	*Medical Waste*		
48	*Contaminated Tin/ Empty Tin*		
49	*Empty jerry cans (clean Condition)*		
50	*Aluminum Oxide (Pack injumbo bag)*		

51	*Powder Coating (Pack in box/jumbo bag)*
52	*Epoxy Waste*
53	*Olivine Sand*
54	*Hard Disc*
55	*PCB – Containing Waste*
56	*PCB – Containing Waste*
41	*Used Gamet + Gravel (Packedin jumbo bag by PT "X")*
42	*Used Gamet (not Packed injumbo bag by PT "X")*
43	*Used Gamet (Packed in jumbobag by PT "X")*
44	*Glass Wool/ Insulation Waste*
45	*Box Packaging (210cm X 110cmX 110cm)*
46	*Negative Used Roll Film*
47	*Medical Waste*
48	*Contaminated Tin/ Empty Tin*

Based on the results of the research involving in-depth interviews and document analysis, PT 'X' has implemented a comprehensive environmental management system since 2019, starting from planning, implementation, to control, which has been approved by the Minister of Environment. These implementations include:

1. waste management of Hazardous and Toxic Materials (B3) generated from industrial processes, especially garnet sand residue from blasting activities with waste code B323-1. The waste is not disposed of, but is reprocessed as a substitute material in the production of paving blocks, as part of environmentally friendly recycling efforts.
2. To support this activity, the company has provided adequate B3 waste storage facilities, in the form of a closed building measuring 18x18x7 meters, with a maximum capacity of 1,300 m^3 per month. The facility is equipped with a waste identification symbol according to its characteristics, specially designed to prevent leaks or spills, and is equipped with safety equipment such as fire extinguishers, early warning systems, and eye and body washing facilities. All storage activities also apply the principles of good housekeeping and K3 procedures in accordance with legal provisions.
3. The waste utilization process is equipped with production equipment such as mixers, paving block printing machines with a capacity of 5,600 units per 8 working hours, and conveyor machines to support production efficiency. Before use, B3 waste must meet a number of technical criteria, namely the main oxide content (SiO_2, Al_2O_3, Fe_2O_3, and CaO) of at least 50%, the Loss of Ignition (LoI) value of no more than 10%, and the radioactivity content for various radionuclides such as U-238, Ra-226, Th-230, and others does not exceed 1 Bq/gr.
4. The production process begins with mixing one part of waste used garnet and two parts of cement using a mixer, then the dough is molded into paving blocks. After printing, the product is naturally dried before being stored in the warehouse as a finished product.
5. To ensure environmental safety and product quality, PT 'X' conducts periodic laboratory testing. Testing of the characteristics of B3 waste is carried out at least once every two years for chemical parameters and once every three years for radioactivity. The quality test of paving block products is carried out every two years with the provision that it meets the minimum SNI standard of class B. In addition, the Toxicity Characteristic Leaching Procedure (TCLP) test on recycled

products is also carried out every two years to ensure that there is no release of harmful substances into the environment, and the results must meet the set quality standards.

6. With this structured and regulation-based approach, PT 'X' has successfully integrated circular economy principles in its operations, while demonstrating a strong commitment to sustainable and responsible environmental management.

Table 12
TCLP quality standards are as follows

No	Parameters	TCLP Quality Standard (mg/L)
1	Arsen, Ace	0.5
2	Cadmium, Cd	0.15
3	Copper, Cu	10
4	Lead, Pb	0.5
5	Mercury,Hg	0.05
6	Nickel, Ni	3.5
7	Selenium,se	0.5
8	Perak, Ag	5
9	Zinc, Zn	50

In accordance with the quality standards listed in Attachment III (TCLP-B) of Government Regulation Number 101 of 2014 concerning the Management of Hazardous and Toxic Waste (B3), every B3 waste utilization activity must be recorded and reported regularly. Applicable provisions include:

a) Every month, the company must record in detail the type of B3 waste stored, including the description of the source, the waste code, and the amount in tons, and enter it in the waste balance as an official management document.
b) The report on the implementation of B3 waste utilization must contain at least the following information:
    1) A complete description of the source, type, and characteristics of B3 waste used.
    2) The volume of B3 waste generated each month.
    3) The amount of B3 waste used per month.
    4) The volume of products from B3 waste recycling produced every month.
    5) Laboratory test results on waste, final products, and environmental quality monitoring.
    6) Supporting documents such as lab test results, recapitulation of B3 waste utilization data, and evidence of activity documentation such as photos and video recordings.
c) The report must be submitted at least once in six months to the Minister of Environment and Forestry, through the Directorate General of Waste, Waste, and Toxic Hazardous Materials Management. A copy of the copy must also be submitted to:
    1) Governor of the Riau Islands, through the Environment and Forestry Service of the Riau Islands Province.
    2) Mayor of Batam, through the Batam City Environmental Service.
d) In the process of transporting B3 waste, PT "X" uses an electronic manifest system (e-manifest) provided by the Ministry of Environment and Forestry, as part of a digital-based waste tracking system.

1) Every party responsible for a business or activity is obliged to make efforts to counter and recover from environmental damage or pollution arising from its operations. This action must be carried out in accordance with the applicable legal provisions, and all costs incurred are the full responsibility of the business actor.
2) The management of B3 waste utilization activities is prohibited from doing the following:
    a) Storing B3 waste exceeds the maximum capacity of a predetermined storage facility.
    b) Utilizing B3 waste types other than those that have been approved, namely used garnet with code B323-1.
    c) Producing paving blocks that do not meet the minimum quality standards of class B according to the applicable SNI.
    d) Producing paving blocks whose TCLP test results exceed the TCLP-B quality standard threshold.
    e) Utilizing B3 waste that does not meet the technical criteria that have been set. Compliance with all these provisions has been stated by PT "X" in the Statement of Commitment Fulfillment Number: S.352/MENLHK/SETJEN/PLB.3/5/2019, which was signed directly by the Minister of Environment and Forestry as proof of compliance with applicable regulations.

2. Discussion

Input Aspects to the management of environmental management system (SML) based on ISO 14001:2015 at PT "X"

In general, the environmental conditions around PT "X's" operational area have not changed significantly compared to the previous period. Based on the monitoring results, environmental quality parameters such as ambient air, surface water, groundwater, seawater, and drainage systems show good conditions and are still below the set quality standard threshold. Some indicators even show a trend of improving quality, meaning that environmental conditions are getting better over time.

Since 2011, PT "X" has successfully achieved ISO 14001 certification after going through an audit process by PT Sucofindo, an independent assessment body. This certification is a formal recognition of the implementation of an adequate environmental management system and in accordance with international standards. The company continues to be committed to ensuring that all of its operational activities are carried out safely and do not cause negative impacts on the environment.

Human Resources

Based on the results of in-depth interviews, field observations, and document reviews, it is known that all related personnel at PT "X" have received training in accordance with their respective fields of duty. This training covers the implementation of environmental management systems, with reference to the company's internal standing procedures (SOPs) and provisions in Law Number 32 of 2009 concerning Environmental Protection and Management.

Training is provided by the company directly, including internal training organized by the company's training division. Every representative from different departments is involved to ensure an equitable dissemination of knowledge. In accordance with the

mandate of Law No. 32/2009, environmental auditors are required to have a certificate of competence issued by an official certification body. To obtain such certification, an auditor must meet a number of criteria, namely:

1. Understand the principles, methods, and procedures for implementing environmental audits.
2. Able to carry out a comprehensive audit, starting from planning, implementation, to the preparation of conclusions and reports.
3. Can formulate recommendations for improvement as a follow-up to the audit findings.
4. This competency certificate is issued by a recognized institution in accordance with the provisions of laws and regulations. From the findings of the research, it can be concluded that PT "X" has fulfilled its obligations in providing competent and certified human resources to support the implementation of environmental management systems.

Financing

The funding aspect for the implementation of the environmental management system is managed by the Department of Environment, which is under the auspices of the Department of Safety. The proposed budget must be approved by the company's Director and then supervised by the Ministry of Finance, in particular in terms of management, monitoring, and destruction of B3 waste.

Based on Law No. 32 of 2009, the government is obliged to implement environmental economic instruments to maintain the sustainability of environmental functions. The instruments consist of: Development planning and economic activities, including:

1. Preparation of natural resources and environmental balances. Integration of natural resource depletion and environmental damage in the calculation of Gross Domestic Product (GDP) and Gross Regional Domestic Product (GDP).
2. The implementation of compensation mechanisms or environmental services between regions, as well as the internalization of environmental costs.

Environmental funding, including: Environmental restoration guarantee fund and Pollution and environmental damage mitigation fund. Trust funds or assistance for conservation. Incentives and disincentives, such as: Procurement of environmentally friendly goods and services. The application of environmentally-based taxes, levies, or subsidies. Sustainable development of financial institutions and capital markets.
Waste or emission permit trading system. Development of environmental insurance, eco-labels, and environmental performance awards.

Facilities and Infrastructure

Based on the results of interviews, document reviews, and field observations, the facilities and infrastructure to support environmental management at PT "X" are considered adequate. The B3 waste storage warehouse has met technical and safety standards, and is regularly reported every month to the Batam City Environmental Office. In the RKL-RPL report for the July-December 2022 period, there are a number of recommendations that are still being monitored to date, including: Presenting actual data on the amount of B3 and non-B3 waste in a transparent manner. Conduct a continuous

reporting system. Complete environmental documents, including B3 waste storage permits.

Technical recommendations for aerial monitoring include:
1. Orderly management of B3 waste in a predetermined storage place.
2. Installation of sampling point marker boards equipped with location coordinates.
3. Implementation of environmental monitoring in accordance with applicable regulations. According to Law No. 32 of 2009, every business that has the potential to have a major impact on the environment, ecosystem, or human health is required to conduct an environmental risk analysis. This analysis includes risk assessment, risk management, and risk communication. Further rules are set out in government regulations.

Regulation

PT "X"'s' internal policy in the implementation of the environmental management system has referred to national regulations and international standards. The main regulations used are Law No. 32 of 2009 concerning Environmental Protection and Management, as well as the ISO 14001:2015 standard. The company also has internal rules that govern the planning, implementation, and monitoring process of environmental parameters such as air quality, noise level, aquatic biota quality, and liquid waste.

Process Aspects in the Implementation of Environmental Management Systems at PT "X"

B3 waste management efforts that have been carried out include:
1. B3 Waste Temporary Storage: PT "X" has provided a special building for B3 waste storage that meets applicable technical and regulatory standards. This facility has obtained a permit from the Batam City Investment and One-Stop Integrated Services Agency (BPPTSP).
2. Cooperation with Licensed B3 Waste Carriers: The Company cooperates with B3 waste carriers that already have:
    a. Recommendations for transporting B3 waste from the Ministry of Environment and Forestry (MoEF).
    b. Transport permit from the Ministry of Transportation: Vehicles that meet the technical requirements of the Ministry of Environment and Forestry and the Ministry of Transportation.

Processing and utilization permits from the Ministry of Environment and Forestry or the Batam City Environmental Agency (DLH). PT "X" had a permit to use used garnet waste as a raw material for paving blocks. However, due to low demand for products and high production costs, this activity was temporarily halted since 2012. However, the company continues to implement the recommendations from the RKL-RPL Report for the July-December 2023 period, namely:
1. Ensure the storage time of B3 waste does not exceed 90 days with continuous transportation.
2. Review the Landfill of waste to ensure that the third party has a valid permit and is able to accept the type of waste generated.
3. Manage B3 waste in accordance with the Decree of the Head of Bapedal No. KEP-01/BAPEDAL/09/1995, and submit it to licensed managers.

4. Report the implementation of storage, utilization of garnet waste, and wastewater disposal to DLH Batam City on a regular basis.

Ambient Air Quality and Noise

Ambient air quality monitoring in the July-December 2023 period was carried out at four locations in the fabrication area. Measurements are carried out every six months using methods based on US-EPA (1978), with quality standards from Government Regulation No. 41 of 1999 concerning National Ambient Air Quality Standards and Government Regulation No. 22 of 2021 concerning Noise Quality Standards. Noise monitoring in the port area in December 2023 was carried out at four locations:

1. Front of the clinic (UAP 1)
2. South Yard North Wall (UAP 2)
3. Batu Merah Village (UAP 3)
4. RUBB Location (UAP 4)

Indoor Air Quality

Deep air monitoring was carried out at one main location in the July-December 2023 period. The decrease in production activities led to a lack of activities in the workshop room. Measurements in December 2023 were carried out in the Growell and RUBB areas.

Quality of Aquatic Biota and Bentos

Monitoring of aquatic biota is carried out by sampling plankton and bentos from waters bordering the port area of PT McDermott Indonesia. Samples were taken from four points (TP 1–TP 4) and analyzed in the laboratory to evaluate community indices, including biodiversity, species uniformity, number of taxa, and number of individuals. Phytoplankton Results (December 2023):

1. TP 1: 690/L, diversity index
2. 2.92, uniformity 0.98
3. TP 2:
4. 682/L, index 2.87, uniformity 0.93
5. TP 3: 682/L, index 2.88, uniformity 0.94
6. TP 4: 688/L, index 2.91, uniformity 0.96

The diversity index ranges from 2.3026 to 6.9078, indicating moderate levels of diversity and stable communities. A uniformity value close to 1 signifies an even distribution of species. Overall, the condition of phytoplankton is categorized as good. High biodiversity is essential for the balance of aquatic ecosystems. Plankton serve as the basis of the food chain and an indicator of environmental health. Disturbance to plankton populations can be an early sign of ecosystem damage.

Bentos: The results of bentos monitoring will be compared with baseline data from the 2008 Port DPPL and the 2023 monitoring results to assess changes in the condition of the seabed ecosystem around the operation site.

Output Aspects in the Evaluation of the Implementation of Environmental Management Systems in PT "X"

Output is a tangible result of the implementation of an environmental management system that reflects the effectiveness of input and process aspects. The following are the achievements that have been achieved by PT "X" in environmental management:

1. Hazardous and Toxic Waste Management (B3)

In 2017, PT "X" revived the initiative to use garnet waste as a substitute material in the production of paving blocks. This concrete step is marked by the purchase of special production equipment in the form of paving block making machines. Currently, the company is in the process of finalizing the application for a re-permit to the Ministry of Environment and Forestry for the utilization activity.

For other types of B3 waste, such as used lamps, damaged batteries, and electronic waste, PT "X" has handed it over to a third party that has an official permit. This handover was carried out in an orderly manner and has received recommendations from relevant government agencies, both at the national level and the Batam City Government.

2. Air Quality and Noise

Ambient Air Quality**:** As of December 2023, ambient air quality monitoring was conducted at 8 points spread across three main locations:

a. Yard Fabrication Area (4 points):
b. UAF 1: Front Power Plant I
c. UAF 4: Batam House
d. UAF 5: Compressor Area
e. UAF 7: East Blasting Area

Batam Marine Base Area (1 point):
UAM 1: Area Blasting BMB
Port Area (3 points):

a. UAP 1: Clinic front road
b. UAP 2: South Yard North Wall
c. UAP 3: Batu Merah Village

The measurement results show that all air quality parameters are still below the quality standard threshold set in Government Regulation No. 22 of 2021. To minimize environmental impact, PT "X" implements a number of preventive measures, including:

a. Installation of dust collector in a closed blasting chamber to control the dispersion of dust.
b. The use of fences and ground covers in open blasting activities to limit the spread of particles.
c. Regular road watering using tanker trucks, especially during the dry season.
d. Planting vegetation (trees) as a buffer for the environment.
e. The application of a maximum vehicle speed limit of 20 km/h in the fabrication area.
f. Construction of more modern enclosed blasting & painting facilities.

3. Ambient Noise Quality

Noise level monitoring is carried out in the same location as ambient air monitoring. The results showed that all measurement points were below the quality standard threshold. Noise values were recorded at 62.4 dB(A) at the South Yard North Wall, 60.3 dB(A) in front of the clinic, and 52.3 dB(A) in Batu Merah Village. Noise reduction efforts continue through:

a. Periodic maintenance of generator machines is based on preventive maintenance systems.
b. Replacement of energy sources from generators to PLN's power grid.
c. Planting trees as a natural sound suppressant.
d. Implementation of annual noise surveys in each work area for periodic evaluation.

4. Indoor Air Quality

Indoor air quality monitoring was carried out at two locations: RUBB (UI 1) and GROWELL (UI 2). The measurement results show very good conditions, with all parameters below the quality standard according to Permenaker No. 5 of 2018. To protect the health of workers, PT "X" implements strict measures such as:

a. It is mandatory to use a blasting helmet with an air supply.
b. Prohibition of cleaning areas with gusts of wind.
c. Installation of a vacuum system to vacuum the dust from the blasting site.
d. Obligation to use respiratory protective equipment in a closed work area.

These measures are part of the company's commitment to reduce health risks in the workplace to the lowest level.

5. Quality of marine biota

Monitoring of aquatic biota includes phytoplankton, zooplankton, and bentos around the port and fabrication areas. Sampling is carried out in the same location as seawater quality monitoring. Phytoplankton Results (December 2023):

a. TP 1: 690/L, diversity index 2.92, uniformity 0.98
b. TP 2: 682/L, index 2.87, uniformity 0.93
c. TP 3: 682/L, index 2.88, uniformity 0.94
d. TP 4: 688/L, index 2.91, uniformity 0.96

The diversity index value ranges from 2.3026–6.9078, indicating moderate levels of diversity and good community stability. A uniformity index close to 1 indicates an even distribution of species. Overall, phytoplankton populations are in the good category. Bentos Results (December 2023):

a. ALP 1: 104/m², diversity index 1.56, uniformity 1.03
b. ALP 2: 104/m², index 1.60, uniformity 1.05
c. ALP 3: 98/m², index 1.51, uniformity 1.95
d. ALP 4: 94/m², index 1.49, uniformity 1.93

Compared to the basic data (DPPL 2008), there has been a change in population, but the condition of the seabed ecosystem remains in the stable category. Maintained biodiversity is an important indicator for the health of marine

ecosystems, as plankton and bentos serve as the basis of the food chain and a marker of environmental quality.

Conclusion

Based on the input, process, and output aspects that have been described, it can be concluded that the company already has a structured, integrated, and sustainable environmental management system. In terms of inputs, all potential environmental impacts arising from fabrication activities have been identified and made the main focus of management. This is supported by the existence of a competent workforce through regular training, financing support integrated into the company's financial system, and adequate facilities and infrastructure, such as B3 waste warehouses and environmental monitoring tools. In addition, the company's internal policies have been aligned with Law No. 32 of 2009 as well as ISO 14001:2015 standards, with clear operational procedures.

From the process aspect, the company consistently conducts internal and external audits on a regular basis. This audit includes the stages of planning, implementation, identification of findings both major and minor, as well as follow-up that serves as a basis for continuous improvement.

Meanwhile, from the output aspect, the implementation of the environmental management system has shown positive results. Success is reflected in B3 waste management, air quality, noise control, and the preservation of aquatic ecosystems. In addition, the company's existence also received a positive response from the surrounding community, both through the absorption of local labor and sustainable community development programs. The reporting and evaluation carried out are also in accordance with the ISO 14001:2015 framework and the provisions of Law No. 32 of 2009, so that overall it reflects the company's commitment to environmental sustainability and social responsibility.

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