

# The Implementation of Occupational Safety, Health, and Environment in the Construction Project (A Case Study of Rehabilitation Project of Wawatobi Irrigation Area in Konawe Regency)

Darwis Baso<sup>1</sup>, Sattar Yunus<sup>1</sup>

<sup>1</sup> Department of Environmental Engineering, Universitas Muslim Indonesia, Indonesia  
Corresponding Author: Darwis Baso

## ABSTRACT

The implementation of construction work shall include control over the work being undertaken where potential risks of failures exist in each process or activity at work. One of the occupational risks can occur in occupational safety, health, and environmental aspects. The construction project comprises activities that can pose high risks in those aspects because the work involves multivarious tools, materials, and labor. Based on the evaluation of the implementation of occupational health, safety, and environment (HSE) on the Rehabilitation Project of Wawatobi Irrigation Area in Konawe Regency, there were two aspects related to health and safety considered safe, namely Occupational Safety, Health, and Environment in general condition and the operations of heavy equipment, generator set, and power tools and panel. Meanwhile, the HSE aspects of the construction work were considered inconsistent. Conclusively, the evaluation result of occupational HSE in the Rehabilitation Project of Wawatobi Irrigation Area in Konawe Regency based on the total gap analysis was 85,084% and considered safe.

**KEYWORDS;**- HSE, Criteria, Implementation, HSE aspects

Date of Submission: 03-02-2024

Date of acceptance: 14-02-2024

## I. INTRODUCTION

Developing countries must have multivarious development undertaken domestically, including irrigation to improve the community welfare. Lack of development will lead to environmental damage that may get worse over time. To avoid this unfortunate event, any development that occurs in the countries must lean towards eco-friendly principles to ensure a sustainable, inveterate practice. Without environmental control and policy formulation, the development potentially brings about a negative impact on the environmental quality as apparent from the economic growth achieved through the industrial sector that has converted the green space into non-eco-friendly industrial areas that generate water, air, and soil pollutions, even hazardous and toxic waste. These consequences have damaged the current ecosystem and turned the natural condition into spoiled, unutilizable resources. Land clearing for infrastructure development can pose multiple environmental problems like flooding, landslides, the extinction of rare wildlife, lack of clean water, and progressing air pollution. The preparedness to implement eco-friendly environmental utilization, evaluation, and service improvement is the most dominant indicators that reflect responsible actions toward the environment [1].

Law of the Republic of Indonesia Number 32 of 2009 Chapter 1(3) [2] stipulates that sustainable development is a conscious, planned effort to incorporate the environmental, social, and economic aspects into the development strategies to ensure environmental integrity as well as the safety, capacity, welfare, and life quality of both present and future generations.

Constructing irrigation works must implement controls over the working process because risks of failures are in place of every process/activity of the work due to imperfect planning, inaccurate implementation, or other unintended consequences like weather conditions, natural disasters, and others. Occupational risks can include, among others, occupational accidents, health, and the environment. When a work accident occurs, regardless of how insignificant it may be, can lead to a great loss, and therefore, shall be prevented or mitigated in the best possible manner and at the earliest time, or at least to reduce its impact. In line with the principles stipulated in Law Number 1 of 1970, the implementation of occupational safety and health (OHS) aims at enabling every laborer and every other individual at work to obtain protection for their safety and health.

Based on the data of the International Labour Organization (ILO), almost every day people die of occupational accidents or occupational illness. More specifically, 2.78 million people die per year, including 2.4

million workers (86.3%) due to occupational sickness and 380.000 workers (13.7%) due to occupational accidents, and it is predicted that globally the loss working days is equal to 4% of Global Gross Domestic Product (GDP), even 6% in some other places [3].

The statistics of occupational accidents have shown a significant increase, according to the Social Security Agency for Employment (BPJS Ketenagakerjaan), amounting to 5.65% from 234,270 cases (2021) to 265,334 cases (2022). This follows an upward trend of the previous years from 123,040 cases (2017) to 173,415 cases (2018), 182,835 (2019), and 221,749 cases (2020). The construction sector has consistently and most significantly contributed to occupational accidents compared to other sectors.

Construction projects are one of the activities that pose risks of occupational accidents, health, and the environment because the projects undertaking involves multivarious equipment, materials, and workforce. Occupational accidents and their impact on the environment can occur due primarily to sub-par monitoring in the implementation of occupational health, safety, and environment. Unsatisfactory implementation of occupational safety and health (OHS) in the construction industry has contributed to the number of incidences and death toll that befall the construction workers and the community [4].

The escalating number of cases of occupational accidents and loss incurred due to occupational accidents, as well as the increasing potential accidents and impacts on the environment imposed by the production process, have called for an integrated, effective, and thorough management of occupational health, safety, and environment. The principles, field of study, process, tools, and techniques that are applied to manage particular elements in the environment, such as the water, air, land, and living organisms are a unity of systems and processes of environmental management that are utilized for guiding the potential impacts of project activities on the environment. The implementation of health, safety, and environmental principles in construction projects cannot be detached from the roles of regulations stipulated by both the national government and international stakeholders. In addition, occupational safety and health cannot be separated from the process of construction work. The potential harms are linear with the level of risk; the higher the potential harm, the higher the risks and the impacts.

Identified four factors to consider in improving safety in the construction location, policy factor namely, it ensures that construction projects comply with safety laws and regulations, and implements HSE as an integral part of the project. Process factor. It limits the number of subcontractors and ensures that the hired subcontractors are capable of providing a secure working environment and establishing effective communication and transfer of information among the related actors. Personnel factor. It affects the safety culture by showing commitment to HSe and providing safety training to employees. Incentive factor. It ensures that the project incentives contribute to safety and that disciplinary actions shall be taken in case unsafe conducts take place [5].

## **II. RESEARCH METHODOLOGY**

Developing countries must have multivarious development undertaken domestically, including irrigation to improve the community welfare. Lack of development will lead to environmental damage that may get worse over time. To avoid this unfortunate event, any development that occurs in the countries must lean towards eco-friendly principles to ensure a sustainable, inveterate practice. Without environmental control and policy formulation, the development potentially brings about a negative impact on the environmental quality as apparent from the economic growth achieved through the industrial sector that has converted the green space into non-eco-friendly industrial areas that generate water, air, and soil pollutions, even hazardous and toxic waste. These consequences have damaged the current ecosystem and turned the natural condition into spoiled, unutilizable resources. Land clearing for infrastructure development can pose multiple environmental problems like flooding, landslides, the extinction of rare wildlife, lack of clean water, and progressing air pollution. The preparedness to implement eco-friendly environmental utilization, evaluation, and service improvement is the most dominant indicators that reflect responsible actions toward the environment [1].

Law of the Republic of Indonesia Number 32 of 2009 Chapter 1(3) [2] stipulates that sustainable development is a conscious, planned effort to incorporate the environmental, social, and economic aspects into the development strategies to ensure environmental integrity as well as the safety, capacity, welfare, and life quality of both present and future generations.

Constructing irrigation works must implement controls over the working process because risks of failures are in place of every process/activity of the work due to imperfect planning, inaccurate implementation, or other unintended consequences like weather conditions, natural disasters, and others. Occupational risks can include, among others, occupational accidents, health, and the environment. When a work accident occurs, regardless of how insignificant it may be, can lead to a great loss, and therefore, shall be prevented or mitigated in the best possible manner and at the earliest time, or at least to reduce its impact. In line with the principles

stipulated in Law Number 1 of 1970, the implementation of occupational safety and health (OHS) aims at enabling every laborer and every other individual at work to obtain protection for their safety and health. Based on the data of the International Labour Organization (ILO), almost every day people die of occupational accidents or occupational illness. More specifically, 2.78 million people die per year, including 2.4 million workers (86.3%) due to occupational sickness and 380,000 workers (13.7%) due to occupational accidents, and it is predicted that globally the loss working days is equal to 4% of Global Gross Domestic Product (GDP), even 6% in some other places [3].

The statistics of occupational accidents have shown a significant increase, according to the Social Security Agency for Employment (BPJS Ketenagakerjaan), amounting to 5.65% from 234,270 cases (2021) to 265,334 cases (2022). This follows an upward trend of the previous years from 123,040 cases (2017) to 173,415 cases (2018), 182,835 (2019), and 221,749 cases (2020). The construction sector has consistently and most significantly contributed to occupational accidents compared to other sectors.

Construction projects are one of the activities that pose risks of occupational accidents, health, and the environment because the projects undertaking involves multivarious equipment, materials, and workforce. Occupational accidents and their impact on the environment can occur due primarily to sub-par monitoring in the implementation of occupational health, safety, and environment. Unsatisfactory implementation of occupational safety and health (OHS) in the construction industry has contributed to the number of incidences and death toll that befall the construction workers and the community [4].

The escalating number of cases of occupational accidents and loss incurred due to occupational accidents, as well as the increasing potential accidents and impacts on the environment imposed by the production process, have called for an integrated, effective, and thorough management of occupational health, safety, and environment. The principles, field of study, process, tools, and techniques that are applied to manage particular elements in the environment, such as the water, air, land, and living organisms are a unity of systems and processes of environmental management that are utilized for guiding the potential impacts of project activities on the environment. The implementation of health, safety, and environmental principles in construction projects cannot be detached from the roles of regulations stipulated by both the national government and international stakeholders. In addition, occupational safety and health cannot be separated from the process of construction work. The potential harms are linear with the level of risk; the higher the potential harm, the higher the risks and the impacts.

Identified four factors to consider in improving safety in the construction location, policy factor namely, it ensures that construction projects comply with safety laws and regulations, and implements HSE as an integral part of the project. Process factor. It limits the number of subcontractors and ensures that the hired subcontractors are capable of providing a secure working environment and establishing effective communication and transfer of information among the related actors. Personnel factor. It affects the safety culture by showing commitment to HSe and providing safety training to employees. Incentive factor. It ensures that the project incentives contribute to safety and that disciplinary actions shall be taken in case unsafe conducts take place [5].

### **III. RESULTS AND DISCUSSION**

The implementation of construction projects, without proper management, potentially inflicts damage to the surrounding environment, initiates change in the community structure, and impacts the economy. Environmental damage, according to Law of the Republic of Indonesia Number 23 of 1997, is the entry or inclusion of living creatures, energy substances, and or other components into the environment due to human activities, instigating the quality of the environment to decrease to a certain level, thus rendering the environment unable to function as its intended purpose. The source of pollution refers to any activity of disposing of pollutants.

The hazards of construction projects are evident, particularly in the project sites. The causes of occupational accidents can be recognized and recurring, and therefore, it is essential to identify the most common causes and plan immediate preventive actions.

The causes of occupational accidents in construction projects may include:

Unimplemented Standard Operational Procedure.

Inappropriate working methods with the field conditions and types of work.

Lack of Job Safety Analysis (JSA) and Hazard Identification Risk assessment and Risk Control (HIRARC). HIRARC is the tool of risk assessment for any work that carries the potential to inflict occupational accidents and their impacts.

Low levels of manpower skills and discipline.

Inconsistent testing of work tools.

The selection of materials and components that negatively affect health and the environment.

*The Implementation of Occupational Safety, Health, and Environment in the Construction Project ..*

Incomplete or lack of OHS planning and procedure at the project sites.

The success of OHS is determined by three pillars:

Technique/work method/process

System

Human factor

A close examination of OHSE criteria of Rehabilitation Project of Wawatobi Irrigation Area in Konawe Regency (Package 1) resulted in the following aspects:

Table 1. Results of General Condition of Occupational Health, Safety, and Environment (OHSE)

No.	Description	Evaluation criteria			
		Non-applicable Process/Activity (N/A)	Unsafe Condition (TA)	Inconsistency of OHS (TK)	Safe Condition (KA)
1	Project Gate/Entry Access to the Gate				V
2	Access to Wok			V	
3	HSE Noticeboard				V
4	Signs, Banners, and Posters			V	
5	General PPE (Personal Protective Equipment)				V
6	New Worker and Safety Induction				V
7	HSE Project Organization				V
8	Tool Box Meeting, Training, Inspection			V	
9	Site Office				V
10	Toilet			V	
11	Rest Area, Shelter and Smoking Area			V	
12	Barrack/Work Shed			V	
13	Workshop			V	
14	Storeroom			V	
15	Fuel Tank			V	
16	Hazardous and Toxic Materials and Waste			V	
17	Domestic Waste Management			V	
18	Management of Harardous and Toxic Materials			V	
19	Emergency Preparedness and Response			V	
20	Light Fire Extinguisher (APAR)			V	
21	First Aid				V

Table 2. Results of HSE Evaluation of The Operations of Heavy Machine, Generator Set, Power Tools, and Pannels.

No.	Descriptions	Evaluation Criteria			
		Non applicable process/activity (N/A)	Unsafe condition (TA)	Inconsistency of OHS (TK)	Safe condition (KA)
1	Excavator			V	
2	Bulldozer/ Tandem Roller, etc				V
3	Dump Truck / Truck			V	
4	Concrete Pump		V		
5	Truk Mixer Beton			V	
6	Power Tools				V
7	Compressor			V	

8	Generator Set				V
9	Welding Engine			V	
10	Cutting Torch / Blending Welder				V
11	Temporary Power Panel and Distribution of Power Cable			V	
12	Electricity and Cable			V	
13	Bar Bending & Cutting			V	

Table 3. Results of HSE Evaluation of Construction Work in the Rehabilitation Project of Wawatobi Irrigation Area in Konawe Regency (Package 1)

No.	Description	Evaluation Criteria			
		Non applicable process/activity (N/A)	Unsafe condition (TA)	Inconsistency of OHS (TK)	Safe condition (KA)
1	Excavation			V	
2	Formwork			V	
3	Casting			V	
4	Concrete Precast/Lining			V	
5	Work Ladder				V
6	Traffic Management			V	

The results of Gap Analysis in this study have obtained the requirement criteria and fulfillment that were used to calculate the percentage of Health, safety, and environment (HSE) of the Rehabilitation Project of Wawatobi Irrigation Area in Konawe Regency (Package-1). Table 4 illustrate the level of fulfillment of procedure and criteria:

Table 4. Evaluation of Health, Safety, and Environment (HSE) Implementation in the Rehabilitation Project of Wawatobi Irrigation Area in Konawe Regency (Package-1)

Elements	Gap Analysis Evaluation				Percentage (%)	HSE Implementation
	N/A	TA	TK	KA		
General Occupational Health, Safety, and Environment (OHSE)	0	0	1,285	1,353	87,943%	Safe conditions
HSE aspects in the operation of heavy machine, generator set, power tools, and pannels.	0	0	1,227	1,542	92,308%	Safe conditions
HSE Aspects in Construction Work	0	0	1,750	0,500	75,000%	Inconsistent
Total Gap Analysis	0	0	1,421	1,132	85,084%	Safe conditions

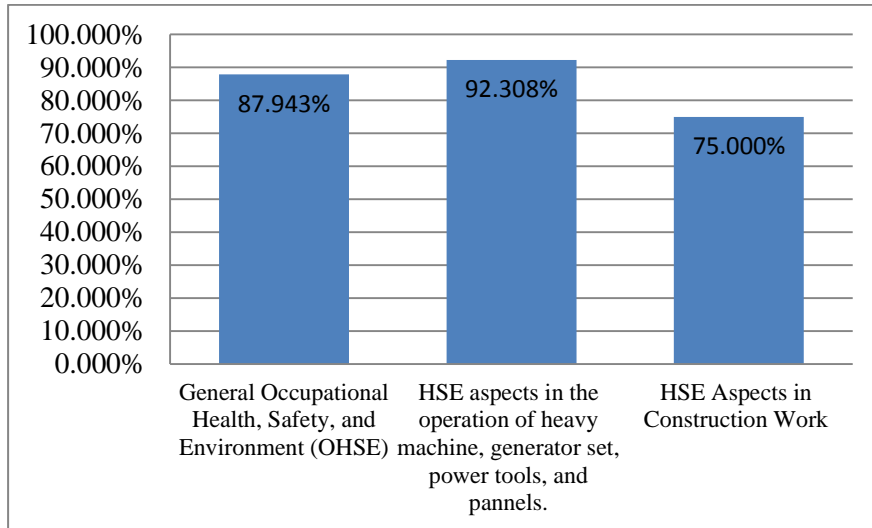


Figure 1. Percentage of Health, Safety, and Environment (HSE) Implementation in the Rehabilitation Project of Wawatobi Irrigation Area in Konawe Regency (Package-1)

Based on the Evaluation of Health, Safety, and Environment (HSE) in Figure 1 above, 2 (two) OHS aspects applied OHS in safe conditions, namely general HSE and specific HSE for operations of heavy machines, generator sets, power tools, and panels. Meanwhile, the OHS aspects of the construction work were inconsistent. The overall evaluation of HSE implementation in the Rehabilitation Project of Wawatobi Irrigation Area in Konawe Regency resulted in safe conditions.

In general, occupational accidents can occur due to the causes of the accidents. Therefore, it takes continual evaluation to measure the implementation of Health, Safety, and Environment (HSE) during the undertaking of the construction.

#### IV. CONCLUSION

Based on the descriptive analysis, this study concludes that: The implementation of health, safety, and environment (HSE) in the Rehabilitation Project of Wawatobi Irrigation Area in Konawe Regency obtained a Safe Condition score in general HSE aspects (87,943%) and the HSE in operations of heavy machine, generator set, power tools, and panel (92,308%).

The general implementation of HSE in the construction work is 75,000%, or inconsistent because the working method did not conform to the standard and criteria OHSE. The implementation of Health, safety, and environment (HSE) in the Rehabilitation Project of Wawatobi Irrigation Area in Konawe Regency reflected from the total Gap Analysis is 85,084%, or safe.

Enhancing the implementation of health, safety, and environment (HSE) can be done consistently by adhering to the regulations and the standard operational procedure. It is imperative to nurture the culture of sensitivity to the environment, responsiveness, cooperation, compliance with procedure, hazard awareness, alertness, and discipline to reduce the level of occupational accidents up to “zero accident”.

#### REFERENCE

- [1] Baso, D., Riniwati, H., & Tamsil, H. A. (2018). Factors influencing satisfaction in housing area infrastructure management service in Pampang Riverbanks. 24(2).
- [2] Law of the Republic of Indonesia Number 32 of 2009 Chapter 1(3)
- [3] ILO (1992) . Keselamatan dan Kesehatan Kerja Keselamatan dan Kesehatan Sarana untuk Produktivitas.
- [4] Saifullah, N. M., & Ismail, F. (2012). Integration of Occupational Safety and Health during Preconstruction Stage in Malaysia. 35 (December 2011), 603–610. <https://doi.org/10.1016/j.sbspro.2012.02.127>
- [5] Teo. Ling, and Chong. (2005). Framework for project managers to manage construction safety. International Journal of Project Management 23: 329-341. <https://doi.org/10.1016/j.ijproman.2004.09.001>
- [6] Kim, S., & Ji, Y. (2018). Gap Analysis. <https://doi.org/10.1002/9781119010722.iesc0079>