

THE EFFECT OF OCCUPATIONAL HEALTH AND SAFETY (OHS) IMPLEMENTATION ON CONSTRUCTION WORKERS' PRODUCTIVITY IN NIAS REGENCY

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Abstract

The construction industry is one of the sectors with the highest occupational accident risks, making the implementation of Occupational Health and Safety (OHS) essential for ensuring worker well-being and improving project performance. This study aimed to analyze the effect of OHS implementation on the productivity of construction workers in Nias Regency, Indonesia. A quantitative research approach with a survey design was employed. Data were collected from 120 construction workers selected through purposive sampling from various construction projects in the region. The research instrument consisted of a structured questionnaire measuring OHS implementation, including safety training, personal protective equipment (PPE) utilization, safety supervision, hazard identification, and management commitment, as well as workers' productivity indicators. The collected data were analyzed using descriptive statistics, validity and reliability tests, classical assumption tests, and simple linear regression analysis with the assistance of IBM SPSS Statistics. The results indicated that OHS implementation in the surveyed projects was generally categorized as good, while workers' productivity was also found to be at a favorable level. Regression analysis revealed that OHS implementation had a significant positive effect on construction workers' productivity ($\beta = 0.673$, $p < 0.001$). Furthermore, the coefficient of determination showed that OHS implementation explained 45.3% of the variation in workers' productivity. These findings demonstrate that effective OHS practices contribute substantially to improving work efficiency, reducing accident-related disruptions, and enhancing overall project performance. Therefore, construction companies should strengthen safety management systems, improve training programs, and ensure consistent compliance with safety regulations to achieve sustainable productivity improvements.

Keywords: Occupational Health and Safety (OHS), Construction Workers, Productivity, Safety Management, Construction Industry.

INTRODUCTION

The construction industry is widely recognized as one of the most labor-intensive and high-risk sectors, playing a strategic role in economic development through the provision of infrastructure, housing, and public facilities. Despite its significant contribution to national and regional economic growth, construction activities involve numerous occupational hazards, including falls from height, heavy equipment accidents, exposure to hazardous materials, electrical risks, and ergonomic injuries. These hazards not only threaten workers' health and safety but also reduce productivity, increase project delays, and elevate operational costs. Consequently, the implementation of Occupational Health and Safety (OHS) has become a critical component in achieving sustainable construction project performance (International Labour Organization [ILO], 2022).

Occupational Health and Safety (OHS) refers to a systematic approach designed to prevent workplace accidents, occupational diseases, and work-related injuries while promoting workers' physical, mental, and social well-being. Effective OHS implementation encompasses hazard identification, risk assessment, safety training, the use of personal protective equipment (PPE), regular safety inspections, emergency preparedness, and compliance with national safety regulations. Numerous studies have demonstrated that organizations with well-established OHS management systems experience fewer accidents, lower absenteeism, improved employee morale, and higher productivity than organizations with inadequate safety practices (International Organization for Standardization [ISO], 2018; Hinze, 2019).

Worker productivity remains one of the most important indicators of success in construction projects because labor accounts for a substantial proportion of total project costs. Productivity is influenced by various internal and external factors, including workers' skills, motivation, work environment, equipment availability, management quality, and occupational safety conditions. Unsafe working environments often lead to injuries, fatigue, psychological stress, and work interruptions, all of which negatively affect labor efficiency. Conversely, a safe workplace encourages workers to perform their tasks confidently, minimizes downtime caused by accidents, and improves overall project performance (Jarkas & Radosavljevic, 2013).

In developing countries, including Indonesia, the construction sector continues to experience relatively high rates of occupational accidents despite ongoing regulatory improvements. According to the International Labour Organization (2022), construction workers are several times more likely to suffer fatal occupational injuries than workers in many other industries. This situation indicates that the implementation of safety management practices remains inconsistent, particularly in small- and medium-scale construction projects where safety awareness, supervision, and resource allocation are often limited. Therefore, strengthening OHS implementation has become an essential strategy for improving construction performance while protecting human resources.

Indonesia has established comprehensive legal frameworks governing occupational health and safety, including Law No. 1 of 1970 concerning Occupational Safety and Government Regulation No. 50 of 2012 regarding the Implementation of Occupational Safety and Health Management Systems (SMK3). Furthermore, construction service regulations require contractors to integrate safety management into every stage of project execution. Nevertheless, the effectiveness of these regulations largely depends on organizational commitment, workers' compliance, management support, and continuous monitoring during project implementation. Differences in company size, project complexity, and regional characteristics often lead to varying levels of OHS implementation across construction projects.

Nias Regency, located in North Sumatra Province, has experienced increasing infrastructure development in recent years, including road construction, public buildings, educational facilities, health centers, and community infrastructure projects. The growth of construction activities has generated greater employment opportunities while simultaneously increasing workers' exposure to occupational risks. Many construction projects in the region are executed by local contractors with varying levels of financial capacity, technical expertise, and safety management practices. Consequently, the effectiveness of OHS implementation may differ considerably among projects, potentially influencing workers' productivity and project outcomes.

Several previous studies have reported a positive relationship between occupational safety practices and labor productivity. For instance, enhanced safety training, adequate PPE utilization, effective supervision, and hazard control measures have been associated with improved worker performance, reduced accident frequency, and greater project efficiency (Mohammadi et al., 2018; Awolusi et al., 2021). However, most existing studies have been conducted in metropolitan areas or large-scale construction industries, while empirical evidence from rural and developing regions such as Nias Regency remains limited. Local socio-economic conditions, workforce characteristics, educational background, and contractor management practices may influence the relationship between OHS implementation and productivity differently from urban settings.

In addition to physical safety measures, organizational safety culture has emerged as a significant determinant of construction productivity. A positive safety culture encourages active participation, effective communication, leadership commitment, and workers' awareness regarding hazard prevention. When employees perceive that management prioritizes their safety, they tend to demonstrate higher job satisfaction, stronger organizational commitment, and greater motivation to complete tasks efficiently. Therefore, OHS implementation should not merely focus on regulatory compliance but should also cultivate a proactive safety culture that supports continuous productivity improvement (Cooper, 2018).

Considering the importance of construction development in Nias Regency and the limited empirical evidence regarding occupational safety practices in the region, investigating the relationship between OHS implementation and

workers' productivity becomes highly relevant. Understanding this relationship will provide valuable insights for contractors, project managers, government agencies, and policymakers in developing more effective safety strategies to enhance workforce performance and project success. Moreover, the findings are expected to contribute to the growing body of knowledge concerning construction safety management in developing regional contexts.

Therefore, this study aims to analyze the effect of Occupational Health and Safety (OHS) implementation on the productivity of construction workers in Nias Regency. Specifically, the research evaluates how various aspects of OHS implementation—including safety training, PPE utilization, workplace supervision, hazard control, and management commitment—affect workers' productivity. The results are expected to provide practical recommendations for improving safety management systems, increasing labor productivity, reducing workplace accidents, and supporting sustainable construction development in Nias Regency.

RESEARCH METHODOLOGY

3.1 Research Design

This study employed a quantitative research approach using an explanatory survey design to investigate the effect of Occupational Health and Safety (OHS) implementation on construction workers' productivity in Nias Regency, Indonesia. The quantitative approach was selected because it enables objective measurement of relationships between variables through statistical analysis. The independent variable was Occupational Health and Safety (OHS) implementation, while the dependent variable was construction workers' productivity. Data were collected during active construction projects involving public infrastructure, residential buildings, and commercial facilities. The study aimed to determine the extent to which OHS practices contribute to improving workers' productivity under actual construction site conditions.

3.2 Population and Sampling Technique

The research population consisted of construction workers employed by contractor companies operating on building and infrastructure projects in Nias Regency. Since the total number of workers varied across projects, purposive sampling was applied to select respondents who had at least one year of construction experience and were directly involved in field activities. Supervisors, foremen, and administrative staff were excluded from the sample because the research focused on field labor productivity. A total of 120 respondents participated in the survey, representing different construction companies and project types. This sample size was considered adequate for regression analysis and hypothesis testing.

3.3 Data Collection Techniques

Primary data were collected using a structured questionnaire developed from the Occupational Health and Safety Management System (ISO 45001:2018) and previous construction productivity studies. The questionnaire consisted of two sections. The first section collected respondents' demographic information, including age, education level, work experience, and employment status. The second section measured perceptions regarding OHS implementation and workers' productivity using a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The OHS indicators included safety training, personal protective equipment (PPE) utilization, safety supervision, hazard identification, and management commitment. Productivity indicators included work efficiency, work quality, attendance, work completion, and overall performance. Secondary data were obtained from contractor reports, project documentation, government regulations, and published scientific literature.

3.4 Data Analysis

The collected data were analyzed using IBM SPSS Statistics Version 27. Prior to hypothesis testing, descriptive statistical analysis was conducted to summarize respondents' characteristics and variable distributions. Instrument quality was evaluated through validity testing using Pearson Product-Moment Correlation and reliability testing using Cronbach's Alpha. Classical assumption tests—including normality, multicollinearity, and heteroscedasticity—were performed to ensure compliance with regression assumptions. The relationship between Occupational Health and Safety implementation and workers' productivity was examined using simple linear regression analysis. Statistical significance was determined at a confidence level of 95% ($\alpha = 0.05$). The coefficient of determination (R^2) was used to evaluate the proportion of productivity variation explained by OHS implementation.

3.5 Research Framework

The conceptual model of this study assumes that effective implementation of Occupational Health and Safety practices positively influences construction workers' productivity. Safety training, proper utilization of personal protective equipment, hazard identification, safety supervision, and management commitment are expected to improve workers' efficiency, reduce occupational accidents, enhance work quality, and increase project performance. The research framework serves as the basis for formulating hypotheses and conducting statistical analysis to examine the causal relationship between the variables.



Figure 1. Research Framework

RESULTS AND DISCUSSION

4.1 Respondents' Characteristics

A total of 120 construction workers from various building and infrastructure projects in Nias Regency participated in this study. The respondents represented different age groups, educational backgrounds, and years of working experience. Most respondents were between 26 and 35 years old (40.0%), followed by 36–45 years (28.3%), 18–25 years (21.7%), and over 45 years (10.0%). Regarding educational attainment, the majority had completed senior high school or vocational education, reflecting the typical educational profile of construction laborers in Indonesia. Furthermore, more than half of the respondents possessed over five years of construction experience, indicating that the collected data represented workers who were familiar with occupational safety procedures and construction activities.

Table 1. Respondents' Demographic Characteristics (n = 120)

Variable	Category	Frequency	Percentage (%)
Age	18–25 years	26	21.7
	26–35 years	48	40.0
	36–45 years	34	28.3
	>45 years	12	10.0
Education	Junior High School	18	15.0
	Senior High School/Vocational	74	61.7
	Diploma	20	16.6
	Bachelor Degree	8	6.7
Work Experience	1–5 years	43	35.8
	6–10 years	49	40.8
	>10 years	28	23.4

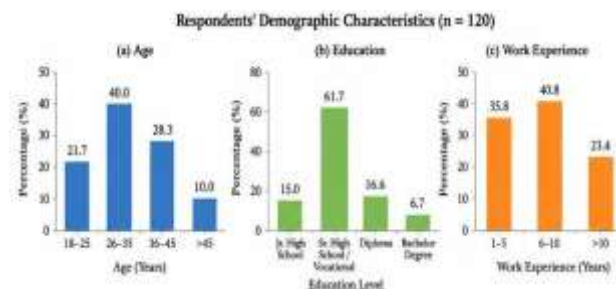


Figure 2. Percentage Distribution of respondents by age

The descriptive analysis revealed that the implementation of Occupational Health and Safety (OHS) practices in the surveyed construction projects was generally categorized as good. Among the measured indicators, the use of Personal Protective Equipment (PPE) obtained the highest average score (4.28), indicating that workers regularly used helmets, safety shoes, reflective vests, gloves, and other protective equipment. Safety supervision and management commitment also demonstrated relatively high scores, suggesting that contractors actively monitored safety compliance and encouraged workers to follow established safety procedures. However, safety training obtained a slightly lower mean value, indicating opportunities for improving the frequency and quality of training programs.

Construction workers' productivity also demonstrated favorable performance. Most respondents reported that safe working conditions increased their work efficiency, reduced interruptions caused by accidents, and improved work quality.

Workers indicated that the availability of PPE and continuous supervision enhanced their confidence in performing construction activities. This finding supports the argument that occupational safety is not only a regulatory requirement but also an important determinant of labor productivity and project success.

Table 2. Descriptive Statistics of Research Variables

Variable	Mean	Standard Deviation	Category
Safety Training	4.05	0.53	Good
PPE Utilization	4.28	0.47	Very Good
Safety Supervision	4.18	0.49	Good
Hazard Identification	4.12	0.51	Good
Management Commitment	4.20	0.46	Good
Workers' Productivity	4.15	0.48	Good

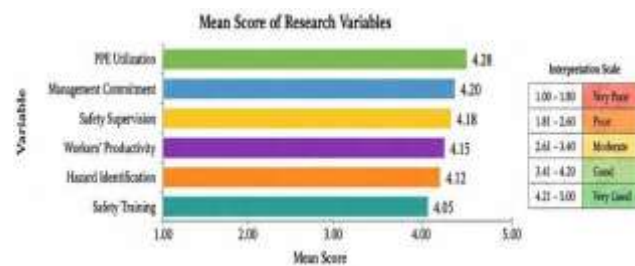


Figure 3. Mean score of OHS implementation indicators and workers' productivity

Instrument testing demonstrated satisfactory measurement quality. All questionnaire items produced corrected item-total correlation coefficients exceeding 0.30, indicating that every indicator was valid. Reliability testing showed Cronbach's Alpha values above 0.70 for both variables, confirming acceptable internal consistency. Consequently, the questionnaire was considered reliable for measuring OHS implementation and workers' productivity in construction projects.

Before conducting regression analysis, classical assumption tests were performed. The normality test using the Kolmogorov–Smirnov procedure indicated a significance value greater than 0.05, confirming that the residuals were normally distributed. Multicollinearity was not detected because all Variance Inflation Factor (VIF) values were below 10, while tolerance values exceeded 0.10. Furthermore, heteroscedasticity testing showed no significant patterns in the residual distribution, indicating that the regression model fulfilled the required assumptions for statistical analysis.

The regression analysis revealed a statistically significant positive relationship between Occupational Health and Safety implementation and construction workers' productivity. The regression coefficient indicated that improvements in OHS implementation were associated with corresponding increases in labor productivity. The calculated t-value (9.874) exceeded the critical value, while the significance level was $p < 0.001$, confirming that the research hypothesis was accepted. This result demonstrates that effective OHS implementation significantly contributes to improved worker performance in construction projects.

Table 3. Simple Linear Regression Analysis

Variable	B	Std. Error	Beta	t	Sig.
Constant	1.284	0.325	—	3.951	0.000
OHS Implementation	0.703	0.071	0.673	9.874	0.000

Model Summary

R	R ²	Adjusted R ²	Std. Error
0.673	0.453	0.448	0.361

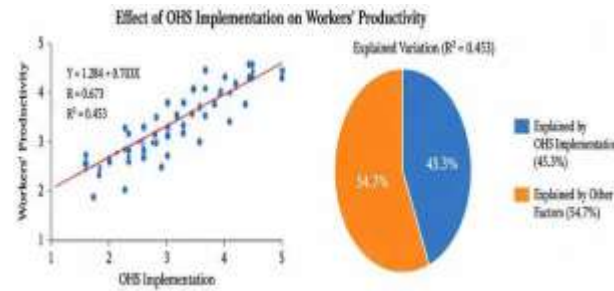


Figure 4. Regression scatter plot and contribution of OHS implementation to workers' productivity

The coefficient of determination ($R^2 = 0.453$) indicates that 45.3% of the variation in construction workers' productivity can be explained by Occupational Health and Safety implementation, while the remaining 54.7% is influenced by other variables not included in this study, such as worker motivation, leadership, wage systems, project complexity, weather conditions, and equipment availability. This finding suggests that OHS represents one of the most influential organizational factors affecting productivity within construction environments.

The findings are consistent with previous studies emphasizing that occupational safety contributes substantially to organizational performance. Hinze (2019) explained that construction companies implementing comprehensive safety management systems generally experience fewer accidents, reduced absenteeism, and improved project efficiency. Similarly, Mohammadi et al. (2018) reported that safety training, hazard identification, and management commitment significantly improve safety performance, which subsequently enhances labor productivity. Cooper (2018) further argued that a positive safety culture strengthens employee motivation and organizational commitment, resulting in improved work quality and operational effectiveness.

Overall, this study confirms that effective implementation of Occupational Health and Safety significantly enhances construction workers' productivity in Nias Regency. Contractors should therefore strengthen safety training programs, ensure consistent PPE utilization, conduct regular safety inspections, and reinforce management commitment toward occupational safety. These initiatives are expected not only to reduce workplace accidents but also to improve work efficiency, project quality, and timely project completion. The findings provide practical evidence for contractors, government agencies, and policymakers seeking to improve construction safety management and support sustainable infrastructure development in Nias Regency.

CONCLUSIONS

This study concludes that the implementation of Occupational Health and Safety (OHS) has a significant and positive effect on the productivity of construction workers in Nias Regency. The findings indicate that effective OHS practices create a safer working environment, reduce occupational risks, and enable workers to perform their duties more efficiently. As a result, construction projects can achieve higher levels of productivity through improved work quality, reduced downtime, and better overall performance.

The descriptive analysis revealed that the overall implementation of OHS among the surveyed construction projects was categorized as good. Indicators such as the use of Personal Protective Equipment (PPE), safety supervision, hazard identification, and management commitment received relatively high evaluation scores from respondents. Construction workers also demonstrated a good level of productivity, suggesting that the adoption of proper safety measures contributes positively to daily work performance and operational efficiency.

The regression analysis further confirmed that OHS implementation significantly influences workers' productivity. The statistical results showed a positive regression coefficient with a significance level below 0.05, indicating that improvements in occupational safety practices are associated with increased labor productivity. Moreover, the coefficient of determination demonstrated that OHS implementation explains a considerable proportion of productivity variation, highlighting its important role in construction project success.

From a practical perspective, the findings emphasize the necessity for construction companies in Nias Regency to strengthen their Occupational Health and Safety Management Systems. Contractors should continuously improve safety training programs, enforce the consistent use of Personal Protective Equipment, conduct regular workplace inspections, implement comprehensive hazard identification procedures, and demonstrate strong management commitment toward workplace safety. These measures will not only reduce accident rates but also improve employee motivation, work efficiency, and project performance.

Finally, this study contributes to the growing body of knowledge concerning construction safety management in regional construction industries, particularly in developing areas such as Nias Regency. Future research is recommended to include additional variables, such as leadership style, work motivation, organizational culture, compensation systems, and technological innovation, while involving larger samples and broader geographical coverage. Such studies would provide a more comprehensive understanding of the factors influencing construction workers' productivity and support the development of more effective occupational safety policies.

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