Society, 12 (2), 859-882, 2024
P-ISSN: 2338-6932 | E-ISSN: 2597-4874
https://societyfisipubb.id

# Synergy of Occupational Safety and Work Environment to Support Productivity and Sustainable Well-Being in the Port Sector

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## ARTICLE INFO

***Publication Info:***
*Research Article*

***How to cite:***
*Firmansyah, H., Gunarto, M., & Andriyansah, A. (2024). Synergy of Occupational Safety and Work Environment to Support Productivity and Sustainable Well-Being in the Port Sector. Society, 12(2), 859-882.*

***DOI:*** *10.33019/society.v12i2.716*



## ABSTRACT

*A sustainable work environment is pivotal in enhancing employee productivity, particularly in the port sector, which faces high occupational risks and complex operational demands. This study aims to analyze the impact of occupational health and safety (OHS) and the work environment on employee productivity at Pelabuhan Indonesia PT (Persero) II, Tanjung Pandan Branch. A quantitative approach was employed using a survey method with structured questionnaires completed by 37 respondents, analyzed through Structural Equation Modeling-Partial Least Square (SEM-PLS). The research variables included OHS dimensions (workplace conditions, safe behaviors, psychological atmosphere) and work environment factors (lighting, air temperature, noise, workspace, safety). The analysis revealed that OHS significantly influences productivity ($p < 0.05$), with a greater contribution from the psychological atmosphere dimension than other technical aspects. The work environment also positively affects productivity, with lighting and workplace safety emerging as the most significant contributors to fostering a supportive work atmosphere. These findings underscore the importance of a conducive work environment, supported by employee security and comfort, in boosting motivation and operational efficiency. The study's social implications highlight that investments in OHS programs and workplace improvements enhance productivity, foster harmonious workplace relationships, reduce conflicts, and strengthen employees' social well-being. Together, these variables account for 68% of the variance in employee productivity, emphasizing the critical role of OHS and work environment management in improving operational*

**Received:** November 22, 2024;
**Accepted:** December 29, 2024;
**Published:** December 31, 2024;

*efficiency. This study offers practical recommendations to strengthen OHS programs through regular training, stringent supervision, and infrastructure enhancements that ensure employee comfort. These results are expected to reference other local ports in developing policies integrating workplace safety and environmental management to achieve sustainable productivity.*

***Keywords:*** *Employee Productivity; Occupational Health and Safety (OHS); Port Management; Sustainable Operations; Work Environment*

## 1. Introduction

Workforce well-being and productivity are critical elements in ensuring the sustainability of the economic sector, particularly in high-risk work environments (Baptiste, 2008; Danna & Griffin, 1999; Harter et al., 2002). As an integral component of the national logistics system, the port sector strategically facilitates the smooth distribution of goods within and across regions. Moreover, ports also serve as local economic hubs, generating employment opportunities and driving regional economic growth (Notteboom & Rodrigue, 2005; Song & Panayides, 2008). However, this sector faces significant challenges, including occupational accident risks, non-conducive work environments, and high operational intensity.

As an archipelagic nation, Indonesia heavily relies on ports to support trade and goods distribution. Pelabuhan Indonesia II PT (Persero) Tanjung Pandan Branch, located on Belitung Island, is one of the strategic ports in Indonesia's distribution network. Its geographically advantageous position establishes it as a key link in inter-island trade and a backbone of the local economy. Operational data indicate an increase in traffic from 1,226,114 units in 2020 to 2,230,628 units in 2023, although growth rates have started to decelerate. This reflects that operational efficiency has not matched the rising volume of activities, underscoring the need for improved risk management to prevent accidents and maintain logistical stability. High operational intensity elevates the risk of workplace accidents, such as the crane collapse incident in July 2024 and a container overturning in October 2024. These incidents jeopardize employee safety, disrupt operations, and escalate logistical costs, highlighting the critical importance of implementing an optimal Occupational Health and Safety (OHS) system to ensure operational continuity without compromising worker safety.

In addition to safety, the quality of the work environment plays a vital role in supporting employee productivity. A conducive work environment—adequate lighting, proper ventilation, and ergonomic spatial arrangements—has boosted morale and operational efficiency (Budianto & Katini, 2017). Conversely, a poor work environment, such as high noise levels and non-ergonomic workspaces, can lead to stress and decreased employee productivity. Such conditions also negatively affect social relationships in the workplace, as a poor work atmosphere can trigger conflicts and reduce employee solidarity. The work environment in the port sector has unique characteristics that often require greater attention, given the high intensity of work and exposure to harsh physical conditions (Setiawan, 2013; Suwanto, 2019).

Previous studies underscore the critical relationship between Occupational Health and Safety (OHS), the work environment, and productivity. Previous research examined the


https://doi.org/10.33019/society.v12i2.716

manufacturing sector and found that workplace safety significantly impacts productivity, while health aspects exert only an indirect influence (Lumenta et al., 2021; Muthohirin, 2019). Similarly, Apriliyani highlighted that the work environment has a more pronounced effect than OHS in the food industry context (Apriliyani, 2022). In the construction sector, Occupational Health and Safety (OHS) plays a significant role in shaping employee productivity, as demonstrated by its substantial contribution to variations in performance outcomes (Rosento et al., 2021; Swatika et al., 2022). Mulyadi further identified the simultaneous influence of OHS management systems and the work environment on productivity in the energy sector (Mulyadi, 2020).

Despite these findings, research in the port sector—particularly within the Indonesian context—remains limited. Moreover, quantitative approaches utilizing Structural Equation Modeling-Partial Least Square (SEM-PLS) are rarely applied to explore these relationships, leaving a gap in the literature. This study addresses this gap by providing a more focused analysis within the local port sector. Drawing on empirical data from Tanjung Pandan Port, this research offers valuable insights into the operational dynamics of Indonesian ports, which could inform the development of national logistics policies.

As a nation with an expanding network of ports, the relevance of this study is amplified in supporting the transformation of Indonesia's logistics sector and national economy. In the strategic context of Pelabuhan Indonesia II PT (Persero) Tanjung Pandan Branch, this research provides essential perspectives on managing workplace safety and environmental conditions to ensure operational stability amidst global trade challenges. With the increasing volume of inter-island and international trade, implementing robust OHS systems and maintaining high standards for the work environment will be pivotal in enhancing the competitiveness of Indonesian ports on the global stage.

Furthermore, the contribution of this research to the literature lies in its unique approach, employing Structural Equation Modeling-Partial Least Square (SEM-PLS), which enables an in-depth analysis of causal relationships between variables within the context of a local port. This approach addresses a gap in the literature, which has predominantly focused on the manufacturing and construction sectors. The findings of this study are expected to provide a foundation for future research, not only in the port sector but also in other sectors characterized by high occupational risks and operational complexities. Thus, this study is practically relevant and enriches the academic discourse on workplace safety, work environment, and productivity.

Enhancing productivity in the port sector has far-reaching implications, extending beyond operational efficiency to the well-being of communities surrounding the port. As one of the largest employers in the region, ports play a crucial role in creating quality employment opportunities and supporting local economic stability. By fostering a safe and conducive work environment, ports can improve regional logistics competitiveness while contributing to social development.

This research aims to examine the impact of Occupational Health and Safety (OHS) on employee productivity at Pelabuhan Indonesia II PT (Persero) Tanjung Pandan Branch and to understand how the work environment influences productivity. Additionally, it analyzes the simultaneous relationship between OHS and the work environment in enhancing the efficiency and effectiveness of port operations. The primary focus is to identify the extent to which the implementation of OHS measures, such as the provision of personal protective equipment (PPE) and safety training, along with the management of a comfortable work environment, contributes to workforce productivity, ultimately supporting the overall operational success of the port.


https://doi.org/10.33019/society.v12i2.716

This study uses a quantitative approach and SEM-PLS techniques to evaluate the relationships among key variables, including workplace safety dimensions, work environment conditions, and employee productivity. Data were collected through questionnaires completed by 30 respondents representing various operational functions at the port. The findings are expected to provide practical contributions to port management in designing policies that support employee well-being and enhance operational productivity. Moreover, the results can serve as a reference for other ports facing similar challenges, particularly in creating safe, comfortable, and productive work environments. Through a sustainability-based approach, this research also offers new insights to support the development of OHS policies and work environment management in the port sector.

## 2. Literature Review

### 2.1. Occupational Health and Safety

Occupational Health and Safety (OHS) refers to systematic efforts to protect workers from occupational accidents and health issues arising from work-related activities. According to Regulation of the Minister of Manpower and Transmigration Number PER-05/MEN/1996, OHS encompasses various control measures to minimize workplace hazards. These measures include managing workplace conditions, mitigating unsafe actions that could lead to accidents, and fostering a psychological environment conducive to employee well-being (Menteri Tenaga Kerja Republik Indonesia, 1996).

The effective implementation of OHS has been shown to impact workplace productivity positively. Consistent adherence to OHS procedures can reduce employee stress levels, enhance security, and prevent workplace accidents that may disrupt operational continuity (Lumenta et al., 2021; Muthohirin, 2019). Similarly, Budiono noted that a structured OHS program improves safety and significantly enhances individual performance (Budianto & Katini, 2017). In the context of ports, the implementation of OHS becomes increasingly critical due to high occupational risks associated with heavy equipment usage, physical work intensity, and environmental hazards (Setiawan, 2013; Suwanto, 2019).

Dimensions of OHS:

1) Workplace Conditions

Workplace conditions encompass various physical aspects that support safety, such as the availability of personal protective equipment (PPE), infrastructure adequacy, and compliance with safety standards in facility management. A workplace designed according to safety standards can reduce the risk of injuries and accidents (Lumenta et al., 2021; Muthohirin, 2019). Workers who perceive their environment as physically safe tend to exhibit higher work motivation (Griffin & Neal, 2000).

2) Safe Behavior

Employee compliance with safety procedures is critical in reducing the likelihood of accidents. Safe behavior at work, such as adhering to guidelines for operating heavy machinery and following safety protocols, reflects employees' awareness of the importance of OHS. Apriliyani's study demonstrated that regular safety training programs enhance employees' awareness and encourage safe workplace behavior (Apriliyani, 2022).

3) Psychological Atmosphere

A work environment that supports employees' psychological well-being is vital in fostering a conducive workplace atmosphere. Prolonged stress due to work pressure can


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negatively affect productivity and safety (Budianto & Katini, 2017). A positive work atmosphere, including psychological support from supervisors, reduces stress levels and improves job satisfaction (Setiawan, 2013; Suwanto, 2019). Consequently, managing psychological aspects, such as reducing excessive workloads and providing emotional support, is integral to implementing OHS.

These studies highlight the importance of implementing OHS measures that address the workplace's physical and psychological dimensions. This study analyzes OHS as an independent variable influencing employee productivity directly by managing physical risks and indirectly by improving psychological well-being.

**2.2. Work Environment**

The work environment encompasses various physical, social, and psychological conditions that can influence employee performance, either directly or indirectly. A conducive work environment supports physical comfort and enhances employee motivation to achieve optimal performance (Robbins & Judge, 2019). It includes all aspects related to workspace, facilities, ambiance, and interpersonal interactions within the workplace.

Budianto and Katini emphasize that a supportive work environment enhances worker comfort by providing adequate lighting, proper ventilation, and ergonomic workspace design. Their research indicates that ideal physical conditions can improve efficiency and reduce the risk of fatigue (Budianto & Katini, 2017). Conversely, A poor work environment, such as excessive noise, uncomfortable temperatures, or inadequate workplace safety, can trigger stress, increase fatigue, and ultimately decrease productivity (Setiawan, 2013; Suwanto, 2019). Therefore, strategic work environment management is critical in supporting operational sustainability, particularly in the port sector, which is characterized by high occupational risks.

Dimensions of the work environment:

1) Lighting

Adequate lighting is an essential element in creating a comfortable work environment. Proper lighting enhances visibility, reduces eye strain, and improves worker concentration (Boyce, 2003). Optimal lighting is particularly important for nighttime operations or activities in high-risk areas in the port sector. Poor lighting can increase the likelihood of accidents and reduce work efficiency.

2) Air Temperature

Comfortable air temperature is a significant physical factor influencing workplace comfort. Extremely high or low temperatures can lead to physical discomfort and decreased productivity (Malchaire, 1994). In the port sector, managing air temperature poses unique challenges, as many activities are conducted in open areas exposed to weather conditions.

3) Noise

Noise levels in the workplace can significantly impact worker concentration. Prolonged exposure to high noise levels can cause stress, decrease efficiency, and even lead to health issues such as hearing loss (Basner et al., 2014; Passchier-Vermeer & Passchier, 2000). In port activities, such as cargo handling with heavy machinery, noise control becomes a priority to create a more comfortable and safer work environment.


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4) Safety

Workplace safety is another critical aspect that supports employee comfort and well-being. According to Budianto and Katini, the degree of protection against potential physical hazards—such as falls, falling objects, or slips—greatly affects employees' perception of their safety (Budianto & Katini, 2017). In the port sector, measures such as using personal protective equipment (PPE), strict supervision of work areas, and implementing safety standards are vital strategies to minimize accident risks.

This study analyzes the work environment as one of the independent variables affecting employee productivity. Aspects such as lighting, air temperature, noise, and workplace safety are the primary focus in assessing how physical conditions at ports can either support or hinder worker performance. With proper management, an optimal work environment enhances productivity and positively impacts employee well-being and safety.

**2.3. Work Productivity**

Work productivity is a critical indicator reflecting the workforce's effectiveness in achieving organizational goals through optimal resource utilization. Work productivity is determined by the quantity of output produced and the quality of results that meet established standards (Robbins & Judge, 2019). In the modern workforce, productivity has become a key factor in creating competitive advantages, particularly in sectors that require speed and precision, such as ports.

Apriliyani's research highlights that work productivity is influenced by various factors, including work environment conditions, motivation, and job satisfaction (Apriliyani, 2022). These factors interact to determine the extent to which an employee can work efficiently and deliver optimal results. In the port sector, employee productivity is often associated with the efficiency of loading and unloading processes, timely task completion, and the quality of customer service. Budianto and Katini found that workplace physical conditions and safety management significantly affect productivity levels in the port sector (Budianto & Katini, 2017).

Productivity is not solely dependent on employees' technical abilities but is also influenced by psychological factors, such as a conducive work atmosphere and managerial support (Setiawan, 2013; Suwanto, 2019). In high-risk work environments such as ports, robust support systems—including adequate tools and regular training—are essential to maintaining optimal productivity.

Dimensions of the work productivity:

1) Efficiency

Efficiency reflects the ability of employees to complete tasks promptly and according to schedule. Efficiency is closely related to the optimal use of time and resources (Robbins & Judge, 2019). In the port sector, efficiency is evident in the speed of cargo loading and unloading processes that align with operational schedules. Low efficiency can lead to delays and increased operational costs.

2) Quality

Quality refers to the standard of work outcomes delivered by the workforce. Employees working in supportive environments tend to produce higher-quality results (Budianto & Katini, 2017). In the port context, service quality is crucial for maintaining customer trust, particularly when handling goods that require special care.


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3) Capability

Capability encompasses employees' capacity to perform tasks according to established standards. Employee capability is influenced by training, experience, and the support provided by the organization (Apriliyani, 2022). In the port sector, employee expertise in operating heavy equipment, such as cranes and forklifts, is a primary indicator of productivity.

This study analyzes work productivity as a dependent variable influenced by Occupational Health and Safety (OHS) and the work environment. The efficiency, quality, and capability dimensions measure how workplace conditions impact employee performance at Tanjung Pandan Port. By understanding these relationships, the study aims to provide recommendations to enhance operational efficiency and workforce well-being simultaneously.

### 2.4. Theoretical Framework

The theoretical framework of this study is constructed based on key concepts that describe the relationships between independent and dependent variables in the context of port operations. By adopting a quantitative approach, the study examines the influence of Occupational Health and Safety (OHS) and the work environment on employee productivity. This framework provides a logical foundation for understanding how these variables interact to create optimal performance.

#### 2.4.1. Research Variables

1) Occupational Health and Safety (OHS)

OHS refers to systematic efforts to create a safe work environment for employees. In this study, OHS is positioned as an independent variable influencing employee productivity through three main dimensions (Rahayu et al., 2019):

- Workplace Conditions
  This includes providing personal protective equipment (PPE), adequate workplace infrastructure, and adherence to appropriate safety standards. Proper conditions help reduce the risk of injury and enhance employees' sense of security.

- Safe Behavior
  Related to employees' compliance with safety procedures, such as consistent use of PPE and adherence to safe work protocols. This dimension reflects the level of compliance and awareness of the importance of OHS.

- Psychological Atmosphere
  A work environment that supports mental well-being, such as reducing work-related stress and providing emotional support from management, has been shown to improve motivation and productivity (Budianto & Katini, 2017).

Effective implementation of OHS enhances employees' sense of security, reduces stress levels, and prevents workplace accidents that could hinder productivity (Lumenta et al., 2021; Muthohirin, 2019).


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2) Work Environment

The work environment encompasses all physical and psychological conditions that affect employee comfort and efficiency. As an independent variable, the work environment in this study consists of four main dimensions (Sedarmayanti, 2019):

- Lighting
  Adequate natural and artificial lighting reduces eye strain and improves worker concentration.
- Air Temperature
  Ideal temperatures create physical comfort that supports work efficiency, particularly in the port sector, often exposed to extreme weather conditions.
- Noise
  Controlling noise levels is critical for reducing stress and maintaining workers' concentration in task execution.
- Safety
  Protecting employees from potential physical hazards, such as falls or falling objects, enhances their perception of workplace safety.

A supportive work environment directly increases worker motivation and efficiency, particularly in high-intensity sectors like ports (Setiawan, 2013; Suwanto, 2019).

3) Work Productivity

Work productivity refers to the ability of the workforce to produce output efficiently following established standards. In this study, work productivity is the dependent variable influenced by OHS and the work environment. Productivity is measured through three dimensions (Sutrisno, 2019):

- Efficiency
  The ability of employees to complete tasks quickly without compromising quality.
- Quality
  Work outcomes that meet or exceed the standards set by the organization.
- Capability
  Employees' skills in performing tasks according to operational requirements.

Apriliyani's research highlights that work productivity is not solely determined by individual abilities but also by supportive physical conditions and work atmosphere (Apriliyani, 2022).

### 2.4.2. Relationships Between Variables

This study focuses on three primary relationships:

1) The Influence of Occupational Health and Safety (OHS) on Work Productivity

Implementing OHS measures, such as adherence to safety protocols and personal protective equipment (PPE), is expected to enhance employee productivity. Workers who feel physically and psychologically safe exhibit higher job performance (Lumenta et al., 2021; Muthohirin, 2019).

2) The Influence of the Work Environment on Work Productivity

A comfortable work environment with adequate lighting and ideal air temperature significantly impacts employee concentration and motivation. A poor work environment can


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trigger stress, while a supportive environment can substantially improve work efficiency (Setiawan, 2013; Suwanto, 2019).

3) The Combined Influence of OHS and the Work Environment on Work Productivity

OHS and the work environment collectively create an optimal operational setting by integrating risk management with supportive physical conditions. This combination contributes positively to productivity, as highlighted by Budianto and Katini, who stated that these factors complement each other in enhancing individual performance (Budianto & Katini, 2017).

### 2.4.3. Conceptual Framework

The relationships between the variables can be illustrated through the following conceptual framework:

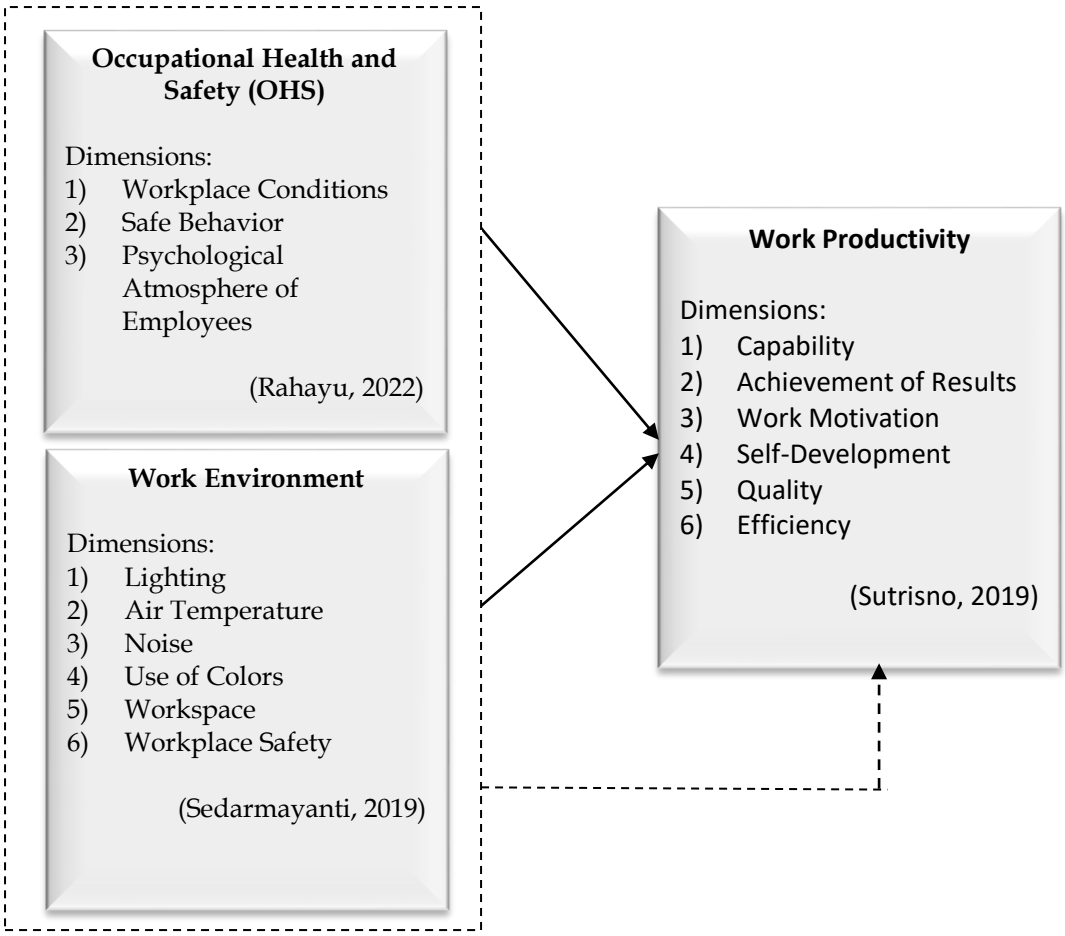


**Figure 1. Conceptual Framework**

### 2.4.4. Research Hypotheses

Based on this theoretical framework, the study proposes five primary hypotheses:

**H1**: Occupational Health and Safety (OHS) positively influences work productivity.
**H2**: The work environment positively influences Occupational Health and Safety (OHS).
**H3**: The work environment has a positive influence on work productivity.
**H4**: The work environment positively influences productivity through Occupational Health and Safety (OHS).
**H5**: Occupational Health and Safety (OHS) and the work environment influence productivity.


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## 3. Research Methodology

### 3.1. Research Approach

This study employs a quantitative approach (Sugiyono, 2019) to examine the relationships between Occupational Health and Safety (OHS), the work environment, and employee productivity. The quantitative approach was chosen because it objectively represents the influence of research variables through numerical data analysis. This explanatory research aims to explain causal relationships between independent and dependent variables.

### 3.2. Research Design

The study uses a survey design, with data collected through structured questionnaires. The questionnaires were developed based on relevant indicators for each research variable: OHS, the work environment, and productivity. Each indicator is measured using a 5-point Likert scale, ranging from "strongly disagree" (1) to "strongly agree" (5), to capture respondents' perceptions of the variables.

### 3.3. Research Location and Population

The research was conducted at Pelabuhan Indonesia II PT (Persero) Tanjung Pandan Branch, a strategic port on Belitung Island. The population of this study includes all operational employees directly involved in port activities, such as cargo handling, heavy equipment operation, and security supervision. Operational employees were chosen as the target population due to their direct exposure to workplace safety and environmental conditions.

### 3.4. Research Sample and Sampling Technique

The study's sample comprises 37 employees selected using purposive sampling, a method based on specific criteria deemed relevant by the researcher. This technique ensures respondents possess characteristics aligned with the research objectives, leading to more specific data collection.

Inclusion criteria for respondents**:**

1) Minimum one year of work experience at Pelabuhan Indonesia II PT (Persero) Tanjung Pandan Branch, ensuring respondents understand the port's working conditions.
2) Direct involvement in operational activities, such as cargo handling, heavy equipment operation, or security supervision. Respondents meeting these criteria are directly exposed to workplace safety, the work environment, and productivity.

The purposive sampling technique was chosen to obtain a sample relevant to the research variables. This method allows the researcher to focus on subjects most likely to provide information aligned with the research objectives (Sugiyono, 2019). In this context, respondents were selected based on their roles in port operations, which form the primary focus of this study.

### 3.5. Data Collection

Data were collected using questionnaires distributed directly to respondents. The questionnaire consists of three main sections:

1) Occupational Health and Safety (OHS)
   Measures employees' perceptions of workplace conditions, safe behaviors, and the psychological atmosphere in the workplace.


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2) Work Environment
   Assesses lighting, air temperature, noise levels, and workplace safety.
3) Work Productivity
   Evaluates efficiency, quality, and employees' capability in completing tasks.

### 3.6. Research Instrument

The questionnaire was developed based on indicators adapted from previous literature. The validity and reliability of the instrument were tested before use to ensure that it consistently and accurately measures the research variables. Validity was assessed using item-total correlation analysis, while reliability was tested using Cronbach's Alpha, with a cut-off value of ≥ 0.7.

### 3.7. Data Analysis Technique

Collected data were analyzed using Structural Equation Modeling-Partial Least Square (SEM-PLS). This technique was chosen for its ability to test causal relationships between variables with a relatively small sample size. The analysis steps include:

1) Measurement Model Evaluation
   To assess the validity and reliability of the constructs for each variable.
2) Structural Model Evaluation
   To test the causal relationships between OHS, the work environment, and productivity.
3) Hypothesis Testing
   Research hypotheses were tested using path coefficients and p-values. A hypothesis is accepted if the p-value < 0.05.

## 4. Results

### 4.1. Respondent Characteristics

Pelabuhan Indonesia II PT (Persero) Tanjung Pandan Branch (IPC Tanjung Pandan) plays a strategic role as a logistics hub on Belitung Island. This study involved 37 respondents, comprising operational employees with characteristics distributed as shown in **Table 1**.

**Table 1. Respondent Characteristics**

| Variable | Category | Frequency | Percentage (%) |
|---|---|---|---|
| Gender | Male | 23 | 62.16 |
| | Female | 14 | 37.84 |
| Age | < 25 Years | 5 | 13.51 |
| | 25–35 Years | 12 | 32.43 |
| | 36–45 Years | 7 | 18.92 |
| | > 45 Years | 13 | 35.14 |
| Education | High School | 7 | 18.92 |
| | Diploma | 13 | 35.14 |
| | Bachelor's Degree (S1) | 12 | 32.44 |
| | Master's Degree (S2) | 5 | 13.52 |
| Work Experience | < 1 Year | 7 | 18.92 |
| | 1–5 Years | 12 | 32.43 |


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| Variable | Category | Frequency | Percentage (%) |
|---|---|---|---|
| | 5–10 Years | 7 | 18.92 |
| | > 10 Years | 11 | 29.73 |
| Employment Status | Contract | 9 | 24.32 |
| | Permanent | 19 | 51.35 |
| | Outsourced | 9 | 24.32 |

**Table 1** illustrates that most respondents hold permanent employment status (51.35%). Most respondents are male (62.16%), aged over 45 years (35.14%), and have a Diploma-level education (35.14%). The predominance of permanent employees reflects the workforce stability at the port.

### 4.2. Occupational Health and Safety (OHS)

The assessment of OHS was conducted using eight indicators, as summarized in **Table 2**.

**Table 2. Respondents' Responses to OHS Indicators**

| No | Indicator | Average Score | Category |
|---|---|---|---|
| 1 | Neat and complete arrangement of work equipment | 3.11 | Moderate |
| 2 | Adequate lighting system | 3.30 | Moderate |
| 3 | Attention to the condition of work equipment | 3.24 | Moderate |
| 4 | Mandatory use of personal protective equipment | 3.16 | Moderate |
| 5 | Use of standardized work procedures | 3.27 | Moderate |
| 6 | Security of work equipment | 3.19 | Moderate |
| 7 | Employees did not feel under pressure while working. | 3.14 | Moderate |
| 8 | Comfort in performing work | 3.19 | Moderate |

**Table 2** is accompanied by a bar chart illustrating the distribution of average scores for OHS indicators. The overall average score of 3.20 indicates that the implementation of OHS is categorized as moderate. The indicator for adequate lighting received the highest score (3.30), whereas the arrangement of work equipment received the lowest score (3.11), suggesting increased attention to equipment organization.

### 4.3. Work Environment

The work environment was assessed using 12 indicators, as presented in **Table 3**.

**Table 3. Respondents' Responses to Work Environment Indicators**

| No | Indicator | Average Score | Category |
|---|---|---|---|
| 1 | Workplace lighting | 3.27 | Moderate |
| 2 | Natural lighting from sunlight | 3.05 | Moderate |
| 3 | Air circulation | 3.32 | Moderate |
| 4 | Comfortable room temperature | 3.27 | Moderate |


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| No | Indicator | Average Score | Category |
|---|---|---|---|
| 5 | Noise control | 3.30 | Moderate |
| 6 | Room colors that inspire work enthusiasm | 3.35 | Moderate |
| 7 | Employee workspace | 3.19 | Moderate |
| 8 | Security of work facilities | 3.14 | Moderate |
| 9 | Workplace cleanliness | 3.26 | Moderate |
| 10 | Availability of work tools | 3.21 | Moderate |
| 11 | Employee insurance | 3.08 | Moderate |
| 12 | Work atmosphere that supports productivity | 3.20 | Moderate |

The overall average score of 3.23 indicates that the work environment is moderate. Among the indicators, air circulation received the highest score (3.32), followed by room colors that inspire work enthusiasm (3.35), underscoring the importance of aesthetic management in enhancing productivity. Conversely, natural lighting from sunlight received the lowest score (3.05), highlighting the need for improvement in this area.

### 4.4. Work Productivity

Work productivity was assessed using 12 indicators, as summarized in **Table 4**.

**Table 4. Respondents' Responses to Work Productivity Indicators**

| No | Indicator | Average Score | Category |
|---|---|---|---|
| 1 | Task execution performed well | 3.24 | Moderate |
| 2 | Improvement in work quality | 3.00 | Moderate |
| 3 | Effective time utilization | 3.22 | Moderate |
| 4 | Ability to complete tasks independently | 3.18 | Moderate |
| 5 | Ability to meet deadlines | 3.21 | Moderate |
| 6 | Satisfaction with work outcomes | 3.19 | Moderate |
| 7 | Teamwork in completing tasks | 3.23 | Moderate |
| 8 | Utilization of work facilities and infrastructure | 3.21 | Moderate |
| 9 | Innovation in completing tasks | 3.15 | Moderate |
| 10 | Improvement in the quality of work outcomes | 3.35 | Moderate |
| 11 | Responsibility in task completion | 3.20 | Moderate |
| 12 | Decision-making in task execution | 3.17 | Moderate |

The overall average score of 3.20 indicates that work productivity is moderate. The indicator "improvement in the quality of work outcomes" achieved the highest score (3.35), while "improvement in work quality" received the lowest score (3.00), highlighting the need for enhancements in this area.


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### 4.5. SEM-PLS Analysis

This study employs the Partial Least Square (PLS) method to analyze the relationships among Occupational Health and Safety (OHS), the work environment, and work productivity at Pelabuhan Indonesia II PT Tanjung Pandan Branch. The analysis includes:

1) Measurement Model (Outer Model): To evaluate the validity and reliability of the indicators.
2) Structural Model (Inner Model): To assess the relationships among latent variables.

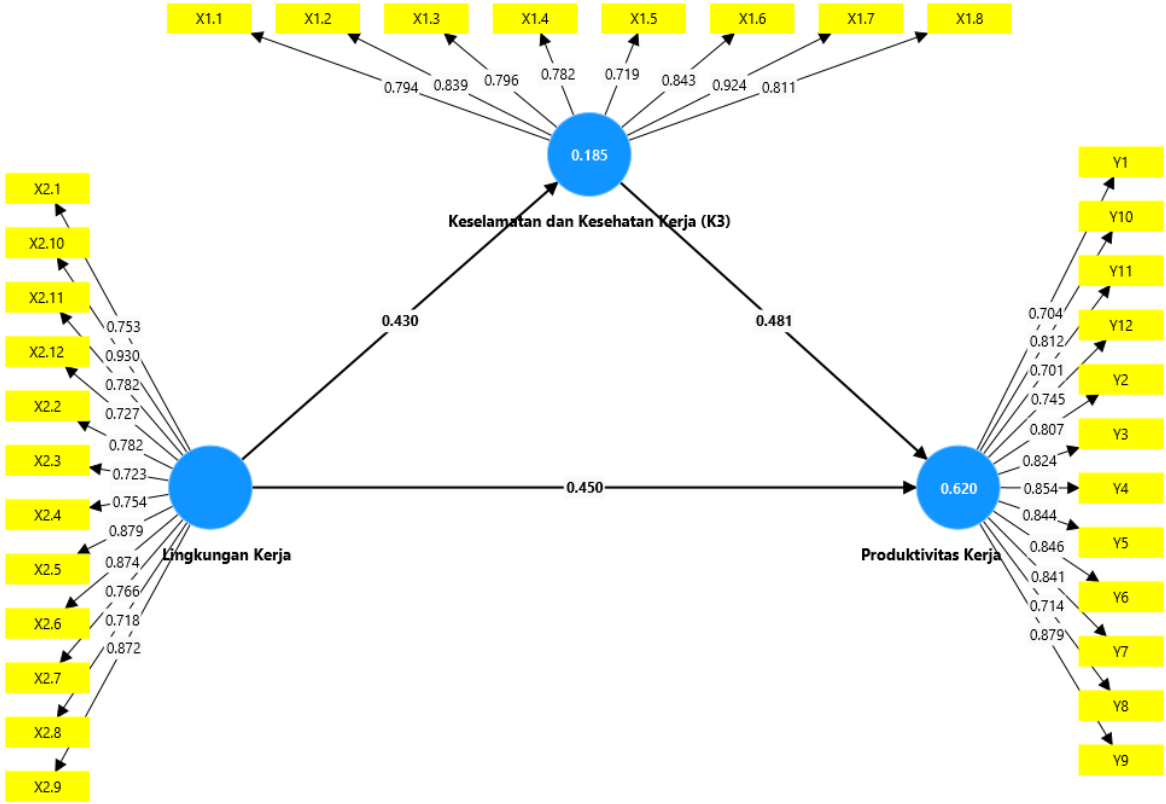


**Figure 2. Standardized Coefficients of the Structural Model**
Source: SmartPLS 4.0 Data Analysis, 2024

**Figure 2** illustrates the relationships between latent variables and their respective indicators. All indicators demonstrate loading factor values above 0.7, significantly representing their associated latent variables.

#### 4.5.1. Measurement Model (Outer Model)

The measurement model evaluates the extent to which the indicators (manifest variables) validly and reliably represent the latent variables (research constructs). The analysis results indicate the following:

1) All indicators have loading factor values > 0.70, demonstrating good convergent validity.
2) The Average Variance Extracted (AVE) values > 0.50, confirming adequate validity for each construct.
3) The Composite Reliability and Cronbach's Alpha values are> 0.70, indicating that the constructs meet the required reliability standards.

The measurement results are presented in the following table:


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**Table 5. Outer Loadings (Measurement Model)**

| Indicator | Occupational Health and Safety (OHS) | Work Environment | Work Productivity |
|---|---|---|---|
| X1.1 | 0.772 | - | - |
| X1.2 | 0.809 | - | - |
| X1.3 | 0.875 | - | - |
| X2.1 | - | 0.817 | - |
| X2.2 | - | 0.837 | - |
| Y1 | - | - | 0.833 |
| Y2 | - | - | 0.835 |

Based on the table above, all indicators meet the criteria for validity and reliability, making them suitable for further analysis.

### 4.5.2. Structural Model (Inner Model)

The structural model evaluates the relationships among latent variables in explaining the dependent variable. The analysis results are as follows:

1) R-Square ($R^2$)
   The dependent variable, work productivity, is explained by OHS and the work environment by 89.2% ($R^2 = 0.892$), indicating that the model has strong predictive power.
2) F-Square (Effect Size)
   - The effect of OHS on work productivity: 0.569 (large).
   - The effect of the work environment on work productivity: 0.691 (large).

**Table 6. R-Square and F-Square (Effect Size)**

| Dependent Variable | R-Square | Independent Variable | F-Square (Effect Size) | Category |
|---|---|---|---|---|
| Work Productivity | 0.892 | Occupational Health and Safety (OHS) | 0.569 | Large |
| | | Work Environment | 0.691 | Large |

These results highlight that both OHS and the work environment significantly affect work productivity, with the work environment demonstrating a slightly larger effect size.

### 4.5.3. Hypothesis Testing

The path diagram in **Figure 3** visually represents the relationships among latent variables and the strength of their influences. This model examines the relationships between Occupational Health and Safety (OHS), the work environment, and work productivity based on data processed using SmartPLS 4.0.


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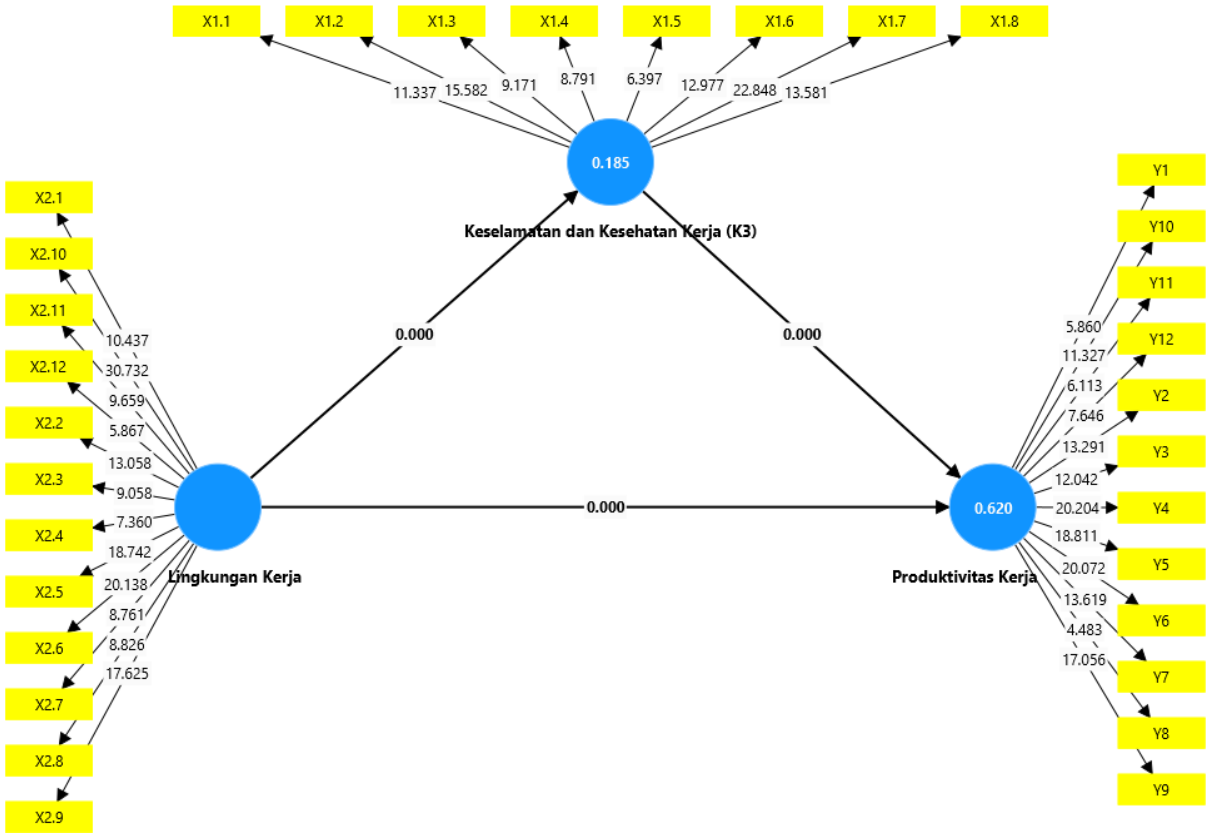


**Figure 3. Path Diagram for Hypothesis Testing**
Source: SmartPLS 4.0 Data Analysis, 2024

Effective Occupational Health and Safety (OHS) management and a well-designed work environment drive employee productivity. The analysis reveals that OHS has a statistically significant effect on productivity, with a p-value of 0.000 (less than 0.05) and a positive path coefficient (β = 0.481). These results underscore the importance of robust OHS practices, including providing personal protective equipment (PPE), regular safety training, standardized, safe work procedures, and consistent monitoring of safety policies. Together, these measures create a secure workplace that minimizes accidents and instills a sense of safety among employees. This enhanced security fosters motivation, focus, and efficiency, improving organizational productivity.

Similarly, the work environment significantly impacts productivity, as indicated by a p-value of 0.000 and a path coefficient (β = 0.450). A conducive work environment supports employee performance by addressing physical and psychological needs. Key elements such as adequate lighting to reduce eye strain, proper ventilation for physical comfort, noise control for a focused atmosphere, and ergonomic workspace arrangements to prevent physical fatigue all contribute to a supportive workplace. These conditions reduce stress and enhance job satisfaction, enabling employees to work more effectively and efficiently. The findings emphasize that optimizing the work environment fosters productivity and enhances overall job performance.

While both OHS and the work environment positively influence productivity, OHS exhibits a slightly stronger effect (β = 0.481 compared to β = 0.450). This reflects OHS's foundational role in ensuring physical and psychological safety, directly impacting employees' ability to perform. In contrast, the work environment provides complementary support by enhancing physical


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comfort and workplace conditions. These factors create a holistic framework that maximizes employee performance and operational efficiency.

Integrating OHS and a conducive work environment generates a powerful synergy that amplifies productivity outcomes. OHS measures reduce workplace disruptions and risks, while an optimized environment enhances focus, comfort, and well-being. Employees who feel safe and comfortable deliver higher-quality work and maintain sustained productivity over time. This synergy underscores the need for a harmonized strategy that addresses safety and environmental factors, particularly in high-risk operational contexts such as ports. Organizations can create a workplace that supports employee well-being, enhances productivity, and ensures long-term success by prioritizing safety and comfort.

## 5. Discussion

### 5.1. The Influence of Occupational Health and Safety (OHS) on Work Productivity

Occupational Health and Safety (OHS) is critical in establishing a safe work environment that supports employee productivity. OHS programs are designed to identify potential risks of workplace accidents and occupational illnesses and implement preventive measures to mitigate these risks (Darmawan, 2021). These measures include providing personal protective equipment (PPE), safety training, and adherence to standardized safety procedures. By ensuring physical protection for employees, OHS programs also contribute to operational efficiency by reducing workplace incidents, leading to lower compensation costs, and minimizing production downtime.

The results of this study show that OHS significantly influences work productivity, as demonstrated by a p-value of 0.000 (< 0.05) and a positive path coefficient ($\beta$ = 0.481). This strong relationship highlights the importance of effective OHS implementation in enhancing employee productivity. Comprehensive OHS programs provide employees with physical and psychological security, enabling them to work with greater focus and efficiency. These findings align with Maslow's hierarchy of needs theory, which positions safety as a fundamental requirement that must be satisfied before individuals can achieve their full potential in productivity. When employees perceive their work environment as safe from risks of accidents or illnesses, they are more confident and effective in performing their tasks, leading to improved productivity.

Beyond direct productivity gains, OHS implementation also offers strategic advantages for organizations. Minimizing workplace accidents fosters employee trust and enhances the company's reputation among the public and business partners. This is particularly significant in high-risk industries like the port sector, where operations often involve heavy equipment, cargo handling, and demanding working conditions. Effective OHS practices ensure operational continuity while also enhancing employee well-being.

The findings of this study are consistent with prior research. OHS implementation at PT. Air Mancur improved work efficiency by reducing workplace accidents (Swatika et al., 2022). Similarly, OHS significantly contributed to employee productivity, where safety training and routine supervision were identified as key factors in creating a safe and productive work environment (Fernández-Muñiz et al., 2007; Lingard, 2007; Zhou et al., 2015). These studies reaffirm the integral role of OHS in human resource management aimed at sustaining workforce productivity.

The impact of OHS on productivity can be analyzed through several perspectives. From an operational standpoint, OHS reduces downtime caused by workplace incidents, ensuring smoother activities. From a cost perspective, effective OHS implementation lowers expenses


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related to compensation, medical treatments, and equipment repairs due to accidents. From the employee's viewpoint, OHS programs enhance motivation and loyalty by addressing their safety and well-being needs. Over time, investing in OHS substantially benefits organizations, improving operational efficiency and workforce satisfaction.

In the port sector, the findings of this study suggest practical steps for enhancing OHS programs. Initiatives such as improving safety training, closely monitoring adherence to work procedures, and providing adequate safety facilities are essential for reducing accident risks while boosting productivity. By optimizing OHS implementation, companies comply with legal obligations and add value through higher workforce productivity and operational efficiency.

OHS is not merely a tool for protecting employees but a strategic investment that supports long-term productivity and organizational success. Strengthening safety training, conducting regular workplace inspections, and strictly monitoring OHS procedures are vital measures for fostering a safer and more conducive work environment that maximizes employee productivity.

### 5.2. The Influence of the Work Environment on Work Productivity

A supportive work environment is crucial in fostering a productive workplace atmosphere. The work environment extends beyond physical aspects to include social and psychological factors that influence employees' experiences at work. Regarding physical factors, adequate lighting, proper ventilation, and comfortable room temperatures are vital in ensuring employee comfort. For instance, good lighting helps reduce eye strain and enhances employee concentration, while proper ventilation ensures healthy air circulation, which is essential for physical comfort during work. Ergonomic workspace design further prevents physical fatigue and injuries caused by uncomfortable working positions. These optimal physical conditions enable employees to work more efficiently and effectively.

Beyond physical aspects, social factors also significantly impact work productivity. Positive relationships among coworkers and supportive management contribute substantially to employees' psychological well-being. When employees feel supported by management and have harmonious working relationships with colleagues, they are more motivated and enthusiastic about achieving shared goals. Psychological factors, such as feeling valued, experiencing fairness in task distribution, and receiving recognition for performance, also enhance employees' morale. This aligns with the previous research perspective, which emphasizes balancing physical and social aspects in the work environment to support productivity (Masitoh et al., 2020).

The findings of this study indicate that the work environment significantly influences employee productivity, with a p-value of 0.000 ($p < 0.05$) and a positive path coefficient ($\beta = 0.450$). This positive relationship suggests that higher-quality work environments lead to increased employee productivity. A conducive work environment reduces work-related stress, enhances concentration, and creates a supportive atmosphere for work. A comfortable and safe work environment is critical in ports, where jobs often involve physically demanding activities. Factors such as lighting in cargo handling areas, warehouse ventilation, and noise control from heavy machinery can directly affect employees' efficiency and effectiveness.

This study aligns with the previous findings, which demonstrated that a conducive work environment improves productivity across various industrial sectors (Ajala, 2012; Taiwo, 2010; Vischer, 2007). The study highlighted that organizations focusing on enhancing the work environment—by addressing physical comfort, strengthening social relationships in the workplace, and creating a supportive work atmosphere—reap the benefits of increased


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employee productivity. Meeting employees' needs boosts productivity and increases employee retention rates, as workers feel more satisfied and valued.

The impact of the work environment on productivity can be analyzed from multiple perspectives. From a physical perspective, an optimal environment helps employees complete tasks faster and with fewer errors. From a social perspective, positive employee relationships foster more effective collaboration, ultimately improving team productivity. From a psychological perspective, a positive work atmosphere enhances employees' sense of ownership and motivation toward their work. Combining these three aspects creates a supportive environment that enables optimal performance.

The implications of this study suggest that organizations should invest resources in improving the quality of the work environment. Measures such as adjusting lighting, installing better ventilation systems, controlling noise levels, and training managers to strengthen workplace interpersonal relationships can significantly impact employee productivity. For example, organizations could regularly evaluate physical workplace conditions, provide adequate rest facilities, and foster a collaborative work culture in the port context. By improving the quality of the work environment, companies not only enhance employee productivity but also build a positive reputation as a workplace that prioritizes employee well-being. These findings affirm that a conducive work environment is key to managing human resources and overall operational efficiency.

### 5.3. The Combined Influence of Occupational Health and Safety (OHS) and Work Environment on Work Productivity

Occupational Health and Safety (OHS) and the work environment are two fundamental elements of human resource management that simultaneously affect employee productivity. OHS programs protect employees from workplace accidents and occupational illnesses, while a conducive work environment fosters a setting where employees can work comfortably and efficiently (Santoso & Oktafien, 2024; Teufer et al., 2019). Combining these two aspects creates a synergy that significantly enhances employee performance and productivity. A safe and comfortable work environment forms a critical foundation for enabling employees to achieve their full potential in operationally challenging sectors, such as ports.

The findings of this study reveal that OHS and the work environment have a significant simultaneous impact on work productivity. With an R-square value of 0.892, these two variables can explain 89.2% of the variance in employee productivity. This underscores the substantial contribution of OHS implementation and improving work environment quality to employee productivity. Furthermore, the F-statistic value of 27.74, which far exceeds the F-table value of 3.28, indicates that the relationship between these two independent variables (OHS and the work environment) and work productivity is highly statistically significant. These results emphasize that organizations cannot overlook either factor, as their simultaneous presence yields a much greater impact than focusing on one in isolation.

From a practical perspective, effective safety programs prevent accidents that could disrupt employee productivity, while a comfortable work environment boosts efficiency and morale. OHS programs that include providing personal protective equipment (PPE), safety training, and monitoring of safe work procedures foster a sense of security among employees. This sense of security alleviates anxiety about accident risks and enhances focus and motivation. On the other hand, the work environment, encompassing factors such as adequate lighting, proper ventilation, noise control, and ergonomic workspace design, creates a supportive atmosphere that encourages productivity. When these two elements are managed together, organizations


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can establish a work environment that is not only safe but also conducive to optimal performance.

This study aligns with previous findings, which concluded that effective OHS implementation and a positive work environment significantly impact employee productivity (Shabani et al., 2023; Voordt & Jensen, 2023). Their research highlighted that organizations integrating OHS programs with improvements in workplace conditions could achieve simultaneous enhancements in operational efficiency and employee satisfaction. This underscores that OHS and the work environment should not be viewed as separate elements but as complementary components that collectively support organizational success.

In the context of ports, where work involves high risks, such as operating heavy machinery and cargo handling, the integration of OHS and a supportive work environment becomes even more critical. OHS implementation reduces the risk of injuries and accidents, while a comfortable work environment provides the physical and psychological support employees need to perform better. For instance, adequate lighting in cargo handling areas improves visibility, while proper warehouse ventilation ensures comfort for employees working long hours. Together, these aspects create a work environment conducive to high productivity.

The results of this study suggest that organizations should adopt an integrated management approach to oversee both OHS and the work environment. Strategies such as regular safety training, evaluation of work procedures, and investments in better workplace facilities can significantly impact employee productivity. By managing these two elements simultaneously, organizations can enhance workforce productivity and create a work environment that supports overall employee well-being.

The findings affirm that organizations concurrently prioritize workplace safety and environmental quality. By focusing on these aspects, companies can create a synergy that supports employee productivity and ensures long-term business sustainability. These findings provide practical guidance for management to continuously improve OHS programs and the work environment as part of a core strategy for achieving operational success and employee satisfaction.

## 6. Conclusion

Based on the data analysis and discussion, it can be concluded that Occupational Health and Safety (OHS) and the work environment are crucial in enhancing employee productivity at Pelabuhan Indonesia II PT (Persero) Tanjung Pandan Branch.

OHS has a significant influence on employee productivity. Implementing OHS measures, such as providing personal protective equipment (PPE), conducting well-planned safety training, and adhering to robust standard operating procedures (SOPs), creates a safe and low-risk work environment. This ensures employees feel physically and psychologically secure, enabling them to work with greater focus and optimal productivity. Ensured workplace safety also promotes operational efficiency by minimizing disruptions caused by workplace accidents, directly benefiting the organization.

Additionally, the work environment also significantly impacts employee productivity. A comfortable work environment, characterized by adequate ventilation, sufficient lighting, and effective noise control, fosters a conducive atmosphere for efficient work. Optimal physical conditions help employees perform more effectively, reduce stress, and boost motivation. These factors enhance the quality of work output and increase job satisfaction, a critical component in sustaining long-term productivity.


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Simultaneously, OHS and the work environment have a significant combined impact on employee productivity. Integrating these factors creates ideal working conditions that protect employees physically from workplace risks while supporting their psychological well-being. The synergy between OHS and the work environment results in a safe, comfortable, and conducive workspace, promoting individual productivity and improving overall operational efficiency. The study findings indicate that 89.2% of the variance in work productivity is explained by the combined effect of OHS and the work environment, demonstrating their strong simultaneous contribution.

Furthermore, the findings reveal that the work environment not only directly affects productivity but also has an indirect influence through OHS. This underscores the importance of comprehensive OHS management as an integral part of strategies to enhance the work environment.

Organizations must continuously improve the implementation of OHS and enhance the quality of the work environment as strategic steps to sustain and increase employee productivity. Strategies such as routine safety training, regular evaluation of work procedures, and investments in better workplace facilities can significantly impact productivity. By managing these two elements simultaneously, organizations can boost workforce productivity and create a work environment that supports employees' overall well-being.

The findings of this study reaffirm the importance of concurrently prioritizing workplace safety and environmental quality. By focusing on these aspects, organizations can achieve a synergy that enhances employee productivity and ensures long-term business sustainability. These findings provide practical guidance for management to continuously improve the quality of OHS programs and the work environment as part of a core strategy for achieving operational success and employee satisfaction.

## 7. Acknowledgment

The authors would like to thank all those who have been willing to cooperate well during this research.

## 8. Declaration of Conflicting Interests

The authors have declared no potential conflicts of interest concerning this article's research, authorship, and/or publication.

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https://doi.org/10.33019/society.v12i2.716