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The Investigation of Safety Climate Using Nordic Safety Climate Questionnaire (Nosacq-50): A Case Study at A Paper Industry

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Abstract

The pulp and paper industry is one of the industries that significantly contributes to the national economy. Indonesia has at least 103 companies in the paper industry sector, with a total paper production capacity of 18.26 million tons per year. The industry has employed 1.36 million workers and generated exports worth USD 7.5 billion in 2021. The paper industry is not only categorized as a labor-intensive industry but also as a high-risk industry. This study aims to analyze the safety climate in the production department of the paper industry in West Java Province, Indonesia. This study involved the participation of 366 individuals in different roles, including managers, supervisors, leaders, officers, and operators, who were interviewed and asked to complete a questionnaire using the NOSACQ-50 method. The NOSACQ-50 method consists of 7 dimensions of safety climate. The results show that all safety climate dimensions scored between 3.38-3.77, which is a perfect level that needs to be maintained and continuously improved. The safety climate score of the paper industry in Indonesia has a similar pattern to the previous research results released by Nordic on its official website but with higher values. The results of this study are consistent with previous research, which posits safety climate as a homogeneous shared perception characteristic of an organization's safety culture.

Keywords: Indonesian, NOSACQ-50, paper industry, safety climate

INTRODUCTION

Occupational safety and health in the workplace are crucial for the sustainability of industrialization. It not only reduces work accidents and injuries but also increases productivity by promoting a healthy and safe work environment. Additionally, it leads to better employee morale, job satisfaction, and retention rates, which are essential for the long-term success of any organization. In addition to production efficiency, it is also necessary to consider the potential increased risk of occupational accidents and occupational diseases, which result in suffering for workers and families and losses for employers the community, and the state. Indonesia already has substantial capital for advancing the national occupational safety and health (OSH) system in the form of regulations and policies, organizations/institutions, human resources, infrastructure, labor inspection system, and parties who play a role, as well as demographic bonuses. The achievement of process indicators has been widely obtained. However, the achievement of outcome indicators is still characterized by high cases of occupational accidents and occupational diseases, with an increasing trend from year to year.

According to data from the Ministry of Manpower of the Republic of Indonesia (2022), in the last 3 years, the number of work accidents in 2021 in Indonesia is 234 thousand cases, or an increase of 11.18% compared to 2019. The complete data profile of work accidents in Indonesia can be seen in Table 1.

Table 1
Lagging indicator achievement

Year	Number of cases	Ascension	Number of dead	Cost (Trillion Rupiah)
2019	210,789	37,374(22.2%)	4,007	1.58T
2020	221,740	10,951(5.1%)	3,431	1.56T
2021	234,370	12,630(5.6%)	6,552	1.79T

Source: Ministry of Manpower of the Republic of Indonesia, (2022)

Safety culture is recommended to be a corporate culture component (Cooper, 2000). A good organization can identify and capture potential hazards before an accident occurs. Overcoming accidents in the workplace can be done with safety approach efforts. The safety approach can be done by implementing an effective safety management system. A widely used safety approach method that focuses on human factors is through safety climate. The importance of safety climate in the workplace cannot be overstated. A positive safety climate can influence workers' behavior and encourage their involvement in safety practices. When workers perceive that safety is a top priority for their organization, they are more likely to engage in safe work practices and participate in safety-related activities. This perception is often referred to as safety climate, which is a term used to describe the shared attitudes, beliefs, perceptions, and values that employees have regarding safety in the workplace. A positive safety climate can have a significant impact on employee behavior and can lead to a safer and more productive work environment. In addition, a positive safety climate can help organizations identify potential problems before they escalate into incidents, enabling them to take preventive action to avoid accidents and injuries.

Furthermore, a positive safety climate provides a focal point for making changes to improve safety in the industry sustainably. By identifying areas where safety can be improved and implementing targeted interventions, organizations can create a culture of safety that promotes safe work practices and encourages workers to be proactive in identifying potential hazards and reporting incidents. This, in turn, can help reduce the incidence of workplace accidents and injuries, creating a safer and more productive work environment for all. Therefore, it is essential to maintain and improve safety climate continuously, not only for the workers' well-being but also for the organization's sustainability (Health and Safety Executive, 1997).

Safety climate is often mentioned as an indicator related to outcome safety. Payne *et al.* (2010) argue that whenever researchers have identified safety climate as a lagging indicator because previous safety outcome measures can influence the subsequent flow of safety climate. In other words, safety climate reflects the current course of safety policy implementation in the workplace and can be used to predict future accidents (Payne *et al.*, 2010). Safety climate refers to the perceptions of employees regarding the overall safety conditions in their workplace, including the policies, procedures, and practices that impact safety. It reflects the shared beliefs, attitudes, and values of workers and management regarding the importance of safety and the extent to which it is prioritized within the organization. Safety climate can vary across different industries, workplaces, and even within different departments of the same organization, depending on the specific factors that influence safety in each setting. By measuring safety climate, organizations can identify areas where safety can be improved and take targeted action to create a culture of safety that promotes safe work practices and reduces the incidence of workplace accidents and injuries (Ma and Yuan, 2009; Kiani *et al.*, 2022). The safety climate is relatively unstable and highly dependent on psychological conditions (Jarvis, Virovere and Tint, 2014). Nevertheless, the safety climate is accurately evaluated. In that case, the results can effectively identify and assess potential problems in the workplace, improve safety behaviors, and reduce the frequency and severity of accidents (Zohar, 2000).

The safety climate in the industry needs to be analyzed to determine workers' perceptions of existing Occupational Health and Safety (OHS) policies. This analysis can show coordination between managerial and labor parties in implementing OHS policies. The safety climate can be analyzed using several questionnaire methods, including the Loughborough Safety Climate Assessment Toolkit (LSCAT), Safety Climate Tools (SCT), Safety Health of Maintenance Engineering (SHoMe) Tool, Score Your Safety Culture Checklist, and Nordic Occupational Safety Climate Questionnaire (NOSACQ-50) (Kines *et al.*, 2011). This study uses an instrument or questionnaire from the NOSACQ-50. The Nordic team developed this questionnaire, the most accessible and widely used one (Kines *et al.*, 2011). The questionnaire has also been developed and is available on the official Nordic website to analyze the questionnaire from data coding to manual data analysis (Det Nationale Forskningscenter for Arbejdsmiljø, 2022).

The Nordic Occupational Safety Climate Questionnaire (NOSACQ-50) method is a versatile tool that can be used in a variety of settings to measure safety climate. It can be used in cross-sectional studies to compare safety climate within and between countries, organizations, multinational companies, departments, and groups. It can also be used in longitudinal studies to evaluate the impact of safety climate interventions over time. The NOSACQ-50 method is widely recognized as a valid and reliable instrument for assessing safety climate, and it has been translated into multiple languages to facilitate its use in different cultural contexts. It can also be used in longitudinal studies to evaluate the impact of safety climate interventions over time. The NOSACQ-50 method is a valuable tool for assessing safety climate across different settings and can provide insights into areas where improvements are needed to enhance safety in the workplace. Its flexibility and ability to be used in various types of research make it a useful tool for researchers and practitioners in the field of occupational health and safety (Kines *et al.*, 2011).

Another study, comparable to this one, examined the safety climate perceptions of construction workers in Bogota, Colombia, working for 26 commercial construction companies, and identified differences in perceptions across various dimensions. Specifically, the study showed that managers had higher safety climate scores than supervisors and construction workers. Despite this, no significant statistical relationship was established between the safety climate perceptions of the various groups (Marín *et al.*, 2019). Evaluation of safety climate in steel companies in Qazvin province of Iran, the results NOSACQ-50 has a satisfactory level of validation to measure safety climate in the working population in Iran (Yousefi *et al.*, 2016).

The research was conducted at a paper mill located in West Java province, Indonesia. This factory produces many types of paper and employs many workers, so it is categorized as a labor-intensive industry. In addition to being categorized as a labor-intensive industry, paper companies are also categorized as high-risk industries. In its production activities, the paper industry uses many hazardous chemicals, including Chlorine ($C_2OH_{16}N_4$), Hydrogen (H_2), Sodium Hydroxide (NaOH) often called Caustic Soda, Hydrochloride Acid (HCl), Sodium Hypochlorite (NaOCl), Sulfuric Acid (H_2SO_4), and others, which if the improper handling and use procedures will be hazardous to humans. From the data above, the company has a total quantity of Chlorine chemicals of 160 tons and Hydrogen of 20 tons, where the NAK is set at 10 tons (Ministry of Manpower of the Republic of Indonesia, 1999). The use of large-scale machines, both in size, speed, energy, and production capacity. The use of complex machinery because each paper production process uses different machines, starting from the raw material preparation process, paper machine, finishing area, and storage warehouse. The paper mill has tight operating hours: 24 working hours per day, 7 days per week with shift work arrangements (morning, afternoon, evening), and consists of only 3 work groups (3 groups of 3 shifts). This work shift model has irregular holiday arrangements, so employees have a short time off. During the production work process, it is inseparable from the risks and hazards that can cause work accidents.

Good safety climate conditions will affect productivity in achieving company targets. In addition, it is also important to know the description of the condition of workers and the work situation experienced by workers so that it can be used as a consideration in determining company policies, especially in the field of K3. This study aimed to analyze the work safety climate of paper mills in the West Java province of Indonesia and analyze the effect of respondent characteristics on the safety climate.

METHOD

A common practice is to measure the safety climate using a self-reporting questionnaire administered through a survey approach. This method involves asking individuals to provide their perceptions and opinions on various aspects of the safety climate in the workplace, such as management commitment to safety, employee participation in safety, and perceptions of risk. Self-reporting questionnaires are widely used in safety climate research because they are cost-effective, easy to administer, and can provide valuable insights into how individuals perceive safety in their workplace. However, it is important to note that self-reporting questionnaires may be subject to biases, such as social desirability bias, and may not always accurately reflect the actual safety climate in the workplace. Therefore, it is important to supplement questionnaire data with other sources of information, such as observation and incident data, to obtain a more comprehensive understanding of the safety climate (Cooper, 2002).

The results of safety climate surveys produce a picture of employee perceptions of the value of safety in the work environment. They are distinguished by individual attitudes, beliefs, and feelings about particular objects or activities (Neal and Griffin, 2002), as an indicator of the overall safety culture in an organization (Zohar, 2010). Safety climate is a multidimensional concept, and it is influenced by a variety of factors, including organizational policies, management practices, communication, training, and worker attitudes and perceptions. To accurately measure safety climate, it is essential to use instruments that can capture this multidimensional nature and provide a comprehensive picture of the prevailing safety conditions in the workplace. The Nordic Occupational Safety Climate Questionnaire (NOSACQ-50) is one such instrument that is widely used and is valid and reliable for measuring safety climate across different settings. However, it is also important to recognize that safety climate is a dynamic concept that can change over time, and regular assessments using appropriate instruments are necessary to ensure that organizations are taking appropriate steps to improve safety and prevent workplace accidents and injuries (Marín *et al.*, 2019).

The NOSACQ-50 was developed by a team of researchers from the Nordic countries, who drew on organizational and safety climate theory, as well as a psychological theory, to develop the questionnaire. They also incorporated feedback from previous research studies and reflections on the continuous development process of other questionnaires. The NOSACQ-50 consists of 50 items that assess seven dimensions of safety climate: management commitment, safety communication, priority of safety, safety training, safety routines, trust in colleagues, and support for safety. The questionnaire is valid and reliable for measuring safety climate in a variety of settings and has been used in numerous research studies and practical applications. It can thus be benchmarked at group, company, sectoral, national, and international levels (Det Nationale Forskningscenter for Arbejdsmiljø, 2022).

The NOSACQ-50 questionnaire consists of 50 statement items, which are divided into seven dimensions, including management safety priority, commitment, and competence; management safety empowerment; management safety justice; workers' safety commitment; workers' safety priority and risk non-acceptance; safety communication, learning, and trust in co-worker safety competence; and workers' trust in the efficacy of safety systems. These dimensions capture various aspects of the safety climate in the workplace and can help organizations identify areas for improvement in their safety policies and practices (Kines *et al.*, 2011; Bergh, 2011). The first three dimensions are related to the perception of safety management in the organization, and the remaining four dimensions are related to the perception of the workgroup (Kines *et al.*, 2011; Yousefi *et al.*, 2016; Zohar and Luria, 2005).

Studies have pointed out that differences in the structural dimensions of safety climate may be influenced by not only country and industry differences but also language and cultural differences. These differences may reflect variations in sample populations, question generalization, and construct labeling. Therefore, when comparing safety climate dimensions across different settings, it is important to consider the influence of cultural and linguistic factors and to exercise caution when making cross-cultural comparisons. Researchers should be aware of potential sources of bias in safety climate research, including differences in language, culture, and other contextual factors that may influence the interpretation of safety climate data (Flin *et al.*, 2000). By taking these factors into account, researchers can improve the accuracy and reliability of safety climate measurements and enhance the validity of cross-cultural comparisons (Cooper and Phillips, 2004).

The NOSACQ-50 method contains 30 positive and 20 negative questionnaire statements. The question in the questionnaire is scored based on a Likert scale. Positive questions are said to be good if they give an answer that agrees or strongly agrees. As for negative questions, it is said to be good if the answer disagrees or strongly disagrees. The scoring mechanism of the NOSACQ-50 safety climate questionnaire follows the rule of scoring questions 4 = strongly agree, 3 = agree, 2 = disagree, and 1 = strongly disagree for each positive question. Items with negative questions are reverse-scored (Bergh, 2011). How to score positive and negative statements can be seen in Table 2. The score calculation is done by looking at the average value obtained on each question. Table 3 presents the rules of thumb for interpreting the scores of each dimension (Det Nationale Forskningscenter for Arbejdsmiljø, 2022).

Table 2
Assessment of positive and negative statements

	Strongly disagree	Disagree	Agree	Strongly agree
Score for positive items	1	2	3	4
Score for negative items	4	3	2	1
Positive statements	1, 2, 4, 6, 7, 10, 11, 12, 14, 16, 17, 19, 20, 22, 22, 23, 24, 33, 34, 36, 37, 38, 39, 40, 42, 43, 44, 46, 48, 50			
Negative statements	3, 5, 8, 9, 13, 15, 18, 21, 25, 26, 28, 29, 30, 31, 32, 45, 47, 49			

Source: Bergh, (2011)

All questionnaire data analysis was conducted using SPSS version 22 statistical software. The data were checked, cleaned, and tidied before entering the computer. The principle of data analysis was carried out by retaining all factors with an eigenvalue more significant than one. To test the validity of the data, three kinds of tests were required: data sufficiency test, validity test, and reliability test. The Kaiser-Meyer-Olkin (KMO) test is a test conducted to determine the adequacy of data or the feasibility of a factor analysis to be carried out (Milijic *et al.*, 2013). The KMO test scale ranges from 0 to 1. High values (between 0.5 - 1.0) identify appropriate factor analysis. If it is below 0.5, it indicates that factor analysis is not appropriate to apply. The validity test is carried out to measure the accuracy of the instrument used in a study. The validity test helps know whether there are questions or statements on the questionnaire that must be removed because they are considered irrelevant. If the value of r count > r table, the data is declared valid, where the value of r count = the value of the Pearson Correlation Coefficient (Sugiyono, 2014).

Table 3
Interpretation of NOSACQ-50

Value	Interpretation
≤ 2.70	Low level, lowest, and requires revision: This indicates that the level of the variable is very low and needs significant improvement or revision.
2.70 – 2.99	The level is quite low, and requires improvement: This suggests that the level of the variable is low, but not at its lowest point. There is a need for improvement to bring it to an acceptable level.
3.00 – 3.30	Good enough, requires slight improvement: This implies that the level of the variable is satisfactory, but there is still some room for improvement.
≥ 3.30	Good level, which must be maintained and improved continuously: This indicates that the level of the variable is already good, and the goal is to maintain this level and continuously improve it.

Source: Det Nationale Forskningscenter for Arbejdsmiljø, (2022)

Reliability is an essential feature of safety climate (Saedi, Majid and Isa, 2021). A variable is reliable if the respondent's answer is consistent or stable over time. The threshold in assessing or testing each variable is accurate using the calculation of Cronbach's alpha coefficient (Milijic *et al.*, 2013). The variable is declared reliable if it has a Cronbach's Alpha coefficient > 0.06 (Ghozali, 2008; Sarstedt, Ringle and Hair, 2020). Cronbach's alpha is a measure of internal consistency reliability, which assesses how well items in a questionnaire or survey measure the same construct. It is typically used when the items are rated on an internal scale, such as a Likert scale, where respondents indicate their level of agreement or disagreement with a statement. Cronbach's alpha coefficient measures the average correlation between all items in the scale or subscale, indicating how well the items are related to each other and the overall construct being measured. A high Cronbach's alpha coefficient (usually above 0.7) suggests that the items are internally consistent and reliable in measuring the construct of interest (Lin *et al.*, 2008).

Many researchers assume that if the amount of sample data has met the requirements of quantitative analysis (with n = 30), then the data is said to be normally distributed. However, sometimes samples that have reached hundreds also have the opportunity to get a distribution that is not normally distributed. Kolmogorov-Smirnov is used to test normality in large samples (>100), while Shapiro-Wilk for small samples (<100). The one-sample Kolmogorov Smirnov (KS) test can be used to compare a sample distribution with a known distribution, such as the normal distribution, or with another sample distribution. It calculates the maximum difference between the cumulative distribution function of the sample and the expected cumulative distribution function of the theoretical distribution. If the calculated p-value is greater than the chosen significance level (usually 0.05), we fail to reject the null hypothesis that the sample comes from the given distribution. The KS test determines whether the scores in the sample come from a population with a theoretical distribution. The Mann-Whitney test followed them to determine the comparison between respondent groups which has a significance value < 0.05.

Respondent groups that have a significant value < 0.05 indicate that it is at the group level that the source of perceptual differences between workers is so that improvement solutions can be focused on significant respondent groups only. The Spearman correlation test was used to analyze the relationship between safety climate dimensions.

Safety climate scores were calculated and analyzed for each dimension. The purpose of analyzing the dimensions is to determine which questions need to be repaired and improved. After the calculation, the results are displayed as a radar diagram for descriptive analysis based on the position of the leader and worker.

RESULTS AND DISCUSSION

In this study, a total of 366 questionnaires were completed, representing a 100% response rate. The average age of the workers who participated in the survey was 40.94 years, with a standard deviation of 11.04, and their ages ranged from 20 to 60 years old. On average, the workers had 14.08 years of work experience, with a standard deviation of 9.28, and their work experience ranged from 1 year to 35 years. The company has a shift work system, which includes 3 work shifts of 3 work groups, with each work shift lasting 8 hours, including 1 hour of rest.

All participating individuals and departments were selected through random sampling. The survey questionnaire was delivered directly to the workers by the researcher. The survey was conducted between March 2022 and May 2022 at a paper mill in the West Java province of Indonesia. Respondent demographic characteristics are shown in Table 4.

Table 4
Demographic characteristics of the respondents

Characteristics	Leader (n=113)	Worker (n=253)	Total (n=366)
Gender			
Male	73(65%)	232(92%)	305(83%)
Female	40(35%)	21(8%)	61(17%)
Age (years)			
30 or below	1(1%)	70(28%)	71(19%)
31-45	51(45%)	118(47%)	169(46%)
46 or above	61(54%)	65(26%)	126(34%)
Education level			
Senior high school	43(38%)	223(88%)	266(73%)
Undergraduate/diploma	67(59%)	30(12%)	97(27%)
Master	3(3%)	0(0%)	3(1%)
Experience in industry			
Less than 5 years	1(1%)	69(27%)	70(19%)
6-15 years	36(32%)	119(47%)	155(42%)
16 years or more	76(67%)	65(26%)	141(39%)

Note: Percentages may not add up to 100 due to rounding

The KMO test results obtained a 0.520 > 0.5, so the factor analysis process can continue. With N = 366, received r table = 0.1025, and the Pearson correlation coefficient value of all items is positive (+) > 0.1025, it can be concluded that all measurement instruments in this study are valid. The reliability test results show that Cronbach's alpha, a reliability index, ranges from 0.605 to 0.823. The most considerable reliability test value is Dim 6 - Safety communication, learning, and trust in co-worker safety competence of 0.823. While the lowest reliability test value is Dim 5 - Workers' safety priority and risk non-acceptance of 0.605. Table 5 presents the results of the NOSACQ-50 safety climate dimension reliability test.

Table 5
Cronbach's alpha coefficient for each dimension of safety climate

Dimension of safety climate	Cronbach's Alpha	N of Items
Dim 1 - Management safety priority, commitment, and competence	0.740	9
Dim 2 - Management safety empowerment	0.796	7
Dim 3 - Management safety justice	0.720	6
Dim 4 - Workers' safety commitment	0.697	6
Dim 5 - Workers' safety priority and risk non-acceptance	0.605	7
Dim 6 - Safety communication, learning, and trust in co-worker safety competence	0.823	8
Dim 7 - Workers' trust in the efficacy of safety systems	0.745	7

Note: N = number of question items

To examine the correlation relationships between the different dimensions of safety climate, the study used Spearman's correlation coefficient. This statistical test is commonly used to measure the degree of association between two variables and is particularly useful when the variables being analyzed are ordinal or when the assumptions of normality are not met. By using Spearman's correlation coefficient, the study was able to identify any significant positive or negative correlations between the various dimensions of safety climate, providing insights into how these dimensions are related to each other and contributing to a more comprehensive understanding of safety climate in the workplace. The correlations between the seven safety climate factors and the general safety climate are shown in Table 6. Due to the large sample size, each correlation coefficient is significant at the 0.01 level, but most of the coefficients are lower than 0.5, especially for Dim 5 - Workers' safety priority and risk non-acceptance; the rs coefficient value is too small, indicating practical importance. However, the correlation coefficient value is still positive, so the relationship is unidirectional.

Table 6
Spearman's correlation coefficient among safety climate dimensions

	Dim1	Dim2	Dim3	Dim4	Dim5	Dim6	Dim7
Dim 1	1	0.620*	0.564*	0.435*	0.327*	0.448*	0.517*
Dim 2		1	0.682*	0.526*	0.303*	0.611*	0.601*
Dim 3			1	0.475*	0.308*	0.607*	0.577*
Dim 4				1	0.298*	0.460*	0.502*
Dim 5					1	0.322*	0.418*
Dim 6						1	0.664*
Dim.7							1
SC	0.730*	0.777*	0.772*	0.600*	0.643*	0.731*	0.762*

**Correlation significant at the 0.01 (1%) level*
Note: Bold numbers indicate a significant strong correlation; SC: Safety Climate

Based on Table 6, the Spearman's correlation coefficient value of Dim 2, Dim 3, and Dim 7 has a sig value (2-tailed) = 0.000, and the coefficient value rs > 0.76, so it is said to have a strong relationship with the safety climate. While Dim 1, Dim 4, Dim 5, and Dim 6 have a sig value (2-tailed) = 0.000, the rs coefficient value is 0.51-0.75, so it can be said to have a strong relationship with the safety climate.

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Based on the normality test using the Kolmogorov-Smirnov method, data for all dimensions of the safety climate produced a significance value (Asymp. Sig. (2-tailed)) < 0.05. All safety climate dimensions are not normally distributed, and parametric statistics cannot be used as data testing for the next stage. A non-parametric test was chosen to test the differences between the leader and worker groups.

The Mann-Whitney test is a non-parametric statistical test that can be used to compare two independent groups when the dependent variable is not normally distributed. It is an alternative to the independent samples t-test, which assumes normality and equal variances. The Mann-Whitney test is also known as the Wilcoxon rank-sum test or the Wilcoxon-Mann-Whitney test. Based on the output of the "Test Statistics" Mann Whitney test for the leader and worker groups, it is known that the Asymp. Sig. (2-tailed) value of 0.057 > 0.05, then "Hypothesis Rejected". Therefore, there is no significant difference, so there is no effect of job position (leader or worker) on the safety climate score in the paper industry.

Based on statistical science, ordinal scales use the median to calculate the median value of respondents' answers. The median can be determined for all scales except nominal scales. However, referring to the NOSACQ-50 method on its official website (Det Nationale Forskningscenter for Arbejdsmiljø, 2022), respondent answer data is calculated using the mean (Susanto, Prastawa and Oktaningrum, 2019). On a scale from 1 to 4, the safety climate measurement based on the leader group has a mean value of 3.69, and the worker group has a mean value of 3.61. The results show that both have a mean value of perceived safety climate > 3.30, which means the value is excellent. Table 7 presents the overall safety climate score.

Table 7
Mean values of responses

Dimension of safety climate	All respondent mean (SD) n=366	Leader mean (SD) n=113	Worker mean (SD) n=253
Dim 1	3.64(0.76)	3.71(0.76)	3.62(0.76)
Dim 2	3.65(0.70)	3.68(0.70)	3.64(0.70)
Dim 3	3.56(0.82)	3.62(0.82)	3.53(0.82)
Dim 4	3.77(0.64)	3.81(0.64)	3.76(0.64)
Dim 5	3.38(1.05)	3.50(1.05)	3.33(1.05)
Dim 6	3.71(0.64)	3.72(0.64)	3.71(0.64)
Dim 7	3.74(0.64)	3.79(0.64)	3.71(0.64)

Based on Table 7, a statistically significant difference in climate scores was identified in Dim 5 - Workers' safety priority and risk non-acceptance, which received the lowest score for all groups (all respondents: 3.38 +1.05, leaders: 3.50 +1.05, and workers: 3.33 +1.05), compared to Dim 4 - Workers' safety commitment which was the highest scoring dimension, also for all groups (all respondents: 3.77 +0.64, leaders: 3.81 +0.64, and workers: 3.76 +0.64).

The radar diagram (Figure 1) plots the scores of the seven measurement dimensions to provide a graphical representation and overall picture of the safety climate in the organization. This collection of individual safety perceptions, when aggregated to the group or organizational level, is likely to be used to measure safety culture (Hall *et al.*, 2013). The graph can be used as a comparison for future safety climate assessments (Zakaria *et al.*, 2020). Based on the figure, generally, the group of workers from the leader position scored higher than those from the worker position. A score close to 4 indicates a better profile (Det Nationale Forskningscenter for Arbejdsmiljø, 2022). There is a significant difference in the radar pattern in Dim 5 - Workers' safety priority and risk non-acceptance between leader position workers

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3.50 +1.05 and worker position workers 3.33 +1.05, compared to the radar patterns of other dimensions. This indicates that leader workers have a higher perception.

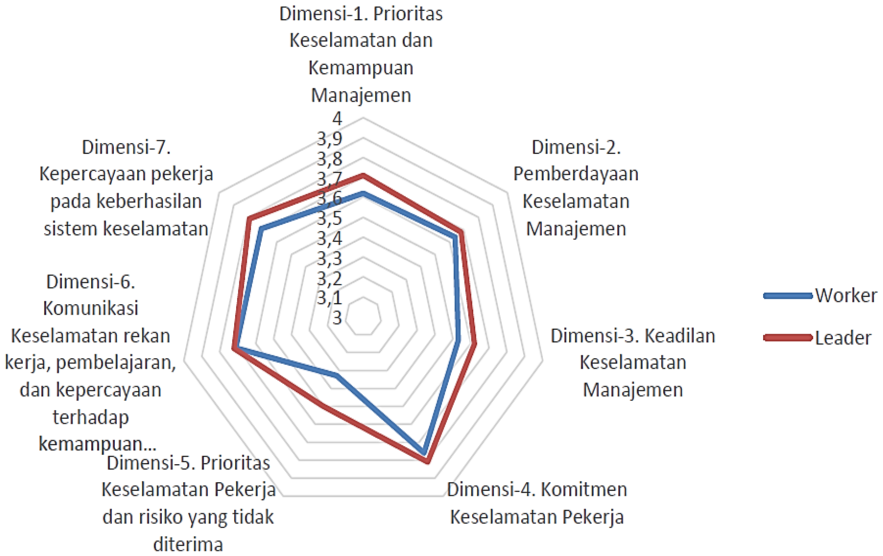

Figure 1. Radar plot showing safety climate score

Respondent characteristics affect the value of the safety climate in paper mills; based on position groups, there are differences in work safety perceptions; in the position of leader, the safety climate score, in general, the score of all dimensions is higher than in the role of the worker. As seen in Figure 1, the radar pattern of the safety climate score of the leader position group is outside or higher than the worker. Differences in perceptions in position groups can occur due to different workloads or work pressures and levels of work risk. Differences in position groups can affect OHS. According to research by Marín *et al.* (2019) the safety climate score in managerial positions was higher than in other workers.

Although there are many questionnaire instruments to measure safety climate or culture, very few have proven to be able to present a consistent factor structure in different contexts. The main objective of this study was to develop a Nordic questionnaire (NOSACQ-50) to measure the safety climate in a non-western country sample. The NOSACQ-50 has been validated and used in various non-western countries, including Indonesia, with modifications to ensure cultural and linguistic relevance.

Safety climate studies are hardly conducted within the Indonesian paper industry. Do Indonesian workers have the same perceptions and beliefs toward safety as their counterparts in developed and modern Western countries? Is the NORDICQ-50 questionnaire suitable and capable of repeating the successful measurement of safety climate as in Western countries? The study aimed to address certain questions regarding the safety climate in the Indonesian paper industry environment. Based on the findings of the study, the conclusions drawn support these questions, and recommendations have been proposed to measure safety climate in this setting. By shedding light on the key factors influencing the safety climate in this industry and identifying potential areas for improvement, this study provides valuable insights that can inform the development of interventions and policies aimed at promoting a safer work environment in the Indonesian paper industry.

Regarding the safety climate score of the paper industry in Indonesia, the results are similar and have the same pattern as the collection of results of previous studies, as released by Nordic. International data in the NOSACQ-50 database, until November 28, 2022, has collected 86,405 respondents consisting of 20,392 leader positions (managers and supervisors); mean age=44; male=85%, female=15%, and 66,013 worker positions; mean age=41;

male=76%, female=24%. Coming from 631 different companies (workplaces) or studies on five continents and spread across 37 industry sectors (Agriculture/ Forestry, Construction, Energy, Healthcare, Manufacturing, Mining, Service, Transport, etc.) (Det Nationale Forskningscenter for Arbejdsmiljø, 2022).

Table 8 presents a comparison of the mean scores and standard deviations of the seven dimensions of safety climate between the international data in the NOSACQ-50 database and the research results in the Paper Industry in West Java, Indonesia. The statistical analysis shows the total mean score = 3.17 out of a maximum score of 4 for the perceived safety climate in the NOSACQ-50 database and the total mean score = 3.65 for the paper industry. This difference in the mean score of safety climate indicates that the general status of understanding of safety perception for paper industry employees is better. The structure of the safety climate questionnaire is also consistent with the Indonesian model of safety theory. The results show that the items in the questionnaire are acceptable and inter-item compatible. They also have reasonable validity in measuring what is intended to be measured in the workplace.

In a study of the safety climate in Indonesia, according to research by Lestari *et al.* (2020), the safety climate in the Indonesian construction industry can be measured using six dimensions: management commitment, communication, rules and procedures, supportive environment, personal accountability, and training. This study is particularly relevant given that the Indonesian construction industry is the second largest in Asia and is associated with a high incidence of work accidents, accounting for more than 30% of all workplace accidents. By identifying the key dimensions of safety climate that are most relevant to the construction industry in Indonesia, this study provides important insights that can inform the development of targeted interventions aimed at improving safety outcomes and reducing the risk of accidents and injuries in this industry. The results indicate a reasonably healthy safety climate.

Table 8
Means and standard deviations of safety climate dimension between
the Indonesian paper industry and the NOSACQ-50 International database

Dimension of safety climate	NOSACQ-50 International Database		Paper Industries at West Java, Indonesia		
	Leader/manager n=20,392	Worker n=66,013	All respondent mean (SD) n=366	Leader/manager mean (SD) n=113	Worker mean (SD) n=253
Dim 1	3.27(0.46)	3.06(0.50)	3.64(0.76)	3.71(0.76)	3.62(0.76)
Dim 2	3.19(0.47)	2.97(0.49)	3.65(0.70)	3.68(0.70)	3.64(0.70)
Dim 3	3.22(0.49)	3.00(0.50)	3.56(0.82)	3.62(0.82)	3.53(0.82)
Dim 4	3.30(0.46)	3.18(0.47)	**3.77**(0.64)	**3.81**(0.64)	**3.76**(0.64)
Dim 5	3.17(0.50)	2.99(0.51)	3.38(1.05)	3.50(1.05)	3.33(1.05)
Dim 6	3.28(0.42)	3.15(0.42)	3.71(0.64)	3.72(0.64)	3.71(0.64)
Dim 7	3.37(0.44)	3.23(0.45)	3.74(0.64)	3.79(0.64)	3.71(0.64)

Note: Mean is out of a maximum score of 4
Bold numbers indicate the average score of the safety climate dimension is higher

Based on Table 8 Dim 4 - Workers' safety commitment was recorded as the dimension with the highest safety climate score = 3.77, compared to the other six sizes, and even higher than the average score of international data in the NOSACQ-50 database. This indicates a high level of workers' awareness of safety, representing their views on health, safety management, and safety needs. The results of this study are consistent with previous research, which posits safety climate as a homogeneous shared perception characteristic of an organization's safety culture.

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Based on these findings, a new integrated safety climate framework must be validated to improve industrial safety performance in Indonesia. A research sample covering several industry sectors is needed to develop a general model for measuring the safety climate in Indonesian workplaces. However, due to time and financial constraints, we only took a random sample of workers from the paper industry, which is expected to be comparable to the construction industry in Indonesia. One potential limitation of this study is that, due to its cross-sectional design, it cannot provide information on the reliability of the safety climate questionnaire measurement tools and other safety variables.

CONCLUSION

A better understanding of the different perceptions of safety climate across paper industry workers allows for the comprehensive design of safety interventions involving managers, supervisors, leaders, officers, and operators. Target each group of workers with customized initiatives to bridge specific gaps between them and identify opportunities to improve occupational safety and health. By identifying the specific perceptions and gaps in the safety climate across different groups of workers in the paper industry, organizations can develop targeted interventions that address the specific needs of each group. This can involve training programs, communication strategies, and changes to policies and procedures that promote a safer work environment. Additionally, involving all levels of the organization, from managers to frontline workers, in these interventions can help promote a culture of safety and ensure that everyone is committed to improving safety outcomes.

Future research should focus on exploring whether safety climate is correlated with safety performance, workplace accidents, or other relevant outcomes, using longitudinal or experimental designs. Structural equation modeling can also be utilized to identify the underlying factors contributing to safety climate and their impact on safety outcomes. By addressing these gaps in knowledge, future studies can enhance our understanding of the safety climate in the Indonesian industrial sectors and contribute to the development of evidence-based interventions to improve workplace safety and prevent accidents and injuries.

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