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Analysis of the application of OHS Management System in the Emergency Assistance for Rehabilitation and Reconstruction (EARR) Project at Mutiara Sis Al Jufri Airport, Palu City

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ABSTRACT

This research with the background of the Airport that must continue to operate along with the implementation of construction work, wants to know the factors that influence, as well as the dominant factors and the most dominant factors on the implementation of the Occupational Safety and Health Management System (SMK3) on the Emergency Assistance for Rehabilitation and Reconstruction (EARR) Project at Mutiara Sis Al Jufri Airport, Palu City. Using factor analysis method, eight (8) new influential factors were obtained. This study uses a population of 119 project staff and workers and a sample selection method with a random sample with the slovin method, obtaining a sample size of 55 respondents. Research data was taken using a questionnaire method, so that the output of data processing results with the factor analysis method was obtained, that the most significant factor was factor 1 (Standard Operating Procedure / OSH Standard), with the variable: The company provides Personal Protective Equipment (PPE) to project workers. (X11 with a loading factor of 0.895).

Key words: Airport, factor analysis, Occupational Safety

1.INTRODUCTION

To realise work safety, there are norms that must be seen which are a means or tool to prevent unexpected work accidents caused by work negligence and an unfavourable work environment.[1].

Accident prevention and control measures are needed to reduce the risk of accidents to aircraft and employees in the workplace. Occupational safety and health efforts in the aviation sector are mandatory to be able to improve planning and management in the aerospace aspect of Indonesia. [2]

Overlay work is carried out at night, starting at 18.00 WITA and must be completed by 04.00 the next morning because at 06.00 WITA, the runway area must be used for landing and take-off aircraft. As for the work of the terminal building area and other locations, it was carried out from 08.00 to 22.00, so that every day had to coordinate with the Airport Implementation Unit (UPBU) as the organiser of community services at Mutiara Sis Al Jufri airport in Palu City. This means that the physical construction works mentioned above absolutely must be guarded by the application of a good and correct Occupational Safety and Health Management System (SMK3) so that runway overlay work and other physical construction work can run smoothly without any work accidents and the quality of work can still be maintained according to the required technical specifications.

Based on this, the researcher is interested in further examining the factors that influence and are most dominant in the application of the Occupational Safety and Health Management System (SMK3) in the Emergency Assistance for Rehabilitation and Reconstruction (EARR) Project at Mutiara Sis Al Jufri Airport, Palu City.

From the background description above, several problems can be formulated as follows:

a. What factors influence the implementation of the Occupational Safety and Health Management System (SMK3) in the *Emergency Assistance for Rehabilitation and Reconstruction* (EARR) project at Mutiara Sis Al Jufri Airport in Palu City?
b. What are the dominant and most dominant factors affecting the implementation of the Occupational Safety and Health Management System (SMK3) in

the *Emergency Assistance for Rehabilitation and Reconstruction* (EARR) project at Mutiara Sis Al Jufri Airport, Palu City?

The objectives of this research are as follows:

a. To find out what factors can affect the application of the Occupational Safety and Health Management System (SMK3) in the *Emergency Assistance for Rehabilitation and Reconstruction* (EARR) project at Mutiara Sis Al Jufri Airport, Palu City.
b. To find out the dominant factors and the most dominant factors in the implementation of the Occupational Safety and Health Management System (SMK3) in the *Emergency Assistance for Rehabilitation and Reconstruction* (EARR) project at Mutiara Sis Al Jufri Airport, Palu City.

While the factors that influence the implementation of SMK3, the factors that influence the implementation of SMK3 are as follows: [3]

1. Occupational Safety and Health (OHS) procedures and regulations, there are seven (7) statements or questions.
2. Management Commitment to OHS there are four (4) statements or questions.
3. The work environment has seven (7) statements or questions.
4. Project Worker Involvement has seven (7) statements or questions.
5. There are eleven (11) statements or questions on the implementation of Occupational Safety and Health (OHS) standards.
6. Evaluation of Occupational Safety and Health Standards (K3) there are four (4) statements or questions.

2.RESEARCH METHODS

2.1 Respondent characteristics

The characteristics of respondents can be described as follows:

2.1.1 Respondents based on position

Based on position, workers are dominant 30 people or 54,55%, see table 1 and figure 1 below:

Table 1: Respondent's Position

P Manager	T Expert	Staff	HSE-K3	Workers	Total
1	10	9	5	30	55
1,82%	18,18%	16,36 %	9,09%	54,55%	100%

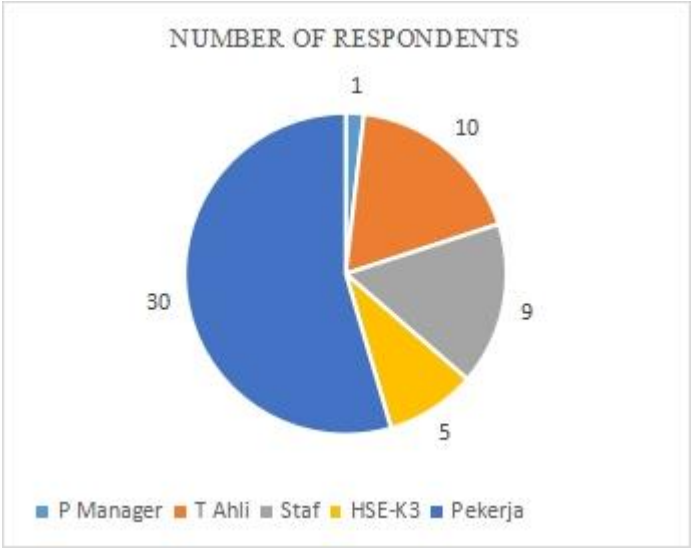

Figure 1: Respondent's position

2.1.2 Respondents based on education

Based on education, senior high school is dominant with 18 people or 32,73%, see table 2 and figure 2 below:

Table 2: Respondent's education

Elementary school SD	Junior High School SMP	Senior High School SMA	D 1	D 3	Bachelor S1	Magister S2	Total
6	8	18	1	7	11	4	55
10,9%	14,54%	32,73%	1,82%	12,73%	20%	7,64%	100%

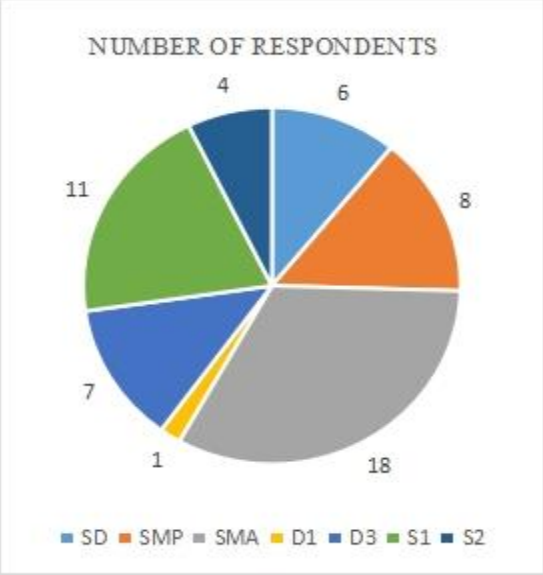

Figure 2: Respondent's education

2.1.3 Respondents based on age

Based on age, people with 21-30 years are dominant 20 people or 36,36%, see table 3 and figure 3 below:

Table 3: Respondents based on age

18-20th	21-30th	31-40th	41-50th	51-60th	61-70th	Total
3	20	13	13	5	1	55
5,45%	36,36%	23,64 %	23,64 %	9,09%	1,82 %	100%

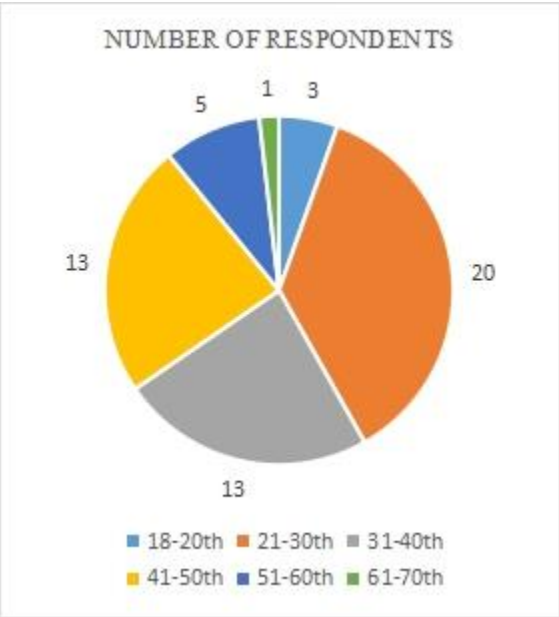

Figure 3: Respondents based on age

2.1 Research variables

The Research variables shown in the table 4 below:

Table 4: Research variables

No.	Variables	Sub Variables	Library
1	Occupational Health and Safety (OHS) Regulations and Procedures	X1-X7	[4]
2	Management Commitment to Occupational Safety and Health (OHS)	X8-X11	[5]
3	Project Work Environment	X12-X18	[6]
4	Worker Involvement (the role of various parties involved, interacting and working together.)	X19-X25	[7]
5	Implementation of occupational safety and health (OHS) Standards	X26-X36	[8]
6	Evaluation of Occupational Safety and Health (OHS) Standards	X37-X40	[3]

2.2 Research Results Factor Analysis Method

Before conducting factor analysis on the 40 variables displayed in the questionnaire, the 40 variables need to be selected and selected with the aim of selecting the right variables.

The results of the validity and reliability tests can be described below:

2.2.1 Validity and reliability test of 40 questionnaire questions

Basic Concepts of Validity and Reliability:

1. Validity and reliability are the main requirements for an instrument to be effective as a research data collection tool.
2. An instrument is said to be valid if it is able to measure what it is intended to measure.
3. The instrument is said to be reliable, if it has stability or consistency in measuring the same thing at various different times.

Validity and Reliability Test of 40 questionnaire items were carried out first on 10 respondents who were randomly selected with the following results:

2.2.1.1 Validity Test

The validity test uses the SPSS 21 program with the Pearson Product Moment correlation testing technique, to determine the degree of closeness of the relationship between 2 variables on an interval or ratio scale, where the way to analyse it is by correlating each item score with its total score.

To determine whether or not an item is appropriate to be used, a significance test of the correlation coefficient is carried out at a significance level of 0.05. The item is said to be valid if the p value is <0.05. However, if there are questions that do not meet the requirements, then these questions will not be used or discarded.

Before the questionnaires were distributed to the research respondents, the researchers tested the validity of the questionnaire questions by distributing the questionnaires to 10 random respondents. Furthermore, the researcher conducted an interview with these respondents, whether they understood the contents and intentions of the questionnaire questions and how to fill them in.

As a result, the ten (10) respondents, consisting of 2 consultant staff with S1 education (age 30-50 years), 2 contractor staff with D3 education (age 30-50 years) and 6 builders with 2 elementary school, 2 junior high school and 2 high school (age 20-40 years) education, have understood and understood the contents and intentions of the questionnaire questions.

The validity test results state that all questionnaire questions are valid, with the P value for 40 questions being 0.00 or <0.05.

2.2.1.2 Reliability Test

The reliability test was carried out on 40 existing questionnaire questions, the variable was said to be reliable if the Crocbach's Alpha value was above 0.6. The greater the reliability value or close to 1, the more reliable it will be. The results of the Reliability Test on 40 questionnaire questions state that all 40 questionnaire questions are reliable, with the following details:

Question X1-X20, Cronbach' Alpha value = 0.956 > 0.6. Meanwhile, for questions X21-X40, the Cronbach' Alpha value = 0.872 > 0.6. In other words, that all questionnaire questions (X1-X40) are declared reliable.The result of reliability test shown in the figure 4 below :

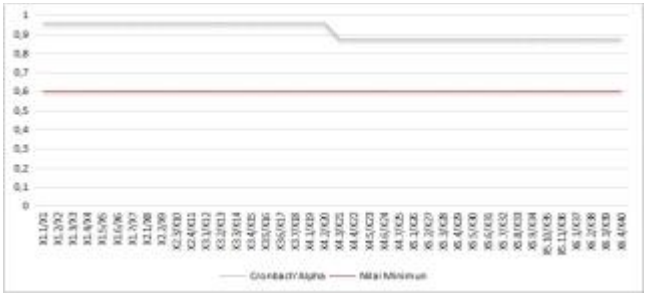

Figure 4: Reliability test results

2.2.2 Factor Analysis

Factor analysis was conducted using the following steps:

2.2.2.1 *Step one:*

Find the KMO and Bartlett's Test values, with the following result and shown in the table 5 below:

Table 5: KMO and Bartlett's Test stage 1

KMO and Bartlett's Test		
KMO-MSA		.604
Bartlett's Test of Sphericity	Approx. Chi-Square	1849.355
	df	780
	Sig.	.000

Explanation of step one as follow as :

KMO - MSA value = 0.604 > 0.50, so the factor analysis process can be continued.

Bartlett's Test of Sphericity value = 1849.355 with sig.= 0.000 < 0.05, **so the sample data is multivariate normally distributed and fulfils the requirements of factor analysis.**

2.2.2.2 *Step two*:

Testing the *Measure of Sampling Adequacy (MSA) value is* said to be valid if the MSA value is ≥ 0.5 where the MSA value can be seen from the *anti-image correlation matrix* value.

MSA value testing is carried out in stages and a total of five (5) stages are carried out until the results of the MSA value ≥ 0.5 are obtained. The results are as follows: (the SPSS output is in the attachment)

Stage 1: the results obtained MSA values that are below 0.5 there are seventeen (17) variables / questions, namely:

X4(0.412), X17(0.437), X18(0.469), X19(0.492), X20(0.305), X21(0.348), X22(0.308), X30(0.426), X31(0,481), x32(0.332), x33(0.440), x34(0.436), x36(0.426), x37(0.254), x38(0.424), x39(0.385) and x40(0.489).

Therefore, a gradual re-running is carried out, by removing one (1) variable with the smallest value, namely X37 (0.254).

Stage 2: the results obtained MSA values that are below 0.5 there are sixteen (16) variables / questions, namely: X4(0.399), X17(0.415), X18(0.456), X19(0.488), X20(0.287), X21(0.359), X22(0.327), X30(0.455), X31(0.459), X32(0.342), X33(0.425), X34(0.478), X36(0.346), X38(0.395), X39(0.364) and X40(0.474).

Therefore, a gradual re-run is carried out, by removing one (1) variable with the smallest value, namely X20 (0.287).

Stage 3: the results obtained MSA values that are below 0.5 there are twelve (12) variables / questions, namely: X4(0.439), X17(0.492), X18(0.475), X21(0.403), X22(0.348), X31(0.445), X32(0.344), X34(0.482), X36(0.356), X38(0.432), X39(0.359), X40(0,460), so a gradual re-run is carried out, by removing one (1) variable with the smallest value, namely X32 (0.344).

Stage 4: the results of the MSA value which is below 0.5 there are eight (8) variables / questions, namely: X22 (0.481), X30 (0.472), X31 (0.460), X34 (0.486), X36 (0.308), X38 (0.414), X39 (0.343), and X40 (0.465).

Therefore, a gradual re-run was performed, removing X36 (0.308).

Stage 5: the results of the MSA value which is below 0.5 there are eight (8) variables / questions, namely: X4 (0.475), X22 (0.470), X30 (0.487), X31 (0.487), X33 (0.499), X38 (0.413), X39 (0.323), and X40 (0.401).

Therefore, a gradual re-run was performed, removing X39 (0.323).

Stage 6: the results of the MSA value which is below 0.5 there are five (5) variables / questions, namely: X22 (0.450), X30 (0.483), X31 (0.471), X33 (0.499) and X38 (0.409).

Therefore, a gradual re-run was performed, removing X38 (0.409).

Stage 7: obtained the results of the MSA value which is below 0.5 there are three (3) variables / questions, namely: X21 (0.486), X31 (0.488), and X40 (0.489).

Therefore, a gradual re-run was carried out, removing X21 (0.486).

Stage 8: obtained the results of the MSA value which is below 0.5 there are three (3) variables / questions, namely: X22 (0.4541), X31 (0.498), and X40 (0.470).

Therefore, a gradual re-run was conducted, removing X22 (0.454).

Stage 9: obtained the results of the MSA value which is below 0.5 there is one (1) variable / question, namely: X40(0,399)

Therefore, a gradual re-run was performed, removing X40 (0.399).

Stage 10: obtained the results of the MSA value which is below 0.5 there is one (1) variable / question, namely: X35 (0.499).So it is done running again in stages, by getting rid of X35 (0.499)

Stage 11: finished

The conclusion of the MSA test results is as follows:

a. The number of variables/questions, which were included in the factor analysis were thirty (30) variables that had MSA values ≥ 0.5, namely: X1(0,805), X2(0,788), X3(0,743), X4(0,617), X5(0,805), X6(0,776), X7(0,755), X8(0,849), X9(0,838), X10(0,837), X11(0,812), X12(0,842), X13(0,817), X14(0,890), X15(0,782), X16(0,747), X17(0.711), X18(0.661), X19(0.684), X23(0.765), X24(0.648), X25(0.883), X26(0.698), X27(0.896), X28(0.824), X29(0.849), X30(0.622), X31(0.523), X33(0.579), X34(0.571).
b. The variables/questions that were not included in the factor analysis because they had MSA values ≤ 0.5 were: X20(0.287), X21(0.486), X22(0.454), X32(0.344), X35(0.499), X36(0.308), X37(0.254), X38(0.409), X39(0.323) and X40(0.399) or a total of 10 variables/questions. MSA score result shows in the figure 5 below:

Figure 5: MSA Score Result

2.2.2.3 *Step three:*

Factor extraction was carried out using the Principal Component Analysis (PCA) method. The grouping of the formation of the number of factors can be known based on the total value of the initial eigenvalues. Factors that have initial eigenvalues ≥ 1 will be retained, while those with ≤ 1 will not be included in the model. PCA extraction shown in the figure 6 below:

Figure 6: PCA Extraction

Step four:

Based on the Total Variance Explained value, it can be seen that the total value of initial eigenvalues ≥ 1 there are eight (8) factor components, so it can be concluded that there are eight (8) new factors formed. Factor 1 formed has a total eigenvalues value of 11,254; factor 2 has a total eigenvalues value of 2,650; factor 3 has a total eigenvalues value of 2,440; factor 4 has a total eigenvalues value of 1,954; factor 5 has a total eigenvalues value of 1,575; factor 6 has a total eigenvalues value of 1,538; factor 7 has a total eigenvalues value of 1,232; and factor 8 has a total eigenvalues value of 1,167. Total Variance Explained shows in the figure 7 below :

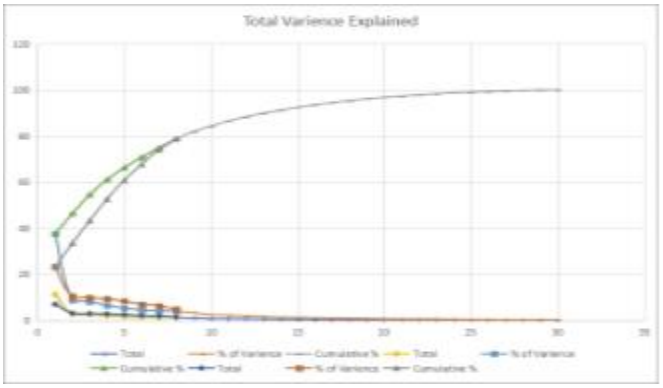

Figure 7: Total Variance Explained

Step Five:

Next we look at the Component Matrix values which show the distribution of the 30 indicators that participated in the factor analysis into the eight (8) newly formed factors, shown in the figure 8 below.

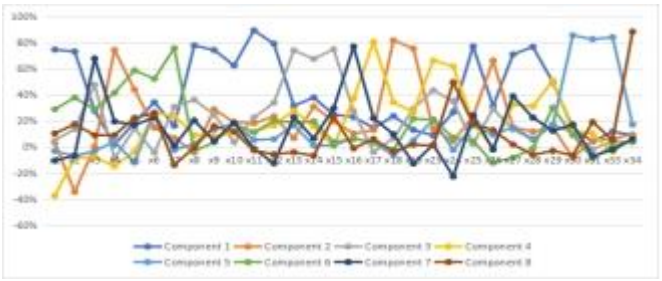

Figure 8: Component matrix values

Furthermore, rotation is carried out with the varimax method which focuses on simplifying the column of the factor matrix so that the resulting structure is simpler and to find out and clearly distinguish, the existing variables join into which factor through the loading factor value, shows in the figure 9 below:

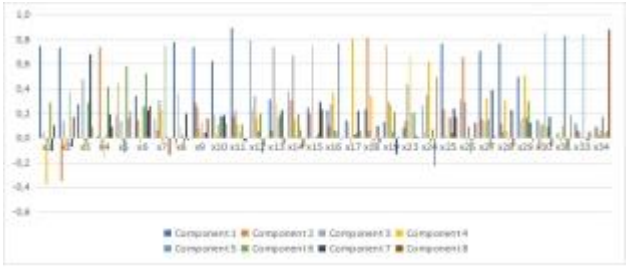

Figure 9: Extraction of Factor Components with varimax method

2.2.2.4 *Step Six: naming the factors newly formed:*

Factor 1: OHS SOP, shows in the table 6 below:

Table 6: SOP Factors

Variable description	**variable**	**Loading Factor**
OHS Procedures and Regulations are indispensable	X1	0,747
OHS procedures and regulations are easy to understand	X2	0,732
The company pays attention to problems that occur during the implementation of OHS	X8	0,779
There are efforts by the Company to improve OHS performance in the period Specifically	X9	0,744
Company management monitors the implementation of OHS	X10	0,626

The company provides Personal Protective Equipment (PPE) to project workers	X11	0,895
The lighting and illumination in the project area is good enough to do the work	X12	0,793
Workers are involved in the development and review of OHS policies	X25	0,771
Coordination between safetyman and foremen and implementers takes place at all times	X27	0,710
All workers wear standard Personal Protective Equipment (PPE)	X28	0,769

Based on the table 6 above, the variable that has the highest loading factor value is X11 (0.895), namely the Company provides Personal Protective Equipment (PPE) to project workers.

This is in accordance with the results of interviews in the field that. This is in line with Hendro Prayogo's (2019) writing that "The company provides Personal Protective Equipment (PPE) to project workers".[9]

Factor 2: OHS Reward & Punishment, shown in the table 7 below :

Table 7: Reward and Punishment Factor

Variable description	variable	Loading Factor
There are sanctions for violations of OHS procedures and regulations	X4	0,744
Cleanliness of the work environment greatly affects the level of worker comfort	X18	0,818
Workers are involved in planning the OHS programme	X19	0,756
The company provides regular and continuous briefings in the form of exposure to OHS	X26	0,663

Based on the table 7 above, the variable that has the highest loading factor value is X18 (0.818), namely the cleanliness of the work environment greatly affects the level of worker comfort. This is in accordance with the results of interviews in the field that the cleanliness of the work environment greatly affects the comfort level of workers. This is in line with the writing of Ardian Zul Fauzi et al (2019) that "Efforts to increase labour productivity are by providing Safety induction, rewards, and punishment to the workforce". [10]

Factor 3: OHS Work Environment, shown in the table 8 below :

Table 8: OHS Work Environment Factors

Variable description	variable	Loading Factor
Tools and equipment are provided by the Company in accordance with the type and stage of work required.	X13	0,741
The layout of work equipment and work machines can support work process activities	X14	0,676
Sufficient material supplies can support the implementation of good work	X15	0,749

Based on the table 8 above, the variable that has the highest loading factor value is X15 (0.749), namely sufficient material supplies can support the implementation of work properly. This is in accordance with the results of interviews in the field that. This is in line with the writing of Bhastary & Suwardi (2018), that "The environment including equipment and layout of work machines and sufficient material supplies can support the implementation of work properly".[11]

Factor 4: Management's Role in OHS, shown in the table 9 below :

Table 9: Management Role Factor in OHS

Variable description	variable	Loading Factor
Noise and vibration due to work, endeavoured so as not to affect the results of the work		
Workers are involved in hazard identification, risk assessment and determination of controls.	X23	0,664
Workers, with the assistance of competent relevant parties, are involved in the investigation of the incident.	X24	0,619
The company conducts Job Safety Analysis at all times related to job risks.	X29	0,510

Based on the table 9 above, the variable that has the highest loading factor value is X17 (0.807), namely Noise and vibration due to work, endeavoured so as not to affect the results of the work.

This is in accordance with the results of interviews in the field that Noise and vibration due to work, endeavoured so as not to

affect the results of the work. This is in line with the writing of Bambang Endroyono (2006), that "The role of management in OHS is very large, including reducing noise, involving workers and conducting OHS analysis".[12]

Factor 5: Workers' Role in OHS, shown in the table 10 belows :

Table 10: Factors of Workers' Role in OHS

Variable description	variable	Loading Factor
Work is carried out in accordance with Standard Operating Procedures (SOPs), to ensure the implementation of OHS	X30	0,857
The company provides an explanation of fire extinguishers (APAR) and technical practices on their use.	X31	0,827
The company investigates accidents that occur	X33	0,842

Based on the table 10 above, the variable that has the highest loading factor value is X30 (0.857), namely Work is carried out in accordance with Standard Operating Procedures (SOP), to ensure the implementation of K3. This is in accordance with the results of interviews in the field that work is carried out according to the SOP. This is in line with the writing of Ryan Adika Putra (2021) that "The head handyman / foreman, apart from having responsibility for supervision and smooth running of the work, is expected to be able to make additional contributions to occupational safety and safety, according to the SOP".[13]

Factor 6: OHS Procedures and Regulations**,** shown in the table 11 below :

Table 11: OHS Procedures & Regulations factor

Variable description	variable	Loading Factor
OHS procedures and regulations are regularly revised to improve employees' knowledge of OHS.	X5	0,588
Changes to OHS procedures and regulations should be socialised to employees.	X6	0,524
Review of outdated OHS procedures and regulations.	X7	0,757

Based on the table 11 above, the variable that has the highest loading factor value is X7 (0.757), namely a view of OHS procedures and regulations that are o longer relevant. This is in accordance with the results of interviews in the field that OHS procedures and regulations are very necessary. This is in line with the writing of M Satria Adi Rahim et al, that "To ensure the safety and health of workers and other people who are in the workplace, as well as production sources, production processes, and the work environment in a safe condition, it is necessary to implement an occupational safety and health management system (SMK3)".[14]

Factor 7: OHS Implementation**,** shown in the table 12 below :

Table 12: OHS Implementation Factors

Variable description	variable	Loading Factor
OHS procedures and regulations are easy to implement with consistency	X3	0,679
Ideal air temperature can support the implementation of good work	X16	0,770

Based on the table 12 above, the variable that has the highest loading factor value is X16 (0.770), namely the ideal air temperature can support the implementation of good work. This is in accordance with the results of interviews in the field that the application of K3 must be easy and consistently supported by a clean air environment that will keep workers healthy. This is in line with

written by Ahmad Ridwan et al (2021), that "The purpose of K3 is to increase workers' K3 knowledge and understanding and create a comfortable and safe work environment".[15]

Factor 8: Job Safety Analysis, shown in the table 13 below :

Table 13: Job Safety Analysis Factors

Variable description	variable	Loading Factor
Workers are aware of the general procedures on safety of MEEP work stages	X34	0,885

3.CONCLUSION

The conclusion of this research is as follows:

1) . The dominant factors affecting the implementation of SMK3 in the Emergency Assistance for Rehabilitation and Reconstruction (EARR) Project of

Mutiara Sis Al Jufri Airport, Palu City are: a).Factor 1: SOP with variables: The company provides Personal Protective Equipment (PPE) to project workers. (X11 with a loading factor of 0.895); b). Factor 2: OHS Reward and Punishment with variables: X18 (0.818), i.e. The cleanliness of the work environment greatly affects the level of worker comfort.

c).Factor 3: K3 Work Environment with its variable: X15 (0.749), namely sufficient material supplies can support the implementation of work properly. d). Factor 4: The Role of Management in K3 with its variables: the variable that has the highest loading factor value is X17 (0.807), namely Noise and vibration due to work, is tried so as not to affect the results of the work. e). Factor 5: The Role of Workers in K3 with its variables: the variable that has the highest loading factor value is X30 (0.857), namely Work

carried out in accordance with the Standard Operating Procedure (SOP), to ensure the implementation of OHS

f). Factor 6: OHS Procedures and Regulations with the variable that has the highest loading factor value is X7 (0.757), namely a review of OHS procedures and regulations that are no longer relevant. g).Factor 7: OHS Implementation with the variable that has the highest loading factor value is X16 (0.770), namely the ideal air temperature can support the implementation of work properly. h).Factor 8: Job Safety Analysis with the variable that has the highest loading factor value is X34 (0.885), namely Workers know the general procedures regarding the safety of mechanical/electrical and plumbing work stages.

2). Of the eight dominant factors mentioned above, there is the most dominant factor, namely factor 1 Standard Operating Procedures (SOP), with the variable: The company provides Personal Protective Equipment (PPE) to project workers. (X11 with a loading factor of 0.895). So it can be said that the **most influential factor** on the application of the Occupational Safety and Health System (SMK3) in the Emergency Assistance for Rehabilitation and Reconstruction (EARR) Project at Mutiara Sis Al Jufri Airport, Palu City.

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