

Mapping of Evacuation Routes and Determination of Assembly Points at the New Terminal of H. Hasan Aroeboesman Airport

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Article Info	ABSTRACT
Article History: Submitted: December 18, 2025 Revised: March 16, 2026 Accepted: August 1, 2026	<i>Airports are facilities that support mobility and transfers between air transportation and other modes of transportation. H. Hasan Aroeboesman Airport, Ende, is located directly adjacent to the ocean and mountains. This condition exposes the airport to potential natural hazards. However, disaster-prevention efforts in the airport terminal building are still not optimal, particularly due to the absence of evacuation routes and designated assembly points. This study aimed to support emergency preparedness at the new terminal building of H. Hasan Aroeboesman Airport, Ende, by developing an evacuation route map, identifying appropriate assembly points, and evaluating terminal users' perceptions of the proposed evacuation plan and its relationship with perceived safety. This study used a descriptive quantitative method to describe the current situation of the research object. Data-collection techniques included observation, documentation, interviews, a literature review, and questionnaire distribution. In the planning stage, the analysis focused on the existing conditions of the airport terminal. Meanwhile, the evaluation stage focused on measuring users' responses to the proposed evacuation routes and assembly points. The sample consisted of 100 respondents, including 50 airport personnel and 50 passengers. The study used both primary and secondary data. Data analysis included validity and reliability tests, descriptive analysis, Spearman's rank correlation, simple linear regression, and a partial t-test. The results proposed three potential assembly-point locations and showed that the average index values for the implementation and perceived-safety variables were 86.60% and 82.80%, respectively. The Spearman correlation coefficient of 0.730 with $p < 0.001$ indicated a strong, positive, and significant relationship between the proposed implementation of evacuation routes and assembly points and the perceived safety of users of the new terminal building at H. Hasan Aroeboesman Airport, Ende.</i>
Keywords: Evacuation Route, Assembly Point, Airport terminal, Emergency preparedness; Perceived safety.	

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INTRODUCTION

H. Hasan Aroeboesman Airport, Ende, is a Class II Airport Operator Unit (UPBU) located in East Nusa Tenggara Province. The airport is approximately 0.5 km from the city center. Its location directly adjacent to the ocean and mountains requires the airport to provide evacuation routes and assembly points as part of its efforts to anticipate and minimize the risks associated with natural disasters [1]. One way to anticipate and minimize disaster risks is by providing evacuation routes and assembly points in airport buildings [2]. The importance of these facilities is also related to the tectonic earthquake that occurred on December 12, 1992, and the volcanic eruption on January 1, 2024, which affected flight operations at H. Hasan Aroeboesman Airport, Ende. However, despite the existing disaster-response efforts, the new terminal building does not yet have clearly designated evacuation routes or assembly points. These facilities are required to support an orderly evacuation process and minimize the risk of injuries, asset damage, and material losses during an emergency.

Disaster prevention comprises a series of activities aimed at reducing or eliminating disaster risks and decreasing the vulnerability of people exposed to potential hazards [3]. According to Article 59 of Government Regulation of the Republic of Indonesia Number 36 of 2005 concerning the Implementation of Law Number 28 of 2002 on Buildings, buildings must be equipped with evacuation routes [4]. These evacuation routes are designed to provide building occupants with safe and appropriate access to exit the building during an emergency.

Assembly points and evacuation routes are essential components of safety management systems in buildings and public facilities. An evacuation route is specifically designed to allow building occupants to exit quickly and safely in the event of an emergency, such as a fire, earthquake, or other disaster. These routes are typically equipped with directional signs, emergency lighting, and easily accessible exits [5]. Evacuation-route planning must consider several factors, including route capacity, exit width, the number of building occupants, and potential obstructions along the route. Previous studies have shown that human behavior, fear, and congestion at exits can affect the total evacuation time. Therefore, evacuation-route design must consider the actual conditions of building use and the potential concentration of people at certain points [6].

In addition to evacuation routes, assembly points are designated safe locations where building occupants gather after evacuation. Assembly points are generally located in open areas away from potential sources of danger, such as buildings, fires, hazardous materials, and other emergency hazards. The availability of assembly points is important to ensure that all building occupants have exited safely and to facilitate occupant data collection by safety officers [7]. In modern evacuation planning, simulation and modeling methods are also used to evaluate the effectiveness of evacuation routes and the suitability of assembly-point locations [8].

Although evacuation routes and assembly points are important components of airport terminal safety, the new terminal building at H. Hasan Aroeboesman Airport, Ende, has not yet been equipped with clearly designated evacuation routes and assembly points. Therefore, evacuation planning is required based on the existing terminal conditions, applicable safety standards, evacuation-route characteristics, and the availability of safe assembly areas. This study aims to develop an evacuation route map, identify appropriate assembly points, and evaluate terminal users' perceptions of the proposed evacuation plan and its relationship with perceived safety at the new terminal building of H. Hasan Aroeboesman Airport, Ende.

METHODS

Research design

This study employed a descriptive quantitative design combined with an evacuation-planning approach [9], [10]. The research was conducted in two stages: the evacuation-planning stage and the evaluation stage. Observations, documentation, interviews, and a literature review were conducted during the planning stage to identify the existing emergency evacuation facilities and develop an evacuation route map and proposed assembly points. During the evaluation stage, quantitative data were collected through questionnaires administered to terminal users to evaluate their perceptions of the proposed evacuation plan and examine the relationship between its proposed implementation and

perceived user safety. The research was conducted at H. Hasan Aroeboesman Airport, Ende, because the researchers had access to the required data during their On-the-Job Training activities.

Population and Sample

The study population consisted of airport personnel assigned to the terminal area and passengers using the new terminal building at H. Hasan Aroeboesman Airport, Ende [11]. All 50 airport personnel from the Aviation Security, Apron Movement Control, Airport Electrical, Engineering, and Information units were included using total sampling. In addition, 50 Wings Air passengers who were present during the data-collection period and willing to participate were selected using convenience sampling. Thus, the study involved a total of 100 respondents.

Data Collection Techniques

Data-collection techniques are an important part of a study because they provide the information required to answer the research questions and achieve the stated objectives [12], [13]. The data in this study were collected through observation, documentation, an interview, a literature review, and questionnaire distribution.

A. Observation

Observation was used to collect data related to the existing emergency evacuation facilities and the planning of evacuation routes and assembly points for disaster response. The observations described the existing conditions of emergency evacuation facilities at the new terminal building of H. Hasan Aroeboesman Airport, Ende. The observed conditions were subsequently compared with Government Regulation of the Republic of Indonesia Number 36 of 2005 concerning Buildings and SNI 03-1746-2000 concerning Procedures for Planning and Installing Means of Egress for Fire Protection in Buildings [4].

B. Documentation

Documentation was used to supplement the field data and improve the accuracy of the information obtained through direct observation. Photographs and relevant airport documents were examined to identify the existing conditions of disaster-response and emergency evacuation facilities at the new terminal building of H. Hasan Aroeboesman Airport, Ende.

C. Interview

An interview was conducted to obtain information regarding the existing conditions of evacuation routes and assembly points at the new terminal building. The interview was directed to the Head of the Aviation Security Unit, who is responsible for safety and security policies in the terminal-building area of H. Hasan Aroeboesman Airport, Ende. The interview consisted of five questions, and the relevant information was analyzed and presented in narrative form [14].

D. Literature Review

A literature review was conducted to obtain the theoretical basis and relevant standards for determining assembly-point capacity, occupant density, walking speed, and evacuation travel time. The calculations were used to evaluate the proposed assembly points and evacuation routes at the new terminal building of H. Hasan Aroeboesman Airport, Ende [15], [16].

The capacity of each assembly point was calculated by dividing its effective area by the minimum space required per person [16], as expressed in Equation (1):

$$C = \frac{A}{0,3} \quad (1)$$

where C is the assembly-point capacity (persons), A is the effective assembly-point area (m^2), and $0.3 m^2/person$ is the minimum area allocated to each person [16].

Occupant density along an evacuation route was calculated using Equation (2):

$$D = \frac{P}{A_c} \quad (2)$$

where D is the occupant density (persons/m²), P is the number of occupants (persons), and A_c is the effective area of the corridor, stairway, or other evacuation facility (m²).

The walking speed, v (m/s), was then determined based on the type of evacuation facility and the corresponding occupant-density category presented in Table 1. The applicable facility types included descending stairs, ascending stairs, and corridors [17], [18].

After the walking speed had been determined, the evacuation travel time was calculated using Equation (3):

$$t = \frac{L}{v} \quad (3)$$

where t is the evacuation travel time (s), L is the length of the evacuation route (m), and v is the corresponding walking speed (m/s). For routes involving more than one facility type, the total evacuation travel time was calculated by summing the travel times for all route segments:

$$t_{\text{total}} = \sum_{i=1}^n \frac{L_i}{v_i} \quad (4)$$

Table 1 presents the standard walking speeds for different evacuation facilities based on occupant-density conditions [17], [18]. The facilities are classified into descending stairs, ascending stairs, and corridors, while the density conditions are categorized as very good, good, normal, and poor. As occupant density increases, the available movement space decreases, resulting in a lower walking speed. Therefore, the appropriate walking-speed value was selected from Table 1 according to the facility type and calculated occupant density for each segment of the evacuation route.

Table 1. Standard Walking Speeds Based on Facility Type and Occupant Density [17] [18]

Type Facility	Movement Condition	Occupant density (persons/m ²)	Walking speed (m/s)
Stairs (Down)	Very Good	<1.9	1.0
	Good	1.9 To 2.7	0.50
	Normal	2.7 To 3.2	0.28
	Bad	>3.2	0.13
Ladder (Go On)	Very Good	<1.9	0.8
	Good	1.9 To 2.7	0.4
	Normal	2.7 To 3.2	0.22
	Bad	>3.2	0.10
Corridor	Very Good	<1.9	1.4
	Good	1.9 To 2.7	0.7
	Normal	2.7 To 3.2	0.39
	Bad	>3.2	0.18

E. Questionnaire

The questionnaire was used as an evaluation instrument for the proposed evacuation routes and assembly points. It was intended to collect terminal users' responses to the proposed evacuation plan and their perceptions of its relationship with user safety. The questionnaire was distributed to 100 users of the new terminal building at H. Hasan Aroeboesman Airport, Ende, consisting of 50 airport personnel and 50 passengers. Responses were measured using a Likert scale [20]. The questionnaire measured two variables: the proposed implementation of evacuation routes and assembly points (X) and perceived user safety (Y).

Data Analysis Techniques

The questionnaire data were analyzed using validity and reliability tests, Spearman's rank correlation, simple linear regression, and a partial t-test. All statistical analyses were performed using SPSS at a significance level of 0.05.

A. Validity Test

The validity test was conducted to determine whether each questionnaire item accurately measured the intended research variable [19]. The test was performed using SPSS by correlating the score of each questionnaire item with the total score of its corresponding variable using Pearson's item-total correlation. The validity test was conducted separately for the implementation of evacuation routes and assembly points variable (X) and the perceived user-safety variable (Y). A questionnaire item was considered valid when the calculated correlation coefficient was greater than the critical correlation coefficient ($r_{\text{calculated}} > r_{\text{table}}$) and the significance value was less than 0.05 ($p < 0.05$).

B. Reliability Test

The reliability test was conducted to evaluate the internal consistency of the questionnaire items used to measure the same construct. The reliability of the research instrument was assessed using Cronbach's alpha and processed using SPSS. Reliability testing was performed separately for the implementation of evacuation routes and assembly points variable (X) and the perceived user-safety variable (Y). The Cronbach's alpha coefficient was calculated using equation below:

$$R_{11} = \left(\frac{n}{n-1} \right) \left(1 - \frac{\sum \sigma_i^2}{\sigma_t^2} \right) \quad (5)$$

where R_{11} is the reliability coefficient, k is the number of questionnaire items, $\sum \sigma_i^2$ is the sum of the variance of each item, and σ_t^2 is the variance of the total score. An instrument was considered reliable when its Cronbach's alpha coefficient was greater than 0.60. Conversely, a coefficient below 0.60 indicated insufficient internal consistency [20].

C. Spearman's Rank Correlation Test

The Spearman's Rank Correlation Coefficient test is a hypothesis test to determine the relationship between two variables. The Spearman's Rank Correlation Coefficient test is a statistical test to examine two variables with ordinal data, or one variable with ordinal data and the other with nominal or ratio data [21]. The Spearman Rank Correlation is used to determine the level of relationship or test the significance of an associative hypothesis when each of the variables connected has ordinal data, and the data sources between the variables do not have to be the same. In determining the level of relationship strength between variables, the correlation coefficient value can be used as a guideline, which is the result of SPSS output, with the following provisions:

Table 2. Interpretation of Correlation Coefficient Values [22]

Coefficient	Category
CC = 0.00	No Correlation / Relationship
$0 < CC \leq 0.20$	Very Low / Weak Correlation Very
$0.20 < CC \leq 0.40$	Correlation Low / Weak
$0.40 < CC \leq 0.70$	Sufficient correlation means
$0.70 < CC \leq 0.90$	High, strong correlation
$0.90 < CC < 1.00$	Very high, strong correlation once, you can reliable
CC = 1	Correlation perfect

The direction of the correlation is determined by the correlation coefficient, which indicates its strength. The correlation coefficient ranges from +1 to -1. A positive correlation coefficient indicates a unidirectional relationship between the two variables. A unidirectional relationship means that if variable X increases, variable Y will also increase. Conversely, a negative correlation coefficient indicates a unidirectional relationship. A unidirectional relationship means that if variable X increases, variable Y will also decrease.

D. Simple Linear Regression Test

Simple linear regression is performed when there is only one independent variable and one dependent variable. Simple regression is based on the functional or causal relationship between one independent variable and one dependent variable. The general equation for simple linear regression is:

Simple Linear Regression is done if only there is One variable free and one variable bound. Regression is simple based on relationships functional or causal One variable independent with One variable dependent. Equality general simple linear regression is:

$$Y = a + bX \quad (6)$$

where Y is the predicted value of perceived user safety, X is the implementation of evacuation routes and assembly points, a is the constant or predicted value of Y when $X = 0$, and b is the regression coefficient representing the expected change in Y for every one-unit increase in X . A positive regression coefficient indicates that a higher value of X is associated with a higher predicted value of Y , whereas a negative coefficient indicates an inverse association. The statistical significance of the regression coefficient was evaluated at a significance level of 0.05.

E. Partial T-test

The partial t-test was conducted to determine whether the regression coefficient for the implementation of evacuation routes and assembly points variable (X) was statistically significant in predicting perceived user safety (Y). The test was conducted at a 95% confidence level with a significance level (α) of 0.05[20]. The hypotheses were evaluated using the following criteria:

1. If $|t_{\text{calculated}}| > t_{\text{critical}}$ and $p < 0.05$, H_0 was rejected and H_1 was supported.
2. If $|t_{\text{calculated}}| \leq t_{\text{critical}}$ or $p \geq 0.05$, H_0 was not rejected.

RESULT AND DISCUSSION

Result

This study was conducted in two stages: the evacuation-planning stage and the evaluation stage. Primary data were obtained through direct observation, interviews, documentation of emergency evacuation facilities, and questionnaires distributed to 100 respondents, consisting of 50 airport personnel and 50 passengers at H. Hasan Aroeboesman Airport, Ende. Meanwhile, secondary data were obtained through a literature review to determine the equations and standards used to calculate assembly-point capacity, occupant density, walking speed, and evacuation travel time.

Observation

Based on the observations, the new terminal building of H. Hasan Aroeboesman Airport, Ende, has several emergency evacuation facilities. However, some of these facilities do not yet comply with the applicable provisions and standards. The identified problems include emergency stairs that do not directly lead to a safe exit, the absence of clearly designated evacuation routes and assembly points, and emergency doors that do not fully meet the applicable requirements [23]. These findings indicate that the terminal building requires improved evacuation planning to support emergency preparedness.

Documentation

Documentation was conducted to identify and record the existing conditions of emergency evacuation facilities at the new terminal building of H. Hasan Aroeboesman Airport, Ende. Photographs and field documents were used to support the observation results and verify the actual conditions of the available facilities. The documentation showed that several facilities did not fully comply with the applicable emergency-evacuation requirements, as presented in Figure 1.

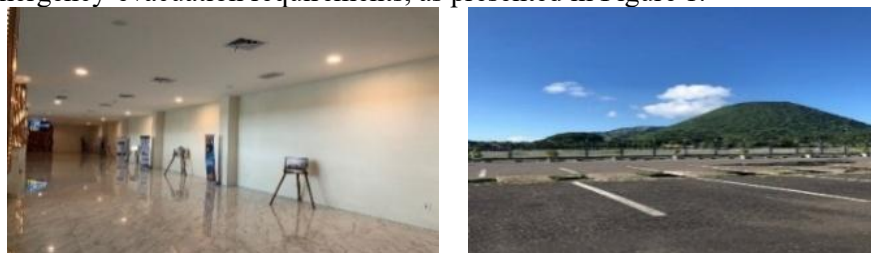


Figure 1 Condition Existing

Interview

An interview was conducted with the Head of the Aviation Security Unit while the researchers were conducting their On-the-Job Training activities. The interview consisted of five questions regarding the existing conditions of emergency evacuation facilities at the new terminal building of H. Hasan Aroeboesman Airport, Ende.

The interview results indicated that the new terminal building did not yet have clearly designated evacuation routes and assembly points. Therefore, evacuation planning was required to improve the safety of building occupants by utilizing the available facilities and identifying the safest and most efficient evacuation routes [24].

Literature review

Based on field data and the availability of open areas at H. Hasan Aroeboesman Airport, Ende, three locations were initially identified as potential assembly points. Each location was evaluated based on its capacity, distance from potential hazards, accessibility, emergency-vehicle access, and possible interference with airport operations.

The apron should not be directly designated as a permanent assembly point because it is an active airside operational area. It may only be considered a temporary emergency holding area if a designated section is safely segregated from aircraft and ground-support-equipment movements and formally approved by the airport operator. The proposed locations and their safety considerations are presented in Table 3.

Table 1 Proposed Assembly-Point Locations and Estimated Capacities

No	Location	Broad (m ²)	Capacity (persons)	Assembly-point type
1	Parking in front of the terminal building	223	743	Temporary assembly point
2	Airside (apron)	9000	30,000	Temporary assembly point
3	Parking area adjacent to the terminal building	330	1,100 people	Final assembly point

As presented in Table 3, the parking area in front of the terminal building has an effective area of 223 m² and an estimated capacity of approximately 743 persons. The apron has a total area of 9,000 m², theoretically corresponding to a capacity of 30,000 persons. However, this value does not represent an approved operational capacity. Only a designated and safely segregated portion of the apron may be considered a temporary emergency holding area, subject to a hazard assessment and formal approval from the airport operator.

Meanwhile, the parking area adjacent to the terminal building has an effective area of 330 m² and an estimated capacity of approximately 1,100 persons. The estimated capacities were calculated by dividing the effective area by the minimum area requirement of 0.3 m² per person.

The proposed evacuation routes for the first and second floors and the locations of the proposed assembly points are presented in Figures 2–4.

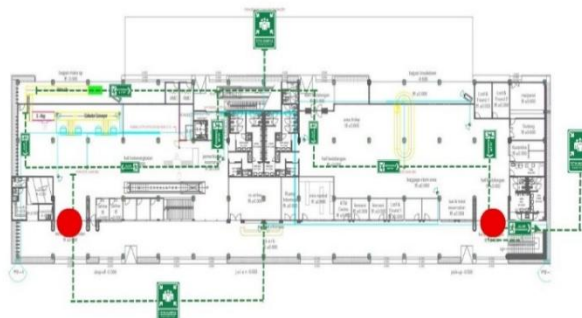


Figure 21st Floor Evacuation Route

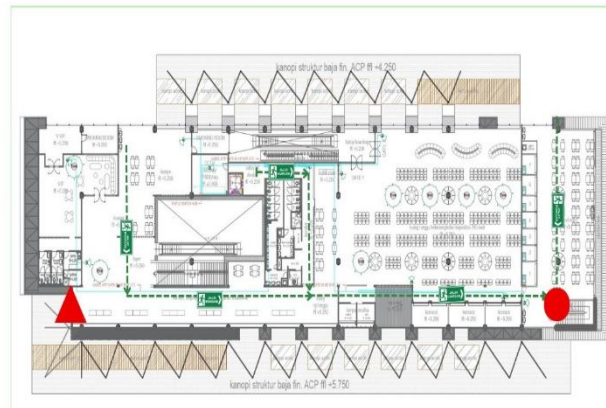


Figure 3 32nd Floor Evacuation Route

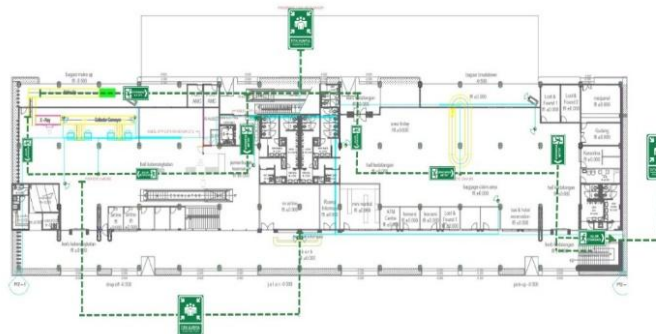


Figure 4 Installation Scheme Point Gather

Based on the evacuation travel-time calculations [25], the estimated evacuation time from the first floor ranged from 20 to 306 seconds. The estimated travel time required to pass through the stairway was approximately 5 seconds. Therefore, the total estimated evacuation time from the second floor ranged from 25 to 401 seconds.

Questionnaire

The questionnaire was used to evaluate users' responses to the proposed evacuation routes and assembly points at the new terminal building of H. Hasan Aroeboesman Airport, Ende. It was distributed to 100 terminal users, consisting of 50 airport personnel and 50 passengers. The responses were measured using a Likert scale [20] and analyzed descriptively by calculating the percentage index for variables X and Y.

The percentage index was calculated using the following equation:

$$\text{Index(\%)} = \frac{\text{Total score obtained}}{\text{Maximum possible score}} \times 100\% \quad (7)$$

The descriptive analysis showed that the implementation of evacuation routes and assembly points variable (X) obtained an average percentage index of 86.60%. Meanwhile, the perceived user-safety variable (Y) obtained an average percentage index of 82.80%. These results indicate that respondents provided highly positive assessments of the proposed evacuation routes and assembly points.

Validity test

The validity-test results showed that the calculated Pearson item-total correlation coefficients for all items measuring variables X and Y were greater than the critical value of 0.1966. In addition, the significance values for all questionnaire items were less than 0.05. Therefore, all items used to measure

the implementation of evacuation routes and assembly points (X) and perceived user safety (Y) were considered valid and retained for further analysis.

Reliability Test

The reliability-test results showed that the Cronbach's alpha coefficient was [insert value] for the evacuation-route and assembly-point implementation variable (X) and [insert value] for the perceived user-safety variable (Y). Both coefficients exceeded the minimum criterion of 0.60, indicating that the questionnaire items for both variables had acceptable internal consistency [20]. Therefore, the instruments used to measure variables X and Y were considered reliable for further analysis.

Correlation Test Rank Spearman

Spearman's rank correlation test was conducted to determine the direction, strength, and statistical significance of the relationship between variables X and Y. The SPSS analysis produced a correlation coefficient of 0.730, indicating a strong positive relationship between the implementation of evacuation routes and assembly points and perceived user safety.

The significance value reported by SPSS was 0.000, which should be presented as $p < 0.001$. Because this value was less than 0.05, the relationship between variables X and Y was statistically significant. The positive coefficient indicates that higher implementation scores tended to be associated with higher perceived user-safety scores.

Simple Linear Analysis

The simple linear regression analysis produced a constant (a) of 0.263 and an unstandardized regression coefficient (b) of 0.164. Therefore, the estimated regression equation was:

$$Y = 0.263 + 0.164X \quad (8)$$

The constant value of 0.263 represents the predicted value of perceived user safety (Y) when variable X is equal to zero. However, this value should be interpreted only as the mathematical intercept, particularly if zero is outside the observed questionnaire-score range.

The regression coefficient of 0.164 indicates that every one-unit increase in the implementation score was associated with an estimated increase of 0.164 units in the perceived user-safety score. The positive coefficient indicates that higher implementation scores tended to be associated with higher perceived user-safety scores.

Partial t-Test

The partial t-test produced a calculated t-value of 10.578 with 98 degrees of freedom. This value was greater than the critical t-value of 1.98447 at a two-tailed significance level of 0.05. The SPSS output reported a significance value of 0.000, which should be presented as $p < 0.001$.

Therefore, H_0 was rejected and H_1 was supported. This result indicates that the regression coefficient for the implementation of evacuation routes and assembly points variable (X) was statistically significant in predicting perceived user safety (Y). Since the regression coefficient was positive, higher implementation scores were significantly associated with higher perceived user-safety scores.

Discussion

The observation and interview results showed that the new terminal building of H. Hasan Aroeboesman Airport, Ende, did not yet have clearly designated evacuation routes and assembly points. Several existing emergency facilities also did not fully comply with applicable safety standards. These conditions may cause confusion and delay the evacuation process during an emergency. Therefore, evacuation planning is required by considering the existing facilities and operational conditions of the airport.

Three locations were proposed as potential assembly points: the parking area in front of the terminal building, a designated apron area, and the parking area adjacent to the terminal building. However, the apron should only be used as a temporary emergency holding area if it is safely segregated from aircraft and ground-support-equipment movements and formally approved by the airport operator.

The estimated evacuation time ranged from 20 to 306 seconds for the first floor and from 25 to 401 seconds for the second floor. These values provide an initial estimate based on route length and standard walking speeds, but they still require verification through an evacuation drill or simulation.

The questionnaire results showed average percentage indices of 86.60% for the implementation of evacuation routes and assembly points variable and 82.80% for the perceived user-safety variable. These results indicate that respondents gave highly positive assessments of the proposed evacuation plan. All questionnaire items were valid, while the reliability coefficients for variables X and Y exceeded the minimum criterion of 0.60, indicating acceptable internal consistency.

Spearman's rank correlation coefficient of 0.730 with $p < 0.001$ indicated a strong, positive, and statistically significant relationship between the implementation of evacuation routes and assembly points and perceived user safety. The regression coefficient of 0.164 was also positive and statistically significant, as supported by the calculated t-value of 10.578, which exceeded the critical t-value of 1.98447, with $p < 0.001$. Thus, higher implementation scores tended to be associated with higher perceived user-safety scores.

Overall, clearly planned evacuation routes and appropriately assessed assembly points may support emergency preparedness at the new terminal building. However, the statistical results represent respondents' perceptions and should not be interpreted as direct evidence of actual safety improvement. The operational effectiveness of the proposed evacuation plan should be evaluated through an evacuation drill or simulation.

CONCLUSIONS

Based on the results, the emergency evacuation facilities at the new terminal building of H. Hasan Aroeboesman Airport, Ende, did not fully comply with the applicable safety requirements. The main deficiencies included the absence of clearly designated evacuation routes and assembly points and the limited suitability of several existing emergency facilities. Therefore, evacuation routes were proposed by utilizing the available access stairs and placing evacuation signs at the identified locations.

Three locations were proposed as potential assembly points: the parking area in front of the terminal building, a designated and safely segregated apron area, and the parking area adjacent to the terminal building. However, the apron should only be considered a temporary emergency holding area after a hazard assessment and formal approval from the airport operator. The estimated evacuation time ranged from 20 to 306 seconds for the first floor and from 25 to 401 seconds for the second floor.

The questionnaire results showed average percentage indices of 86.60% for the implementation of evacuation routes and assembly points variable and 82.80% for the perceived user-safety variable. Spearman's rank correlation coefficient of 0.730 with $p < 0.001$ indicated a strong, positive, and statistically significant relationship between the proposed evacuation-plan implementation and perceived user safety. This result was supported by the regression coefficient of 0.164 and the calculated t-value of 10.578, which exceeded the critical t-value of 1.98447, with $p < 0.001$.

Overall, the proposed evacuation routes and assembly points may support emergency preparedness and improve users' perceptions of safety at the new terminal building. However, their operational effectiveness should be evaluated through an evacuation drill or simulation before full implementation.

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