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Research Paper

Risk Response To Time Performance Post-Disaster Home Reconstruction in Bogor Regency

Usri Waiti [1], Fitri Suryani [2], Dwi Dinariana [3]
[1,2,3] *(Faculty of Civil Engineering, Department of Engineering and Construction Project Management, Persada Indonesia YAI University)*
Corresponding Author: Usri Waiti

ABSTRACT: *Indonesia has a greater potential for disasters compared to other countries due to its location on the disaster path, thus requiring fast and effective post-disaster management. Bogor Regency is an area where almost all of its territory is prone to disasters, such as floods, landslides and landslides movement, which can cause major damage to every sector, including housing. Post-disaster house reconstruction often experiences risks at every stage and will impact the urgent target time for completing disaster management time. The purpose of this study is to identify, determine the dominant risks and risk responses that affect the performance of post-disaster house reconstruction time in Bogor regency. The study was conducted via collecting data through literature reviews, interviews, and distributing questionnaires to related parties to be validated by experts using the Delphi technique. Risk analysis uses the Probability Impact Matrix (PIM) to determine the dominant risks and risk responses were determined through expert judgment. The analysis results showed 2 risks. very high- category and 3 moderate category risks which are the dominant risks, namely uncertain weather conditions, difficult access for heavy equipment vehicle, high rainfall intensity causes erosion at the construction site, hard to reach project locations and the occurrence of natural disasters that affect the construction process. The mitigation responses obtained are adjusting work schedules to weather conditions such as overtime during good weather and accelerating work on sunny days, making a gradual mobilization plan according to field site conditions, carrying out temporary compaction and strengthening on slopes by making sheet piles, scheduling material deliveries in stages, and implementing an early warning system and emergency response measures.*

KEYWORDS: *Response, Risk, PIM, Reconstruction, Post-Disaster*

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I. INTRODUCTION

The construction sector plays a crucial role in supporting economic growth through the development of infrastructure, buildings, and housing. However, construction projects are complex, involving multiple stakeholders, requiring significant investment, and relying heavily on technology and resources. These conditions contribute to high levels of uncertainty and risk in construction projects. The success of construction projects is generally measured by three main indicators: time, cost, and quality, with time performance often being the most vulnerable aspect to deviations due to various factors during the implementation phase.

The level of risk and complexity of projects increases in post-disaster construction activities. Indonesia, located in the Ring of Fire, has a high potential for natural disasters, resulting in frequent damage to infrastructure and settlements. Post-disaster stages include rehabilitation and reconstruction activities aimed at restoring the physical, social, and economic conditions of affected communities [1]. Therefore, the implementation of post-disaster reconstruction requires effective project planning and control so that time, cost and quality targets can be achieved optimally.

Bogor Regency is one of the areas in West Java Province that has a high level of disaster vulnerability, such as flooding, landslides, strong winds, and landslides. Topographic conditions, low soil stability, changes in land use, and extreme weather intensity are factors increasing the potential for damage, particularly in the housing sector. Post-disaster home reconstruction in Bogor Regency faces various risks that impact timelines, including delays in land clearing, high rainfall that causes slippery roads and erosion, limited road access, obstacles to material mobilization, and loss of infrastructure some materials [2].

The primary challenge in post-disaster housing reconstruction is meeting the need for permanent housing quickly to shorten the length of stay for people in evacuation centers, while simultaneously producing buildings that are more resilient to disasters and able to reduce future risks. Various incidents that arise during the reconstruction process, if not adequately anticipated, can impact delays in completion. Therefore, a systematic effort is needed to identify, analyze, and anticipate risks that could potentially impact the timeline for post-disaster housing reconstruction.

Based on this situation, this study aims to identify the risks that affect the performance of post-disaster house reconstruction time in Bogor Regency, determine the dominant risks based on their frequency and impact levels, and formulate appropriate risk responses as recommendations for the implementation of post-disaster house reconstruction projects in the future.

II. LITERATURE REVIEW

POST-DISASTERS HOUSE RECONSTRUCTION

Reconstruction is the rebuilding of all infrastructure and facilities, institutions in post-disaster areas, both at the government and sosial community levels with the main target of the growth and development of economic, social and cultural activities, the establishment of law and order, and the rise of community participation in all aspects of community life in post-disaster areas [1]. A house is a building that functions as a habitable place to live, a means of family development, a reflection of the dignity and worth of its occupants, and an asset for its owner [3]. A disaster is an event or series of events that threaten and disrupt the lives and livelihoods of the community caused by natural and/or non-natural factors as well as human factors, resulting in human casualties, environmental damage, property losses, and psychological impacts. Meanwhile, post-disaster is the stage after a disaster is considered to be over [4]..

Post-disaster construction projects have unique characteristics that distinguish them from normal construction projects. They require relatively short time-frames and high levels of pressure due to the emergency situation. Furthermore, resource constraints often arise due to the nature of the disaster-affected area, and complex coordination is required among the various stakeholders involved in the project implementation process.

RISK

Risk is an uncertainty event or condition that, if it occurs, has a positive or negative impact on one or more project objectives. Negative risks are referred to as threats, and positive risks are referred to as opportunities [5]. Risk in a construction project is the possibility of an event or condition occurring that could have a negative impact on the achievement of project objectives [6].

Potential risks can arise from various factors, including weather conditions, geographical characteristics of the region, logistical problems, limited availability of labor and materials, and administrative obstacles that occur during project implementation. Risks in implementing post-disaster home reconstruction can originate from various aspects, including government policy risks, politics, regulations and force majeure, contractual risks, social risks, natural risks, environmental risks, and risks related to labor [7].

RISK IDENTIFICATION

Risk identification is a systematic process for assessing potential risks and uncertainties that is carried out continuously throughout the project cycle [8]. Risk identification is iterative, because the possibility of new risks emerging can be identified as the project develops and is implemented. Risk identification can be carried out using various methods, namely the Delphi technique, brainstorming, interviews, surveys and root cause analysis.

The main objective of risk identification is to compile a list of risks and potential events that can affect the achievement of each objective that has been set in a project [9]. The main result of risk identification is the compilation of a risk list that is documented and made part of the project management plan.

RISK ANALYSIS

Risk analysis is the process of assessing the level of impact and frequency of risk occurrence, and formulating appropriate actions to manage the risk[6]. The stages in risk classification include:
assessment of the level of frequency of occurrence, which is determined based on the potential for risk to occur at each stage of the project using a likert scale.

Table 1. Frequency Classification

Mark	Frequency of Occurrence	Information
1	Very low	Ignored/impossible to happen Very rare
2	Low	The possibility of this happening is small
3	Medium	The possibility of this happening is high
4	Tall	Very likely/almost certain to happen
5	Very hig	Ignored/impossible to happen Very rare

Source : [10]

Assessment of the level of risk impact, which is measured based on the magnitude of the influence on project completion time using a likert scale.

Table 2. Impact Classification

Mark	Impact of Occurrence	Information
1	Very low	There is no significant delay
2	Low	Late completion < 3 months
3	Mediun	3 months late completion
4	High	Late settlement > 3 months
5	Very High	Late settlement beyond the budget year

Source : [10]

Determining the risk level is done by classifying the magnitude of the risk based on an equation that links the frequency value and the impact of the risk:

$$R = P \times I$$

Information:
R = Risk
P = Probability
I = Impact

Table 3. Risk Classification

R value = P x I	Risk Category	Symbol
≤ 5	Very low risk (negligible)	
6 – 9	Low risk (acceptable)	
10 – 15	Moderate risk (critical)	
16 – 25	High-very high risk (unacceptable, planning adjustments required)	

Source : [10]

Probability Impact Matrix (PIM)

The consequence–likelihood matrix, also known as a risk matrix or heat map, is a tool for visualizing risks based on the level of consequence and likelihood of occurrence, and combining these two characteristics to determine the level of risk significance [11].

Table 4. Risk Matrix

Probability/ Frequency		Impact				
		Very Low 1	Low 2	Medium 3	High 4	Very high 5
Very High	5					
High	4					
Medium	3					
Low	2					
Very Low	1					

Source : [10]

RISK RESPONSE

Risk response is the process of developing and selecting alternative strategies and determining the actions needed to control the overall project risk exposure and individual risks that arise during project implementation [12]. This process aims to determine the most appropriate approach to managing risks so that their impact on project performance can be minimized.

Commonly used risk response strategies include risk avoidance, risk transfer, risk reduction, and risk acceptance.

III. RESEARCH METHODOLOGY

This study applies a qualitative approach through data and information collection aimed at identifying risks and gaining a comprehensive understanding of various events that affect the performance of post-disaster house reconstruction implementation time in Bogor Regency.

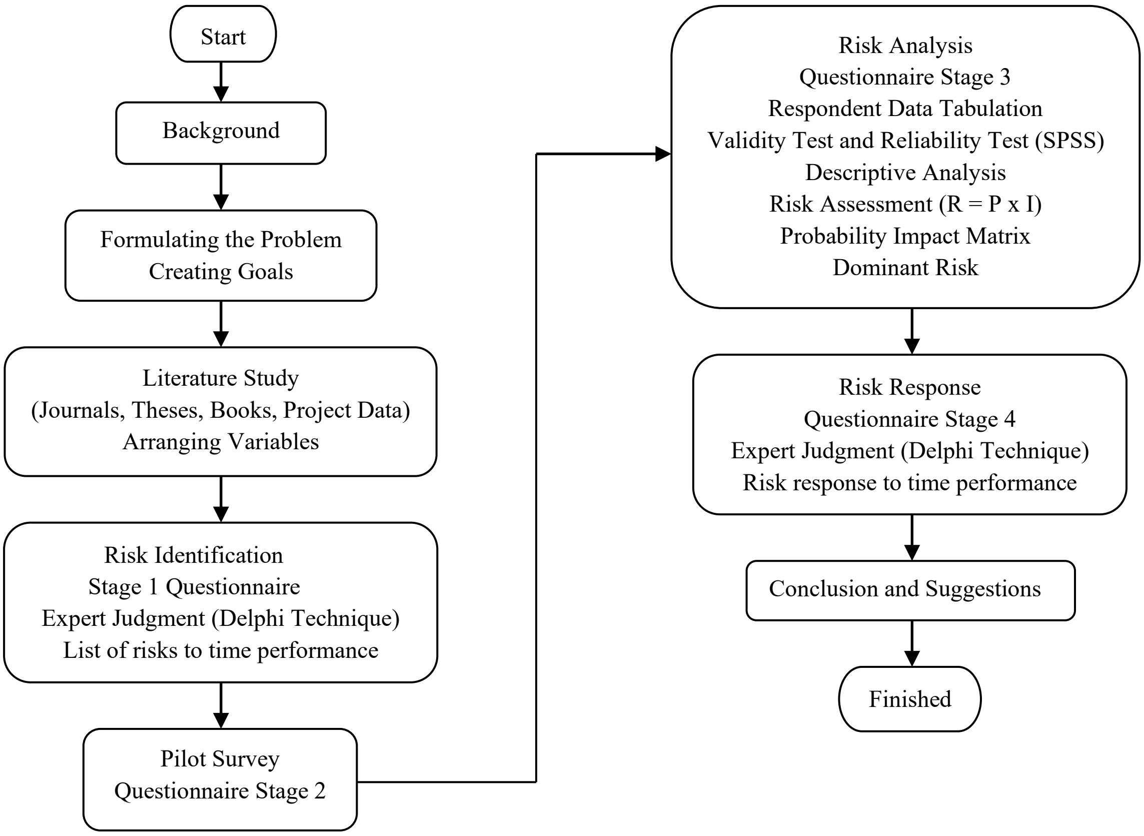

Figure 1. Research Flow
Source : Processed Results, 2025

RESEARCH DATA

Primary data is obtained directly from the main source that provides information to researchers, while secondary data comes from indirect sources, such as other parties or supporting documents relevant to the research [13]. Data collection in this study was carried out through two types of data sources, namely primary data and secondary data. Primary data in this study was obtained through interviews and the distribution of questionnaires which were carried out in stages to respondents involved in the implementation of post-disaster house reconstruction in Bogor Regency. Secondary data in this study were obtained through literature studies including scientific journals, theses, and books, as well as collecting project data sourced from agencies related to post-disaster house reconstruction in Bogor Regency.

Data collection began with a literature review, encompassing books, journals, theses, project data, and expert input, to identify risk variables relevant to post-disaster home reconstruction projects. Next, data were collected through questionnaires distributed to respondents involved in the reconstruction process to obtain risk probability and impact values using a probability impact matrix. The final stage involved data processing and determining risk responses to the dominant risks affecting post-disaster home reconstruction performance using the Delphi technique.

DATA COLLECTION

Data collection in this study was carried out to obtain information to achieve the research objectives. Data collection was carried out through the following stages:

1. Data collection stage 1, through literature studies to obtain expert judgment as part of identifying risks that affect time performance using the Delphi technique.
2. Data collection stage 2, was carried out through a pilot survey with a questionnaire to test the level of respondents' understanding of the research instrument.
3. Data collection stage 3, in the form of distributing questionnaires to respondents to assess the level of frequency and impact of risks on the performance of post-disaster house reconstruction time in Bogor Regency, which was then tested for validity and reliability using SPSS software and perform descriptive analysis and risk assessment using the Probability Impact Matrix (PIM).
4. Data collection stage 4, is carried out through expert judgment of risk response alternatives formulated using the Delphi technique.

RISK VARIABLES

Based on the results of the literature study, a number of risk variables were identified that could potentially impact time performance, which were then validated by experts during the risk identification stage. These risk variables were grouped into several factors: materials, labor, equipment, external factors, natural factors, project location, construction implementation and supervision, planning, and occupational safety and health.

IV. RESULTS AND DISCUSSION

RISK IDENTIFICATION

The process of identifying risks affecting post-disaster house reconstruction time performance in Bogor Regency was conducted based on the results of a literature review, along with expert clarification and validation of 52 initial variables. From this process, 43 variables were approved by the experts. In addition, there were 3 additional variables proposed by experts, while 1 variable was eliminated, resulting in a total of 45 risk variables which were then used as research instruments and distributed to respondents.
Expert judgment result variables include:

Table 5. Risk Identification on Time Performance Based on Expert Judgment Results

Variables	Risks to Post-Disaster Home Reconstruction Time Performance
A	**MATERIAL FACTOR**
X1	Delay in delivery of materials to the field
X2	Damage during shipping and storage of materials
X3	Loss of materials and work equipment during the project
X4	Difficulty obtaining materials
B	**LABOR FACTOR**
X5	Limited number of workers at the project site
X6	Unequal understanding of job specifications
X7	Absenteeism of labor
X8	The workforce brought in by the contractor uses local residents
X9	Workers on strike
X10	Low labor productivity
C	**EQUIPMENT FACTOR**
X11	Incomplete equipment
X12	Equipment damage during the implementation of the reconstruction project
X13	Difficult access for heavy equipment
X14	Productivity and efficiency decrease
D	**EXTERNAL FACTORS**
X15	There was a delay in signing the contract
X16	There is sabotage (destruction) of facilities/materials
X17	Cultural conditions and customs of the community around the project location

Variables	Risks to Post-Disaster Home Reconstruction Time Performance
X18	Delay in payment of stimulus assistance to aid recipients
X19	Slow licensing
X20	Poor coordination and communication between various parties
X21	Unrealistic budgeting for post-disaster reconstruction
X22	Corruption
X23	Long bureaucratic process
X24	Land clearing work is delayed
X25	Land acquisition is hampered
X26	Lack of security for land that has been cleared
X27	Lack of socialization with the community
X28	Public disputes/demonstrations/protests
X29	Financial capability of the work implementer
E	**NATURAL FACTORS**
X30	The occurrence of natural disasters that affect the construction process
X31	Uncertain weather conditions
X32	Fire affecting the construction process
X33	High rainfall intensity causes erosion at construction sites
F	**PROJECT LOCATION FACTOR**
X34	Hard-to-reach project locations
X35	Surface and underground conditions
X36	Lack of supporting infrastructure (water, electricity)
X37	Specific geographic constraints at the location
X38	Strict environmental regulations and requirements
G	**CONSTRUCTION AND SUPERVISION FACTORS**
X39	Misunderstanding between facilitators and aid recipients
X40	Poor workmanship and construction errors led to rework
X41	Poorly structured work plan
H	**PLANNING FACTORS**
X42	There are design changes by the homeowner
X43	Planning changes arising from the results of field measurements and investigations
I	**OCCUPATIONAL SAFETY AND HEALTH FACTORS**
X44	Epidemic of a disease
X45	Occurrence of work accidents

Source: Processed Results, 2025

RISK ANALYSIS

Validity is a measure that indicates the extent to which a research instrument can be considered valid, namely the extent to which the instrument can carry out its function properly [14]. A question item is considered valid if the calculated r value is higher than the table r value. In this study, the table r value applied was 0.3961 [15].

Based on the results of the validity test carried out using the SPSS program, there are 37 variables that then used in the next data analysis stage in this study.

Table 6. Risks to Time Performance Validity Test Results

Code	Risks to Post-Disaster Home Reconstruction Time Performance
X1	Damage during shipping and storage of materials
X2	Unequal understanding of job specifications
X3	Workers on strike
X4	Low labor productivity
X5	Incomplete equipment
X6	Equipment damage during the implementation of the reconstruction project
X7	Difficult access for heavy equipment
Code	**Risks to Post-Disaster Home Reconstruction Time Performance**

X8	Productivity and efficiency decrease
X9	There was a delay in signing the contract
X10	There is sabotage (destruction) of facilities/materials
X11	Cultural conditions and customs of the community around the project location
X12	Delay in payment of stimulus assistance to aid recipients
X13	Slow licensing
X14	Poor coordination and communication between various parties
X15	Unrealistic budgeting for post-disaster reconstruction
X16	Corruption
X17	Long bureaucratic process
X18	Land clearing work is delayed
X19	Land acquisition is hampered
X20	Lack of security for land that has been cleared
X21	Lack of socialization with the community
X22	Public disputes/demonstrations/protests
X23	Financial capability of the work implementer
X24	The occurrence of natural disasters that affect the construction process
X25	Uncertain weather conditions
X26	Fire affecting the construction process
X27	High rainfall intensity causes erosion at construction sites
X28	Hard-to-reach project locations
X29	Surface and underground conditions
X30	Lack of supporting infrastructure (water, electricity)
X31	Specific geographic constraints at the location
X32	Strict environmental regulations and requirements
X33	Misunderstanding between facilitators and aid recipients
X34	Poor workmanship and construction errors led to rework
X35	Poorly structured work plan
X36	Epidemic of a disease
X37	Occurrence of work accidents

Source: Processed Results, 2025

Reliability testing is a measure of the consistency of a measuring instrument, namely how reliable the test is in producing stable values, which are relatively unchanged even when carried out in various situations [14]. According to Sendiko Pramayoga in Ghozali (2005), a variable is declared reliable if the Cronbach's Alpha value is > 0.60 [16]. The results of the Cronbach's Alpha (ÿ) frequency reliability test are greater than 0.60, namely .955 with N of Items 45, while the results of the Cronbach's Alpha (ÿ) impact reliability test are greater than 0.60, namely .978 with N of Items 45.

Descriptive analysis is the analysis of numerical data to present an orderly, concise, and clear picture of a phenomenon, event, or situation so that a certain understanding or meaning can be drawn [14]. The mean is a value often used to summarize data, obtained from the total sum of all data or respondent answers divided by the number of data. The instrument measurement scale in this study is explained in the following table.

Table 7. Frequency Measurement Scale

Scale	Evaluation	Information
1	Very Rarely	The chance of this happening is very small (0-1 occurrence)
2	Rarely	The chance of this happening is quite moderate (2-3 times)
3	Sometimes	The chance of this happening is moderate (4-6 times it happens)
4	Often	The chance of this happening is quite frequent (7-9 times)
5	Very often	The chance of this happening is very frequent (≥ 10 times)

Source: Processed Results, 2025

Table 8. Impact Measurement Scale

Scale	Evaluation	Information
1	Very Small	≤ 14 days earlier than planned time
2	Small	According to the planned time
3	Medium	1 – 10 days longer than planned time
4	Big	11 – 25 days longer than planned time
5	Very Big	≥ 26 days longer than planned time

Source: Processed Results, 2025

The risk will be calculated from the product of frequency and impact. The results of the risk assessment are presented. in table 9 below.

Table 9. Risk Value

Code	Frequency	Impact	Risk Value P x I
X1	1,92	2,08	3,99
X2	2,04	2,28	4,65
X3	1,60	2,04	3,26
X4	2,00	2,32	4,64
X5	1,60	2,56	4,10
X6	1,88	2,28	4,29
X7	3,16	3,28	10,36
X8	2,48	2,68	6,65
X9	1,80	2,32	4,18
X10	1,40	2,04	2,86
X11	1,96	2,28	4,47
X12	1,84	2,28	4,20
X13	1,72	2,36	4,06
X14	1,76	2,40	4,22
X15	2,00	2,64	5,28
X16	1,36	2,16	2,94
X17	2,04	2,40	4,90
X18	2,00	2,36	4,72
X19	2,32	2,64	6,12
X20	2,00	2,52	5,04
X21	1,68	2,12	3,56
X22	1,68	2,16	3,63
X23	2,08	2,68	5,57
X24	2,68	3,12	8,36
X25	3,48	3,76	13,08
X26	1,84	2,64	4,86
X27	2,72	3,20	8,70
X28	2,72	3,12	8,49
X29	2,16	2,60	5,62
X30	2,44	2,92	7,12
X31	2,28	2,60	5,93
X32	2,04	2,60	5,30
X33	2,16	2,68	5,79
X34	1,84	2,52	4,64
X35	1,76	2,36	4,15
Code	**Frequency**	**Impact**	**Risk Value**

			P x I
X36	1,56	2,28	3,56
X37	1,88	2,56	4,81

Source: Processed Results, 2025

The multiplication results, which are the risk values in Table 9, are entered into a risk matrix to determine the risk level category. These categories are displayed in the risk matrix in the table below.

Based on the table above, there are two risks categorized as very high: unpredictable weather conditions and difficult access for heavy equipment. Three risks are categorized as medium: high rainfall intensity causing erosion at the construction site, difficult-to-reach project locations, and natural disasters affecting the construction process. The dominant risks are identified based on frequency and impact analysis, which indicates a high level of consequence. This can hamper the project implementation time target, thus requiring special handling and effective efforts to reduce its impact on post- disaster house reconstruction in Bogor Regency.

Table 10. Risk Matrix

Probability/ Frequency		Impact				
		Very Low 1	Low 2	Medium 3	High 4	Very High 5
Very High	5					
High	4				7, 25	
Medium	3			2, 4, 8, 15, 17, 18, 19, 20, 23, 29, 30, 31, 32, 33	24, 27, 28	
Low	2			1, 3, 5, 6, 9, 10, 11, 12, 13, 14, 16, 21, 22, 26, 34, 35, 36, 37		
Very Low	1					

Source: Processed Results, 2025

Code	**Risk**	**Risk Level**
1	Uncertain weather conditions	Very high-high
2	Difficult access for heavy equipment	Very high-high
3	High rainfall intensity causes erosion at construction sites	Medium
4	Hard-to-reach project locations	Medium
5	The occurrence of natural disasters that affect the construction process	Medium

Table 11. Dominant Risk

Source: Processed Results, 2025

RISK RESPONSE

The discussion of risk responses begins with an explanation of the cases, causes, and impacts of the identified dominant risks. This description aims to provide a comprehensive overview of the actual conditions in the field and the impact of these risks on project performance over time, as a basis for determining an appropriate risk response strategy. This explanation is presented in Table 12.

Table 12. The Dominant Risk Influence

No.	**Risk**	**Case**	**Cause**	**Impact**
1	Unpredictable weather conditions	- Casting and roofing work delayed due to continuous rain - Sudden rain during structural work such	- High rainfall and unpredictable extreme weather changes - Limited short-term weather forecast data	- Construction work delayed due to reduced work days - Difficult access to the site due to the still-

		as foundations and columns - Sand material carried away by rainwater	in the project area - Lack of work schedule planning that adapts to weather conditions	earth condition of the site - Increased potential for material damage
2	Difficult access for heavy equipment	- Heavy equipment cannot enter the site due to narrow roads - Heavy equipment must stop far from the site due to the location being near cliffs or remote areas - Damaged roads delay material mobilization	- Access routes with steep, winding, and steep terrain - Difficult access for large vehicles due to the steep location - Roads damaged by previous disasters	- Material transportation hampered due to the long distance and dangerous access for two-wheeled vehicles - Delayed progress of work using heavy equipment
3	High rainfall intensity causes erosion at construction sites	- High rainfall intensity affects land clearing work - Small landslides occur around the construction site	- Unstable soil conditions after a disaster - High rainfall in a short duration - Lack of a temporary drainage system	- Hampers land control and subsequent work, especially on slopes/hills due to steepness and high rainfall accelerating erosion - Additional soil repair and strengthening work
4	Hard -to-reach project locations	- Long distances for material delivery - Project locations are located in remote or hilly areas	- Hilly geography - Infrastructure has not fully recovered after the disaster	- Progress is hampered due to delays in mobilizing materials to the project site - Material delivery is hampered due to long distances and risky access
5	The occurrence of natural disasters that affect the construction process	- Strong winds, storms, landslides, and subsequent/follow-up landslides - Access to the site is cut off again	- Locations are at risk of further disasters - Locations are on disaster-prone areas - Prolonged extreme weather events - Environmental conditions remain unstable after the disaster	- Damage to completed or ongoing work, such as damage to Roof trusses - Progress hampered by work being temporarily halted - Resource mobilization hampered by landslides

Source: Processed Results, 2025

Based on the risk values obtained from the risk analysis, risk response measures are needed to address the risks that arise during post-disaster housing reconstruction in Bogor Regency. These risk responses are shown in the following table.

Table 13. Risk Response

No.	Risk	Risk Response			
		Avoid	**Accept**	**Transfer**	**Mitigate**
1	Unpredictable weather conditions	- Plan critical work schedules during seasons with low rainfall intensity - Avoid carrying out structural work when the weather	- Adjust work durations taking into account all conditions encountered on site - Add an	- Create a contract clause regarding completion due to force majeure - The relevant	- Adjust the work schedule to weather conditions, such as working overtime during good weather and accelerating work on sunny days

		forecast indicates a high potential for rain	implementation time limit based on the technical justification from the contractor regarding work delayed due to weather	agency reviews the technical justification submitted by the contractor regarding the implementation schedule due to weather	- Monitor daily weather forecasts as a basis for field decision-making - Prioritize roofing work to avoid rain disruption during interior finishing work - Cover exposed sand, such as with tarpaulin
2	Difficult access for heavy equipment	- Coordinate between parties to plan the work schedule and the use of heavy equipment, adjusting construction methods to field conditions - Avoid using large heavy equipment in locations with limited access - Coordinate relocate affected homeowners to an easily accessible and safer location	- Find alternative access routes to the site - Accept limited access as a disaster-affected area by optimizing manual labor for specific tasks - Adapt work plans to limited access at the site and optimize manual labor according to field conditions	- Use local transportation with smaller vehicles - Delegate certain tasks to local workers familiar with access conditions - Homeowners seek solutions for locations difficult to reach by heavy equipment	- Create a phased mobilization plan according to field conditions - Use small-sized heavy equipment - Village government temporarily improve access to the site - Use local suppliers in the area for heavy equipment mobilization
3	High rainfall intensity causes erosion at construction sites	- Map slope gradients and water flow paths to determine points most vulnerable to high rainfall - Avoid heavy earthworks during heavy rains	- Adjust plot layouts in areas experiencing erosion if such conditions have already occurred - Reschedule work schedules taking into account rainfall intensity forecasts	- Involve homeowners, village government, and local communities in land use planning and the construction of safety barriers in vulnerable areas erosion - Use a geotechnical consultant for technical advice	- Implement temporary compaction and reinforcement on slopes by constructing sheet piles - Create temporary drainage - Limit the size of the land clearing area to prevent the land from being exposed for too long before the house reconstruction process begins
4	Hard-to-reach project locations	- Coordinate with village and sub-district officials to understand work plans that could potentially hinder the project implementation - Do not carry out construction	- Arrange work duration and methods - Issue time addendums to accommodate delayed work schedules - Implementers and the	- Implementers coordinate with homeowners and local residents to assist with material transportation - Utilizing the surrounding	- Scheduling material deliveries in stages to avoid using large trucks all at once - Using local materials - Storing materials in the closest location

		simultaneously in all difficult locations - Determine the sequence of locations that are more easily accessible	government strive to optimally open access routes to facilitate material distribution and minimize work delays	community as labor - Coordinating with homeowners and landowners through whom access is provided to obtain a grant of a portion of land for access to the site	
5	The occurrence of natural disasters that affect the construction process	- Avoiding construction in red zones. - Adjusting the house construction location in accordance with technical disaster mitigation recommendations	- Adjusting the schedule and implementation methods to suit field conditions	- Creating a force majeure clause in the contract - Assigning responsibility for handling the impacts of natural disasters to relevant parties according to their authority to minimize disruptions to construction	- Conducting in-depth geological studies on the relocation site plan to identify potential disasters. - Implementing disaster-resistant housing designs. - Implementing early warning systems and emergency response measures. - Intensive collaboration with relevant agencies

Source: Processed Results, 2025

V. CONCLUSION

The results of the literature study indicate that there are 52 risks that affect the performance of post-disaster house reconstruction time. After validated by 5 experts, 45 risk variables were obtained to be presented to respondents. Data obtained from respondents were analyzed using the Probability Impact Matrix (PIM) to obtain dominant risks. The analysis results show that there are two risks in the very high- high category, namely uncertain weather conditions with a risk value of 13.08 and difficult access for heavy equipment with a risk value of 10.36. In addition, there are three risks in the medium category, namely high rainfall intensity causes erosion at construction sites with a risk value of 8.70, hard-to-reach project locations with a risk value of 8.49, and the occurrence of natural disasters that affect the construction process with a risk value of 8.36.

Risk management in post-disaster house reconstruction shows that each dominant risk requires a specific response strategy to maintain project time performance. (1) The risk of uncertain weather conditions is managed through schedule adjustments, work sequence arrangements, and risk transfer through force majeure clauses and time addendums, (2) the risk of difficult access for heavy equipment is mitigated by adapting construction methods, using small tools, and optimizing local labor and resources, (3) the risk of high rainfall intensity causes erosion at construction sites is responded to through limiting land clearing, temporary slope reinforcement, and involving technical consultants to minimize disruption to the schedule, (4) the risk of difficult-to-reach project locations is handled by arranging construction stages, gradual distribution of materials, and cooperation with transportation providers and local communities, and (5) the risk of further natural disasters is treated as an external risk that cannot be completely avoided, so it is managed by avoiding vulnerable zones, implementing disaster-resistant house designs, and creating force majeure clauses in contracts.

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