

## The Contractor's Role in Mitigating Disasters in Cianjur City, West Java, Indonesia's Ciawi Road Project

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**ABSTRACTS:** Construction projects for road infrastructure are typically undertaken outside and are very susceptible to unforeseen circumstances, such as natural catastrophes. An extensive workforce, high-quality building supplies, and schedule-driven construction implementation strategies were employed by the contractor to complete this project. The purpose of this research was to discover the steps that contractors need to follow in the event of a natural disaster while they are in the process of building, in order to prevent losses for them. The Ciawi Road Project in Cianjur, West Java, serves as the research case study. Ten variables can be used by contractors as preventive measures for disaster management for other contractors and other civil projects, according to data obtained from a questionnaire method and analysis using SPSS statistics.

**KEYWORDS:** The Contractor's Role, Disasters, Construction Projects.

### INTRODUCTION

One type of force majeure that might happen at any time and without warning are natural disasters. This event had a wide range of effects, including damage to buildings, buildings that collapsed, rock debris, landslides, ground fractures, tsunamis, floods brought on by destroyed embankments, and even fatalities and injuries. In addition, because destroyed infrastructure makes it difficult for locals to carry out their daily economic operations, natural catastrophes also have an effect on the regional economy.

On March 28, 2018, a natural disaster struck a road portion in the Puncak Pass area of Bogor, specifically the Ciawi - Cianjur City road segment. Specifically, a landslide that resulted from the region's significant rainfall blocked access between Cianjur City and Bogor district. And while repairs were being done, there was another landslide on this stretch of road. The landslide recurrence on the Ciawi - Cianjur City route happens unexpectedly and is unpredictable. Because of this, contractors will suffer losses because newly constructed and existing roads may sustain damage again, necessitating repair and rework (repair and rework) and leading to cost overruns.

Pamidimukkala et al. (2020) list 11 obstacles that can have a major impact on a post-disaster project's development. The literature highlights several significant obstacles,

including rising costs and higher margins. Other significant challenges include the growing need for manpower and equipment as well as the disruption of transportation networks. In addition, Elnaz Safapour, et al. (2020) said that a substantial quantity of rework has a detrimental effect on the development of transportation infrastructure systems as well as their rebuilding following a disaster. After a qualitative and quantitative analysis of the survey data, it became clear that transportation project reconstruction is highly complex, requiring a significant amount of rework at a high cost. Additionally, the assignment of experienced and qualified project managers is necessary to enable quick decision-making. It was also discovered that there was a clear relationship between the quantity of rework and the extent of infrastructure damage. Project managers and competent field personnel must collaborate when defect rates are high in order to minimize the requirement for needless rework. The results of this study will assist program managers and decision-makers in avoiding unnecessary costs and delays in the reconstruction of damaged infrastructure following natural catastrophes.

It may be inferred that sustainable construction projects are an essential component of road infrastructure repair projects based on the perspectives of two scholars regarding the effects of natural catastrophes on construction projects (Kumar, et al, 2013). This paper

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examines the effects of sustainable building projects on the social, economic, and environmental spheres and describes the disaster recovery measures that were put into place to reconstruct the road infrastructure that was destroyed during the Queensland Flood Disaster in January 2013 to October 2010. In order to maximize the sustainability of a disaster recovery road project that will serve the Queensland community in Australia, it creates a framework for improvement.

Road infrastructure projects are implemented by contractors that have previously signed a work contract with the owner, which is the local regional government. In the event that a natural disaster strikes while the construction project is being completed, the contractor has the direct liability. Using percentage levels in the areas of human resources (53.3%), implementation methods (46.7%), equipment (60%) and materials (50%), Elfitri et al. (2016) concluded that contractors have the willingness to play a role/contribute to reducing building failures due to earthquakes in the city of Padang. In addition, there is a connection between the types of human resources, tools, materials, and execution strategies and the decrease in building failures brought on by earthquakes in the city of Padang. Based on the statistical test results,

which showed a p value of 0.00 ( $p\text{-value} < 0.05$ ), there is a relationship between the four categories and lowering the probability of building failure.

The purpose of this study is to determine what steps contractors working on the Ciawi Cianjur road project in West Java can do to mitigate the effects of natural catastrophes. This is significant because other contractors working on construction projects, particularly in the areas, can use it as input and a sense of what to expect.

### RESEARCH METHODS

This research was carried out using a survey method (questionnaire) after previously conducting observations at the Ciawi, Cianjur road project location which was affected by natural disasters, determining research objectives, as well as studying literature related to the impact of natural disasters on construction projects as shown in the following figure 1.

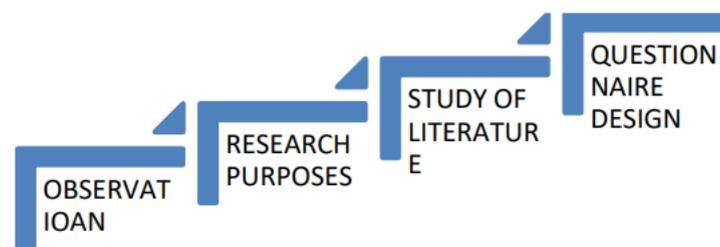


Figure 1. Research Stages

On the Ciawi Cianjur road project, which was impacted by natural disasters, observations were made by looking at damaged sections of the road and speaking with contractors in brief. The next step was to develop the research objectives and carry out a literature review in

order to create a questionnaire that would be distributed to respondents.

The questionnaire's design was informed by prior study findings about the likelihood of natural disasters during construction projects. As shown in the accompanying table 1, each

variable was chosen in accordance with the research objectives.

**Tabel 1. Research Questionare**

No	Code	Research Questionare	Source
1	X1	To reduce the risk of disasters, construction implementers must have a certificate of work skills and work expertise	Elfitri, Resi. Suraji, Akhmad. Hakam, Abdul (2016)
2	X2	To mitigate building failure due to disasters, contractors must have experience working on projects similar to the project being implemented	Elfitri, Resi. Suraji, Akhmad. Hakam, Abdul (2016)
3	X3	It is very important to create a waste management hierarchy to minimize material wasted due to natural disasters	Kumar, Arun. Desha, Cheryl. (2013)
4	X4	The contractor must carry out careful inspections during project implementation	Rifai, Andri I. Prasetyo, Eko G. Thalib, Hikmawati. (2022)
5	X5	Building damage due to natural disasters is also influenced by project implementation that does not pay attention to building standards	Zulfiar, Muhammad Heri. Jayady, Arman. (2018)
6	X6	Contractors must pay attention to environmental issues in the construction process to avoid environmental pollution	Elfitri, Resi. Suraji, Akhmad. Hakam, Abdul (2016)
7	X7	The level of damage to buildings due to disasters is influenced by material specifications	Ambiya, Firhan. Malahayati, N. Nurisra (2021)
8	X8	It is very important to increase equipment rental costs to anticipate the risk of natural disasters	Ambiya, Firhan. Malahayati, N. Nurisra. (2021)
9	X9	It is very important for permits to be carried out first before carrying out a construction project	Zulfiar, Muhammad Heri. Jayady, Arman. (2018)
10	X10	It is very important to add tools and workforce after a disaster strikes a project	Pamidimukkala, A. Kermanshachi, S. Karthick, S. (2020)
11	X11	It is very important to pay attention to damage to buildings, equipment and materials if a disaster occurs	Pamidimukkala, A. Kermanshachi, S. Karthick, S. (2020)
12	X12	It is very important to add access points to post-disaster construction projects	Safapour, E. Kermanshachi, S. Nipa, TJ. (2020)
13	X13	It is very important to add material construction to anticipate subsequent natural disasters	Safapour, E. Kermanshachi, S. Nipa, TJ. (2020)
14	X14	The occurrence of a disaster causes inflation in the costs of construction materials and labor	Ambiya, Firhan. Malahayati, N. Nurisra. (2021)
15	X15	Contractors must pay attention to the structures used in accordance with the potential disasters that exist at the construction project site	Elfitri, Resi. Suraji, Akhmad. Hakam, Abdul (2016)
16	X16	It is very important to add specialized experts to construction projects in the event of a disaster	Rifai, Andri I. Prasetyo, Eko G. Thalib, Hikmawati. (2022)
17	X17	The selection of building specifications is adjusted to the potential for natural disasters at the project location	Kumar, Arun. Desha, Cheryl. (2013)

**Tabel 1. Research Questionare (Continuation)**

No	Code	Research Questionare	Source
18	X18	The implementation of construction projects is carried out by paying attention to environmental impacts so that new disasters do not occur again	Kumar, Arun. Desha, Cheryl. (2013)
19	X19	Poor disposal of leftover materials can increase the risk of damage to construction project sites if a natural disaster occurs	Lili, Xi. Zhe, Que (2018)
20	X20	Potential dangers in the construction project area and in the construction itself need to be considered	Lili, Xi. Zhe, Que (2018)
21	X21	Improved communication between various parties in the construction project environment	Safapour, E. Kermanshachi, S.Nipa, TJ. (2020)
22	X22	Improve team performance with team performance training in construction projects	Pamidimukkala, A. Kermanshachi, S. Karthick, S. (2020)
23	X23	The application of disaster mitigation in construction projects must pay attention to the potential for disasters that might recur return	Rifai, Andri I. Prasetyo, Eko G. Thalib, Hikmawati.(2022)
24	X24	It is very important to address environmental and safety issues in construction project areas to anticipate disasters	Safapour, E. Kermanshachi, S. Nipa, TJ. (2020)
25	X25	It is very important to pay attention to the risks of construction projects to minimize if a natural disaster occurs.	Rifai, Andri I. Prasetyo, Eko G. Thalib, Hikmawati.(2022)

**RESULT AND DISCUSSION**

Research participants who had direct involvement with the Ciawi road project were given questionnaires. The selection of these respondents was based on their employment agency, which was separated into three

categories: consultants, contractors, and owners of construction projects. Including information about your employment and the organization where you work (table 2 and 3).

**Table 2. Respondent Data Based on Workplace**

No	Agency	Amount	Percentage
1	Directorate General of Civil Development (Owner)	3	7,5%
2	PT Wijaya Karya Tbk. (Contractor)	25	62,5%
3	Consultant	12	30%
<b>Total</b>		<b>40</b>	<b>100%</b>

**Table 3. Respondent Data Based on Position**

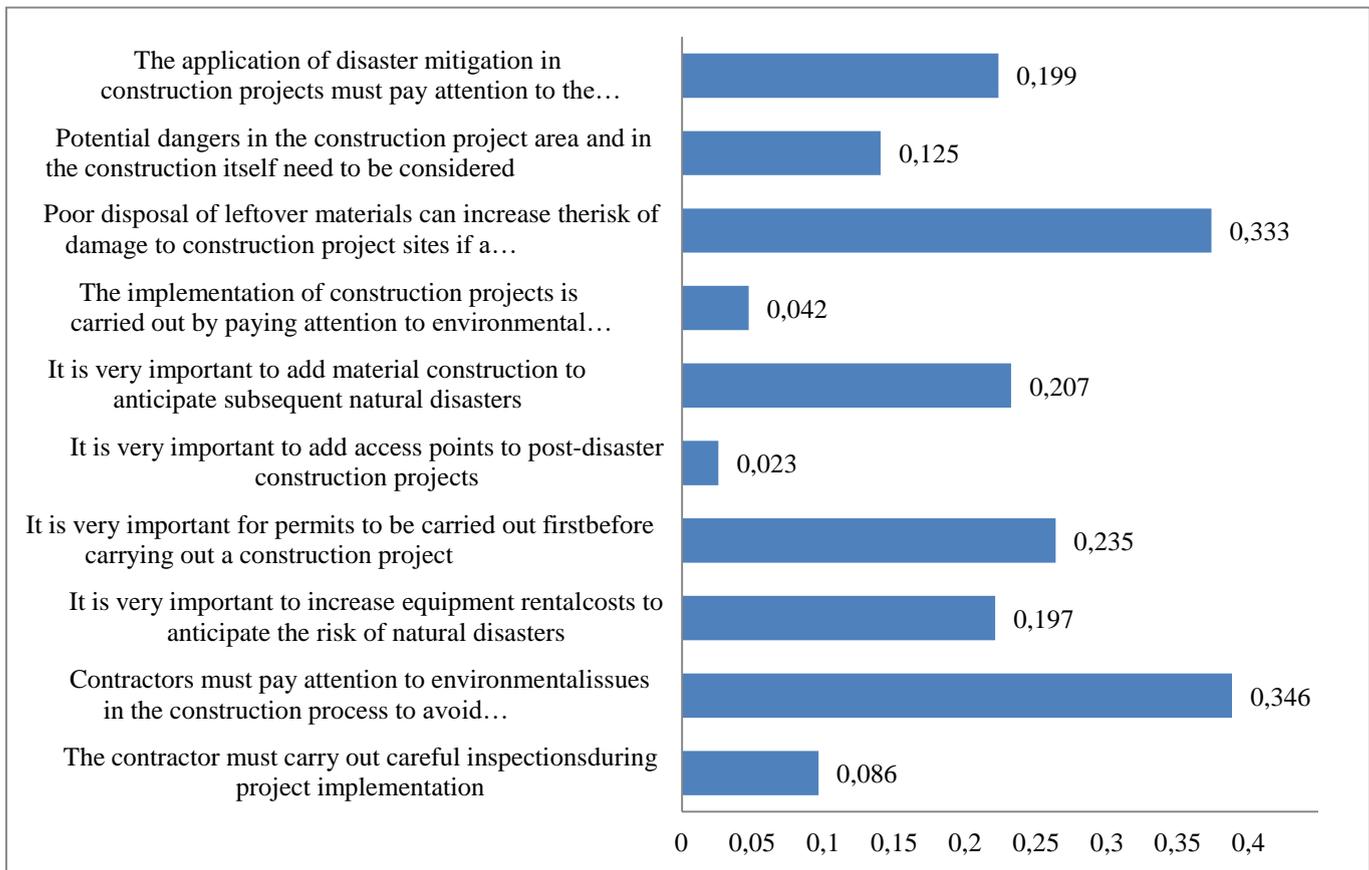
No	Position	Amount	Percentage
1	Expert Assistance	6	15%
2	Technical Director	1	2,5%

3	Drafter	2	5%
4	Geotech Engineer	1	2,5%
5	HSE Officer	2	5%
6	Executor	3	7,5%
7	Main Executor	3	7,5%
8	Quality Control	5	12,5%
9	Quantity Surveyor	3	7,5%
10	Site Engineer	1	2,5%
11	Site Manager	2	5%
12	commercial staff	3	7,5%
13	Technical Staff	5	12,5%
14	Experts	3	7,5%
<b>TOTAL</b>		<b>40</b>	<b>100 %</b>

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Respondents fill out questionnaires via Gform, and the completed forms are then analyzed using SPSS statistical analysis. This process uses a factor analysis formula to try to limit the number of variables so that inferred conclusions may be made that are both

practical and reasonable (fig 2). The factor analysis outcomes from the questionnaire design (table 1) above produced the variable rankings shown in the following table.



**Figure 2. Results of Factor Analysis**

The aforementioned image illustrates how the ten factors are ranked (table 4).

**Table 4. Ranking elements for the Ciawi Cianjur road project in West Java that contractors need to be aware of.**

Code	Variable	Standardized Coefficients		Rank
		B	Std. Error	
X6	Contractors must pay attention to environmental issues in the construction process to avoid environmental pollution	0,346	0,272	1
X19	Leftover materials can increase the risk of damage to construction project sites if a natural disaster occurs	0,333	0,325	2
X9	It is very important for permits to be carried out first before carrying out a construction project	0,235	0,214	3

**Table 4. Ranking elements for the Ciawi Cianjur road project in West Java that contractors need to be aware of (Continuation)**

Code	Variable	Standardized Coefficients		Rank
		B	Std. Error	
X13	It is very important to add material construction to anticipate subsequent natural disasters	0,207	0,128	4
X23	The application of disaster mitigation in construction projects must pay attention to the potential for disasters that might recur	0,199	0,323	5
X8	It is very important to increase equipment rental costs to anticipate the risk of natural disasters	0,197	0,270	6
X20	Potential dangers in the construction project area and in the construction itself need to be considered	0,125	0,382	7
X4	The contractor must carry out careful inspections during project implementation	0,086	0,191	8
X18	The implementation of construction projects is carried out by paying attention to environmental impacts so that new disasters do not occur again	0,042	0,272	9
X12	It is very important to add access points to post-disaster construction projects	0,023	0,145	10

**CONCLUSION**

The ten criteria mentioned above are explained in the following.

- 1) Contractors must pay attention to environmental issues in the construction process to avoid environmental pollution. The first and most important thing that contractors can do to lower the danger of natural catastrophes on the Ciawi Road -Cianjur City development project is to pay attention to environmental issues throughout project execution. Natural disaster risk can be reduced by paying attention to environmental issues, such as environmental contamination.
- 2) Leftover materials can increase the risk of damage to construction project sites if a natural disaster occurs. The second aspect that can lessen the risk of natural catastrophes on the Ciawi Road - Cianjur City development project is the possibility of hazard that is present in every

task. If safety measures are not followed, such as being aware of potential hazards, then risks may arise.

- 3) It is very important for permits to be carried out first before carrying out a construction project. The third aspect that can lower the danger of natural disasters on the Ciawi Road - Cianjur City development project is the contractor's need to add manpower and tools if a disaster happens during the construction process. In order to complete the evacuation and return tasks by the deadline, more personnel and equipment are definitely required.
- 4) It is very important to add material construction to anticipate subsequent natural disasters. The decline in the value of the rupiah relative to the dollar exchange rate leads to inflation. This is the fourth component that lowers the danger of natural disasters on

the Ciawi Road - Cianjur City development project. It is caused by a number of reasons, including the incidence of catastrophes. The contractor must be very careful because inflation can increase the RAB estimate.

5) The application of disaster mitigation in construction projects must pay attention to the potential for disasters that might recur return.

The fifth aspect that might lower the danger of natural catastrophes on the Ciawi Road - Cianjur City construction project is understanding how critical it is to resolve environmental and safety issues in the project region. The availability of personal protective equipment must be carefully evaluated, as safety is the first concern when performing job.

6) It is very important to increase equipment rental costs to anticipate the risk of natural disasters.

Potential dangers in the construction project area and in the construction itself need to be considered as the fifth factor that reduces the risk of natural disasters on the Ciawi Road - Cianjur City construction project. Potential dangers are something that will always be present in construction work, so these potentials must be prevented and controlled so that the work is safe from potential dangers.

7) Potential dangers in the construction project area and in the construction itself need to be considered.

On the Ciawi Road - Cianjur City development project, the seventh component that can lower the danger of natural disasters is improving communication between various parties within the project environment. Effective communication is essential in the workplace since construction projects necessitate effective coordination between multiple stakeholders. If this coordination is compromised, it will also impact the project's progress.

8) The contractor must carry out careful inspections during project implementation. The eighth component on the Ciawi Road - Cianjur City construction project that lowers the danger of natural catastrophes is the contractor's obligation to conduct thorough inspections during project execution. An appropriate inspection can reduce building failures as well as the chance of natural disasters happening.

9) The implementation of construction projects is carried out by paying attention to environmental impacts so that new disasters do not occur again.

Because it impacts the ecosystem, it is crucial to pay attention to the locations where garbage is disposed of. On the Ciawi Road - Cianjur City development project, this is the ninth component that lowers the risk of natural disasters. Overstock materials that are not regulated may pose risks and result in building that does not adhere to standards.

10) It is very important to add access points to post-disaster construction projects.

Tenth, adding construction materials is crucial to preventing materials from being harmed by disasters. This element can help lower the danger of natural disasters on the Ciawi Road - Cianjur City development project. In the event of a calamity, the inclusion of this item is meant to avert shortages or price hikes.

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