

## Relationship Between Location of Project and Height of Building Toward Health and Safety Cost in Rusunawa Construction Projects

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### ARTICLE INFORMATION

#### Publication Information

#### Research Article

#### HOW TO CITE

Amran, Y., & Nisa. (2021). CSR in the Covid-19 situation in Indonesia. *Journal of International Conference Proceedings*, 9(1), 23-31.

#### DOI:

<https://doi.org/10.32535/jicp.v4i2.1251>

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Received: 3 September 2021

Accepted: 26 October 2021

Published: 16 November 2021

### ABSTRACT

The rise of separatist actions in various regions in Indonesia raises concerns for all parties, including contractors as providers of construction project services. Not only separatism, thuggery acts that occur in the construction project environment are also considered to be 'natural'. The current SMK3 cost planning does not take into account events in different project locations, particularly in the western, central, and eastern parts of Indonesia. This should be considered since each region in Indonesia has different climatic conditions and characteristics. This study focuses on analyzing the relationship between project location and building height on K3 cost and further reviews the factors in these variables which are the dominant influence on K3 cost. The purpose of this study is to analyze the factors in each variable that affect K3 costs and analyze the relationship between project location variables and building heights on the K3 cost model in Rusunawa construction projects. This study analyzes data from 5 experts and 12 respondents who work in construction companies using quantitative methods and questionnaires. The results of the study indicate that there are 5 variables with 33 indicators that affect the K3 cost of the Rusunawa construction project.

**Keywords:** Height, K3 Cost, Location, Relationship Model, Rusunawa

**JEL Classification:** C14, L70, L74

## **INTRODUCTION**

Indonesia is a developing country in the form of an archipelago whose land area is separated by wide seas. According to Baiquni (2014), various special characteristics (purity, character, privilege, and uniqueness) possessed by each regional unit as well as the existence of human activities and natural forces, can provide opportunities between regions to be interconnected. However, a number of diverse physical and cultural characteristics have not been optimally utilized as a potential to support regional development in Indonesia (Kusuma & Muta'ali, 2019). According to BPS (2018), the level of inequality in Indonesia is still growing with an index of 0.389. One of the reasons for this disparity is the lack of adequate infrastructure in each province. The availability of minimal infrastructure can be the main cause of high logistics costs and low inflow of investment (Bappenas, 2014).

In increasing economic growth through infrastructure development in Indonesia, the Government is making efforts to accelerate projects that are considered strategic and have high urgency to be realized in a short period of time. The Ministry of PUPR as one of the government agencies that has the authority to manage the needs of the Indonesian people's board, has a priority housing program whose budget is devoted to the One Million Houses Program (Program Sejuta Rumah). One of the development programs that will be implemented is the construction of flats (Siregar, 2021). Gambatese et al. (2005) stated that design for construction safety includes handling the safety of construction workers in a permanent design on a project. It can be concluded that considering safety in the design stage is very important in construction and hence the design concept for construction safety has been officially proposed in the global construction research agenda (Lestari, 2021).

In the process of building flats, of course, there are several obstacles, both from internal and external factors (Magatri & Sunarno, 2020). Obstacles from external factors more often occur due to lack of communication with local communities such as refusal to implement apartment construction projects with uncontrolled environmental management issues and lead to environmental pollution. Project hazards are a natural part of the initial conditions of the construction site due to the scope and location of the project (Imriyas et al., 2007). These development projects often take locations that are already inhabited by the community therefore it causes conflict. Employees are the core of management (Uloli et al., 2019). Mohyi (2020) stated that worker performance is influenced by internal factor and external factor.

Many factors can cause conflict. Basically, the source of conflict in Indonesia consists of five factors, namely ideology/religion, politics, economy, inter-ethnicity, and separatism (Wicaksono, 2013). This conflict can be seen in the results of research belonging to Rusim et al. (2018), that unpredictable external risks, including ulayat rights issues, war and riots, as well as political and social stability in the location, have a high-risk scale (p. 197). Then it is followed by predictable external risks, which include erratic weather conditions, material damage, project location in terms of geographical location, and natural disasters. Sillia (2019) revealed that the construction industry is an industrial sector that has a high level of risk because it is very dangerous to public safety, property, human life, and the environment as well as disruption of construction activities.

However, in reality, the obligation to implement K3 in Indonesia is not balanced with the active role of service providers, namely contractors, in implementing K3 effectively. Research conducted by Machfudiyanto et al. (2017) concluded that the level of implementation of SMK3 in Indonesia is still very low. More than 70% of surveyed

construction projects do not implement SMK3. At the enterprise level, only one-third of the large qualified contractor companies implement SMK3 in their projects.

Based on the results of Hadwiansyah's research (2020) that the implementation of safety management calculations during the construction phase does not always run optimally because the costs required for its implementation are rarely analyzed comprehensively. Meanwhile, research by Mahmudah (2020) and Fitriani (2020) describes several indicators that affect the determination of K3 costs in a project location with a certain height. However, Indonesia as an archipelagic country which is divided into 3 regions, namely the Western region, the Central region, and the Eastern region has different characteristics in each location. The vulnerable factor of crime events outside the project site is one of the things that needs to be considered in determining the cost of K3 construction projects.

Therefore, based on the findings above, this research is focused on analyzing the cost of K3 safety in the correlation between project location and building height to K3 safety costs in order to be able to further review the factors in these variables which becomes the dominant impact on K3 general, K3 special, and K3 safety cost.

## LITERATURE REVIEW

### Cost of K3 Rusunawa Project

In the PUPR Ministerial Regulation Number 10 year 2021, in article 40 paragraph (1) it is stated that the costs of implementing SMKK are budgeted and implemented by the Service Provider. Moreover, these costs must be delivered by the Service Provider in the offering document in accordance with the components of the SMKK implementation activities. The details of the cost of implementing SMKK at least include:

- Preparation of RKK, RKPPL, and RMLLP;
- Socialization, promotion and training;
- Work protective equipment and personal protective equipment;
- Insurance and licensing;
- Construction Personnel Safety
- Facilities, infrastructure, and medical equipment;
- Necessary traffic signs and equipment (or traffic management);
- Consultation with experts regarding Construction Safety; and
- Activities and equipments related to Construction Safety Risk control, including environmental testing/inspection costs.

### K3 Cost Structure

#### General K3 Cost

In PUPR Ministerial Regulation Number 28 year of 2016 about Guidelines of Construction Safety Management Systems (SMK3), the calculation of costs for general K3 purposes such as Personal Protective Equipment (PPE) in the form of helmets, vests, shoes, masks, raincoats, hats, gloves, protective eyewear and others are included in the general overhead costs.

**Table 1.** Occupational Safety and Health (K3) General Construction Clause

Item K3	Water Resources	Bina Marga	Cipta Karya
<b>General K3</b>	Personal Protective Equipment (PPE) such as helmets, vests, raincoat, shoes,	Seksi 1.19 (K3)	Personal Protective Equipment (PPE) such as helmets, vests, raincoat, shoes,

umbrella, handkerchief,  
goggles

umbrella, handkerchief,  
goggles

Source: Minister Regulation PUPR No. 28 year of 2016 Attachment

### Special K3 Cost

In the PUPR Minister Regulation Number 28 year of 2016 concerning Guidelines for Construction Safety Management Systems (SMK3), the calculation of costs for specific K3 purposes includes several items contained in the table of Occupational Safety and Health (K3) Construction.

**Table 2.** Occupational Safety and Health (K3) Special Construction Clause

Item K3	Sumber Daya Air	Bina Marga	Cipta Karya
<b>Special K3</b>	<ul style="list-style-type: none"> <li>• Mobilization: K3 personnel, work protective equipment (APK), signs</li> <li>• Health facilities</li> <li>• Labor insurance and licensing</li> </ul>	Section 1.2 (Mobilization) dan Section 1.19 (K3)	<ul style="list-style-type: none"> <li>• Mobilization: K3 personnel, work protective equipment (APK), signs</li> <li>• Health facilities</li> <li>• Labor insurance and licensing</li> </ul>

Source: Minister Regulation PUPR No. 28 year of 2016 Attachment

### K3 Security Cost

In the Regulation of the Minister of Public Works and Public Housing Number 10 of 2021 concerning Guidelines for Construction Safety Management Systems, it is stated that the procedures and/or instructions for securing the work environment signed by the relevant Engineer and the Head of Construction Work Executor/Management Deputy at least include:

- Security officer;
- CCTV;
- Safety fences; and
- Identification (ID Card).

As for the several lists of construction safety personnel who participate in the practice of construction work whose competence is proven by SKA and SKT as well as length of experience of similar work, which include:

- 1) Construction K3 Expert/ Construction Safety Officer
- 2) Medical officers;
- 3) First aid officers;
- 4) Firefighter officer;
- 5) Signal giver (flagman); and
- 6) Security Officer (security).

### Project Location

The location of Rusunawa development is spread across 34 provinces in Indonesia which geographically is an archipelagic country consisting of 17,504 islands with an area of 1,910,931 km<sup>2</sup> (Wikipedia, 2021). The construction sites have different characteristics and pose different occupational risks. This has also been stated in Ratih Fitriani (2020) research that according to Allan Holt (2005) there are 2 conditions of construction safety principles at every construction work site. The first is the conditions around the project location, such as land use, soil stability and pollution, traffic systems and restrictions, environmental disturbances such as vandalism or thuggery, ambient noise disturbance, and other disturbing factors. While the second is the conditions in the project site, such as the status and the land location for supporting activities, traffic conditions and

limitations, results of land investigations, underground obstructions, soil contamination, and groundwater conditions.

### Building Height

Based on the PUPR Ministerial Regulation Number 22 of 2018 concerning State Buildings, the category of high-rise buildings is divided into 3 types, namely high-rise buildings with more than 8 floors, medium buildings with 5 to 8 floors, and low buildings with less than 5 floors.

### Theory of between Project Location and K3 Cost

According to BPS, the construction cost index issued annually (BPS, 2018) determines the total cost of the resources used, especially for wages, materials, and equipment for workers. The number of flats spread across the country has a different construction cost index in each region. The characteristics of the construction industry that is unique are being in different work locations, open, affected by the weather, limited execution time, dynamic, demanding high physical endurance and using a lot of untrained workers, involving a large enough workforce and the construction industry. There are many dangers and risks in every type of work. Work accidents are closely related to the costs that must be incurred by contractors as service providers in an effort to prevent and heal accident victims, in this case dominated by construction workers.

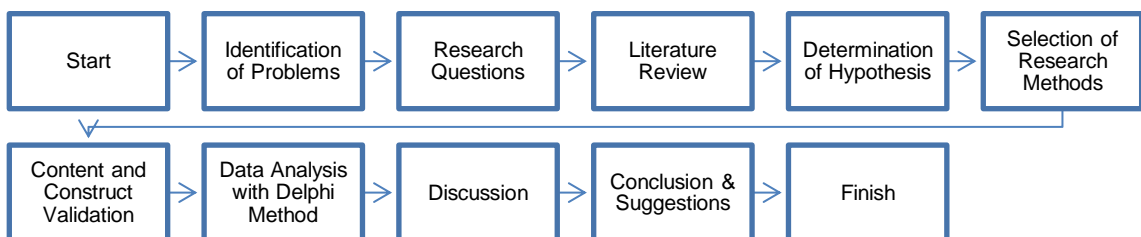
### Theory of Relationship between Building Height and K3 Cost

According to John Ridley (2008), working at heights increases the risk of accidents. In this type of work, work accidents that occur tend to be serious and often result in permanent disability and death. Meanwhile, construction workers are less aware of these risks, often neglecting the use of personal fall arrest systems, which actually have been regulated in the construction K3 guidelines (Mahendra et al., 2015).

## RESEARCH METHOD

In achieving the objectives of the research, a research strategy is needed. In this study using survey methods, case studies, and expert judgment. Then for the quantitative research process starting from theory, hypothesis, research design, selecting subjects, collecting data, processing data, analyzing data, to writing conclusions. The following are the stages in the research:

Figure 3.1. Stages in Quantitative Research



### Data Collection

The research instrument used to answer the research questions is to use a questionnaire. Data collection is done by validating the variables that have been obtained from the literature study, namely as many as 5 variables with 37 sub-variables that affect the cost of K3 construction projects. Variable validation was carried out by several experts in the construction field with at least 10 years of experience from practitioners, both government and academics.

## RESULTS

In the previous study, there were 10 sub-variables on the project location and 3 sub-variables on the height of the building that affected the K3 costs. In addition, security costs are not included in K3 costs because they are considered to be included in other costs because currently K3 costs are only centered on safety in construction projects. Whereas according to Magatri & Sunarno (2020) that in the process of building flats, of course, there are several obstacles, both from internal and external factors. Obstacles from internal factors tend to be rare because the conditions specified in the development must be met in order to obtain a permit to build. Meanwhile, obstacles from external factors more often occur due to lack of communication with the local community, such as the refusal to implement apartment construction projects with uncontrolled environmental management issues and lead to environmental pollution. This incident should not have happened if from the beginning the developer carried out socialization and approaches to community groups so as to minimize the protests or unwanted reactions. In addition, these development projects often take locations that are already inhabited by the community so that it can cause conflict.

Based on the literature study and also the validation of 5 construction experts, researcher was able to identify as many as 5 variables with 33 sub-variables that could be used in this study, namely:

1. Project Location (X1)
2. Building Height (X2)
3. General K3 Cost (Y1)
4. Special K3 Cost (Y2)
5. Safety K3 Cost (Y3)

**Table 3.** Research Variable and sub-variable of Project Location & Building Height

Variable	Sub-variable		
<b>X1</b>			
		X1.1	High Density Level
		X1.2	Medium Density Level
		X1.3	Low Density Level
		X1.4	Open Location
		X1.5	Narrow Location
		X1.6	Soil stability
		X1.7	Contamination Around the Land
		X1.8	Traffic System & Limitations
		X1.9	Thugs & Vandalism
		X1.10	Vulnerable Areas (Disaster, Crime, & Conflict)
		X1.11	Islands
		X1.12	Mainland
		X1.13	Weather
		X1.14	Regional Differences in Indonesia (West, Central, and East Regions)
	X1.15	Military Area	
<b>X2</b>			
	<b>Building Height</b>	X2.1	Low (1-4 lantai)
		X2.2	Medium (5-8 lantai)
		X2.3	High (>8 lantai)

**Table 4.** Research Variable and sub-variable of General K3 Cost, Special K3 Cost, and Safety K3 Cost

Variable	Sub-variable	
<b>Y1</b>		
<b>General K3 Costs</b>	Y1.1	Preparation of RKK, RKPPL, dan RMLLP
	Y1.2	Personal Protective Equipment (PPE), such as helmets, vests, raincoats, shoes, umbrellas, gloves, goggles
	Y1.3	Activities and equipment related to Construction Safety Risk Control, including environmental testing/inspection costs
<b>Y2</b>		
<b>Special K3 Costs</b>	Y2.1	K3 Personnel
	Y2.2	Work Protective Equipment (APK)
	Y2.3	Traffic signs and equipment required (traffic management)
	Y2.4	Facilities, Infrastructure, and Medical Devices
	Y2.5	Insurance and Licensing
	Y2.6	Consultation with Experts regarding Construction Safety
<b>Y3</b>		
<b>Safety K3 Costs</b>	Y3.1	Security Officer
	Y3.2	Worker Identity Card and CCTV
	Y3.3	AKK (Construction Safety Analysis)
	Y3.4	IBPRP (Identification of Hazards, Risk Assessment, Determination of Risk Control, and Opportunities)
	Y3.5	Safety Net Work
	Y3.6	Safety Fence Work

## DISCUSSION

In conducting interviews and distributing questionnaires to experts, there were 3 sub-variables on the Project Location variable and 1 sub-variable on the Safety K3 Cost which was eliminated because it was considered less affecting the K3 Cost of the Construction Project. For the sub-variable 'Noise disturbance around the area' is considered to have no effect because it has been included in the construction planning so that the area management will definitely allow it, although with certain notes. Then the sub-variable 'Land Status' is considered to have no effect because issues related to this should be resolved during planning so that later it will not cause problems. Then for the sub-variable 'Regional Spatial Plan' it is assessed that it will only affect the design of a building and will not affect K3 costs. Regarding the 'Mobilization' sub-variable, it is also considered to have no effect because it has been included in the work item. So, from the analysis and data collection, the results obtained that 5 variables and 33 sub-variables affect K3 costs, especially in Rusunawa construction projects. K3 safety costs are an important point in construction projects that need to be reviewed and improved.

## CONCLUSION

It can be concluded that the application of K3 costs for Rusunawa construction projects in Indonesia has been going well. However, new problems can occur if the safety outside the construction project is not properly considered. Safety costs are often not prioritized in determining K3 costs while external hazards are much more unpredictable than internal hazards. Therefore, in an effort to determine the K3 cost of a Rusunawa construction project, it is necessary to have a model of the relationship between the project location and the height of the building to several K3 costs. Based on the literature study and expert validation in this research, it appears that there are five variables that can be used to measure K3 costs.

### **LIMITATION**

The K3 costs in question are the costs charged to service providers regarding the K3 needs of construction projects in the West, Central, and East regions. This research is limited only to the Rusunawa construction project.

### **ACKNOWLEDGMENT**

I would like express my deep gratitude to Prof. Dr. Ir. Yusuf Latief, M.T. as first advisor and Ratih Fitriani, S.T, M.T. as second advisor for their patient guidance, enthusiastic encouragement and useful critiques of this research work. Their willingness to give their time so generously has been very much appreciated. I would also like to thank to several experts who have provided all inputs and opinions on this research and several parties for their help in collecting the data. Finally, I wish to thank my parents for their support and encouragement throughout my study.

### **DECLARATION OF CONFLICTING INTERESTS**

The present study which is reported in this article is not being published in other publisher and is free from the interests of any party.

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