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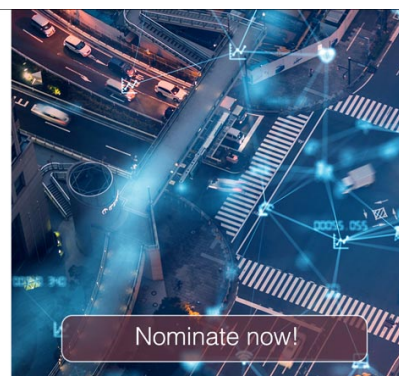


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# What causes cost overrun in highway strategic project in Indonesia?

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**Abstract.** In 2016, Indonesia is concerning about the acceleration of public infrastructure projects through the existence of government strategy projects that spread across several project sectors, including in highway projects. Totally, there is a 44 highway strategic project in Indonesia and several of them are currently in Central Java. Unfortunately, as a national strategic project, even though all of these projects are prioritized in their construction process, the implementation of the national strategic projects are faced up problems especially related to high pressure from the government that has an impact to project cost even causing cost overrun including in highway strategic project. The research aim is to analyze factors causing cost overrun in highway strategic project from owner and contractor perspectives. This study is limited to a case study in Pemalang-Batang Highway Strategic Project. The analysis of the study is using Risk Breakdown Structure to identify risk factors causing cost overrun. From a total of 14 risks identify, both parties agreed to design change as the most risk factor in causing cost overrun in highway strategic project in Indonesia.

## 1. Introduction

Improving the quality of infrastructure is one of Indonesia's challenges as a developing country. In 2014, Dirjen Bina Marga stated in the report that the findings from ADB in 2010 Indonesia are inadequate and have low quality infrastructure, especially in the transportation network and electricity supply, as well as irrigation in several provinces [1]. Whereas the adequacy of the number and quality of a country's infrastructure will increase productivity and the economy of the community. It means, that infrastructure has an important play role in supporting the economy of a country.

Roads are one of the type infrastructure in a country. In Indonesia, one of the national road is located in Pantai Utara Jawa and or it is called Pantura. Pantura road has a length of about 1316 km and stretches from Merak in West Java Province to Ketapang Banyuwangi in East Java Province and at about crosses 3 (three) others provinces namely Banten, DKI Jakarta and Central Java province. In 2010, Ministry of Public Works has stated that Pantura road serves by approximately 50,000 vehicles per day [1]. Moreover, every year during the Eid al-Fitr celebration, the Pantura road has been a main roads especially on the Java Island. But unfortunately, the data shows 40% of the Pantura road was damaged, and this was due to lack of maintenance and the number of vehicles that exceeded the load that crossed the Pantura road. The number of vehicles crossing the Pantura road, especially on celebratory days such as Eid al-Fitr that is unbalance with good road quality services causes high congestion at some point along the Pantura road. Moreover, the traffic jam that occurred on the Losari-Brebes one of Pantura road segment even reached 80 km during Eid Al-Fitr in 2016.

This situation underlies the idea of building the Trans Java Highway, this project is expected to reduce the burden of Pantura road and be able to reduce the congestion that occurs in Pantura road.



The Trans Java Highway Project is one of 44 other national strategic projects. This project consists of several highway project, one of which is Pemalang-Batang highway project. As national strategic project, Pemalang-Batang highway project has a priority in their construction based on the Presidential Regulation Number 3 of 2016 about the Acceleration of The Implementation Nasional Strategic Project.

The implementation of Pemalang-Batang Highway Project there were several obstacles, one of which was related to the issue of land acquisition. This causes the Pemalang-Batang highway project which should be targeted for use in 2017 to experience a delay in construction until the end of 2018. Besides the problem related to land acquisition, the high demand from the government for national strategic projects including the construction of the Pemalang Batang highway also has an impact on the project costs. In this term was lead the increasing budget of the project as commonly referred as cost overrun [2]. Based on data it can be seen that the project experienced a cost overrun of around 19%. This cost overrun will have an impact to the whole project including target and the parties involved in the project.

All the problems faced are used as background in this research study to analyze the factors that cause cost overrun in Pemalang-Batang highway as national strategic projects. Hence, the purpose of this research are to identify and to analyze the occurrence of cost overrun in Pemalang-Batang highway project as national strategic project from the owner and contractor perspectives. Highway project with long concession period will have an impact to rise more risks in return of investment [3]. Eventhough, generally highway construction project should provide a meeting point between commercial criteria and financial viability to attract investors to participate in the project. Therefore, analysing factors causing cost overrun must be seen from all parties participated in the project to dig a complete information of the causes cost overrun in national strategic highway project. It is important because the key to the success of a project involves not only one party but all parties were in the project from planning to operational and maintenance.

## 2. Cost Overrun

### 2.1 Factors Causing Cost Overrun

Unfortunately, cost overrun is one of common problem in project construction including in transport infrastructure in a worldwide [4]. Poor cost/ budget planning was deemed as the main problem of causing cost overrun in the project [5]. Further mentioned in previous study that the risk of cost overrun in a project depends on planning and controlling the estimated cost [5] [6].

Memon et al. [7] stated that cost overrun can be caused by several factors i.e poor design and design delays, duration of contracts and unrealistic work scope, lack of experience, delay in delivery of materials and equipment, relationship between management and workers, lack of preparation and approval of drawings, inadequate planning and scheduling, poor site management and supervision, errors during construction, and changes in specifications and material types. While Creedy et al. [4] stated factors causing cost overrun in construction project are changes in the design and scope of work; inadequate investigation and latent conditions; lack of documentation, specifications and design; cost of project management by the owner; cost of relocation; constructability; price escalation; right-of-way-costs; contractor risk; and environment. Both previous researches mentioned design as factor causing cost overrun.

### 2.2 Previous Study

Some previous study related factors causing cost overrun in construction project can be seen in Table 1.

**Table 1.** Previous Study

Year	Researcher	Factor Causing Overrun
<b>2016</b>	Lindhard et al. [8]	a. Material misjudgment; b. Inconsistency of contract; c. Late user change; d. Lack of preliminary study; e. Lack experience of consultant

Year	Researcher	Factor Causing Overrun
<b>2016</b>	Samarghandi et al. [9]	From the contractor's perspective: 1. Inaccuracy of budgetting and planning resources; 2. Lack of quality materials and quantity of equipment; 3. inexperienced human resources. From the consultant's perspective 1. Inaccurate in the feasibility study; 2. Poor technical document; 3. Inaccuracy of technical documents
<b>2015</b>	El-Sayegh et al. [10]	Inefficiency of planning was the top of risk to the construction project.
<b>2013</b>	Alinaitwe et al. [11]	1. Contract change order; 2. Delay in payment; 3. Poor supervision and control; 4. The high cost of capital; 5. Political unstable.

### 3. Method

This research was used quantitative descriptive. Data in this research was collected using questionnaires through owner and contractor perspectives. Variable were used in this research based on the previous study. Generally, analyzing data in this research was divided in 2 steps: (1) Identifying factors causing cost overrun, and (2) analysing the rank factors through owner and contractors perspectives.

Step (1) Identifying factors causing cost overrun was started with brainstorming to Expert in Pemalang-Batang highway project. Then the result was compared by previous research related cost overrun. Table 2 describes the result of variable were used as factors causing cost overrun in this research.

**Table 2.** Factor Causing Cost Overrun

Category		Factors	References
Internal	1	Design error	[9, 10]
	2	Contract change order in design/ scope	[9, 11]
	3	Lack experience of consultant	[8]
	4	Lack experience of contractor	[8, 9]
	5	Poor Technical Documents	[9]
	6	Lack quantity of labour	[11]
	7	Low Labour Productivity	[9]
	8	Outdated Construction Method	[9, 10]
External	9	Rework	[11]
	10	Poor monitoring	[11]
	11	Unforeseen Soil Conditions	[10]
	12	Location	[11]

Category	Factors	References
13	Inflation	[9, 11]
14	Bad Weather	[9, 10]

Based on the brainstorming and previous research, 14 factors have been identified and used in this research. First, factors were classified in internal category i.e design error, contract change order in design/ scope, lack experience of consultant, lack experience of contractor, poor technical document, lack quantity of labour, outdated construction method and rework. In external category i.e poor monitoring, unforeseen soil conditions, location, inflation and bad weather.

Step (2) Data collected through questionnaire to expert in project from the representative of owner, contractor and consultant in Pemalang-Batang Highway Project. Questionnaire was used to digging the perspectives of owner and contractor in analysing the most factor causing cost overrun in Pemalang-Batang Highway Project as one of the National Strategic Project.

#### 4. Result and discussion

The factors causing cost overrun in National Strategic Highway Project in this research was divided into internal and external category. Table 3 below shown the result of rank factors causing cost overrun as perceived by owner and contractor.

**Table 3.** Internal Factors Causing Cost Overrun in National Strategic Highway Project

Risk Ranking	Internal Factors Causing Cost Overrun by	
	Owner	Contractor
1	Contract change order in design/ scope	Contract change order in design/ scope
2	Design error	Design error
3	Lack experience of consultant	Lack quantity of labour
4	Lack experience of contractor	Lack experience of consultant
5	Lack quantity of labour	Poor monitoring
6	Low labour productivity	Low labour productivity
7	Poor monitoring	Outdated Construction Method
8	Poor Technical Documents	Poor Technical Documents
9	Outdated Construction Method	Lack experience of contractor
10	Rework	Rework

Table 3 shows that between owner and contractor agreed factors related design as the most internal factors causing cost overrun in national strategic highway project. While to the other factors both have different perception in determining risk ranking of factors causing cost overrun in project. This finding was similar with previous study that mentioned each parties both owner, contractor and consultant will have different opinion in assessing the factors causing cost overrun, because each party have different play role and stage participation in every project [9]. Meanwhile, as external factors the rank factors causing cost overrun shown in Table 4.

**Table 4.** External Factors Causing Cost Overrun in National Strategic Highway Project

Risk Ranking	External Factors Causing Cost Overrun by	
	Owner	Contractor
1	Unforeseen Soil Conditions	Unforeseen Soil Conditions

<b>2</b>	Bad weather	Bad weather
<b>3</b>	Inflation	Inflation
<b>4</b>	Location	Location

According to Table 4, both parties have similar perception about external factors causing cost overrun in national strategic highway project. Also both owner and contractor agreed unforeseen soil conditions as the most external factor in causing cost overrun to the national strategic highway project.

## 5. Conclusion

Cost overrun in construction project will lead by risk factors that occurred in the project. From the 14 factors identified, both owner and contractor agreed risk related design as the most influential factor causing cost overrun in internal category and risk related unforeseen soil condition as the most influential factor leading cost overrun in external category. Therefore, analysing factors causing cost overrun must be seen from all parties participated in the project to dig a complete information of the causes cost overrun in national strategic highway project. It is important because the key to the success of a project involves not only one party but all parties were in the project from planning to operational and maintenance.

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