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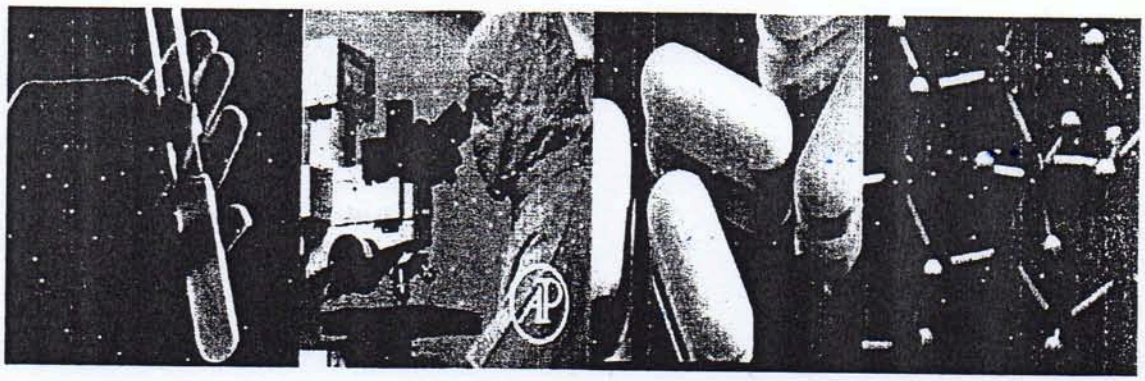

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# Risk Analysis Using State Budget Changes (APBN-P) In the Implementation of Construction Projects in Indonesia (Case Study)

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## ABSTRACT

This research is a case study on the possibility of various risks on construction projects using state budget funds in Indonesia. Procedures that used in this study is *Six Risk Analysis Method*, which is by using questionnaires distribution to the respondents. Analysis of the data using the mean frequency and severity analysis then included in risk mapping/profiling. Research concludes that the important aspects that lead to the risk of large-scale, *avoidance* categories (risk to be avoided) are found in order of their effects and probability scales. Important sources of risk, which is the most dominant source of high-risk scale, the category of *avoidance* (risk to be avoided), high-scale risk *transfer* category (risk to be transferred), lower middle-scale risks, *mitigate* categories (risk to be reduced), and the risk of small-scale, *acceptance* category (risk that must be accepted), also found based on their order of impact and probability scales on a project done using state budget funds in Indonesia. Risk allocation can be charged to the project owner, consultants, contractors, sharing or other appropriate parties of the risk occurring sources. *Stakeholder* strategy to avoid or reduce the risk they pose is done with cooperation of specialists' subcontractors or insurance

**KEYWORDS**: risks, project, construction, state budget

## INTRODUCTION

Activities of every company must have the possibility of a variety of risks that may occur. Business risk can be caused by natural or non-natural risks [1]. There are a lot of various risk types that may occur in any corporate activity [2], as well as in the construction service business. Lots of risks that occur in the activities of construction service business is because there are many parties involved, the unique and specific characteristics businesses, the limited and scheduled time required, and the predetermined and considerable resources involved [3]. Competition among construction services companies in the current globalization era is increasingly sharper. This encourages any construction company to improve the quality, productivity and reducing costs, improving project management strategy and implementing appropriate management and effectively managing project risks [4]. Construction projects can not be predicted. Risks and uncertainties can potentially have damaging consequences for construction projects [5], [6]. Therefore at this time, risk analysis and management continues to be a major feature of the construction project management in an effort to deal effectively with uncertainty and unexpected events in order to achieve optimal project success [4]. To recognize the risk of construction project first need to know *the life cycle of the project* and the *stakeholders* involved directly or indirectly [1], [2] According to different sources, each construction project is unique and has different risk [7], [8]. Construction projects are extremely inherent, complex and dynamic, and involve a lot of managers [9], [10]. Different managers with different experience and skills usually have different expectations and different interests [11]. It naturally raises problems and difficulties for the management, even for the most experienced project managers [1].

In Indonesia, funding sources of government construction projects are very diverse; it can be from the State Budget (APBN), the Provincial or District / City local budget (APBD), General Allocation Fund (DAU), Special Allocation Fund (DAK), central government stimulus funds, foreign investors / domestic, World Bank / local and other sources. [12] A funding source of government construction projects that has much attention today is revised state budget (APBN-P). It is because the revised state budget allocated to construction projects has a limited time span, so that it's very risky to plan and implement the project. Various media sources in Indonesia notes that many of the projects funded from the revised state budget were deserted and could not be completed on time (Kompas, July 2010). Many contractors made false statements to draw term interests from the revised state budget funds even though the physical work in the field had not been completed (Media Indonesia, October 2010), while Jawa Pos (January 2011) reported that approximately 33.5% of projects funded by state budget could not be absorbed by the contractor [13].

Therefore, the research related to risk analysis of revised budget using for construction projects in Indonesia is very necessary and important to do. The reasons are the considerably big funds allocated for construction projects as described above and quite a lot of contractors who are directly involved in the implementation of funded projects in the state budget. On construction projects there are so many varied risks

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[2] [14]. Therefore the risk should be anticipated early because it will affect the performance of the project in terms of time, cost and quality [15]. On the other hand, it is possible that the allocation of responsibility for risk is less wear or not optimal either for service users (project owners) or for service providers (contractors and supervisor consultants).

## MATERIALS AND METHODS

### Research Model

Managing the risks in construction projects have been recognized as a very important process in order to achieve the project objectives in terms of time, cost, quality, safety and environmental sustainability [16]. The techniques of risk analysis and management has been described in detail by many authors [17], [18], [19], [20], [21]. A risk management includes the major steps as follows: risk identification, risk assessment, risk mitigation, and risk monitoring [22]. While Darmawi [23], states that risk management is an attempt to find, analyse, and manage risk in every activity of the company in order to obtain the effectiveness and higher efficiency. Identification of risk is an important step in the risk management process, as it attempts to identify the sources and types of risk. Carbone and Tippett [24] states that the identification and mitigation of project risks are crucial steps in managing successful projects.

Based on the results of previous research, i.e. the researches of L.Y. Shen *et al* [25], Shield, H. *et. Al* [26], and Baloi and Prince [27], in this study described that the aspects (variables) of project risk are determined by 8 variables as shown in Table 1 below. Each risk aspect consists of a total of 40 indicators as shown in Table 2 below. Although there are a lot of indicators that the risk of construction project happens, but they are limited to only 40 indicators in this study in accordance with the conditions of the analysed project.

Table 1 Aspect of Project Risks

| No. | Aspects of Project Risks | Sources of Reference |
|---|---|---|
| 1 | Nature | Smith *et al* [21], Darmawi [23], Wibowo [1] |
| 2 | Project Planning | Smith *et al* [21], Nerija *et al*., [4], Wibowo [1] |
| 3 | Contractual | Perera *et al* [14], Wibowo [1] |
| 4 | Project Implementation | Darmawi [23],Yulianti [15], Oyegoke [7], Pheng dan Chuan [8] |
| 5 | Project Management | L.Y.Shen *et al*. [25], Perera *et al* [14], Shield, H. *et al*. [26], Baloi & Price [27]. |
| 6 | Project Risk Management | Carbone dan Tippett [24], Darmawi [23], Wysocki [22], Wibowo [1] |
| 7 | Economic & Financial | Smith et al [23], L.Y.Shen *et al*. [25], Perera et al [14], Shield, H. *et al*. [26], Darmawi [23], Baloi & Price [27] |
| 8 | Politics | Smith *et al* [21], L.Y.Shen *et al*. [25], Perera *et al* [14], Shield, H. *et al*. [26], Darmawi [23] Baloi & Price [27] |

Source; various references

### Research Design

This research is a case study conducted at the University Campus Development Project Trunojoyo Indoneisa Bangkalan Madura, which is funded through the state budget in 2012. The method used in this study is the survey and interview method. Participants or respondents involved in filling the questionnaire consist of: service users (project owners), service provider (planning consultant), service provider (consultant supervisor), service providers (contractors), subcontractors, suppliers, and directors (representatives of government / related agencies). Stages used in this study using the *"Six Risk Analysis Method"* which is commonly used in project risk management [1] [20], [22], [24], which consists of the following stages:

1. Risk Management Planning: The definition of risk management is manifold, but it is essentially related with the risk management methods used by a company to prevent or cope with the risks faced by Kerzner [28]. The risks of construction projects execution that use state budget funds are the risks regarding tender, construction planning, construction, construction supervision and matters related to the regulation.
2. Risk Identification: Observations on the implementation of the construction project is focused on the development stages of the implementation process associated with the applicable rules and regulations. After conducting risk identification and sequence of operational risk in each area, the questionnaire based on the level of frequency (frequency) and the level of greatness of impact (severity) of risk was made.
3. Quantitative Analysis: Assessing priorities identified risks using the opportunities and impact on project objectives if the risk occurs. Assessing other factors such as the time frame and risk tolerance of the constraints of cost, schedule, scope, and quality. Scale used in this study are:
   a. Impact Scale (Rupiah)
      (1) *Insignificant* (very small) : < 50 million
      (2) *Minor* (small) : ( 50 – 200 ) million

(3) *Moderate* (medium) : ( 200 – 350 ) million
(4) *Mayor* (large) : ( 350 – 500 ) million
(5) *Catastrophic* (very large) : > 500 million

b. Probability Scale (%)

(1) Rare (never) : 0 – 20 %
(2) *Unlike* (seldom) : 20 – 40 %
(3) *Possible* (sometimes) : 40 – 60 %
(4) *Likely* (often) : 60 – 80 %
(5) *Almost* (always) : 80 – 100 %

4. Qualitative Analysis: Done base on risk prioritized by qualitative risk analysis process. This quantitative analysis process using techniques of analysis such as :
   a. Calculating the possible outcomes and chances
   b. Assessing opportunities to achieve project objectives
   c. Identifying risks requiring the most attention by counting contribution relative to the overall project risk
   d. Identifying realistic and achievable cost, schedule, and scope targets
   e. Determining the project management decision when some uncertain conditions or outcomes happen
5. Risk Response Planning: The process of developing options and determining actions to enhance opportunities and reduce threats to project objectives. Based on qualitative and quantitative analysis can be seen in any of the variables and risk indicators. In the qualitative analysis of each indicator variable can be determined whether these indicators include the category of high risk *(avoidance)*, the medium risk *(transferred)*, lower middle *(mitigate)* or risk category of small *(acceptance)*. In the quantitative analysis of each indicator variable can be considered a low and a high level of risk and the level of chance *(probability)* the likelihood of those risks.
6. Risk Control & Monitoring: The process of identifying, analysing, and planning new risks emerge, tracking identified risks, analysing risks birthday present, monitor the condition triggers contingency plans, monitoring residual risks, and reviewing the implementation of risk responses while evaluating other effectiveness. The other purpose is to ascertain if: project assumption is still valid, risk (as assessed) changed from the previous, risk management policies and procedures are followed, the cost and schedule contingency reserves be modified as the project risk

Mean analysis is averaging quantity data (MF and MS) that were obtained from the results of the questionnaire sheet against the risk frequency (fi) and severity (si) that occur in each aspects of risk (MF) and the sources of risk (MS) of a project. The value calculated by the MF and MS analysis of *the mean* as follows:

MF1 = Mean frequency per aspects of risk based on respondents' answers

$$= \frac{\sum fi}{n \quad risk} \text{ ; Fi = frequency to-1, 2,3, ..., n = 8 ..... (1)}$$

MS1 = average *severity* per the sources of risk

$$= \frac{\sum si}{n \quad risk} \text{ ; Si = frequency of } severity \text{ to-1, 2,3, ..., n = 8 0 ..... (2)}$$

*Risk mapping / profiling* includes the preparation of risk in the matrix, with dimensions on one side is the probability of occurrence *(frequency)* as the abscissa and the other is the level of magnitude that occurred *(severity)* as ordinate. Each source of risk has a risk category: a). high scale or so-called *avoidance* (risk to be avoided), b). The risk scale is called secondary or *transfer* (risk to be transferred or insured), c). Risk of lower middle-scale or *mitigate* known (risk to be reduced), and d). Risk of small-scale is or so-called *acceptance* (risk that must be accepted).

*Risk mapping / profiling* could also include the preparation of risk in the matrix, with dimensions on one side is the probability of occurrence *(frequency)* as the abscissa consisting of: a.) *Rare* (never) to probabilities risk between 0-20%, b) *Unlike* (rarely) with probabilities risk between 20-40%, and c) *Possible* (sometimes - sometimes) with probabilities risk between 40-60%, d) *Likely* (often) with risk probability between 60-80% and e) *Almost* (always) the risk probabilities between 80-100%. The other is an order of magnitude (scale) effect occurs *(severity)* as ordinate consisting of: a). *Insignificant*, b). *Minor*, c). *Moderate*, d). *Mayor* and d) *Catastrophic. Risk mapping / profiling* used in this study as shown in Figure 1 and Figure 2 below.

## RESULTS AND DISCUSSION

Of 100 questionnaires distributed, as much as 80 respondents (80%) complete and return the questionnaire, while 20 respondents (20%) did not return the questionnaire. As much as 97.5% of respondents were male, 32.5% were in the age group 40-47 years and as much as 43.75% has a bachelor's levels of education. The validity of test results in this study showed that all of the indicator variables company strategy,

company performance, and sustainability firm correlation results have significance less than 0.05 *(p-value* <0.05), thus all indicators considered valid for further analysis. The reliability test results showed all the *Cronbach's Alpha* value for strategic decision variables, company performance, and sustainability of the company, which produced> 0.60, it can be said that the measure is reliable [29].

Qualitative analysis is divided into two, namely the impact analysis and the probability analysis. Impact analysis can be divided into three areas; impact on time, cost and quality of construction work. Qualitative analysis of the results is shown in Table 2 below. Table 2 below shows that the risk aspects that are examined in this study consisted of eight aspects, namely: A, B, C, D, E, F, G and H. Each of these aspects of risk consists of a total of 40 indicators.

Table 2 Qualitative Analysis of Impact Risk

| No. | Cause of Risk | Impact of Risk | | | Risk Information |
|---|---|---|---|---|---|
| | | Cost | Time | Quality | |
| **A** | **Aspects of Nature** | | | | |
| **A.1** | *Act of God,* | B | Ma | Mb | Ma |
| **A.2** | Fire | B | Ma | Mb | Ma |
| **A.3** | *Force Majeure* | B | B | K | Ma |
| **A.4** | Changes in weather / flooding | Mb | Mb | Mb | Mb |
| **B** | **Economic & Financial Aspects** | | | | |
| **B.1** | Fluctuations in interest rates / exchange rate | K | K | K | K |
| **B.2** | No budget (revised budget failed) | B | B | Ma | B |
| **B.3** | Material price increases | Ma | K | K | Mb |
| **B.4** | Inflation | K | K | K | K |
| **B.5** | Government's monetary policy | K | K | K | K |
| **C** | **Aspects of Planning** | | | | |
| **C.1** | Planning delays | Ma | B | B | B |
| **C.2** | Planning errors | B | Ma | B | B |
| **C.3** | Changes in planning | B | B | M | B |
| **C.4** | Cost estimation errors | B | K | B | Ma |
| **D** | **Contractual aspects** | | | | |
| **D.1** | Late payment | B | B | B | B |
| **D.2** | Errors of understanding the contract. | Mb | Mb | Mb | Mb |
| **D.3** | Contents of the contract dispute. | K | B | K | K |
| **D.4** | Failure / Extension of contract | B | B | B | B |
| **E** | **Political Aspects** | | | | |
| **E.1** | Substitution Rector / Vice Rector | K | K | K | K |
| **E.2** | Substitution Regents or the Head of Department | K | K | K | K |
| **E.3** | Substitution Ministry official | Mb | Mb | Mb | Mb |
| **E.4** | Bribery or corruption. | B | Mb | Ma | Mb |
| **E.5** | Policy changes of leadership | Mb | Mb | Mb | Mb |
| **F** | **Project Management** | | | | |
| **F.1** | Error procedure / tender procedures. | B | B | Ma | B |
| **F.2** | Delay starting work on the project. | Mb | B | K | Mb |
| **F.3** | Failure of team / project management. | K | K | K | K |
| **F.4** | Project handover delays. | B | B | K | Ma |
| **F.5** | Negotiations for a change order | Mb | Mb | Mb | Mb |
| **G** | **Project Implementation** | | | | |
| **G.1** | Construction failures | B | B | B | B |
| **G.2** | The closure of project driveway | B | B | M | B |
| **G.3** | Theft of building materials | B | Ma | Mb | Ma |
| **G.4** | Less precise method of implementation. | K | K | K | K |
| **G.5** | Delay material / equipment | M | B | M | Ma |
| **G.6** | Plainly traffic disruption around the project. | K | K | K | K |
| **G.7** | Poor subcontractor performance. | B | B | B | B |
| **G.8** | Existing conditions in the project | Ma | Mb | K | Mb |
| **H** | **Risk Management** | | | | |
| **H.1** | Low labour productivity | B | Ma | Mb | Ma |
| **H.2** | Low work productivity tools. | B | Mb | K | Mb |
| **H.3** | Work accident | B | Ma | Ma | Ma |
| **H.4** | Low quality jobs. | Mb | Ma | B | Ma |
| **H.5** | Risk dispute / quarrel workers | Mb | Mb | K | Mb |

Source: Analysis of Research Results (2011)

Table caption:

K = Small Risk (Low)

Ma = Risk Senior High

Mb = Medium Risk Down

B = Risk Large (Height)

Based on qualitative analysis of each indicator shows that 10 high-risk indicators (25%), high risk by 10 indicators (25%), lower intermediate risk by 11 indicators (27.5%) and a small risk by 9 indicators (22.5 %).

| | | | | |
|---|---|---|---|---|
| | | | **Avoidance (25%)**<br>(B2), (C1), (C2), (C3) | |
| | | (A1), (A2)<br>(A3), | (G1), (G2), (G7)<br>(F1), (D1), (D4) | |
| | (A4), (B3),<br>(D2), (E3) | **Transfers (25%)**<br>(C4), (F4), (G3), (G5), | | |
| (B1), (B4)<br>(B5), (D3) | **Mitigate (27.5%)**<br>(E4), (E5), (F2), (F5), | | (H1), (H3), (H4) | |
| **Acceptance (22.5%),**<br>(E1), (E2), (F3), (G4), (G6), | | (G8), (H2),<br>(H5) | | |

Figure 1 Depth Qualitative Risk Analysis Based Sources: Table 2 (processed)

Based on the analysis of qualitative and quantitative analysis mentioned earlier, it is known that aspects of the 8 following 40 indicators of risk (risk sources) were examined in this study found that 10 (25%) risk indicators have large-scale, found 10 (25 %) indicator scale has a high risk, found 11 (27.5%) intermediate risk indicator scale and have also found the 9 (22.5%) had indicators of small-scale risks. Each risk scale every indicator has *probability* (chance) occurs with different percentages. Similarly, the size of the impact of different risks there are also insignificant, small, medium, medium, and large scale disaster impact. The results are shown in Table 3, Table 4 and Table 5 below

Table 3 Sources and Large-Scale Risk Allocation

| Ranking Risk | Code | Sources of Risk | Score | Prob. (%) | Risk Allocation |
|---|---|---|---|---|---|
| **1** | C.2 | Planning errors | 21.38 | 60-80 | Planning Consultant |
| **2** | C.3 | Changes in planning | 20.63 | 60-80 | Planning Consultant |
| **2** | B.2 | No budget (failed) | 20.63 | 60-80 | Project Owner |
| **3** | D.1 | Late payment | 19.75 | 60-80 | Project Owner |
| **4** | C.1 | Planning delays | 19.00 | 60-80 | Planning Consultant |
| **5** | G.1 | Construction failures | 16.25 | 60-80 | Contractors, Planning Consultant, Consultant Supervisor |
| **6** | D.4 | Failure / Extension of contract | 15.38 | 60-80 | Project Owner, Contractor Planning Consultant |
| **7** | F.4 | Project handover delays | 15.13 | 60-80 | Contractors, Planning Consultant, Consultant Supervisor |
| **8** | G.7 | Poor subcontractor performance. | 15.00 | 60-80 | Contractors, Subcontractors |
| **9** | F.1 | Error procedure / tender procedures. | 13.88 | 60-80 | Project Owner |

Source: Result of data analysis

Table 3 above explains that there are 10 (25%) source of risk that have large scale of 40 sources of risk is examined. Ranking risks in the table shows the order of the size of the risk. The first rank is the highest order of large-scale risks and so on. Scores in the table above shows the magnitude of the multiplication between the impact and probability of risk (probability) of the risk. The higher the risk the greater the impact occurred and probability. Impact scale is ranging from 1 to 5. Probability scale is ranging from 1 to 5. Biggest score is 25 if the scale of the case at the 5 and the probability scale is also equal to 5 (5 x 5 = 25). In the same way the risk of having a source of high-scale, medium-scale and small-scale bottom can be shown in Table 3 through Table 5 below.

Table 4 Sources and Risk Allocation Upper Medium Scale

| Ranking Risk | Code | Sources of Risk | Score | Prob (%) | Risk Allocation |
|---|---|---|---|---|---|
| **10** | G.5 | Delay of material / equipment | 12.50 | 40-60 | Contractor |
| **11** | A.1 | *Act of God* | 12.38 | 40-60 | Sharing |
| **12** | G.3 | Theft of building materials | 12.25 | 40-60 | Contractor or Sharing |
| **13** | A.2 | Fire | 9.25 | 20-40 | Contractor |
| **13** | C.4 | Cost estimation errors | 9.25 | 60-80 | Consultant planner |
| **14** | F.2 | Delay starting the project | 7.38 | 40-60 | Project Owner |
| **15** | A.4 | Changes in weather / flooding | 7.00 | 40-60 | Contractor |
| **16** | A.3 | Force Majeure | 6.63 | 40-60 | Sharing |
| **17** | B.3 | Material price increases | 6.25 | 40-60 | Contractor |
| **18** | B.5 | Government's monetary policy | 6.13 | 40-60 | The project owner |

Source: Result of data analysis

Table 4, above explains that there are 10 sources of risk (25%) of the total surveyed incoming high risk category of sources, with the score started from 6:13 until 12.5, the average probability of between 40-60% and the level of risk from the level the tenth to the eighteenth.

Table 5 below explains that there are 10 sources of risk (25%) of the total surveyed categorized as medium of below risk source, with scores ranging from 4.00 to 5.63, the average probability of between 20-40% and the level of risk ranging of the nineteenth up to twenty-seventh level of the total 40 levels.

Table 5 Sources and Allocation of Low-Medium Scale Risk

| Risk Ranking | Code | Sources of Risk | Score | Prob (%) | Risk Allocation |
|---|---|---|---|---|---|
| **19** | D.2 | Contract understanding errors | 5.63 | 40-60 | Contractor, Planner Consultant, or Sharing |
| **19** | H.1 | Low labour productivity | 5.63 | 20-40 | Contractor or Subcontractor |
| **20** | E.5 | Policy changes leadership | 4.88 | 40-60 | Project Owner |
| **21** | F.5 | Negotiating *change orders* | 4.75 | 20-40 | Sharing |
| **22** | H.3 | Work accident | 4.63 | 20-40 | Contractor or Sharing |
| **23** | H.4 | Low quality jobs. | 4.38 | 20-40 | Contractor |
| **24** | E.3 | Substitution of ministry official | 4.13 | 20-40 | Project Owner |
| **24** | G.8 | Existing conditions in the project | 4.30 | 00-20 | Sharing |
| **25** | G.2 | Project driveway closure | 4.25 | 40-60 | Contractor or Sharing |
| **26** | H.2 | Low work productivity tools. | 4.13 | 00-20 | Contractor |
| **27** | D.3 | Contents of the contract dispute. | 4.00 | 20-40 | Sharing |

Source: Result of data analysis

A spec-risk aspects are examined in this study consisted of 8, each of which consists of several aspects of risk sources of risk (indicator) as many as 40 indicators. Results of quantitative analysis in detail about the risks caused by each type of indicator and their category respectively, to make it more convenient and practical to understand it can be seen in the map of risks that are mapped in Figure 1 below

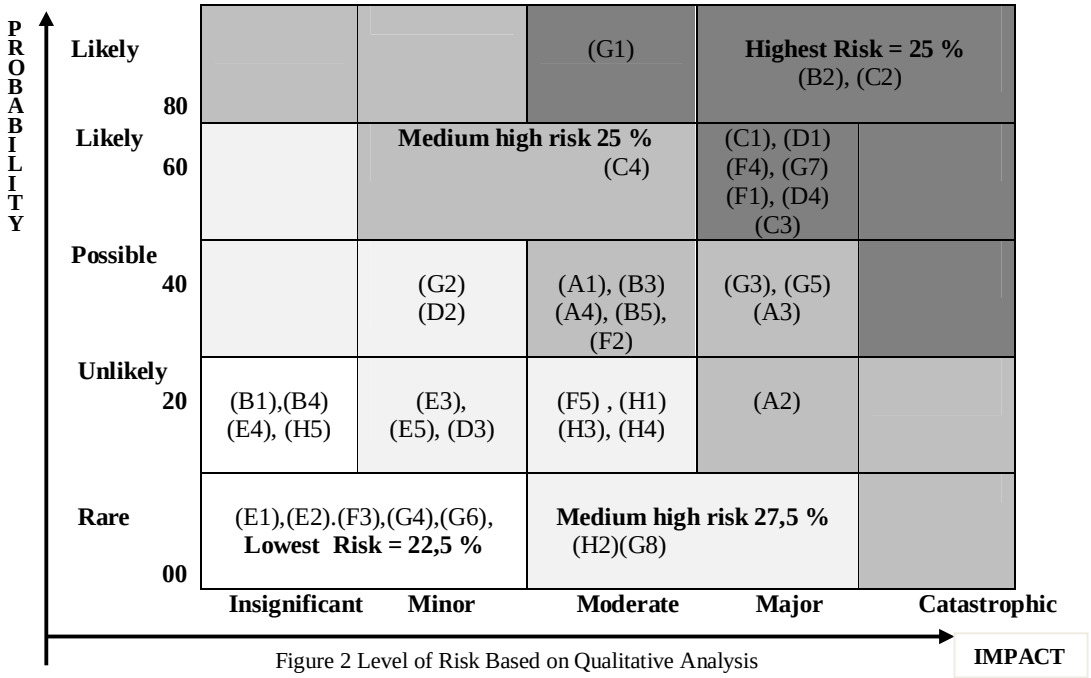


Figure 2 Level of Risk Based on Qualitative Analysis
Source: Results of data analysis (processed)

## CONCLUSION

The important aspects that lead to the happening of large-scale risks in avoidance categories (risk to be avoided) are found in order of scale effects and probability scale. Important risk sources that become the most dominant source of large-scale high-risk, category of *avoidance* (risk should be avoided), high-scale risk *transfer* category (risk to be transferred), lower middle-scale risks, *mitigate* categories (risk to be reduced), and the risk of small-scale, *acceptance* category (risk that must be accepted), also found based on order of scale effects and probability scale in the project done using state budget funds in Indonesia. Risk allocation can be charged to the project owner, consultants, contractors, equally shared (sharing) or other appropriate parties of the risk occurring sources. *Stakeholder* strategy to avoid or reduce the risk occurring can be undertaken in collaboration with specialists or uninsured subcontractors.

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