INDONESIAN JOURNAL OF MULTIDISCIPLINARY SCIENCE

P-ISSN: 2808-5957
E-ISSN: 2808-6724
ijoms.internationaljournallabs.com

# RISK MANAGEMENT OF TIME CONTROL ON THE CONSTRUCTION OF SAUMLAKI PORT

**Arman Jayady, Edwin Moerdianto**
*Persada University of Indonesia Y.A.I, Indonesia*
*Email : ajayady@yahoo.co.id, edwinmoerdianto@gmail.com*

**ARTICLE INFO**

Date received : 05 September 2022
Revision date : 16 September 2022
Date Approved : 25 September 2022

***Keywords:*** *Time performance, port construction, risk management.*

**ABSTRACT**

In the development of the port, there are potentially risk factors that are not identified during its implementation, which can affect work delays and add to unforeseen costs, thus requiring handling in accordance with the classification of risks that occur. The risk is in accordance with the type of activity and the environment of the construction project implemented. The study aims to analyze the influential risk factors during the work carried out, based on the perspective of service providers (consultants and contractors) and *owners* as well as how to handle risks (mitigation) and the effect of the implementation of the Saumlaki Port Facility Construction work on controlling the timing of work. Identifying risks - risks encountered in the study using the interview method against potential risks that are likely to occur. The survey results show that there are three risks that have a high risk classification from the perspective of service providers that have the greatest impact on project delays. Theconclusion in the research is the need to apply risk management to the implementation of development to minimize delays and reduce unforeseen costs. .

This work is licensed under CC BY-SA 4.0

## INTRODUCTION

In accordance with the development of the province and regency area, Saumlaki City is the entrance / exit of Maluku Province in the southernmost which directly makes this island cluster as a cluster of islands bordering Timor Leste and Australia. Saumlaki Port became a movement orientation in cities located in Southwest Maluku and West Southeast Maluku Regencies.

Saumlaki port waters currently serve port operational activities such as loading and unloading general cargo, Sea Tolls and Pelni Passenger Ships. The condition of the

port pool is very adequate for development with a depth of up to 7 – 20 m LWS and a groove depth of between 15 – 25 mLWS.

Saumlaki Port has several dock segments that are integrated in one faceline with a total length of 240 m, existing activities serving ship berths include KM Nusantara Pelangi 101, KM Leuser and Sirimau and KM Sabuk Nusantara 103. To anticipate the flow of loading and unloading cargo goods, Sea Tolls and Pelni Passenger Ships, it is necessary to develop facilities and infrastructure with construction work for the construction of saumlaki port facilities.

Risk management can help increase project awareness, delays in project construction are often caused by risk factors in projects that have not been identified, and cause project delays and unexpected cost increases. Each project has different risks depending on the type of activity and the conditions of the work site, the handling carried out will be different. Construction delay is defined as the completion time of construction beyond the date agreed in the contract (Assaf and Al-Hejji 2006).

Sources of risk that fall into the major category include customer or government sources such as changes in local regulations and bureaucracy. Financial risks such as changes in the government's fiscal policy. Project risks are like changing the scope of the project. Project Organization Risks (e.g. Authority to engage in the organization of Project Leaders. Planning Risks; Regional Situation Risk (Weather); Contractor's Risk as executor of Contractor Experience and Financial Status. Construction Significant risks to; occupational risks; risk logistics (site access), inflation risk, risk of price fluctuations and unavoidable risk (Raaftery, 1994).

(Kenzner, 2005) Risk Management procedures include strategies that are established at the beginning of the work, and risks are continuously processed throughout the project life cycle including some relevant behaviors; 1) risk planning is the process of developing a systematic and comprehensive and interactive strategy and documenting using risk problems, developing risk transfer planning planning, and identifying and analyzing risk change monitoring;2) Risk assessment, program programming and risk identification technology and risk analysis are important in improving performance, and target costs; 3) Identify risks, program areas and processes to examine important technical processes to determine and document relevant risks; 4) Processes for investigating risk system issues that determine the analysis of risks, potential risks and estimate their impact; 5) Processing is the process of identifying and selecting strategies to adjust risk to a level of accepting restrictions and program objectives.

Research to identify risks that have the potential to occur during the construction work of the Saumlaki Port Facility Construction, as well as how to handle it to minimize delays in project implementation Identify risks to reduce negative impacts that cause delays in work and have an impact on increasing costs in the implementation of work.

Reducing the risk of construction projects with a methodology to minimize the risks that occur is supported by all parties involved in the project. Minimize a large number of risks that affect the overall performance of the project, analyze them and determine appropriate measures to mitigate those risks. (Al-Ajmi, 2018).

In construction projects for risk mitigation are divided into three groups: external risks, project risks, and internal risks. His findings show that decision-making in construction management is very important, the selection of contractors and suppliers as a result of risk assessment in construction projects (Rehacek,2017).

While Septiani et al. (2015) identified risks from the planning stage to implementation and classified them into eight groups: pre-construction (permits) and construction (design/research, land acquisition, financing, development), risk equipment, unavoidable forces, and social policy. Different sources of risk can arise as well as different assessment perspectives among individual researchers meaning different groupings of risks.

The objectives of the study are: 1) to analyze the dominant risk factors in the Construction of the Saumlaki Port Facility, based on the perspective of service providers (consultants and contractors) and owners. 2) risk handling (mitigation) of the implementation of the Saumlaki Port Facility Construction work which affects the control of work time. The benefit of the study is to provide information and input to stakeholders regarding risks found in high categories and that may occur in the remaining time of work implementation, in order to overcome these risks in the implementation of similar projects in the future.

The author's hypothesis is that inadequate risk management can lead to delays in port construction projects due to unknown, large and significant risks.

## METHOD

Risk determination is carried out by interviewing resource persons to identify the causes of uncertainty in civil engineering work for the construction of port facilities and classifying risks based on the causes of uncertainty is carried out through field observation research. The research conducted is descriptive research, which collects detailed information to explain existing symptoms, identify problems, and investigate applicable conditions and practices (Sugiyono, 2019).

The potential and impact of the risk are categorized in discussions with the owner's project coordinator. Questionnaires are distributed in two stages. At the first stage, questionnaires are distributed to competent service providers: team leaders on behalf of consultants and project managers on behalf of contractors. The questionnaire of the first stage is aimed at determining the relevance of risks to the construction activities of port facilities. The questions included in the first stage of the questionnaire were divided into

26 indicators of the perception of consultants and 34 indicators of perception of contractors.

The second phase of the questionnaire was distributed to two supervisory consultant respondents as well as four from contractors. Respondents consisted of practitioners who understood the actual situation at the site during the construction of the port facility. The second phase of the questionnaire aims to clarify how the risks of implementing the construction of the Saumlaki port affect the delay in implementation time. The questionnaire was distributed to respondents in two stages, namely the preliminary and main questionnaires.

The main questionnaire is intended to get an idea of how the risks of building port facilities affect work delays. Indicators included in the relevant second stage questionnaire and included in the risk registration based on the expert opinion of service provider practitioners, according to a literature review. Respondents filled out the Likert scale with a scale interval of 1 to 5 to assess the likelihood and impact of risk occurrence on all risk indicators (results of the first stage questionnaire).

Probabilities can be categorized as follows: Probability/not at all (very low), impossible (low), sometimes (normal), high probability (high), very likely (very high). Risk impact assessment whose classification is based on LKPP Perlem No. 9/2018 i.e. larger 48 calendar days (very large) because the impact classification does not affect the schedule (very small), there will be delays.

**Data Analysis**

The data collected from the distribution of surveys that passed the validation and reliability test requirements were then searched for the value of the probability index and its implications. With reference to risk analysis and response studies conducted by Isnaini (2011) for the Ramongan Shipyard Construction Project, a risk assessment method with the *Severity Index* (SI) method, to help with risk classification. Severity index by formula (Al Hammad, 2014) :

$$SI = \frac{\sum_{i=1}^{n} a_i \cdot f_i}{m. \sum_{i=1}^{n} f_i} . 100\%$$

SI is *Severity Index* n is the number of *rating* m is the weight with the largest *rating* ai is the weight of *the fi rating* is the frequency of respondents sesuai with the indicator value, probability measures and impact assessments can be determined by first transforming the indicator value using classification (Davis & Cosenza, 1998, Al Hammad, 2014).

**Table 1. Probability and Impact Scale**

| No | Information | Value | Probability Scale | Scale of Impact |
|---|---|---|---|---|
| 1 | Very Low | 1 | YES ≤ 20% | As planned |
| 2 | Low | 2 | 20% < SI ≤ 40% | There is a delay between 1 day to 17 calendars |
| 3 | Keep | 3 | 40% < SI ≤ 60% | There is a delay between 18 days to 34 calendar days |
| 4 | Tall | 4 | 60% < SI ≤ 80% | There is a delay between 35 days to 49 calendar days |
| 5 | Very High | 5 | 80 < SI ≤ 100% | There is a delay of more than 50 calendar days |

Processed data sources

As per PMBOK (2017) method for identifying risks with *probability impact matrix*. Williams (1993), *Probabilistic Impact Matrix* is an approach developed using two main risk metrics. That is, probability is the probability of an adverse event occurring, and the impact is the extent or extent of the impact. Impact on other activities in the event of an adverse event. Hillson (2002) explains that risk scores are the product of probability scores and impact scores, and risk scores are obtained from respondents. Risk can be measured using the following formula:

R = P * I ..... (formula 1)

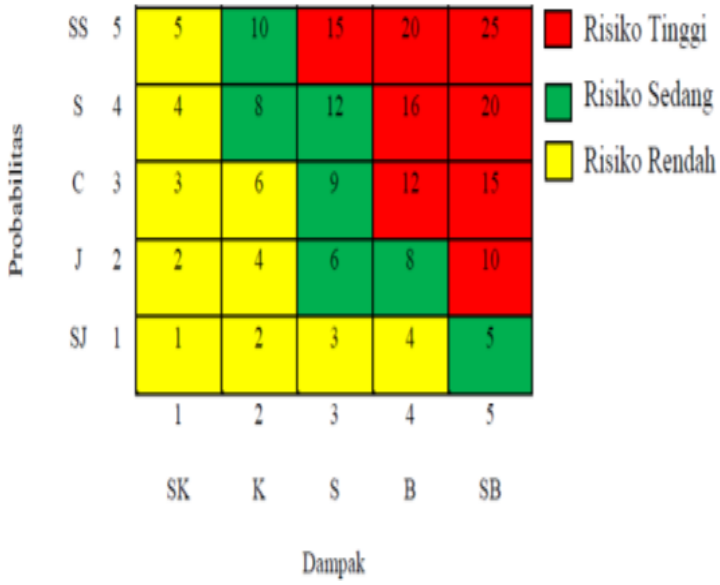
where:

R = Level of risk

P = Probability of risk occurring (*probability*)

I = The degree of impact of the risk occurring (*Impact*)

Table 2. Risk Tiers




Source : Marantika.D (2017)

**Risk Response**

How to increase alternatives to increase opportunities and reduce harm to work goals, according to Williams( 1993*) Probability Impact Matrix* is an approach that is raised *Risk response strategies* can be tried using *tools* and *techniques* are: 1) Strategies against risks that have a negative impact, namely: a) *Avoid* or avoid risks by carrying out changes to the blueprint management concept to eliminate risk hazards, isolate project targets from impacts by reducing the *scope* or duration of work; b) Transfers or transfers by sending the consequences of risk impacts including liability to third parties. Transferring risk is always linked to the payment of a risk bonus to the party who welcomes the provision of risk, a kind of insurance. Contracts can be used to send risks to other parties; c) *Mitigate* or reduce the opportunity and consequences of a risk event at the threshold that can be obtained. Carrying out early action to reduce opportunities and or consequences of risks in the blueprint is very efficient from carrying out corrections after the destruction is established. 2) Positive risk strategies are a) *Exploits* generally these strategies are selected for risks that have positive consequences where the group wants to ensure that it is possible that it can be realized. You can use it by increasing the energy base better to reduce the duration of blueprint handling or by sharing the better quality of your early concept. b) Providing for the purpose of providing Positive Risk with third parties in order to profit from the blueprint. The illustration of positive risk rationing is a risk rationing partnership, squad, and joint venture. c) Replacing the opportunity dimension by increasing opportunities and or positive consequences, as well as increasing

by recognizing and optimizing risks due to positive consequences. d) Response Strategy Some answers or actions are designed to be used when certain events occur.

Ensuring that the risk reaction is sourced from the results of the risk level analysis from the perspective of the service facilitator. The owner then responded as the owner of the highest provision. The owner's assumptions will be fed back to the provider to ensure the concept of enforcement action for handling the construction of the Saumlaki wharf facility.

## RESULT AND DISCUSSION

The results of the analysis on the Construction of the Saumlaki Port Facility 7 risks were identified: natural risks, political risks, technical risks, project risks, economic risks, human risks, and environmental risks. Of the seven variables categorized into 26 supervisory risk indicators (RS) as per Table 3 and 34 contractor risk indicators (RK) as per Table 4.

**Table 3. Identify the risk of consultant perception**

| Category | Risk Factors | Code |
|---|---|---|
| NATURAL RISKS | Occurrence of unexpected things such as extreme weather (heavy rains, climate change) | RS1 |
| | *Force majeur* (flooding, etc.) | RS2 |
| | Tides of sea water | RS3 |
| | Big Wave | RS4 |
| RISK POLICY | Policy changes resulting from changes in local government policies | RS5 |
| | Riots Occurred | RS6 |
| TECHNICAL RISKS | The design does not correspond to field conditions | RS7 |
| | Delays in obtaining planning approval | RS8 |
| | Delays in administration and licensing processes | RS9 |
| PROJECT RISKS | Work accidents during the project | RS10 |
| | Inaccuracy of the erection point | RS11 |
| | Shifting Erection Locations | RS12 |
| | Improper use of stakes | RS13 |
| | Procurement of materials is not on schedule | RS14 |

| Category | Risk Factors | Code |
|---|---|---|
| | Disagreement of working methods with contractors | RS15 |
| | Cost overruns due to the addition of work items | RS16 |
| | The presence of cracks in the dock structure | RS17 |
| | Setting a poor implementation schedule | RS18 |
| ECONOMIC RISKS | Risks of inflation rates and interest rates | RS19 |
| | Deferred payments | RS20 |
| | Contractor financial problems | RS21 |
| HR RISK | Lack of skill skills from workers | RS22 |
| | Uneven communication between workers | RS23 |
| | Shortage of labor numbers | RS24 |
| ENVIRONMENTAL RISKS | Inaccurate environmental studies | RS25 |
| | The response of the surrounding community is less supportive of the project | RS26 |

Processed data sources

**Table 4. Identify contractor perception risks**

| Category | Risk Factors | Code |
|---|---|---|
| NATURAL RISKS | Occurrence of unexpected things such as extreme weather (heavy rains, climate change) | RK1 |
| | *Force majeur* (flooding, etc.) | RK2 |
| | Tides of sea water | RK3 |
| | Big Wave | RK4 |
| RISK POLICY | Policy changes resulting from changes in local government policies | RK5 |
| | Riots Occurred | RK6 |
| ENGINEERING RISKS | The design does not correspond to field conditions | RK7 |
| | Delays in obtaining planning approval | RK8 |
| | Delays in administration and licensing processes | RK9 |
| PROJECT RISKS | Work accidents during the project | RK10 |

| Category | Risk Factors | Code |
|---|---|---|
| | Inaccuracy of the erection point | RK11 |
| | Shifting Erection Locations | RK12 |
| | Improper use of stakes | RK13 |
| | Heavy equipment damage during the execution of work | RK14 |
| | Procurement of materials that are not on schedule | RK15 |
| | Disagreement of working methods with contractors | RK16 |
| | Procurement of materials that do not meet specifications | RK17 |
| | Lack of equipment in the field | RK18 |
| | Cost overruns due to the addition of work items | RK19 |
| | The presence of cracks in the dock structure | RK20 |
| | Setting a poor implementation schedule | RK21 |
| | Changes to specifications or working drawings | RK22 |
| ECONOMIC RISKS | Risks of inflation rates and interest rates | RK23 |
| | Deferred payments | RK24 |
| | Contractor financial problems | RK25 |
| | Fuel price increase policy | RK26 |
| HR RISK | Lack of skill skills from workers | RK27 |
| | Uneven communication between workers | RK28 |
| | Low worker productivity | RK29 |
| | There are differences of opinion with stakeholders | RK30 |
| | Shortage of the number of worker personnel | RK31 |
| ENVIRONMENTAL RISKS | Inaccurate environmental studies | RK32 |
| | The response of the surrounding community is not supportive of the construction *project* | RK33 |

| Category | Risk Factors | Code |
|---|---|---|
| | Noise pollution due to mobilization and fabrication | RK34 |

Processed data sources

**Table 5. *High risk* (RS) consultant perception**

| Code | Risk Factors | Prob (P) | Impact (I) | R= P*I | Category |
|---|---|---|---|---|---|
| RS1 | The occurrence of unexpected things such as extreme weather (heavy rains, climate change) | 4 | 4 | 16 | *High* |
| RS4 | Big Wave | 4 | 4 | 16 | *High* |
| RS14 | Procurement of materials is not on schedule | 3 | 4 | 12 | *High* |
| RS15 | Disagreement of working methods with contractors | 3 | 4 | 12 | *High* |
| RS16 | Cost overruns due to the addition of work items | 3 | 4 | 12 | *High* |

Processed data sources

**Table 6. *High risk* (RK) contractor perception**

| Code | Risk Factors | Prob (P) | Impact (I) | R= P*I | Category |
|---|---|---|---|---|---|
| RK1 | The occurrence of ha-unexpected things such as extreme weather (heavy rains, climate change) | 4 | 4 | 16 | *High* |
| RK4 | Big Wave | 4 | 4 | 16 | *High* |
| RK14 | Heavy equipment damage during the execution of work | 4 | 4 | 16 | *High* |

| Code | Risk Factors | Prob (P) | Impact (I) | R= P*I | Category |
|---|---|---|---|---|---|
| RK15 | Material sourcing is not on schedule | 3 | 4 | 12 | *High* |
| RK19 | Cost overruns due to the addition of work items | 4 | 4 | 16 | *High* |
| RK24 | Deferred payments | 3 | 4 | 12 | *High* |
| RK26 | Fuel price increase policy | 3 | 4 | 12 | *High* |

Processed data sources

**Table 7. *Stakeholders* risk response**

| Code | Risk Factors | Consultant | Contractor | Owner |
|---|---|---|---|---|
| RS1*/RK1* | Occurrence of unexpected things such as extreme weather (heavy rains, climate change) | Avoided | Avoided | Avoided |
| RS4*/RK4* | Big Wave | Avoided | Avoided | Avoided |
| RK14 | Heavy equipment damage during execution | | Accepted | Accepted |
| RS14*/RK15* | Procurement of materials that are not on schedule | Reduced | Reduced | Reduced |
| RS15 | Disagreement of working methods with contractors | Reduced | | Reduced |
| RS16/RK19 | Cost overruns due to the addition of work items | Reduced | Reduced | Reduced |

| Code | Risk Factors | Consultant | Contractor | Owner |
|---|---|---|---|---|
| RK24 | Deferred payments | | Accepted | Accepted |
| RK26 | Fuel price increase policy | | Accepted | Accepted |

Processed data sources

Consultant perception risk analysis

The results of the analysis according to the opinion of the consultant (RS) there are five risks of high category and twelve risks of having a moderate category and seventeen risks of low category. Where the risk with a high category according to the processing of perception data by the consultant consists of natural risk variables RS1 (occurrence of unexpected things such as extreme weather (heavy rain, climate change)) and RS4 (large waves), project risk variables RS14 (Procurement of materials that are not on schedule) and RS15 (disagreement of work methods with contractors) and economic risk variable RS16 (swelling of arena costs for adding work items) As shown in Table 5, these are high category risk responses that consultants need to manage and cannot be predicted simply by avoiding them, except for the risk of extreme weather conditions. Avoiding these risks creates jobs indirectly, thus avoiding those who benefit.




Picture. 1. Consultant risk response

**Contractor perception risk analysis**

According to the expert opinion of the contractor, the results of the pilot survey revealed 34 relevant risks and continued the second phase of the questionnaire, according to the assessment of the results of the second phase of the questionnaire, 7 entered high risk, 16 medium risk, and 11 risks classified as low risk. The high category of risk groups are the natural risk variable RK1 (occurrence of unexpected things such as extreme weather (heavy rain, climate change)) and RK4 (large waves), the political risk variable RK14 (Heavy equipment damage during implementation), the risk variable of the RK15 project (procurement of materials that are not on schedule), the economic risk variable RK19 (cost swelling due to the addition of work items), RK24 (the owner's deferred payment) and RK26 (fuel price increase policy) according to Table 6.




Figure 2. Contractor perception risk response

**Action plan at high category risk**

The decision of the risk management action plan is made by the service provider according to the response of the owner, without neglecting the interests and objectives of the service provider company. As per Table 8 and Table 9, the management methods performed or performed by service providers in a given action display not all high risk categories can be managed through avoidance. The level of risk associated with decision making, other considerations may need to be considered. , including in the consultant

risk classification (RS15) Disagreement on work methods with contractors according to the *owner* for these risks can be reduced because these risks for handling consultants can regularly conduct meetings and coordinate with contractors to determine work methods in the field that are in accordance with the conditions when implementing, in addition to supervision and monitoring of implementation in the field become the obligation of supervisory consultants so that Disagreements between work methods and contractors can be eliminated by conducting a perception equation of the method that is possible to be most suitable to be implemented in the field.

**Table 8. Risk mitigation of high category of consultant perception**

| Perception | Code | | Indicator | Mitigation |
|---|---|---|---|---|
| Consultant | RS1 | Natural Risks | Occurrence of unexpected things such as extreme weather (heavy rains, climate change) | Optimizing the implementation during sunny weather |
| | RS4 | | Big Wave | Suggesting the right execution time to the contractor |
| | RS14 | | Procurement of materials that are not on schedule | Reviewing the scheduling of mature material procurement and coordination with *stakeholders* |
| | RS15 | Project Risk | Disagreement of working methods with contractors | Coordinating and meeting with contractors to equalize perceptions |
| | RS16 | Economic Risks | Cost overruns due to the addition of work items | Recalculate the main work so that it can be minimized |

Processed data sources

**Table 9. Risk mitigation of high category contractor perceptions**

| Perception | Code | | Indicator | Mitigation |
|---|---|---|---|---|
| Contractor | RK1 | Natural Risks | Occurrence of unexpected things such as extreme weather (heavy rains, climate change) | Optimization of implementation on sunny weather days and increasing working hours with overtime |
| | RK4 | | Big Wave | Optimization of the implementation before the month there is a large wave |
| | RK14 | Project Risk | Heavy equipment damage during execution | Bring in new equipment if repairs cannot be carried out |
| | RK15 | | Procurement of materials is not on schedule | Drawing up a material procurement schedule and immediately holding materials according to the plan after obtaining approval from the owner |
| | RK19 | Economic Risks | Cost overruns due to the addition of work items | Conducting field inspections properly on MC 0, related to the suitability of the volume, design drawings with conditions in the field, so that the right calculation of volume and costs can be obtained. |

| Perception | Code | Indicator | Mitigation |
|---|---|---|---|
| | RK24 | Deferred payments | Coordination with *the owner* related to the terms of payment terms and report formats |
| | RK26 | Fuel price increase policy | Accepting if possible can include a price increase in the contractor's cost estimate |

Processed data sources

## CONCLUSION

The results of data processing were concluded:

1) Similar perceptions between consultants and contractors on the risk of unexpected things happening such as extreme weather (heavy rain, climate change) (RS1 / RK1), large waves (RS2 / RK2), procurement of materials that are not on schedule (RS14 / RK15) and cost overruns due to the addition of work items (RS16 / RK19);
2) Differences in perceptions between consultants and contractors on the risk of disagreement of work methods with contractors (RS15), damage to heavy equipment during implementation (RK14), deferred payments (RK24), and fuel price increase policies (RK26);
3) The perception equation is the relationship of the determinants of time performance as the main determinant while differences in perception are other determinants of time performance that affect the process of carrying out work.
4) Mitigation at high risk becomes an action plan carried out to prevent project delays, namely: a) coordinating with related parties and making adjustments to policies imposed by the local government, b) compiling a material procurement schedule and immediately holding materials according to the plan after obtaining approval from *the owner* , c) conducting a proper field inspection on MC 0, relating to the suitability of the volume, design drawings with the conditions in the field, d)coordination with the *owner* related to the terms of payment of the termination and format of the report, e) accepting if possible can include a price increase in the contractor's estimated costs.

## REFERENCE

Sopiah et al (2020). Analysis and Risk Response to Building Construction Projects.

Sugiyono. (2019). Quantitative, qualitative, and R&D research methods.

Iswanto et al Risk Management towards Time Control of The Pier Port Construction Project.

Darmawi, Herman (2013). Risk Management, PT. Bumi Askara, Jakarta Han and Diekmann.

Ismisyati et al (2019), Application of Risk Management in the Construction of the Log Pier Extension Project (Case Study: Port in Tanjung Emas Semarang.

Al-Ajmi (2018) , Journal, Risk Management in Constraction Projects.

Indah et al, (2014) , Risk Identification in The Implementation of Development Projects Piers/Ports In Nusa Penida

Hillson, David, (2002). *Use a Risk Breakdown Structure (RBS) to Understand Your Risks*, San Antonio, Texas, USA.

Rehacek (2017), *Journal Risk Management in Construction Projects*