THE IMPLICATION RISK-IMPACT OF PROJECT ACCELERATION ON PAVEMENT RUNWAY

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ABSTRACT

The process of building a new Yogyakarta airport in Kulon Progo District or New Yogyakarta International Airport (NYIA) continues to accelerate. The document on the analysis of environmental impacts (Amdal) is still in the process of preparation. Airport development, has implications for productive land grabbing, settlement evictions, lost probability at the site plan and at the location of supporting infrastructure. In fact, there was no study on tsunami risk reduction in the formulation of environmental impact (Amdal), so there is no guarantee of safety. On the analysis of the risk probability in the pavement runway project is divided into five probabilities of risk for three samples. In calculating risk, it is divided into three project acceleration assumptions, namely the assumption of a duration of 50% or 7 weeks, 40% or 6 weeks and 25% or 4 weeks from normal duration 14 weeks. Risk probability is obtained from the probability of the event and the probability of the impact. The highest loss is in 4 weeks duration (25% assumption) where has a total loss 308,638,309.40 rupiahs. The smallest loss is in normal duration 14 weeks where has a total loss 108,444,489.74 rupiahs. the relationship between probability and project acceleration is found. Where, there is an increase in the probability of a duration of 4 weeks by 0.17459% and a decrease in the probability of a normal duration of 14 weeks by 0.0618%.

Keywords: risk impact, pavement runway, risk probability

1. INTRODUCTION

The construction project is one type of project that has a relatively high risk potential compared to other projects. The potential development of construction projects in Indonesia can be seen from the use of new methods and technologies as well as an increase in the number of parties involved. The construction industry, unlike other industries, is more complicated and difficult to manage because it requires special skills and techniques (Jamil, 2008). Project risk is an uncertain event or condition, if it occurs has a positive or negative effect on one or more project objectives such as scope, schedule, cost and quality. Risk may have one or more causes and if it does, there may be one or more effects. The cause may be needs, assumptions, constraints or potential conditions that are likely to have negative or positive results (PMBOK, 2013). Project risk management includes the process of carrying out risk management planning, identification, analysis, response planning, and risk control for a project. The aim of project risk management is to increase the likelihood and impact of positive events, and reduce the likelihood and impact of negative events in the project (PMBOK, 2013).
The process of building a new Yogyakarta airport in Kulon Progo District or New Yogyakarta International Airport (NYIA) continues to accelerate. The document on the

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analysis of environmental impacts (Amdal) is still in the process of preparation. Airport development, has implications for productive land grabbing, settlement evictions, lost livelihoods at the site plan and at the location of supporting infrastructure. In fact, there was no study on tsunami risk reduction in the formulation of environmental impact (Amdal), so there is no guarantee of safety (Sandera, 2017). However, at the end the development of the New Yogyakarta International Airport (NYIA) continued without regard to the dangers or risks that would occur in the future. The NYIA development project is a strategic project which is able to attract the attention of ordinary people and show the project's performance can be calculated. However, the reality is inversely proportional and so far the performance of the project has not been maximized to be used because there are still many obstacles that have not been resolved. So, that's why we need to discuss about how to identification the risk due an airport project is running. It makes a reason why to choose this topic as the research.

2. THEORITICAL BASIC

Project is a complex business activity, is not routine, has limited time, budget and resources and has its own specifications for the products to be produced. With the limitations in working on a project, then a project organization is needed to manage the available resources in order to carry out synchronous activities so that project objectives can be achieved. Project organization is also needed to ensure that work can be completed in an efficient, timely and in accordance with the expected quality.

Efforts or activities organized to achieve important goals, objectives and expectations using budget funds and available resources, which must be completed within a certain period of time (Nurhayati, 2010). A series of tasks directed at a main outcome (Heizer and Render, 2006). A project is a temporary effort to produce a unique product or service. In general, the project involves several people who are interconnected with their activities and the main sponsor of the project is usually interested in the effective use of resources to complete the project efficiently and on time (Schwalbe translated by Dimiyati and Nurjaman, 2014).

In this research to find the percentage of project acceleration simulation assumptions obtained from the following formula:

Table 1. Variable of percentage simulation.

RW	**d (weeks)**
Normal 100%	14
Assumption 50%	A
Assumption 40%	B
Assumption 25%	C

Asumtion 50% = 50% × dnormal

Where:

RW = is a variable of percentage simulation on normal duration and assumption duration.

d = is a duration (weeks).

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The airside work consists of five jobs in the form of pavement runway work, parallel taxiway work, holding bay work, rapid exit taxiway work and apron work. However, this study only reviews the impact of risk on pavement runway work. There are several jobs in working on pavement runway such as flexible work of the runway and flexible work of the runway. In doing the two types of work there are several jobs that must be done such as AC-WC work, CT-BC work, work Crushed Aggregate Subbase, tack coat work and prime coat work. From some of the work we can identify the risks that occur when doing the work. The results of risk identification are entered into a table and then classified in the order of work. After identifying risks and classifying risks, proceed with making a risk chart or what is often referred to as the Risk Breakdown Structure.

3. RESEARCH DESIGN AND METHODOLOGY

3.1 STEP BY STEP RESEARCH

There are some steps of research in the project. This research must be carried out clearly and regularly so that it gets good and true results and can be justified.

3.1.1 STEP I

At this step, start from survey literature than trying to identify even or problem that happened on project with research question. After that, make sure with literature review to get the hypothesis so we know how to assign the variable and literature such as risk factor, technical risk and assumpting duration on project acceleration 50% (7 weeks), 40% (6 weeks), 25% (4 weeks) from normal duration (14 weeks). So, we can collacting the primary and secondary data by consisting of general data of the pavement runway project by survey on site.

3.1.2 STEP II

At this step, starting to identify the risk as what we get an even on site by questioner and interview for primary data and Work Breakdown Structure (WBS) pavement runway project, time scheduling data for the pavement runway project and photo document as the secondary data. Than, analyzing that risk so we can get the value of the risk. The last but not least, we’ve to make some responses and maps the risk**.**

3.1.3 STEP III

At this step, we get the result of all those things that we’ve done from step I through step II named Risk Level that could be happened on pavement runway project. We need to discuss about how we can get those data by using formula, literature also theories on step I. Than, we just need to compare primary and secondary data to the formula and theories on step I.

3.1.4 STEP IV

At this step, we just focus on how important the expected monetary of loss between risk level on 50% (7 weeks), 40% (6 weeks), 25% (4 weeks) assumption project acceleration. We’ve to know what kinds of implication if it happened, how high the risk was and how much the money lossed away. The last part is concluding from step I through step IV than give some recommendation for this research to get better or to be used as material for future correction.

4. RESULT AND DISCUSSION

In the results and discussion chapter we get the results of the impact or risk implications of the project acceleration in the form of risk identification, risk analysis, risk categories and risk responses that we can find out the risk implications of accelerating a pavement runway project.

4.1 THE ACCELERATION SIMULATION ON PROJECT DURATION CALCULATION

In this research in accelerating the duration of work using assumptions where the normal duration is 100% 14 weeks, the duration of the assumption is 50% 7 weeks, the duration of the assumption is 40% 6 weeks, the duration of the assumption is 30% 5 weeks and the duration of the assumption is 10% 2 weeks. The step to calculate the project acceleration simulation in this study is to calculate the percentage of assumptions with the duration of the pavement runway work per week.

In this research to find the percentage of project acceleration simulation assumptions obtained from the following formula:

Table 2. Variable of percentage Simulation on assumption duration.

RW	**d (weeks)**
Normal 100%	14
Assumption 50%	7
Assumption 40%	6
Assumption 25%	4

- Assumption 50% = 50% × dnormal
  = 50% × 14 weeks
  = 7 weeks.
- Assumption 40% = 40% × dnormal
  = 40% × 14 weeks
  = 6 weeks.
- Assumption 25% = 25% × dnormal
  = 25% × 14 weeks
  = 4 weeks.

4.2 RISK IDENTIFICATION

In identifying a risk there is some data that must be known. Risk is traditionally defined as uncertainty or the possibility of loss. The uncertainty of events is subjective and the existence of "whether or not," "when," "circumstance," and "severity." While the loss caused by the occurrence of an event is objective, emphasizing the possibility of loss. The definition of risk may differ in research but always emphasizes the expected value combining probability and severity.

Detecting risks helps control the occurrence of airport risks during operations. This paper introduces the concept of detection in airport risk management and defines risk as an expected value combining probability, severity, and detection. In this study, risk identification is obtained from a runway work chart or often called the Work Breakdown Structure in Figure 1.

Figure 1 explains that the airside work consists of five jobs in the form of pavement runway work, parallel taxiway work, holding bay work, rapid exit taxiway work and apron work. However, this study only reviews the impact of risk on pavement runway work. There are several jobs in working on pavement runway such as flexible work of the

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runway and flexible work of the runway. In doing the two types of work there are several jobs that must be done such as AC-WC work, CT-BC work, work Crushed Aggregate Subbase, tack coat work and prime coat work.

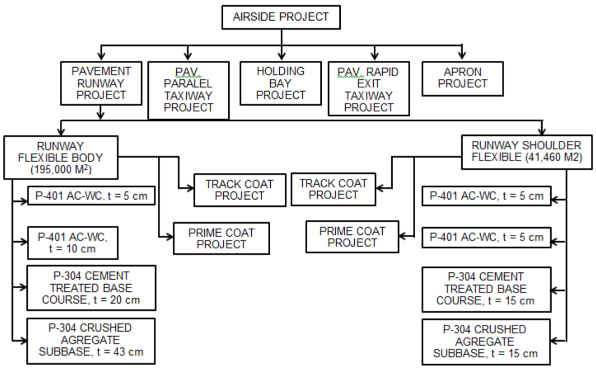

Figure 1. Work breakdown structure airside work.

From some of the work we can identify the risks that occur when doing the work. The results of risk identification are entered into a table and then classified in the order of work. After identifying risks and classifying risks, proceed with making a risk chart or what is often referred to as the Risk Breakdown Structure. In Figure 3.2 explains the various possible risks that occur when doing pavement runway work.

4.3 RISK BREAKDOWN STRUCTURE

In this study, the risk of runway work is described in the Risk Breakdown Structure in Figure 4.2 below. Risk Breakdown Structure as the following form:

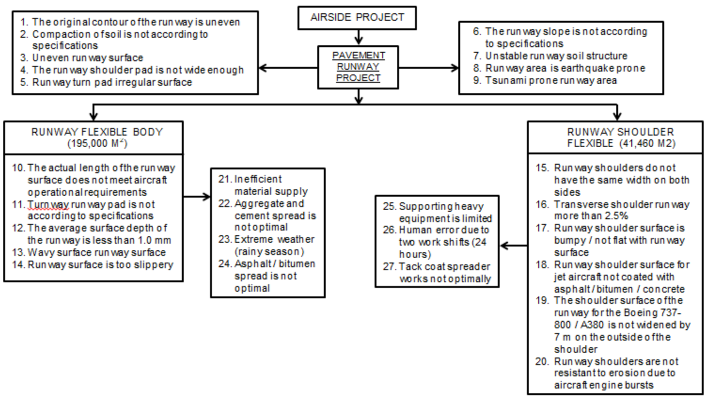

Figure 2. Airside risk breakdown structure at the pavement runway work.

In Figure 2 it is known that there are 27 technical risk factors that might occur in the pavement runway work. These risks have been classified according to their respective sub jobs. After outlining the technical risk factors that might occur into the risk breakdown structure, the next step is to calculate the level of risk from probability and impact. This aims to determine the size of the risk that may occur in the pavement runway.

4.4 RISK CALCULATION ON NORMAL DURATION AND THREE ASSUMPTION OF DURATION

In calculating risk, it is divided into three project acceleration assumptions, namely the assumption of a duration of 50% or 7 weeks, 40% or 6 weeks and 25% or 4 weeks from normal duration 14 weeks. Risk probability is obtained from the probability of the event and the probability of the impact. After getting the results of the risk probability per work item, then the risk probability can be related to the expected monetary of loss and the percentage of the probability that might be occurred on each work item.
For example, to calculate the risk probability of normal duration of 14 weeks on work item C.2.1. P-401 AC-WC, t= 5 cm, by multiplying the results of the probability of the event and the probability of the impact obtained from the results of the questionnaire. Then the number is normalized by dividing by the largest number in the data. Then, the result of risk probability is 1.0%.
From figure 3 the highest total percentage of risk probability is on assumption 25% duration (4 weeks) 12,5%. The lowest total percentage of risk probability is on normal duration 100% (14 weeks) 4,2%. It means, more accelerate the porject, the higher possibility of risk occurring on the project will happen.

Table 3. Total risk probability and project acceleration on pavement runway project.

Duration (weeks)	RP (%)
4	12.5
6	9.1
7	6.7
14	4.2

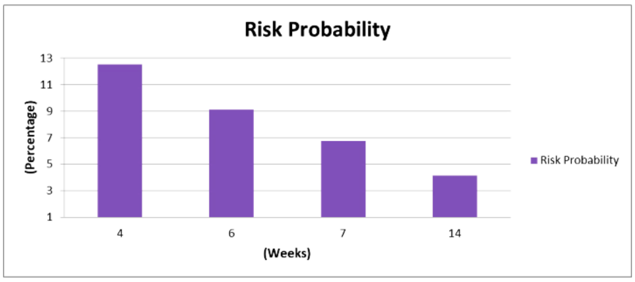

Figure 3. Graphic of total risk probability and project acceleration on pavement runway project.

4.5 RISK CALCULATION ON NORMAL DURATION AND THREE ASSUMPTION OF DURATION

This chapter discusses the level of risk to the risk response and the risk strategy and the parties responsible for the risk.

Table 4. Response strategy and risk allocation in pavement runway projects.

No.	Risk Factor	Risk Categories	Risk Response Strategy	Responsible Party
R1	The original land of runway contour weavy	Mitigate	Do leveling the soil structure / doing excavation.	Contractor
R2	Soil compaction is not according to specifications	Mitigate	Survey of original soil conditions, selection of hill material, compaction layer by layer and	Contractor

			inspection of layer by layer compaction.	
R3	Runway surface is weavy	Mitigate	Do leveling the soil structure / doing excavation.	Contractor
R4	Runway shoulder pad runway is not wide enough	Mitigate	Adjustment of the runway turn pad surface with widening per layer.	Contractor
R5	Runway turn pad irregular surface	Mitigate	Adjustment of the runway turn pad surface by carrying out excavations on the runway.	Contractor
R6	The runway slope is not according to specifications	Mitigate	Do the runway back slope test.	Contractor
R7	Unstable runway soil structure	Mitigate	Carry out treatment on runway soil structure.	Contractor
R8	The earthquake-prone runway area	Avoidance	Conduct an AMDAL test on the runway.	Owner, Consultant Planner & Contractor
R9	Runway area prone to tsunamis	Avoidance	Carry out a Tsunami Wave test	Owner, Consultant Planner & Contractor
R10	The actual length of the runway surface does not meet aircraft operational requirements	Mitigate	Do the actual runway surface length test again.	Contractor
R11	Runway turn pad is not according to specifications	Mitigate	Do runway turn pad specifications.	Contractor
R12	The average texture depth of the new runway surface is less than 1.0 mm	Mitigate	-	Contractor
R13	Corrugated (weavy) runway surface	Mitigate	Adjustment of runway ground level by carrying out excavations on the runway.	Contractor
R14	Runway surface is too slippery	Mitigate	The addition of material that can increase the friction force so that the runway surface is not slippery.	Contractor
R15	Runway shoulders do not have the same width on both sides	Mitigate	Adjustment of the runway turn pad surface with widening layer by layer.	Contractor
R16	Runway shoulders more than 2.5%	Mitigate	Adjustment of the crossing shoulder surface of the runway by carrying out excavations on the runway.	Contractor
R17	Runway shoulder surface is bumpy / not flat with runway surface	Mitigate	Adjustment of runway ground level by carrying out excavations on the runway.	Contractor
R18	The runway shoulder surface for jet aircraft is not coated in asphalt / bitumen / concrete	Mitigate	Overlay asphalt / bitumen / concrete laying on the runway shoulder surface.	Contractor
R19	The shoulder surface of the runway for the Boeing 737-800 / A380 is not widened by 7 m outside the shoulder	Mitigate	Adjustment of the runway shoulder surface with widening layer by layer.	Contractor
R20	Runway shoulders are not resistant to erosion due to aircraft engine bursts	Mitigate	Survey of original soil conditions, selection of sheet pile material and inspection of runway shoulder endurance against erosion due to aircraft engine bursts.	Contractor
R21	Inefficient material supply	Mitigate	Time management between the distance and the time the material arrived at the site.	Contractor
R22	Aggregate and cement layouts are not optimal	Mitigate	Time management between the distance and the time the material arrived at the site.	Contractor
R23	Extreme weather (rainy season)	Avoidance	Control the weather.	Owner, Consultant Planner & Contractor
R24	Asphalt / bitumen spread is not optimal	Mitigate	Time management between the distance and the time the material arrived at the site.	Contractor
R25	Limited support machines	Mitigate	Use that machines effectively and alternately / add heavy equipment.	Contractor
R26	Human error due to 24 hours of work	Mitigate	Increased work motivation and adjustment of work time.	Contractor
R27	Tack coat spreader works not optimal	Mitigate	Operate the tool regularly so that there is no damage to the tack coat spreader.	Contractor

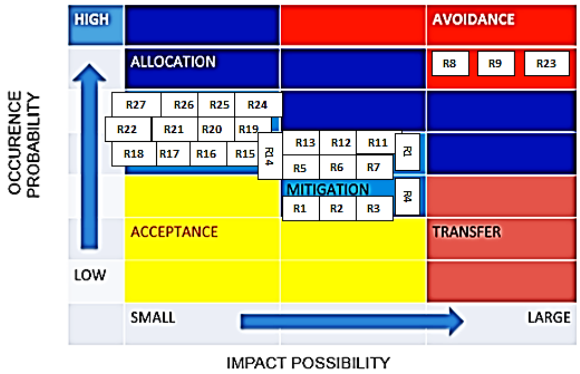

Figure 4. Risk maps on pavement runway project.

4.6 RELATIONSHIP BETWEEN EXPECTED MONETARY OF LOSS AND PROJECT ACCCELERATION

In this section, explain the relationship between risk probability with the value of the project loss. The project loss value is obtained from the calculation of the total price per work item on runway project.

From figure 5 we can see that the highest loss is in 4 weeks duration (25% assumption) where has a total loss 308,638,309.40 rupiahs. The smallest loss is in normal duration 14 weeks where has a total loss 108,444,489.74 rupiahs. In short, the higher of risk impact occurs, the higher of losses to response.

In this section to calculate the amount of loss due to risk probability by multiplying the risk probability and the percentage of risk impact also the value of cost plan per work item. Then, the expected monetary of losses due to project acceleration is obtained. After knowing all the estimated losses, all the losses are totaled to get the total value of the expected monetary of losses due to project acceleration by assumption. For example, to calculate the expected monetary of loss on one of the work items, namely P-304 Cement Treated Base Course, t = 15 cm by multiplying the risk probability 1.6% with the risk impact percentage 2.5% and the cost budget value 4,771,808,813 rupiah . Then, it get an expected monetary of loss at 1,898,607.29 rupiah on that work item.

Table 5. Relationship between expected Monetary of loss and project acceleration.

EML (Rupiahs)		Duration (weeks)
Rp	308,638,309.40	4
Rp	218,495,666.08	6
Rp	176,328,352.36	7
Rp	108,444,489.74	14

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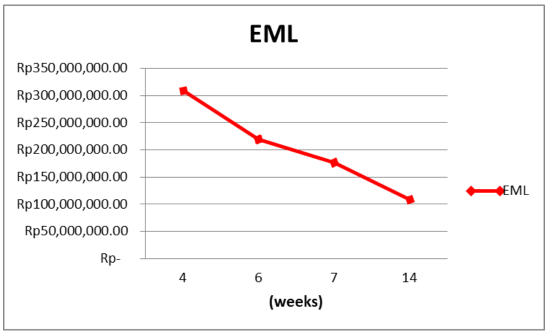

Figure 5. Graphic relationship between loss value and project accelerationper work item at pavement runway project.

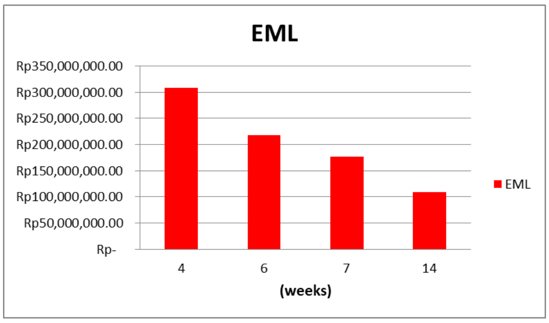

Figure 6. Graphic relationship between loss value and project acceleration per work item at pavement runway project (1).

4.7 RELATIONSHIP BETWEEN TOTAL RISK PROBABILITY AND TOTAL EXPECTED MONETARY OF LOSS

Table 6. Relationship between expected monetary of loss and risk probability.

Risk Probability (%)	EML (Rupiahs)
4.2	Rp 108,444,489
6.7	Rp 176,328,352
9.1	Rp 218,495,666
12.5	Rp 308,638,309

Based on figure 7 we can see that the higher total expected monetary of loss is on 25% assumption duration (4 weeks) which has risk probability 12,5% at 308,638,309.40 rupiahs. The lower total loss value is at normal duration (14 weeks) where 4,2% on risk probability at least 108,444,489.74 rupiahs.

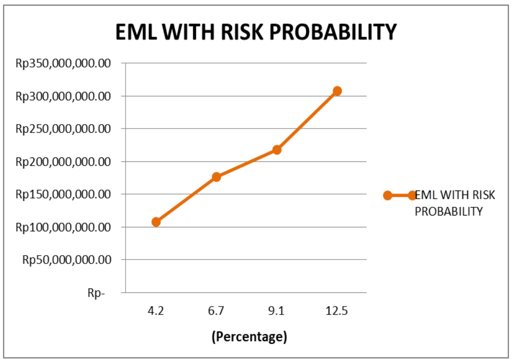

Figure 7. Graphic relationship between total loss value and total risk probability at pavement runway project.

4.8 RELATIONSHIP BETWEEN PROBABILITY AND PROJECT ACCELERATION

In this section to calculate the percentage of probability by comparing the results of the total expected monetary of loss with the total budget value. So, the probability result is obtained. For example, to calculate the percentage probability on the assumption of project acceleration of 25% (4 weeks) by dividing the total expected monetary of loss 308,638,309.40 rupiah with the total budget cost of 175,440,044,816 rupiah. Then, the probability value is 0.1759% as on the table 4.13.

Table 7. Relationship between probability and project acceleration

Probability (%)	Duration (weeks)
0.1759%	4
0.1245%	6
0.1005%	7
0.0618%	14

From figure 8 the relationship between probability and project acceleration is found. Where, there is an increase in the probability of a duration of 4 weeks by 0.17459% and a decrease in the probability of a normal duration of 14 weeks by 0.0618%.

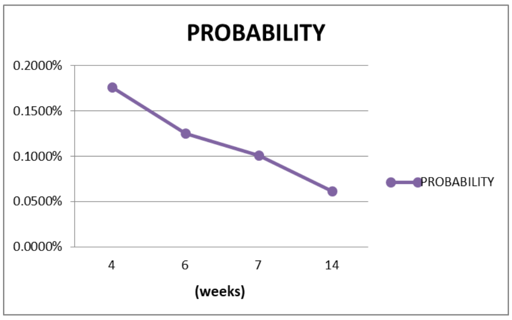

Figure 8. Graphic Relationship between Probability and Project Acceleration per work item at Pavement Runway Project

5. CONCLUSIONS

The conclusions of the several descriptions in chapters 1 through 5 regarding the implications of the risk impact on project acceleration are:

1. On the indentification a risk we just need a framework on pavement runway project. Starting from a variety of airside works to focus on runway projects then brings them in the table with variables R1 to R27 on each runway project.
2. On the analysis of the risk probability in the pavement runway project is divided into five probabilities of risk for three samples. The highest total percentage of risk probability is on assumption 25% duration (4 weeks) 12,5%. The lowest total percentage of risk probability is on normal duration 100% (14 weeks) 4,2%. It means, more accelerate the porject, the higher possibility of risk occurring on the project will happen.
3. In mapping or categorizing risks to the level of risk in this research based on the value of the percentage of probabilities and impacts explained that twenty-four of twenty-seven technical risk factors are categorized as mitigable risks while three of them are categorized as risks to avoid.
4. On the risk response or risk allocation strategy if viewed from the risk category that can be mitigated, the risk can be minimized by changing work or technical methods. If viewed from the category of risk that must be avoided, the risk can be minimized by carrying out risk control in the form of field testing or laboratory testing to avoid hazards during the project or after the project is completed.
5. The higher total expected monetary of loss is on 25% assumption duration (4 weeks) which has risk probability 12,5% at 308,638,309.40 rupiahs. The lower total loss value is at normal duration (14 weeks) where 4,2% on risk probability at least 108,444,489.74 rupiahs.
6. The highest loss is in 4 weeks duration (25% assumption) where has a total loss 308,638,309.40 rupiahs. The smallest loss is in normal duration 14 weeks where has a total loss 108,444,489.74 rupiahs. In short, the higher of risk impact occurs, the higher of losses to response.
7. The relationship between probability and project acceleration is found. Where, there is an increase in the probability of a duration of 4 weeks by 0.17459% and a decrease in the probability of a normal duration of 14 weeks by 0.0618%.

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