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Risk Management in Implementation City Road Project in Padang City

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ABSTRACT

Risks can have an impact on the productivity, performance, quality and cost limits of a project and risks can be said to be consequences that may occur unexpectedly. The success of a construction project really depends on the ability of project management to manage the risks that occur. The role of transportation in the city of Padang is to support the economic, education, tourism and defense and security sectors. Construction projects are a dynamic field and contain risks. The aim of this research is to identify risks and carry out risk analysis in the implementation of city road construction projects in the city of Padang as well as carry out risk responses for risk ownership in order to reduce the consequences caused by these risks. This research uses primary and secondary data which will later become a questionnaire and conduct interviews. Questionnaires were distributed to respondents, namely contractors, the results of the questionnaire calculation analysis using the Severity Index (SI) method from during the implementation of urban road construction in the city of Padang, 47 (forty seven) risks were identified based on activities at the project implementation stage. The risks identified are 2 (two) political risks, 7 (seven) environmental risks, 2 (two) planning risks, 2 (two) marketing risks, 3 (three) economic risks, 1 (one) financial risk, 6 (six) natural risks, 7 (seven) project risks, 7 (seven) technical risks, 2 (two) human risks, 3 (three) criminal risks and 5 (five) safety risks. Of the identified risks, an analysis of the level of risk acceptance was carried out which showed that there were 23 (twenty-three) risks that were included in the highest risk category or unacceptable risk category (Unacceptable) and 24 (twenty-four) risks that were included in the risk category. not expected (Undesirable). Ownership of the greatest risks is the responsibility of the contractor because during the project, the contractor has a central role as controlling the overall course of the project.

Keywords: *Risk Identification, Risk Response, Severity Index.*

INTRODUCTION

The development of city road infrastructure in the city of Padang is not free from several mistakes, including poor project risk management. As seen in the picture below, there are risks that occurred during the construction of the Kurao road project in the city of Padang with the presence of electricity poles in the middle of the road.

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Figure 1. Electric poles are on the road at the Kurao road project, Padang

According to the Head of the Highways Division of the Padang PUPR Service, Harisman, said that the project was still under construction at that time and had not yet received a PHO (Provisional Hand Over) or temporary handover of work. If the Kurao highway project does not comply with the specifications, it is certain that the party will not pay the partner and this could result in losses to the contractor on the project, which could ultimately result in accidents for motorists passing on the road. The electricity pole is a state asset from PLN and the contractor (service provider) cannot just dismantle it. This risk is a lack of coordination between related agencies between the contractor and PLN.

The reason for this research was to mitigate the risk of this problem by increasing coordination and communication between related agencies in order to maintain cohesiveness and increase awareness for common goals [1]. Some problems such as project delays can also be caused by poor project management and also errors caused by human resources in it. Weak risk management can cause projects to be late, project costs to increase and cause projects to have high risks [2]. The process of identifying. analyzing and responding to risks as a procedure to control the level of risk and to reduce its impact and organize options for dealing with risks in project implementation [3].

METHOD

Explaining This research uses primary and secondary data which uses quantitative data measurements and the object of research is respondents (contractors) registered in the LPSE City Road Development Package in Padang City in 2021 which is under the management of the Padang City Public Works and Spatial Planning Department where the entire package is located in the Padang city area, which will later become a questionnaire and interviews will be conducted. The research begins with the background, problem formulation, problem limitations and the aim of this research, namely identifying risks, carrying out analysis and evaluation of these risks. The sources and research risk variables were obtained from previous literature studies as follows:

Table 1. Sources and risk variables from previous literature studies

No.	Source	Code	Variable
1.	Political	A1	Lack of coordination between related agencies
2.		A2	There is a change in the structure of responsibilities of government agencies

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3.	Environment	B1	Noise
4.		B2	Environmental damage
5.		B3	Accumulation of project waste materials
6.		B4	There was damage to public facilities around the project
7.		B5	Traffic jams around the project site
8.		B6	Access for materials and equipment to the project site is difficult
9.		B7	Plague or infectious disease
10.	Planning	C1	Non-conformity of quality with specified specifications
11.		C2	Problematic land acquisition in the project area
12.	Marketing	D1	Requests for materials/materials that do not match specifications
13.		D2	Market price competition
14.	Economy	E1	There was an increase in prices during project implementation
15.		E2	Increase and scarcity of fuel
16.		E3	Late payment of terms by the owner to the contractor
17.	Finance	F1	Project cost overruns
18.	Natural	G1	Heavy rain at the project site
19.		G2	Earthquake
20.		G3	Flooding at the project location
21.		G4	Landslide
22.		G5	Difficult field conditions
23.		G6	Natural disasters
24.	Project	H1	Quantity planning and control is still inaccurate
25.		H2	Material needs are not met
26.		H3	Project management is still low
27.		H4	Lateness/postponement of work
28.		H5	Delays in the supply and import of construction equipment
29.		H6	Delays in delivery of project materials
30.		H7	Additional work at unbalanced prices
31.	Technical	I1	Inappropriate design
32.		I2	Inappropriate working methods
33.		I3	Heavy equipment damage
34.		I4	Incompatibility of the volume of work in the contract and field conditions
35.		I5	Misuse of materials
36.		I6	The equipment used is not good
37.		I7	Old equipment
38.	Human	J1	Work in the dark/night
39.		J2	Labor strike while the project is underway
40.	Kriminal	K1	Vandalism/sabotage
41.		K2	Theft in the project area
42.		K3	Lack of security in the project
43.	Safety	L1	Construction work accidents
44.		L2	Exposure to hazardous substances
45.		L3	Got hit by an explosion
46.		L4	There was a fire in the project area
47.		L5	Accident resulting in death

These risk variables, which will later be used as initial identification, will then be distributed to respondents in the form of questionnaires classified according to age, gender, position, company classification and education. Pilot tests are required on 3 (three) samples of contractors to represent respondents who will be researched to see whether they understand

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and truly understand the questionnaire that will be distributed to respondents. After the questionnaire data is obtained from the respondents, a validity and reliability test is carried out to obtain valid and reliable values for the questionnaire data carried out. Next, the questionnaire data was analyzed to calculate risk using the Severity Index (SI) method and a risk assessment was obtained to be mitigated by experts.

RESULTS AND DISCUSSION

In this discussion, data will be discussed to obtain answers (output) from this research, in accordance with data obtained through questionnaire interviews with respondents which are then processed based on theories from the literature review, where data processing is carried out with Microsoft Office (Excel).

Classification of Research Respondents

In this research, the number of respondents was 40 (forty) people representing the research population, namely contractors working on city road projects in the city of Padang. Before completing the questionnaire, the aims and objectives of this research were explained first. From the results of the questionnaire that has been distributed, the demographic data of respondents can be explained which are categorized based on position, gender, age, company classification, work experience and level of education. The data obtained will be explained in table form as follows:

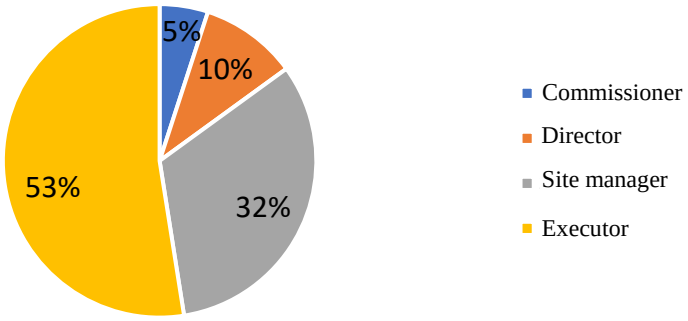

Figure 2. Classification based on position

From figure 2, the results show that 2 (two) respondents have the position of komisaris with a percentage of 5%, 4 (four) direktur with a percentage of 10%, 13 site manager with a percentage of 32% and 21 executor with a percentage of 53%.

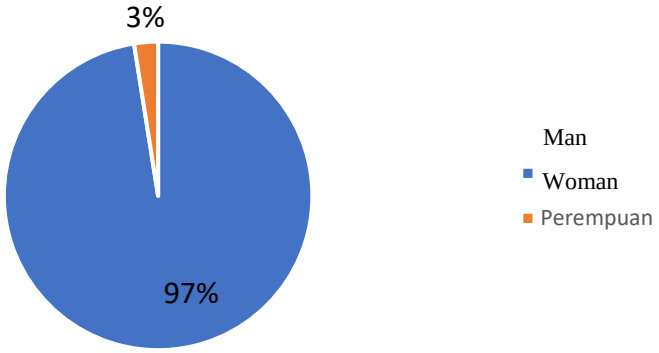

Figure 3. Classification based on gender

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From figure 3, the results show that there were 39 (thirty nine) laki-laki respondents with a percentage of 97% and 1 (one) perempuan respondent with a percentage of 3%.

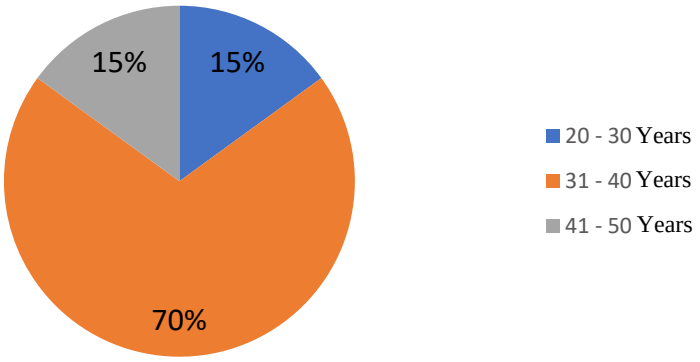

Figure 4. Classification based on age

From figure 4, the results show that respondents aged 20 - 30 years were 6 (six) people with a percentage of 15%, aged 31 - 40 years were 28 (twenty eight) people with a percentage of 70% and aged 41 - 50 years were 6 (six) people with a percentage of 15%.

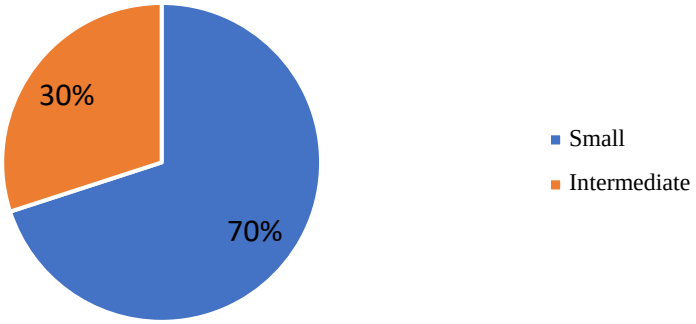

figure 5. Classification based on company

From figure 5, the results obtained from respondents with a small company classification were 28 (twenty eight) people with a percentage of 70% and a medium company classification of 12 (twelve) people with a percentage of 30%.

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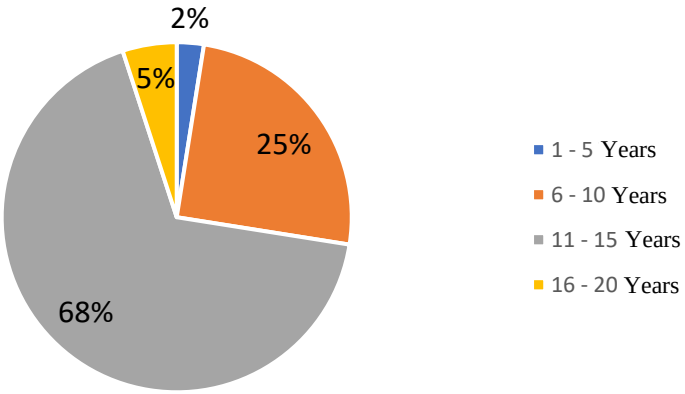

figure 6. Classification based on experience

From figure 6, the results show that respondents with work experience of 1 – 5 years were 1 (one) person with a percentage of 2%, 6 – 10 years were 10 (ten) people with a percentage of 25%, 11 – 15 years were 27 (twenty seven) people with a percentage of 68% and 16 – 20 years old as many as 2 (two) people with a percentage of 5%.

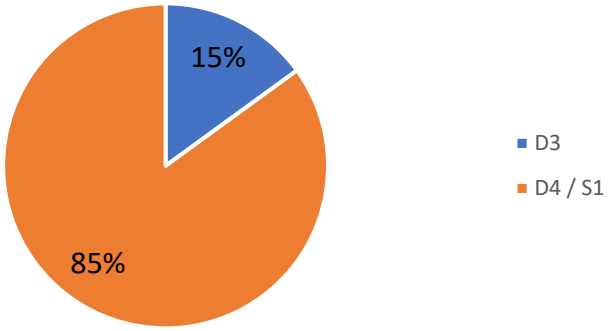

Figure 7. Classification based on education

From figure 7 above, the results show that respondents with D3 education were 6 (six) people with a percentage of 15% and D4/S1 as many as 34 (thirty four) people with a percentage of 85%.

Validity Test

Validity testing aims to find out the truth of what is actually measured (Ghozali, 2011). Validity testing is carried out using Person Correlation. In general, the determine whether each question item that supports the research variables is valid or not, opinions are quoted (Ghozali, 2011). If the r-calculated value > r-table, then the question items or statements in the questionnaire are significantly correlated with the total score, meaning that the items in the questionnaire are declared valid.

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Table 2. Frequency and impact validity test results

Code	Frequency			Impact		
	r- count	r-table	Conclusion	r- count	r-table	Conclusion
A. Political						
A1	0.47	0.31	**Valid**	0.52	0.31	**Valid**
A2	0.37		**Valid**	0.38		**Valid**
B. Environment						
B1	0.33	0.31	**Valid**	0.37	0.31	**Valid**
B2	0.34		**Valid**	0.33		**Valid**
B3	0.48		**Valid**	0.53		**Valid**
B4	0.68	0.31	**Valid**	0.38	0.31	**Valid**
B5	0.46		**Valid**	0.41		**Valid**
B6	0.47		**Valid**	0.44		**Valid**
B7	0.67		**Valid**	0.39		**Valid**
C. Planning						
C1	0.58	0.31	**Valid**	0.34	0.31	**Valid**
C2	0.42		**Valid**	0.41		**Valid**
D. Marketing						
D1	0.73	0.31	**Valid**	0.44	0.31	**Valid**
D2	0.67		**Valid**	0.39		**Valid**
E. Economy						
E1	0.34	0.31	**Valid**	0.49	0.31	**Valid**
E2	0.66		**Valid**	0.39		**Valid**
E3	0.57		**Valid**	0.37		**Valid**
F. Finance						
F1	0.63	0.31	**Valid**	0.39	0.31	**Valid**
G. Natural						
G1	0.42	0.31	**Valid**	0.43	0.31	**Valid**
G2	0.80		**Valid**	0.35		**Valid**
G3	0.53		**Valid**	0.57		**Valid**
G4	0.63		**Valid**	0.35		**Valid**
G5	0.35		**Valid**	0.46		**Valid**
G6	0.76		**Valid**	0.34		**Valid**
H. Project						
H1	0.31	0.31	**Valid**	0.34	0.31	**Valid**
H2	0.68		**Valid**	0.35		**Valid**
H3	0.71		**Valid**	0.34		**Valid**
H4	0.41		**Valid**	0.45		**Valid**
H5	0.44		**Valid**	0.40		**Valid**
H6	0.67		**Valid**	0.47		**Valid**
H7	0.64		**Valid**	0.65		**Valid**
I. Technical						
I1	0.36	0.31	**Valid**	0.35	0.31	**Valid**
I2	0.73		**Valid**	0.44		**Valid**
I3	0.51		**Valid**	0.41		**Valid**
I4	0.42		**Valid**	0.33		**Valid**
I5	0.68		**Valid**	0.33		**Valid**
I6	0.58		**Valid**	0.45		**Valid**
I7	0.74		**Valid**	0.56		**Valid**
J. Human						
J1	0.36	0.31	**Valid**	0.33	0.31	**Valid**

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J2	0.38		**Valid**	0.31		**Valid**
K. Criminal						
K1	0.49	0.31	**Valid**	0.40	0.31	**Valid**
K2	0.51		**Valid**	0.40		**Valid**
K3	0.53		**Valid**	0.52		**Valid**
L. Safety						
L1	0.61	0.31	**Valid**	0.45	0.31	**Valid**
L2	0.57		**Valid**	0.37		**Valid**
L3	0.41		**Valid**	0.44		**Valid**
L4	0.60		**Valid**	0.39		**Valid**
L5	0.69	0.31	**Valid**	0.34	0.31	**Valid**

From table 2 it can be explained that in this study the sample used was 47 risk variables with a validity test value of r-count greater than r-table, namely 0.312.

Reliability Test

Reliability testing shows the extent to which the measurement can provide relatively different results, if the measurement is repeated on the same subject (Ghozali, 2011). This test can only be carried out on valid variables. Reliability testing is carried out using the *Cronbach's Alpha* formula. Data is said to be reliable if Cronbach's Alpha is greater than or equal to the *Cronbach's Alpha* coefficient of 0.60.

$$r1 = \left(\frac{k}{k-1}\right)\left(1 - \frac{\sum \sigma \frac{2}{b}}{\sigma \frac{2}{t}}\right)$$

Note:

r1 = Reliability

k = The many variables

$\sum \sigma \frac{2}{t}$ = Total variance

$\sum \sigma \frac{2}{b}$ = Number of variances

Criteria Test:

1. If the Cronbach's Alpha value is ≥ 0.60, it shows that all valid variables are reliable variables.
2. If the Cronbach's Alpha value is ≤ 0.60, it shows that all valid variables are unreliable variables.

Table 3. Frequency and impact reliability test results

Risk	**N = 40**		**Rule**	**Information**
	Number of Questions	**Cronbach's Alpha**		
Probability	47	0.95	0.6	RELIABLE
Impact	47	0.88	0.6	RELIABLE

Risk Assessment (Severity Index)

After the questionnaire is obtained from the respondent, the next stage will be a risk assessment analysis by calculating the *Severity Index (SI).*

Table 4. Severity index value category for frequency

No.	**Category**		**Percentage Value**	**Value**
	Probability	**Impact**		
1.	Very often (SS)	Very large (SS)	87.5% ≤ SI ≤ 100%	5.0

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2.	Often (S)	Big (B)	62.5% ≤ SI ≤ 87.5%	4.0
3.	Sometimes (KK)	Currently (S)	37.5% ≤ SI ≤ 62.5%	3.0
4.	Seldom (J)	Small (K)	12.5% ≤ SI ≤ 37.5%	2.0
5.	Very rarely (SJ)	Very small (SK)	0.00% ≤ SI ≤ 12.5%	1.0

Table 5. Risk assessment of probability with severity index

Sources of Risk	Value SI (%)	Category	Value
A. Political			
A1	73.5	Often	4.0
A2	66.5	Often	4.0
B. Environment			
B1	74.5	Often	4.0
B2	69.5	Often	4.0
B3	86.0	Often	4.0
B4	60.0	Sometimes	3.0
B5	89.0	Very Often	5.0
B6	65.5	Often	4.0
B7	47.5	Sometimes	3.0
C. Planning			
C1	66.0	Often	4.0
C2	74.0	Often	4.0
D. Marketing			
D1	62.5	Sometimes	3.0
D2	66.0	Often	4.0
E. Economy			
E1	66.5	Often	4.0
E2	70.0	Often	4.0
E3	69.5	Often	4.0
F. Finance			
F1	63.0	Often	4.0
G. Natural			
G1	72.0	Often	4.0
G2	45.0	Sometimes	3.0
G3	59.0	Sometimes	3.0
G4	36.5	Seldom	2.0
G5	57.5	Sometimes	3.0
G6	48.0	Sometimes	3.0
H. Project			
H1	66.5	Often	4.0
H2	63.0	Often	4.0
H3	70.5	Often	4.0
H4	70.5	Often	4.0
H5	60.0	Sometimes	3.0
H6	67.0	Often	4.0
H7	54.0	Sometimes	3.0
I. Technical			
I1	67.00	Often	4.0
I2	55.50	Sometimes	3.0
I3	58.50	Sometimes	3.0
I4	75.00	Often	4.0

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I5	50.00	Sometimes	3.0
I6	55.00	Sometimes	3.0
I7	56.50	Sometimes	3.0
J. Human			
J1	66.50	Often	4.0
J2	47.50	Sometimes	3.0
K. Criminal			
K1	39.00	Sometimes	3.0
K2	51.00	Sometimes	3.0
K3	69.00	Often	4.0
L. Safety			
L1	49.50	Sometimes	3.0
L2	40.00	Sometimes	3.0
L3	31.00	Seldom	2.0
L4	33.50	Seldom	2.0
L5	36.50	Seldom	2.0

Table 6. Risk assessment of impacts with severity index

Sources of Risk	Value SI (%)	Category	Value
A. Political			
A1	70.50	Big	4.0
A2	72.00	Big	4.0
B. Environment			
B1	53.00	Currently	3.0
B2	68.00	Big	4.0
B3	73.50	Big	4.0
B4	73.50	Big	4.0
B5	81.50	Big	4.0
B6	77.00	Big	4.0
B7	71.50	Big	4.0
C. Planning			
C1	82.00	Big	4.0
C2	75.50	Big	4.0
D. Marketing			
D1	79.50	Big	4.0
D2	69.50	Big	4.0
E. Economy			
E1	77.00	Big	4.0
E2	77.00	Big	4.0
E3	80.50	Big	4.0
F. Finance			
F1	77.50	Big	4.0
G. Natural			
G1	81.00	Big	4.0
G2	71.50	Big	4.0
G3	84.50	Big	4.0
G4	79.50	Big	4.0
G5	75.00	Big	4.0
G6	77.00	Big	4.0
H. Project			

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H1	75.50	Big	4.0
H2	81.50	Big	4.0
H3	77.00	Big	4.0
H4	77.50	Big	4.0
H5	74.50	Big	4.0
H6	79.50	Big	4.0
H7	58.00	Currently	3.0
I. Technical			
I1	82.00	Big	4.0
I2	81.00	Big	4.0
I3	84.50	Big	4.0
I4	76.50	Big	4.0
I5	82.00	Big	4.0
I6	73.00	Big	4.0
I7	75.50	Big	4.0
J. Human			
J1	65.00	Big	4.0
J2	82.50	Big	4.0
K. Criminal			
K1	75.50	Big	4.0
K2	80.50	Big	4.0
K3	77.00	Big	4.0
L. Safety			
L1	73.00	Big	4.0
L2	75.00	Big	4.0
L3	77.00	Big	4.0
L4	76.50	Big	4.0
L5	83.50	Big	4.0

Risk Acceptance

Risk acceptance in this research uses the Godrey method which has been developed. Assessment of the level of risk acceptability. These Unacceptable risk variables can be seen in the following table 7.

Table 7. Variables and sources of risk with unacceptable risk.

No.	Code	Risk Variables	Source	Risk Acceptance
1.	B5	Traffic jams around the project site	Environment	Unacceptable
2.	A1	Lack of coordination between related agencies	Political	Unacceptable
3.	A2	There is a change in the structure of responsibilities of government agencies		Unacceptable
4.	B2	Environmental damage	Environment	Unacceptable
5.	B3	Accumulation of project waste materials		Unacceptable
6.	B6	Access for materials and equipment to the project site is difficult		Unacceptable
7.	C1	Non-conformity of quality with specified specifications	Planning	Unacceptable
8.	C2	Problematic land acquisition in the project area		Unacceptable
9.	D2	Market price competition	Marketing	Unacceptable

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10.	E1	There was an increase in prices during project implementation	Economy	Unacceptable
11.	E2	Increase and scarcity of fuel		Unacceptable
12.	E3	Late payment of terms by the owner to the contractor		Unacceptable
13.	F1	Project cost overruns	Finance	Unacceptable
14.	G1	Heavy rain at the project site	Natural	Unacceptable
15.	H1	Quantity planning and control is still inaccurate	Project	Unacceptable
16.	H2	Material needs are not met		Unacceptable
17.	H3	Project management is still low		Unacceptable
18.	H4	Delay/postponement of work		Unacceptable
19.	H6	Delays in delivery of project materials		Unacceptable
20.	I1	Inappropriate design	Technical	Unacceptable
21.	I4	Incompatibility of the volume of work in the contract and field conditions		Unacceptable
22.	J1	Work in the dark/night	Human	Unacceptable
23.	K3	Lack of security in the project	Criminal	Unacceptable

Risk Response and Risk Ownership

Response and ownership of these 23 (twenty three) risks will be mitigated by experts through interviews and risk ownership will be obtained, there are risks which will be discussed with experts with ± 20 years of experience in the field of implementing city road project construction in the city of Padang.

Based on risks that have been identified and mitigated by experts. Next, allocate risk ownership to each party involved in the construction of a city road project in the city of Padang as follows:

1. Owner : -
2. Supervisory Consultant : -
3. Contractor : *23 (twenty three) risks*

CONCLUSION

The risks identified are 2 (two) political risks, 7 (seven) environmental risks, 2 (two) planning risks, 2 (two) marketing risks, 3 (three) economic risks, 1 (one) financial risk, 6 (six) natural risks, 7 (seven) project risks, 7 (seven) technical risks, 2 (two) human risks, 3 (three) criminal risks and 5 (five) safety risks. Of the identified risks, an analysis of the level of risk acceptance was carried out which showed that there were 23 (twenty-three) risks that were included in the highest risk category or unacceptable risk category and 24 (twenty-four) risks that were included in the category not expected (Undesirable).

Risk mitigation actions are carried out to reduce the negative impact of the risks included in the highest risks. Of the highest risks, action is taken by reducing risks (Risk Reduction) on the following risks: Traffic jams, Lack of coordination between relevant agencies , Changes in the structure of responsibilities of government agencies, Environmental damage, Accumulation of project leftover materials, Difficult access for materials and equipment to the project site, Non-conformity of quality with specified specifications, Problematic land acquisition in the project area, Market price competition, Increases and shortages fuel, late term payments by the owner to the contractor, overrun of project costs, planning and quantity control is still inaccurate, material requirements are not met, project management is still low, work delays/postponements, delays in delivery of project materials, inappropriate design, non-

compliance volume of work in the contract and field conditions, Working in the dark/night, Lack of security on the project, and Risk Retention on the following risks: Price increases during project implementation, Heavy rain at the project site.

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