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Risk Analysis Contruction Infrastructure Incinerator Tpa Basirih In Banjarmasin City

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ABSTRACT: *Construction in Banjarmasin City every year there is always development and improvement to meet the needs of the public, then the Government of Banjarmasin City held a construction incinerator at the TPA Basirih intending to be able to meet the increasing need to handle medical waste. It is estimated that the construction of an incinerator for handling medical waste from Sultan Suriansyah Hospital and 26 public health centers in Banjarmasin City. Every construction project has risks that must be faced, including the construction incinerator at the TPA Basirih. Realized risk can be a problem that will greatly affect the performance of the project.*

This research discusses the risk management analysis of incinerator development. With risk management analysis, all risks that may occur in the project can be avoided from financial losses, project delays, and losses of other implementing parties. For this reason, risk management analysis focuses on the construction incinerator because this type of construction is not generally handled by the Dinas PUPR Bidang Cipta Karya Banjarmasin City. From the results of risk acceptance, it can be concluded that there are 10 undesirable risks and 2 acceptable risks so that the factors risk political, natural and environmental, technical, human, security and safety including undesirable risk so it's a mature handler is needed to handle undesirable risk project.

The risk strategy for undesirable risk is based on the level of acceptance of risk is to multiply the frequency of an event by the impact of the event. Risk strategy actions are taken to reduce and avoid the negative impact of risks belonging to the dominant risk category. One of the undesirable risks is the lack of security and risk strategy is measures in the form of adding security personnel and educating the labor side not to commit crimes while working on construction projects.

KEYWORDS: *Incinerator Construction, Risk, Risk Strategies.*

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I. INTRODUCTION

Construction in Banjarmasin City every year there is always development and improvement to meet the need of the public. One of the public needs is a clean environment and there is no source of disease in the form of accumulation of garbage and medical waste. So that the Banjarmasin city government held the construction of an incinerator at the TPA Basirih

Risk management analysis that focuses on the construction of an incinerator in Banjarmasin City is very important because this type of work is not commonly handled by Dinas PUPR Bidang Cipta Karya Banjarmasin City that where development incinerator infrastructure including rare construction in the city of Banjarmasin and the development of the incinerator infrastructure development budget it is known that around 40% for the procurement of the incinerator machine unit and the incinerator IPAL pump unit, and it is known that incinerator machine units and incinerator IPAL pump units only produce outside the city of Banjarmasin and are in industrial areas hence the need for a risk management analysis from the start of work until the final stage of work so that risks that could harm the owner do not occur hence the importance of this risk management analysis for smooth and security of construction incinerator infrastructure by minimizing it and avoid all risks that may occur

II. LITERATURE REVIEW

Risk is the possibility of an event that can harm the company. Risk is essentially an event that has a harm on company goals and strategies the likelihood of a risk occurring and its consequences for the business is fundamental to identifying and measuring.

Risk management is an organized approach to discover potential risks to reduce the occurrence of unexpected things. Furthermore, it can be identified the unexpected adverse effects and an appropriate response plan can be developed to address these potential risks. So, through risk management, the right method can be found to avoid and reduce the amount of loss that is caused by risk. Proper risk management can avoid the costs forced and project failure due to an adverse event.

Control is systematic efforts to determine standards following with planning objectives, designing information systems, comparing standards with implementation, then taking the necessary corrective actions so that resources are used effectively and efficiently to achieve goals

III. RESEARCH METHODS

Through this research studying risk analysis in the form of knowing the level of frequency and impact as well as risk mitigation on the infrastructure development of the Basirih landfill incinerator in Banjarmasin City. The approach taken is to first determine and measure the risk factors in question. The result of this activity is to know the qualitative level of risk, the aspect risk acceptance, and risk mitigation strategies to deal with risks to the construction of the Basirih landfill incinerator infrastructure in Banjarmasin City. Preliminary studies are carried out by collecting, reading, and analyzing library sources related to the theme of this thesis writing.

IV. RESULT

4.1. RESULT

4.1.1 Information Stage

In this study, a risk analysis will be calculated to determine the risk of incinerator infrastructure development at the TPA Basirih Banjarmasin. The TPA Basirih Banjarmasin is located on the street of Governor Soebardjo, South Basirih Village, South Banjarmasin District. It is estimated that the construction of a medical waste incinerator for handling medical waste from the Sultan Suriansyah Hospital and 26 Public Health Center in Banjarmasin City. If medical waste and hazardous and toxic waste (B3) in Banjarmasin City could become a serious threat if not treated immediately.

4.1.2 Creative Stage

At this creative stage to determine the risk analysis, interviews are conducted with the owner, the contractor, the consultant to determine the results of risk levels and risk acceptance and to obtain the results of risk mitigation strategies. Below in Table IV.1

Table IV.1 Identification Risk of Incinerator Construction

Aspects Reviewed	Variable	Identification Risk
Political	X_1	Government Policy
	X_2	Chaos
Economics and Financial	X_3	Inflation
	X_4	Bankruptcy
Nature and Environment	X_5	Bad weather
	X_6	Environmental Impact
Technical	X_7	Equipment
	X_8	Material Use
Human	X_9	Error
	X_{10}	Culture
Security and Safety	X_{11}	Lack of Security
	X_{12}	Collapse

4.1.3 Analysis Stage

1. Validity and Reliability Test

Validity test to determine its validity, from all the questions given in the form of a questionnaire to the respondents, the validity test was carried out on each question item in the variable group. The validity test criteria used the Spearman correlation. The questionnaire can be categorized as valid if the correlation value is greater than the validity value using the Spearman correlation.

Table IV.2 Results of the Validity Test on Frequency

No	Aspects Reviewed	Variable	*R*	Conclusion
1	Political	Government Policy	0,30	Valid
		Chaos	0,45	Valid
2	Economics and Financial	Inflation	0,41	Valid
		Bankruptcy	0,43	Valid
3	Nature and Environment	Bad weather	0,46	Valid
		Environmental Impact	0,49	Valid
4	Technical	Equipment	0,55	Valid
		Material Use	0,70	Valid
5	Human	Error	0,68	Valid
		Culture	0,59	Valid
6	Security and Safety	Lack of Security	0,54	Valid
		Collapse	0,56	Valid

Table IV.3 Results of the Validity Test on Impact

No	Aspects Reviewed	Variable	*R*	Conclusion
1	Political	Government Policy	0,36	Valid
		Chaos	0,28	Valid
2	Economics and Financial	Inflation	0,59	Valid
		Bankruptcy	0,36	Valid
3	Nature and Environment	Bad weather	0,49	Valid
		Environmental Impact	0,43	Valid
4	Technical	Equipment	0,68	Valid
		Material Use	0,82	Valid
5	Human	Error	0,78	Valid
		Culture	0,67	Valid
6	Security and Safety	Lack of Security	0,57	Valid
		Collapse	0,66	Valid

From Table IV.2 and Table IV.3 the results of the validity test on the frequency and impact, it is known that all the tested variables proved to be valid and can be used for further testing.

Table IV.4 Reliability Test Results

	Frequency	Impact	Information
Reliable	0,75	0,80	Valid

2. Recapitulation of The Risk Identification Survey The Frequency and Impact of The Respondent's Results On The Frequency of Risk Identification

Table IV. 5 Recapitulation of Respondents on Frequency

Category	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}
1	7	12	4	19	2	1	1	0	1	1	2	12
2	19	20	11	19	8	1	6	9	9	13	5	16
3	18	14	20	8	16	18	25	23	12	12	9	12
4	6	4	14	4	16	23	15	13	20	19	26	5
5	0	0	1	0	8	7	3	5	8	5	8	5
Indeks Skor	2,46	2,2	2,94	1,94	3,4	3,68	3,26	3,28	3,5	3,28	3,66	2,5

Based on Table IV.5, it can be concluded that the representation of the results of the respondent's response to the frequency scale 1 (very rare) is 1 risk, scale frequency 2 (rarely) is 4 risks, scale frequency 3 (sometimes) is 7 risks, scale frequency 4 (often) is 0 risk and 5 scale frequency (very often) is 0 risk. And it can be seen that the scale 3 frequency is a risk that has an influence/impact on the incinerator development project.

3. Respondents Results on the Impact / Impact of Risk Identification

Table IV. 6 Recapitulation of Respondents on Frequency

Category	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}
1	1	0	5	4	1	2	1	1	1	1	1	1
2	8	9	11	4	10	3	2	4	3	10	3	6
3	14	20	17	9	12	15	17	16	15	19	8	7
4	22	15	15	18	18	21	22	13	16	13	20	11
5	5	6	2	15	9	9	8	16	15	7	18	25

Indeks Skor	3,44	3,36	2,96	3,72	3,48	3,64	3,68	3,78	3,82	3,3	4,02	4,06

Based on Table IV.6, it can be concluded that the representation of the results of the respondent's response to scale 1 (very small) impact is 0 risk, scale 2 (small) impact is 1 risk, scale 3 (medium) impact is 9 risks, scale 4 (large) impact is 2 risk and 5 scale impact (very large) is 0 risk. And it can be seen that the scale 3 impact is a risk that has an impact on the incinerator development project.

4. Qualitative Risk Levels Based on Frequency and Impact

Table IV. 7 Qualitative Risks to Frequency and Impact

Category	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}
Frequency Events	R	R	R	VR	S	S	S	S	S	S	S	R
Impact Events	M	M	S	M	M	M	M	M	M	M	B	B
Qualitative Risk Level	M	M	L	M	H	H	H	H	H	H	E	H

Based on the data above, it can be concluded that the qualitative risk level of High Risk is a risk that influence the incinerator infrastructure development project.

5. Risk Acceptance Rate

Table IV. 8 Acceptance of Risk-Based on Frequency and Impact

Category	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}
Frequency Events	2	2	2	1	3	3	3	3	3	3	3	2
Impact Events	3	3	2	3	3	3	3	3	3	3	4	4
Qualitative Risk Level	6	6	4	3	9	9	9	9	9	9	12	8

The risk assessment is carried out by multiplying the frequency by the impact as shown in Table IV.8. The result of this multiplication shows the risk value which can determine the acceptability of risk. The result of risk acceptance was undesirable (10 risks were not expected), while 2 risks were acceptable

4.1.4 Risk Strategy Formulation Stage

1. Distribution of Risk Acceptance for Each Source of Risk

Table IV. 9 Respondents Results Based on Acceptance of Risk

Risk Source	Identification Risk		Risk Acceptance Rate			
			Undesirable		Acceptable	
	Amount	%	Amount	%	Amount	%
Political	2	16,67	2	16,67	0	0
Economics and Financial	2	16,67	0	0	2	16,67
Nature and Environment	2	16,67	2	16,67	0	0
Technical	2	16,67	2	16,67	0	0
Human	2	16,67	2	16,67	0	0
Security and Safety	2	16,67	2	16,67	0	0
Percentage	12	100	10	83,33	2	16,67

2. Dominant Risks (Major Risk)

Major risks are risks that are categorized as undesirable. This risk is a risk with the risk acceptability of the frequency and impact matrix values equal to or above 5. The existence of dominant risks (major risk) will have a major effect on the incinerator infrastructure development work project in Banjarmasin City.

The results of respondents based on risk acceptance above can be explained that the percentage of risk acceptance rate is undesirable as many as 10 risks. It can be seen from the results of the study that 83,33% of the risk acceptance of undesirable is a major risk.

From the data and percentage, the identified major risks are identified, namely the undesirable category risk, which will then take mitigation action by the contractor leader who is responsible for the risk.

3. Risk Management Model

This management model is structured directed in the form of a mitigation strategy, risk mitigation is carried out by interviewing competent parties. The types of risks that are targeted for mitigation are in the undesirable category according to the analysis results. Mitigation is carried out as follows:

1. Government policy in the form of central or local government policies in Banjarmasin City. From the interview results, it is known that one of the government policies is the government policy towards COVID-19 which has an impact on the regional budget to the construction of the incinerator construction because the regional budget is diverted to the budget for handling COVID-19. So that these activities must follow the health protocol according to the ministerial circular number 18 / SE / M / 2020 concerning the implementation of new normal arrangements and adaptations in the implementation of construction services that make contractors and workers have to adapt to follow the health protocol appropriately and In projects that have procurement, they must follow new government policies so that the contractor must consult with the owner because for the procurement of goods from outside the city with the new policy, the contractor requires an additional budget to follow new government policies such as following the material/equipment receipt mechanism according to the letter Circular 18 / SE / M / 2020, forming a task force, checking workers' health, providing health facilities, providing vitamins and nutrition and the incinerator construction project being postponed to next year, only one construction project will take place during this pandemic. For this reason, it is recommended that mitigation conduct consultations with the owner in case of government policies.

2. Chaos in the form of the political origin or things that can disrupt the development of the incinerator. From the results of the interview, it is known that one of the chaos is that at the end of 2020 there was a political period in the form of a candidate governor/candidate deputy govenor and mayor candidate election in which the community disagreed with each other's choices, so there was a possibility that opinions or conflicts among the community were disputed. Political chaos had occurred in Banjarmasin City in 1997 so that parties involved in the construction of the incinerator infrastructure development had to anticipate the possible risk of chaos that had occurred in the past. For this reason, it is recommended to increase security such as being given a zinc fence around the construction and installing CCTV cameras in construction projects.

3. Bad weather in the form of storm conditions, heavy rain can hinder construction. From the results of the interview, it is known that one of the bad weather conditions is the La Nina phenomenon which is caused by the change from the dry to the rainy season, namely the rainfall that increases between 20 and 40 percent from normal conditions. This phenomenon not only hinders construction work but can also hinder and endanger the delivery of incinerator machine units conducting expeditions by sea. For this reason, it is recommended to consult with the owner and supervisor to anticipate and in case of bad weather that hinders construction activities.

4. Environmental Impact in the form of all activities during construction that has a negative or inappropriate environmental impact. From the interview results, it is known that there are so many environmental impacts on construction projects from domestic waste from construction workers to air pollution due to heavy equipment as well as from the delivery of the incinerator machine unit to the installation of the incinerator machine. Therefore, it is recommended to arrange construction waste countermeasures procedures.

5. Equipment in the form of inadequate quality of equipment on construction projects. From the interview results, it is known that the quality of equipment also affects construction projects such as heavy equipment excavators, mobile cranes, and other equipment such as concrete mixer, hoes. If the quality of equipment is poor it will result in obstruction and delay of one of the work activities that have an impact on subsequent work activities. For this reason, it is recommended to check the contractor's equipment which is feasible and not feasible.

6. Material used in the form of inappropriate or inappropriate material use in planning. From the results of the interview, the use of materials must be supervised by each related party, not only the contractor, the materials related to the incinerator machine unit must be considered, if at the stage of the inspection there is no conformity with the latest plans, it will be detrimental to the parties concerned. For this reason, it is recommended to check the material before use.

7. Mistakes in the form of the negligence of construction workers that can make construction mistakes or failures. From the results of interviews, the most fatal worker mistakes usually occur in heavy equipment operators who are less skilled in heavy equipment application and there is a possibility that the heavy equipment operator chosen by the company/contractor is less competent in the field of work to be done so that mistakes are often made. The operator of both minor and major errors. In particular, work-related incinerator projects, such as lifting large and heavy incinerators, requires caution. And besides, operators who have bad personalities such as stealing and the most common such as drug use. For this reason, it is recommended to conduct a health check for each worker, educate workers before starting work and replace operators if they are deemed unskilled and competent.

8. Culture in the form of bad culture of workers such as less diligence, laziness, and a bad work ethic. From the results of the interviews, the cultural differences brought by each worker are very influential, especially if in one project there are various kinds of teams of different head craftsmen, resulting in quarrels or disputes between craftsmen where fights or disturbances occur. Sometimes this incident can hamper the work for one day or until one of the works handled by the head craftsman team is delayed, in the incinerator construction project, there may be 2 different teams of head masons because the incinerator and IPAL installations require a special team of head masons. For this reason, it is recommended to conduct supervision and reprimand for workers who have a bad work ethic.

9. Lack of security in the form of implementing parties who are not optimal in the security of the incinerator construction. From the results of the interview, the lack of security was not only from outside the project, sometimes from within the project itself, such as workers who had bad personalities or had the opportunity to commit acts of theft. Lack of security from a small scale in the form of theft and on a large scale in the form of sabotage from parties who feel disadvantaged or seeking profit, by increasing security greatly affects the smoothness of the project, especially in the incinerator development project with an industrial area view which is known to lack supervision from the surrounding community and security forces so that the risk is theft is huge. For this reason, it is recommended to add security personnel, educate workers not to commit criminal acts, and be given supervision of access to construction projects.

10. Collapse in the form of a collapse in the incinerator construction. From the interview results, although the possibility of collapse is very small, if it occurs it will be very dangerous and have fatal consequences for construction project workers so that related parties must minimize the possibility of a collapse in the incinerator construction project. For this reason, it is recommended to use workers who are professional in their fields and check the quality, material, and installation of bolts/welds on the roof frame of the incinerator construction.

V. CONCLUSIONS AND SUGGESTIONS

The conclusions that can be made from this research are obtained:

1. In terms of frequency, there are 1 risk that is on a very rare scale, 4 risks that are on a rare scale, 7 risks that are on an occasional scale, and no risk that is on a frequent and very frequent scale. Meanwhile, in terms of impact, there are no risks that are very small and very large scale, 1 risk is of a small scale, 9 risks are of medium-scale and 2 of the risks are of a large scale. The purpose of risk identification recapitulation is the initial stage to determine the level of qualitative risk and the level of risk acceptance. The impact caused by the value engineering on the initial contract is that with the change in the foundation design, the initial contract needs to be revised because it is no longer following the work to be carried out. And with these changes, it will change the value of the contract to be reduced due to the change of foundation work from the bore pile foundation to the good foundation.
2. From the results of the qualitative risk analysis, the risk level is known to be 1 small risk (low risk), 3 moderate risk (medium risk), 7 high risk (high risk), and 1 extreme risk (extreme risk).
3. From the results of the risk acceptance level, there are 10 undesirable risks and 2 acceptable risks. Thus, the undesirable risk is considered the dominant risk, which requires risk mitigation.
4. The mitigation strategy in this study is aimed at managing risks that are classified as undesirable which refers to the level of risk acceptance by Godfrey's theory and takes various risk strategy actions such as

increasing security, developing procedures, and coordinating as well as conducting supervision to avoid and reduce risks.

From the description of the calculations from the above conclusions, the following suggestions can be given:

1. The level of risk in the high risk and extreme risk categories in this study and for the acceptance of risks in the undesirable category, more attention should be paid to reducing the negative impact which results in work obstruction and mismatch of costs, time, and quality to harm the implementing contractor
2. The results of this study are expected to be used as a guide for identifying risks, taking strategic action for research, and also expected to be input for the implementing contractors to build constructions around the incinerator construction.

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