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Early risks identification on sources and causes waste road construction project materials

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Early risks identification on sources and causes waste road construction project materials

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Abstract. Waste material affects the road construction project consisting of ready mix concrete, lean concrete, B aggregate, landfill and cement. Identify risks by looking at the source and causes of waste material in the five materials. The source and causes of waste material for road construction do not yet exist. So it is necessary to take literature from a simplified building project so that it can be used for road construction projects with the help of experts. Risk identification is carried out with primary data, namely the questionnaire, then consulted by experts with the Delphi Method with three stages. The results of the Delphi method produce each of the causes of waste material for road construction projects that result in the identification of Early Risks.. Ready Mix concrete has 8 sources of waste material and 21 causes of waste material. Concrete Concrete has 7 sources of waste material and 18 causes of waste material. Aggregate B has 7 sources of waste material and 15 causes of waste material. Landfill has 8 sources of waste material and 26 causes of waste material. Cement has 7 sources of waste material and 31 causes of waste material.

1. Introduction

Waste material is a term from the large percentage of waste material occurs and is one of the serious problems in the implementation of the road construction project(waty et al,2018) Waste material is influences the contractor's profit by producing a Road Development Project regression model that produces three waste materials which have the effect of aggregate B, Ready Mix Concrete and Lean Concrete(waty et al. 2018). Likewise, waste material that influences contractor's profit on road improvement projects also results in three waste materials which are influential namely cement, aggregate B, and landfill (waty et al,2018). So there are a total of five waste materials that are influential in road construction projects. The number of types of waste material that occurs, causing researchers to risk management of the source and causes of waste material. Risk management is carried out by identification, analysis, risk response and administration system (Al Bahar and Crandall, 1990) which aims to minimize waste material in construction projects the road that has never been done so far. The first step taken is to identify risks first. Risk identification is defined as: a systematic process and continuous identification, categorizing and assessing the early significance of the risks that join a construction project. (Al-Bahar and Crandall, 1990). Risk identification "is the process of determining which risks may affect the project and documenting their characteristics" (Project Management Institute [PMI], 2008). Early Risk Identification by examining the sources and causes of waste material by searching for previous literature.

2. Literature Review
In the previous literature there were several opinions from the authors relating to the sources and causes of waste material. The source and causes of the waste material that comes from the source and causes of the building project material, because indeed there has been no reference to the source and material causes of the road construction project. After combining several opinions, it is obtained the grouping of sources and causes of waste material into nine sources and 91 causes of waste material.

3. Delphi Method
The Delphi Method is a systematic method of collecting opinions from a group of experts through a series of questionnaires, where there is a feedback mechanism through 'rounds' / rounds of questions held while maintaining the respondent's anonymity, namely experts (Foley et al, 1984). The Delphi method is a structured communication technique, originally developed as a method that predicts interactively and relies on a number of experts. (Lindstone, 1975). The Delphi method is implemented by inviting and asking for opinions from competent experts in the civil field consisting of one academician and consultant and four executing contractors and two person from the owner of the Public Works Agency. The average experience is above 15 years and knows the condition of the project East Kalimantan road well. The total experts contacted were seven person.

4. Research Methodology
Research Methodology is done by looking for sources and causes of waste material with several phase At the initial phase, there are 91 causes of waste material and 9 waste material sources. Then do the Delphi method which is assisted by experts. After the Delphi method is applied, new results are obtained to identify the Early Identification Risks. Research locations were conducted in the provinces of East Kalimantan and North Kalimantan.

5. Discussion and Results
Step of the method of the Delphi Method in this study is:
1. Development first questionnaire and test (First Phase)
    a. In accordance with the reference opinion of the beginning of the questionnaire that will be   made using nine sources and 91 causes of waste material.
    b. The sample size is carried out in groups of around 10-15 respondent
       In carrying out the questionnaire one was carried out on ten or fifteen respondent which included 91 causes and 9 sources and tried to ask the respondents.
       This results are mostly confused, there are also many who do not answer or answer soberly because of confusion and phase one can be seen in table 1. (only examples from one source and its causes).
2. Develop one questionnaires and test (Second Phase)
    Because of confuse for the first phase so researcher go to expert to revise. In the second questionnaire after revision, experts produced questionnaires from 91 causes to 52 causes for ready mix concrete waste materials. Similarly for others. The test was carried out using a two questionnaire and was carried out for about 10 to 15 people and resulted in some respondents' doubts in filling in, so it was necessary to revise the source and causes of waste material. Of the 91 causes that were changed to 52 causes and occurrence of each waste material that was not the same cause as in Table 2 (which is one example of five waste materials)
3. Develop third questionnaires and test (Third Phase)
    For advance the questionnaire because of confuse for the second phase so researcher go to   expert to revise again.Developing from the simplified third questionnaire was tried out to the respondents. And the result is that respondents are easier to do and do not raise doubts about the question because of the fewer number of questions in the language that is easily understood by the respondents.

4. Final Report (Final Result)
The final report in the form of causes that have been simplified into and can be seen in the example as in Table 3, which is Early Identification Risk

Table 1. Sources and Causes of Waste Materials (First Phase)

No	Sources		Causes of Waste Material	References
1	Design (Gavilan dan Reynold, 1994)	1	Error in Contract Document	Bossink, 1996
		2	Incomplete contract documents,	Bossink, 1996
		3	Change in Design	Bossink, 1996
		4	Select product specifications	Bossink, 1996
		5	Choose low quality products	Bossink, 1996
		6	Not paying attention to the size of the product used	Bossink, 1996
		7	Designers do not know the type of products used by	Bossink, 1996
		8	Details of the complicated picture of	Bossink, 1996
		9	Information on drawings of incomplete road design	Bossink, 1996
		10	Less coordinating with contractors and less knowledgeable about construction	Bossink, 1996
		11	Lack of complete information on problem types and material sizes in design documents	Ekanayake, 2000
		12	Planning for imperfect construction	Polat and Ballard,(2004)

Table 2. Second Source Questionnaire and Causes of Ready Mix Concrete Waste Materials (Second Phase)

No	Causes of *Material Waste*	Sources
1	Error in contract documents	
2	Not complete contract documents	
3	Select product specifications	
4	Choose low quality products	
5	Not paying attention to the size of the product used	
6	Designers are not familiar with other types of products	Design (Gavilan and Reynold,1994)
7	Information on pictures of road designs that are not complete	
8	Less coordinating with contractors and less knowledgeable about construction	
9	The lack of complete information about the type and size of the material in the design document	
10	Orders cannot be made in small quantities	
11	Suppliers of goods senders that do not meet specifications	Material Procurement (Gavilan and Reynold,1994)
12	Insufficient understanding of alternative products	
13	Waiting for material	
14	Damage due to transportation to / at the project site	
15	Scattered on the road	
16	Materials sent are lacking	

No	Causes of *Material Waste*	Sources
17	The attitude or actions of the project team and workers who are not friendly / rude	Material Handling (Gavilan and Reynold,1994)
18	Theft (Can be sold on the street)	
19	Damage to material in place (slow cutting of fc '30 MPa)	
20	Errors in the preparation of material in the field	
21	Errors caused by labor Implementation	
22	Equipment that does not function properly	
23	Bad weather	
24	Work accidents in the field	
25	Use of the wrong material in the aggregate mixture so that it needs to be unloaded	
26	Errors due to negligence	
27	Damage due to less skilled workers	
28	Repair of finishing work	Implementation
29	Schedule delays	
30	Slow / ineffective repairman	(Gavilan and Reynold,1994)
31	Lack of supervision / poor quality	
32	Improvements to structural work	
33	Improvements to formwork work	
34	Waiting for workers	
35	Unreliable equipment	
36	Repair of foundation work	
37	Waiting for instructions	
38	Design changes and slow revision and distribution images	
39	Waste material due to the Residual use process	Residual(Gavilan and Reynold,1994)
40	Poor control of material in the project and management planning for the waste material	Miscelenous (Gavilan and Reynold,1994)
41	Lack of attitude initiatives	
42	Doubts reduce the waste material	
43	Lack of knowledge of residual values, consequences of residual material, ways to reduce residual material, and responsibility for waste material	Attitudes (Loosemore and Teo, 2001)
44	Believing that waste material cannot be avoided	
45	Pragmatic culture Subjective	
46	Culture of waste	Subjective Norms (Loosemore and Teo, 2001)
47	Waste material that is not clear	
48	waste material is the last priority	
49	Management commitment that is lacking	
50	Lack of consultation	
51	Material scheduling control irregularities	Behavior Controlling (Loosemore and Teo, 2001)
52	Material cost control deviations	

Table 3. Early Risk Identification of Sources and Causes of Ready Mix Concrete Waste Materials
(Third Phase)

No	Causes of Material Waste	Sources
1	Design information that lacks design	
2	Lack of coordination with contractors and lack of knowledge about construction	Design (Gavilan and Reynold,1994)
3	The lack of complete information about the type and size of the material in the	
4	Orders cannot be made in small quantities	Material Procurement (Gavilan and Reynold,1994)
5	Damage due to transportation to / at the project site	
6	Scattered on the road	Material Handling (Gavilan and Reynold,1994)
7	Theft (Can be sold on the street)	
8	Material damage in place (slow cutting of fc'30)	
9	Errors in the spread of material in the field	
10	Equipment that does not function properly	
11	Bad weather	Implementation (Gavilan and Reynold,1994)
12	Workplace accident	
13	Mistakes made by labor	
14	Unreliable equipment	
15	Waste material due to the Residual use process material	Residual (Gavilan and Reynold,1994)
16	Poor control of material in the project and management planning for the remaining material	Miscelenous(Gavilan and Reynold,1994)
17	Lack of attitude initiatives	
18	Doubts reduce waste material	Attitude (Loosemore and Teo, 2001)
19	Lack of knowledge of residual values, consequences of residual material, ways to reduce residual material, and responsibility for residual material	
20	Emphasizing the timing of Behavioral Control	Behavior Controlling (Loosemore and Teo, 2001)
21	Emphasis on costs	

6. Conclusion

The final result shows the results which are the Early risk Identification displayed in the form of recapitulation below. The result is a novelty for the causes of waste material for road construction projects.

Table 4. Recapitulation of Early Risk Identification Expert Phase
Sources and Causes of Road Works Projects

No	Material	Causes Early Literature (First Phase)	Second Phase	Third Phase	Causes of Early Risk Identification	Souces of Early Risk Identification
1	Readymix Concrete	91	52	21	21	8
2	Lean Concrete	91	52	18	18	7
3	B Aggregate	91	46	15	15	7
4	Landfill	91	47	26	26	8
5	Cement	91	50	31	31	7

7. Suggestion

Early Risk identification will be continued by carrying out further research to obtain further risk identification on road construction projects by conducting quantitative measurements.

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