Kuala Kapuas City Solid Waste Management Strategy

YuyunHendra Soeta[1], Rusdi H.A.[2]

Study Program Magister of Civil Engineering, LambungMangkurat University
Corresponding Author: Yuyun Hendra Soeta

ABSTRACT : *In the development of the city waste management is needed because this is part of a number of factors that affect the face of the city. The method used by the Department of Public Works, Spatial Planning, Housing and Settlements in Kapuas Regency has been collected, transported, disposed of to landfill, in the landfill sorting is done to separate organic waste used as compost material with inorganic waste to be stockpiled with the Method Control Landfill. According to the 2014 EHRA Report of Kapuas Regency, the management of waste carried out by the related agency was unsatisfactory at 88.9%, 84.5% of unprocessed local waste, frequency and timeliness in transporting inadequate and inadequate waste by 100%. This study aims to evaluate the performance of the agency in managing waste in the City of Kuala Kapuas and make a strategy that can optimize municipal solid waste management. This study concludes that the performance in managing waste in Kuala Kapuas City is quite good and the level of service in managing waste is classified as good, the proposed solid waste management strategy starts from the source level (household) with waste sorting scenarios, at the regional level with a scenario of waste free area program and at the city level with the scenario of scavenger empowerment, construction of organic landfill and construction of incenerator.*
KEYWORDS : *waste management, evaluation, strategy.*

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I.   INTRODUCTION

The 2014 report of the Environmental Health Risk Assessment (EHRA) study of Kapuas Regency, which states that the waste management behavior of respondents, namely the Kapuas Regency community, mostly still practice burning garbage by 51% and throwing garbage into rivers / times / sea / lake by 33% , while the practice of sorting waste 100% of the total respondents surveyed did not practice the sorting of waste, this illustrates that in Kapuas Regency the habit of sorting waste is still not well implemented.

The EHRA report above also conducted a study of waste management carried out by agencies related to the results stating that unsatisfactory waste management amounted to 88.90%, unprocessed local waste as much as 84.50%, the frequency and timeliness of transporting waste was not enough and not on time by 100%.

With the background of the description above, a study was conducted on "Kuala Kapuas City Solid Waste Management Strategy" to be able to improve solid waste management which has been carried out by the Kapuas Regency Public Works and Public Works Service Office to provide optimal results.

The formulation of the problem obtained based on the description above is how to formulate a strategy that can optimize waste management in Kuala Kapuas City.

The purpose of this study includes making a strategy that can optimize the management of waste in Kuala Kapuas City by evaluating the performance of waste management in Kuala Kapuas City carried out by the relevant agencies.

The results of the implementation of this study are expected to be able to provide thought and input to the relevant agencies in the Regional Government of Kapuas Regency in order to optimize waste management in the City of Kuala Kapuas.

II.   THEORITICAL REVIEW

According to CiptaKarya (1993) the activity of managing waste from collection activities, separating waste, the process of moving and processing waste until final disposal is waste management. There are 2 (two) types of waste management, namely management carried out at the garbage or local or individual sources and management carried out centrally for the environment / settlement or urban.

According to SNI 19-2454-2002 urban waste management systems are factors that support each other interact with each other to achieve goals, namely to achieve a city that is clean of waste, healthy and orderly. The factors in question are institutional aspects, operational technical aspects, financing aspects, legal regulatory aspects and aspects of community participation.

According to Anwar PrabuMangkunegara (2000) performance or work performance is the work achieved by an employee in carrying out his duties both in quantity and quality in accordance with the responsibilities given to him. Whereas according to Marwansyah and Mukaram (2000) quoting from Levinson states that performance is a person's achievement with regard to tasks assigned to him.

So performance is the result of someone's work process that is carried out in accordance with their duties and responsibilities. Regarding organizational performance this is very much needed because of the achievement of the objectives of establishing the organization. Organizational performance analysis is done by hoping to measure the extent to which the implementation of the duties and responsibilities of the organization has been carried out.

To assess the performance of an organization, it can use 5 (five) assessment indicators, such as those presented by AgusDwiyanto (1995), namely productivity, service quality, responsiveness, responsibility and accountability.

In order to develop a performance evaluation system an approach to the framework can be logically used which is expected to provide data on the indicators and performance targets evaluated. The performance indicators in question are components that can be assessed so that they can provide an overview of program performance. While the performance target is the work performance that is the goal of the program specified in the plan of input, output, results, benefits, impacts both positive and negative.

Evaluation in general is an activity that aims to measure and provide value objectively to the achievement of goals that have been previously planned. The purpose of the evaluation in question can be used for planning again.

The activity of measuring performance can be carried out well if there is an organizational commitment to measure performance tailored to the organization, this activity is a process carried out continuously.

According to Parasuraman in the quote RambatLupiyoadi (2001) there are 5 (five) aspects of service quality, namely tangibles, reliability, responsiveness, assurance and empathy.

Integrated waste management or Integrated Material Recovery is defined as an effort in choosing technology in waste management to obtain the best and applicable waste management system. There are 4 (four) levels of integrated waste management, namely Resource Reduction, Recycling, Waste Transformation and Land Filling.

According to DPU (2003) waste management is an attempt to reduce waste in terms of quantity and / or transform waste into something that is reused or useful. These businesses include burning, composting, compacting, chopping or crushing, drying and recycling. Waste management should be carried out from the source, in temporary dumps, in waste depots and in landfills.

III. RESEARCH METODOLOGY

As explained in the introduction that this study used the Descriptive Method with qualitative and quantitative approaches. The data collection method uses Stratified Random Sampling with an open and closed questionnaire to collect data, systematic direct observation and structured or not conducted interviews with the community, officers and managers.
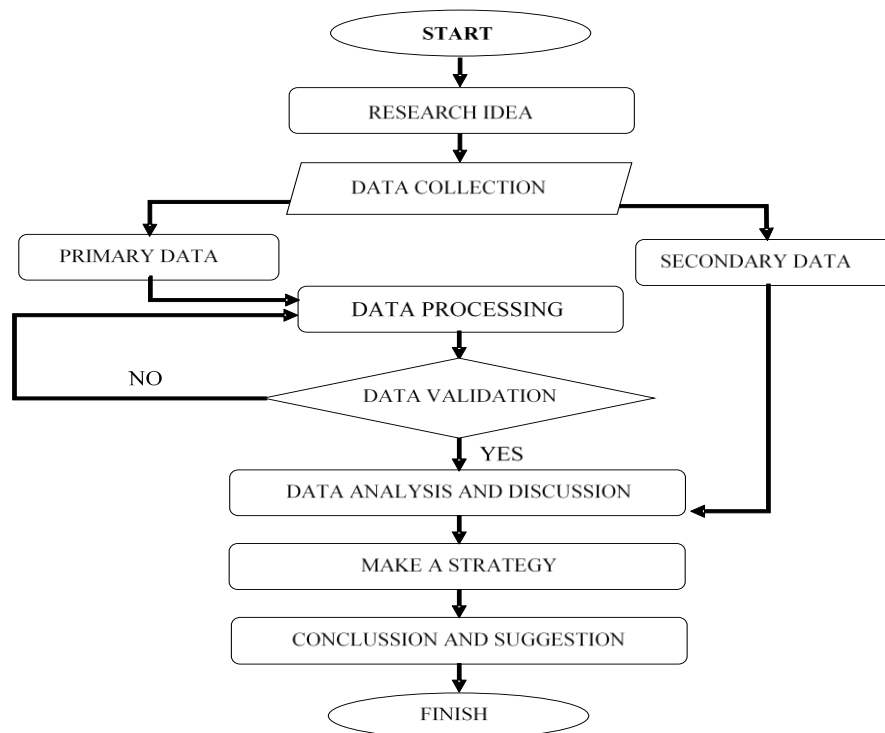
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Fig. 1.Research Procedure Chart

The sample in this study was taken by the Randomized Structural Sample Method which was based on the number of households contained in the waste management service area in Kuala Kapuas City, which was 16,313 units (N) so that by using the Slovin formula the samples for this study were 100 respondents (n).

While the performance appraisal variable in this study is operational technical in managing waste in the City of Kuala Kapuas carried out by relevant agencies and the performance in managing waste in Kuala Kapuas City based on community perceptions outlined using a questionnaire model and operational technical indicators of waste management.

In order to assess the performance of the Kapuas Regency Department of Public Works, Spatial Planning, Housing and Settlements, community participation indicators are rated using the Likert Scale, the values for each question are 4 to 1. The component measured in assessing the performance of the Kapuas Regency Department of Public Works, Spatial Planning, Housing and Settlements refers to the opinion of ZeitHaml et al. quoted by Husein Umar (2000).

Table. 1.Indicators for Assessing Performance Levels in Managing Waste based on Community Perception

No.	Performance variable	Indicator	Score (Likert Scale)
1.	Tangibles	1. Complete facilities 2. Network completeness 3. Number, type and capacity of facilities 4. Use of attributes	4, 3, 2 and 1
2.	Reliability	1. Punctuality 2. Seriousness of the officer 3. Reliability of service 4. Actual promise	4, 3, 2 and 1
3.	Responsiveness	1. Service consistency 2. Willing to clean 3. Handle customer complaints 4. Willingness to help	4, 3, 2 and 1
4.	Assurance	1. Easy to contact 2. Honesty of officers 3. Knowledge of officers 4. Sense of security	4, 3, 2 and 1
5.	Empathy	1. Concern 2. Communication 3. Hospitality / manners 4. Sympathetic attitude	4, 3, 2 and 1

Components of operational engineering performance in managing waste which are performance indicators can be seen in Table 2.

Rational Analysis Construct Validity was used in this study with the aim of testing the level of validity of the research instruments in this section the questions contained in the questionnaire were in accordance with the concept in measuring the performance of solid waste management carried out by the agency at the location of this study.

For the sample data collected from the research instrument, 3 (three) stages of the test were carried out, namely the Normality Test, Reliability Test and Validity Test. This is done in order to obtain a valid and reliable level of research.

Table. 2.Indicators of Evaluation of Operational Technical Performance in Managing Waste

No.	Variable	Indicator
1.	Service Level	• The number of residents served
		• The area served
		• The amount of waste transported to the landfill
2.	Storage	• Storage pattern
		• Type, quantity and capacity of storage
3.	Transport and transfer	• Pattern of transportation
		• Type, amount and capacity of transportation
		• Frequency of transportation
4.	Processing	Waste processing techniques used
5.	Final Disposal	• Land area
		• Method used
		• Type and number of facilities

To measure the level of operational engineering performance, operational costs and maintenance in waste management that has been carried out so far by the Kapuas Regency Department of Public Works, Spatial Planning, Housing and Settlements Service, researchers used an ordinal scale of measurement by classifying the performance level into 4 (four) categories as stated by the State Administration Agency and the Financial Supervisory Agency and Development (2000) as follows:

1. The performance level of 85% - 100% is categorized as very good
2. Performance levels of 70% - <85% are categorized as good
3. Performance level of 55% - <70% is categorized quite good
4. Performance level <55% is categorized as poor

IV.   RESULT AND DISCUSSION

In this study to collect data used questionnaires made as follows:

1. The title of the questionnaire is the condition of waste management according to people's perceptions.
2. The purpose of the questionnaire is to obtain an overview of the conditions of waste management carried out by the Kapuas Regency Department of Public Works, Spatial Planning, Housing and Settlements.
3. The respondents to this questionnaire were the people of Kuala Kapuas City andThe Kapuas Regency Public Works and Public Works Service Office.
4. Questionnaire items are question items, in this study made according to the title or theme of the questionnaire.

Table. 3.Data Normality Test Results

		TOTAL
N		100
Normal Parameters[a,b]	Mean	40,7600
	Std. Deviation	7,08123
Most Extreme Differences	Absolute	0,112
	Positive	0,065
	Negative	-0,112
Test Statistic		0,112
Asymp. Sig. (2-tailed)		0,004

Table 3 shows the results of questionnaire data processing carried out data normality test (Kolmogorov-Smirnov Test), from the results of this test conclusions were taken that the research instruments used were not normally distributed because of the level of significance (Asymp. Sig. (2-tailed))> 0,05. To overcome this problem a descriptive analysis was carried out on the data using the SPSS program assistance.

From the results of the descriptive analysis, there are 3 (three) extreme data, namely data P12, P21 and P95, based on these results, the next step is to eliminate extreme data from the overall data and return normality tests to the remaining data.

Table.4.Data Normality Test Results

		TOTAL
N		97
Normal Parameters[a,b]	Mean	41,3814
	Std. Deviation	6,21900
Most Extreme Differences	Absolute	0,083
	Positive	0,069
	Negative	-0,083
Test Statistic		0,083
Asymp. Sig. (2-tailed)		0,097

Table 4 shows that the research instruments used were normally distributed with a significance level of <0.05. This explains the data used in this study came from the same population or could be accepted.

Validity test using the Pearson Product Moment Correlation Method is carried out on the research instrument from the results of the normality test with the coefficient requirements of ≥ 0.30 so the sample is declared valid. Table 5 below shows the results of the validity test which states that each part of the question in the questionnaire has a validity level with a good category.

Table. 5.Data Validity Test Results

No.	Question	Pearson Correlation	R Table	Sig. (2-tailed)	Sample (N)	Validity
1.	P-1	0,713	0,1663	0,000	97	Valid
2.	P-2	0,750	0,1663	0,000	97	Valid
3.	P-3	0,633	0,1663	0,000	97	Valid
4.	P-4	0,516	0,1663	0,000	97	Valid
5.	P-5	0,675	0,1663	0,000	97	Valid
6.	P-6	0,691	0,1663	0,000	97	Valid
7.	P-7	0,616	0,1663	0,000	97	Valid
8.	P-8	0,555	0,1663	0,000	97	Valid
9.	P-9	0,705	0,1663	0,000	97	Valid
10.	P-10	0,736	0,1663	0,000	97	Valid
11.	P-11	0,641	0,1663	0,000	97	Valid
12.	P-12	0,772	0,1663	0,000	97	Valid
13.	P-13	0,639	0,1663	0,000	97	Valid
14.	P-14	0,534	0,1663	0,000	97	Valid
15.	P-15	0,599	0,1663	0,000	97	Valid
16.	P-16	0,677	0,1663	0,000	97	Valid
17.	P-17	0,679	0,1663	0,000	97	Valid
18.	P-18	0,576	0,1663	0,000	97	Valid
19.	P-19	0,688	0,1663	0,000	97	Valid
20.	P-20	0,605	0,1663	0,000	97	Valid

Furthermore, to measure the level of stability of the research instrument, a reliability test was conducted on the criteria of the research instrument that had been tested for validity.

Table. 6.Data Reliability Test Results

	Statistics for scale
Mean	41,38
Variance	38,676
Standar Deviation	6,219
N of Variable	20
Cronbach's Alpha (CA)	0,928
Cronbach's Alpha Based on Standardized Items (CA-BSI)	0,928
Criteria	Reliable

Table 6 shows the results of the data stability test with CA and CA-BSI coefficient values greater than 0.6 (0.928> 0.6), this means that each part of the question in this questionnaire is very reliable.

From the collected questionnaire it can be concluded that the assessment of the level of performance of the Public Works, Spatial Planning, Housing and Settlement Areas in Kapuas Regency in managing waste in Kuala Kapuas City according to community perceptions in this case the respondents fall into the unfavorable category, to be more clearly seen in Table 7.

Table. 7.Level of Waste Management Performance According to Community Perception

No.	Components of Waste Management Performance		Score		Percent (%)	Performance Category
			Expection	**Reality**		
1.	**Tangibles**		**16**	**7,9**	**49,38**	**Not good**
	a.	Complete facilities	4	1,89	47,25	Not good
	b.	Network completeness	4	1,86	46,5	Not good
	c.	Number, type and capacity of facilities	4	2,09	52,25	Not good
	d.	Use of attribute	4	2,06	51,5	Not good
2.	**Reliability**		**16**	**8,63**	**53,94**	**Not good**
	a.	Punctuality	4	2,61	65,25	QuiteGood
	b.	Seriousness of the officer	4	2,38	59,5	QuiteGood
	c.	Reliability of service	4	2,04	51	Not good
	d.	Actual Promise	4	1,6	40	Not good
3.	**Responsiveness**		**16**	**8,7**	**54,38**	**Not good**
	a.	Service consistency	4	2,02	50,5	Not good
	b.	Willing to clean	4	2,37	59,25	Quite Good
	c.	Handle customer complaints	4	2	50	Not good
	d.	Willingness to help	4	2,31	57,75	Quite Good
4.	**Assurance**		**16**	**7,04**	**44,00**	**Not good**
	a.	Easy to contact	4	1,64	41	Not good
	b.	Honesty of officers	4	1,78	44,5	Not good
	c.	Knowledge of officers	4	1,78	44,5	Not good
	d.	Sense of security	4	1,84	46	Not good
5.	**Empathy**		**16**	**8,49**	**53,06**	**Not good**
	a.	Concern	4	2,09	52,25	Not good
	b.	Communication	4	1,95	48,75	Not good
	c.	Hospitality / manners	4	2,31	57,75	Quite Good
	d.	Sympathetic attitude	4	2,14	53,5	Not good
Total			**80**	**40,76**	**50,95**	**Not good**

By using the Spearman Rank Correlation statistical test on the relationship between indicator variables and the performance of waste management, the results show that there is a real relationship.

The results of the analysis of the level of solid waste management services, infrastructure for temporary disposal of waste, garbage transport equipment and the infrastructure of waste disposal sites in Kuala Kapuas City can be seen in Table 8 through Table 11.

Table 8 shows the results of the analysis of the level of solid waste management services in the City of Kuala Kapuas with an average percentage of 74.30%.

Table. 8.Level of Solid Waste Management Services in Kuala Kapuas City

No.	Parameter	Ideal (Analysis Results)	Existing	Served Percentage	Performance Category
1.	Transportable Trash	170,02m³/day	99m³/day	58,23%	Quite Good
2.	Wide Area Served	202,74Ha	159,64Ha	78,74%	Good
3.	Served Population	74.468Life	64.007Life	85,92%	Good
	Average			**74,30%**	**Good**

For the level of temporary disposal infrastructure services garbage, garbage transport equipment and waste disposal site infrastructure are analyzed by comparing the existing conditions in the research location with the results of calculations using the Indonesian National Standard (SNI) related to waste management.

Table. 9.Levels of Bin Infrastructure Services

No.	District name	Total Population (Person)	Existing (Unit)	Requirement (Unit)	Service Level (%)	Performance Category
1.	Selat	55.158	261	276	94,64	Very Good
2.	Kapuas Hilir	8.849	4	44	9,04	Not Good
	Total	**64.007**	**265,00**	**320**	**51,84**	**Not Good**

Table 9 shows that the level of service for bin infrastructure in the City of Kuala Kapuas is classified as unfavorable with the percentage of service being 51.84%.

**Table. 10.Level of Infrastructure Services for Waste Transport Equipment**

No.	Type of Transport Equipment	Existing (Unit)	Requirement (Unit)	Service Level (%)	Performance Category
1.	Tricycle Motor	4	67	6,00	Not Good
2.	Dump Truck /Armroll Truck	8	11	71,99	Good
	Total	**12,00**	**78**	**39,00**	**Not Good**

Table 10 shows that the level of infrastructure services for garbage transport in the location of this study is classified as poor with a percentage of service of 39.00%.

Table. 11.Level of Landfill Infrastructure Services

No.	Description	Existing	Unit	Requirement (Unit)	Service Level (%)	Performance Category
1.	Area	10,6	Ha	12	87,67	VeryGood
2.	Excavator	1	Unit	2	50,00	NotGood
3.	Bulldozer	0	Unit	2	0,00	NotGood
4.	Loader	0	Unit	2	0,00	Not Good
	Total				**34,42**	**Not Good**

Table 11 shows that the level of service for landfill infrastructure in this research location is classified as poor with a percentage of service of 34.42%.
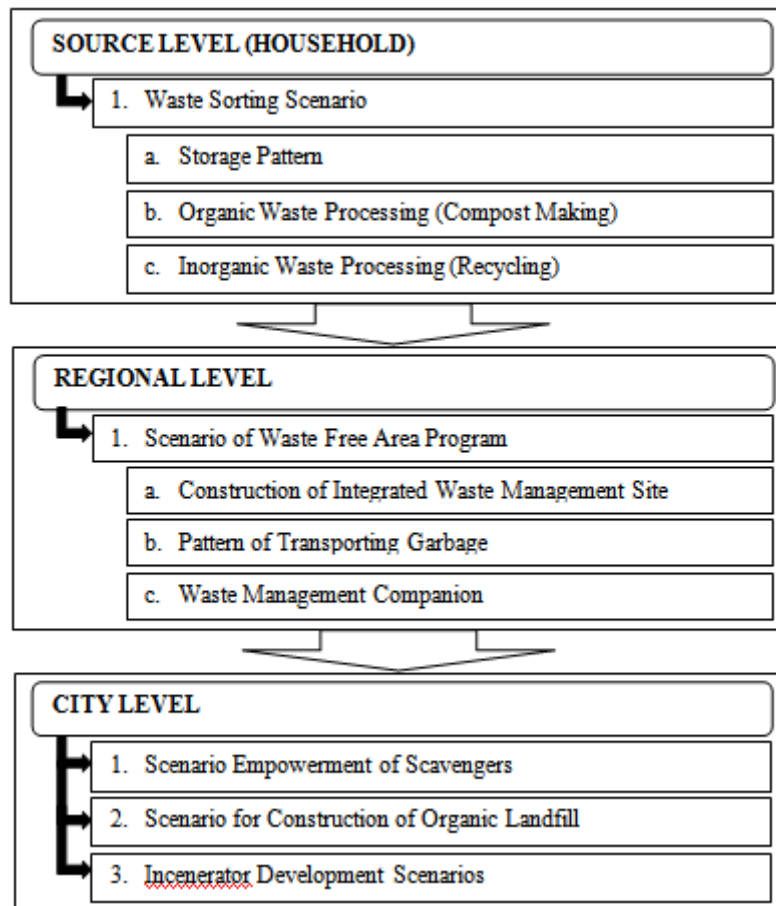
Fig. 2Kuala Kapuas City Solid Waste Management Strategy

The conclusions from the discussion and the results of the study conducted are as follows:
1. The proposed Kuala Kapuas City Solid Waste Management Strategy is as follows:
a. Source Level (Household)
- The pattern of storage by making waste bins disaggregated or better known as 3R bins with the aim that the waste has been sorted so as to facilitate the handling of further waste.
- Processing of organic waste with a household scale composting method so that it can be used alone or sold so as to increase people's income.
- Processing inorganic waste by recycling methods for household scale by reusing or utilizing it into raw materials and made into various handicrafts that can be used alone or sold so as to increase people's income.
b. Regional Level
For the regional level, the scenario of a Waste Free Zone Program is proposed with the aim of piloting an Independent Waste Group managed by the community itself and fostered and accompanied by the government to be independent. This scenario has three proposed action plans, namely:
- Construction of an Integrated Waste Management Site.
- Pattern of Transporting Garbage
- Waste Management Companion
c. City level
At the city level several scenarios are proposed, namely:
- Empowering Scavengers
- Construction of Organic Landfill
- Construction of an Incenerator
2. The performance of waste management in the city of Kuala Kapuas based on the assessment of the community is classified as poor seen from several performance indicators.
3. The level of waste management services served by the Public Works, Spatial Planning, Housing and Settlement Areas of the Kapuas Regency is categorized as good.

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