Assessment the Level of Readiness of the Waste Bank Development into a City Scale Waste Bank

Baiq Mardhiyanti Kusuma Dewi, Iwan Juwana, and Siti Ainun

Department of Environmental Engineering
Institut Teknologi Nasional, Bandung, Indonesia

Abstract. Waste Bank is one of the strategies used to implement waste reduction at the source. Bandung city is one of the cities that implemented this program, either through government or NGO. This study aims to assess the level of readiness of the waste bank development into a city-scale waste bank. That method by waste bank indicator development, through descriptive analysis approach, referring to the integration of laws and guidelines of waste bank. That there are three components in the assessment of readiness of development of city-scale waste bank, they are quality of building construction, management system, and operational system, where each component have weight, they are 33%, 33%, and 34%. This indicator used to assess the implementation of Resik Waste Bank of PD Kebersihan to be developed into a city-scale waste bank. Assessment for each indicator used the ordinal and Guttman scale. The result of the assessment showed that Resik Waste Bank is ready to be developed into a city-scale waste bank with a value of 77,09.

Keywords: *waste bank, waste, assessment.*

1 Introduction

One of the basic implementation of the Undang-Undang No. 18, 2008 was Reduce, Reuse and Recycle (3R) activity at the source. The same strategy can be applied through waste bank program. This program potentially to improve waste separation by the community and can provide economic benefits [4]. To get the maximum benefit from the waste, the city scale waste bank are needed [7].

With the city scale waste bank, it is expected that the reduction of waste generation can be measured, recorded, and well controlled. As well as the implementation of waste banks can increase the benefits, both for the community, environment, and government.

Bandung city is one of the cities that implemented this program, either through government or NGO. Resik Waste Bank of PD Kebersihan is one of the waste bank built by the government of Bandung City and potentially to be developed into city-scale waste bank view in terms of institutional, management, financing, and business development, as well as integration with municipal waste

management [3]. This study aims to assess the level of readiness of the Resik Waste Bank development into a city-scale waste bank by waste bank indicator development.

2 Materials and Methods

The method of this research was a descriptive analytical approach, by the data analyzed either from the literature or the results of the previous research [9]. The flow diagram of this research can be seen in Figure 1.

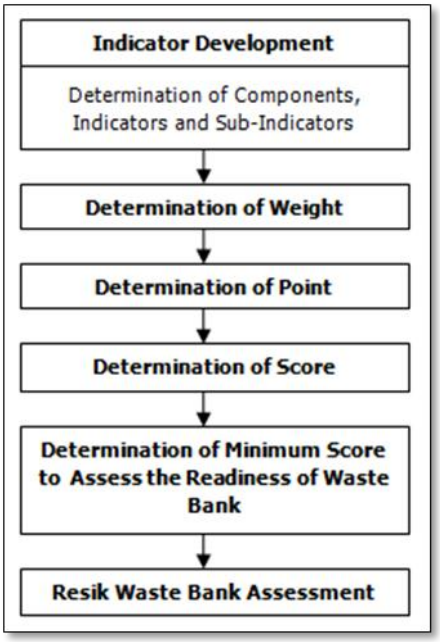

Figure 1 Flow Diagram of Research

There are secondary data used as reference, i.e. technical requirements of transfer station (TPS 3R) in Appendix II PerMenPU No. 03/2013, PerMenLH No. 13/2012 about the Guideline Implementation of 3R through Waste Bank, and City Scale Waste Bank Concept Book published by the Deutsche Internatioale Gesellschaft für Zusammenarbeit (GIZ) GmbH.

In Appendix II PerMenPU No. 03/2013, there are technical requirements of TPS 3R,i.e. area, supporting facilities, recycling activity, composting, bio gas, and TPS placement provisions.

In PerMenLH No. 13/2012, mentioned there are four aspects in the implementation of the waste bank, i.e. the construction requirements,

management system, work mechanism, and implementation of waste bank, where there are several components in each aspect. Aspects and components required in PerMenLH No. 13/2012 can be seen in Table 1.

Table 1 Aspects and Components in PerMenLH No.13/2012

Aspect	Component
1. Construction Requirement	1. Floor
	2. Wall
	3. Ventilation
	4. Roof
	5. Ceiling
	6. Door
	7. Waste bank area
	a. Gate
	b. Yard
	c. Garden
	d. Parking
	8. Drainage
	9. Space savers/ customers
2. Management System	1. Savers/ customers
	2. Officer
	3. Recycling industry
	4. Waste management
	5. The role of officer
3. Work Mechanism	1. Waste separation
	2. Waste submission to waste bank
	3. Waste weighing
	4. Recording
	5. Waste sales result submitted put into saving book
	6. For results
4. Implementation	1. Determination of working hours
	2. Withdrawal of savings
	3. Borrowing money
	4. Savings book

Aspect	Component
	5. Pick-up service
	6. Kind of savings
	7. Kind of waste
	8. Pricing
	9. Waste condition
	10. Minimum weight
	11. Waste bins
	12. System for results
	13. Salary

In construction component for floor, walls, vents, roof, ceilings, and doors, were not mentioned the kind of the building, whether it's an office, warehouse, or both. In management system were described in general. As well as in mechanism work aspect, which has not been described each of its components. Components in implementation of waste bank aspect were as already clear.

In the City Scale Waste Bank Concept Book [7], mentioned there are five components that became the concept of waste bank development, i.e. the establishment of the Organization, the management of the city waste bank, management, financing and business development, as well as integration with the municipal waste management. Indicators required in City Scale Waste Bank Concept Book [7] can be seen in Table 2.

Table 2 Indicators in City Scale Waste Bank Concept Book

Components	Indicators
1. Establishment	a. Has a legal basis as a condition of legal
	b. Has the kind of institution
	c. An alternative type of institution : BLUD, BUMD, fungtional cooperative, foundation
	d. Area
	e. Building
	f. Equipments and tools
	g. Manager/ officer
	h. Capital basic
2. City Scale Waste Bank Organization	a. Executive board
	b. Savers/ Customers

Components	Indicators
	c. Institutional structure
3. Management	a. Coordination of City Government
	b. Operational standard
	c. Quality assurance
	d. Operational method
4. Financing and Business Development	a. Capital
	b. Partnership
	c. Dissemination and Promotion
	d. Increasing the role of community
5. Integration with Municipal Solid Waste Management	a. The existence of the Government's authorized in waste management
	b. The Government should craft a district/ city waste management planning

2.1 Indicator Development

Scheme integration of existing indicators can be seen in Figure 2. Area requirements, supporting facilities, and TPS placement provisions can be integrated with the requirements of building construction, to be in the component quality of waste bank construction. Based on PerMenPU No. 03/2013, it is mentioned that the meaning of TPS 3R is place for the collecting and sorting waste that have economic value. Based on this, the waste bank can be interpreted as the place for the implementation of 3R activities, as mentioned in PerMenLH No. 13/2012. So the quality of existing construction in the waste bank should be able to support the 3R activities in it. However, in terms of quality of construction of waste bank buildings also need to consider the location of the determination of garbage bank, which is related to clear land ownership, as well as violation or not of the building to the Spatial Plan (RTRW). Thus, in the quality component of building construction added indicator of the location of the building of the waste bank.

The requirements of the management system can be integrated with the components of establishment, organization management, financing and business development, as well as integration with municipal waste management, to be within the components of the management system. In this component added job description indicator from the waste bank management. This is useful for assessing whether any officer of waste bank has done its own work or not.

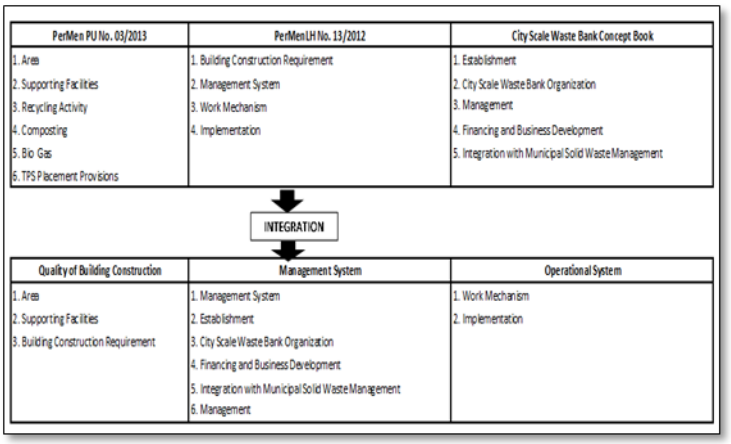

Figure 2 Scheme Integration of Existing Indicators

The requirements of work mechanism and implementation of waste bank can be integrated with the management component, to be within the operational system components. In this component added indicator Health and Safety. This becomes important to avoid the presence of diseases caused by solid waste and / or accidents due to operational activities conducted in waste banks.

In addition to being considered to facilitate the assessment, development or addition of this indicator is also considered important in the implementation of city-scale waste banks later, because the indicators have been developed will be used to assess the readiness of a waste bank to be developed into a waste bank operating on a city scale. Based on the results of development, the illustration of indicators can be seen in Table 3, while the complete structure of the City Scale Waste Bank indicator can be seen in Table 4.

2.2 Determination of Weight

The third component of the next elected given the weight value, where the weighting given to the components of the quality of building construction, system management, and operational system, each amounting to 33%, 33%, and 34% of the total value of 100. So if all the indicators and indicator are met, then the bank trash that votes will have a value of 100. Operating system components are given weights a little bit larger than the other two aspects due to the operational system is considered as an aspect of the implementation of what has been planned on the quality of Imperial construction and building management systems.

Each indicator and sub indicator that exist within each component are also given weight to the value of each indicator and indicator. The granting of the weighting is based on a scale of interests of any indicators or indicators, so that the indicator

or indicators that are considered more important will earn a percentage of the value. In addition, the size of the percentage also determined based on the difficulty of the arranged.

For example the warehouse building is considered more important than acreage residue buildup. This is because the warehouse was the location for storage of the product until demand is big enough to carry out its distribution[2], where storage is considered necessary to adapt the product to the needs of the consumer. In addition, the warehouse can also be defined as a place that bears the duty to save the items that will be used in the production of the goods is requested, until the appropriate production schedule [1]. So the sub indicator warehouse has a larger percentage than the sub indicator acreage buildup of residue.

Table 3 Illustration of City Scale Waste Bank Indicators

Component	Indicator	Point	Sub Indicator	Score
Component 1	Indicator 1		Sub Indicator 1.1	
			Sub Indicator 1.2	
	Indicator 2		Sub Indicator 2.1	
			Sub Indicator 2.2	
			Sub Indicator 2.n	
	Indicator 3			
	Indicator 4			
	Indicator 5			
Component 2	Indicator 1			
	Indicator 2			
	Indicator n			
Component 3	Indicator 1			
	Indicator 2			
	Indicator n			

Table 4 City Scale Waste Bank Indicators

Component	Indicator		Point
I. Quality of Building Costruction (CS) (33%)	CS 1	Location of Waste Bank (20%)	6.6
	CS 2	Building (20%)	6.6
	CS 3	Building Area (30%)	9.9
	CS 4	Warehouse (15%)	4.95
	CS 5	Office (15%)	4.95
II. Management System (MS) (33%)	MS 1	Institutional (20%)	6.6
	MS 2	Capital (20%)	6.6
	MS 3	Institutional Structure (10%)	3.3
	MS 4	Job Description of Officer (5%)	1.65
	MS 5	Human Resources (5%)	1.65
	MS 6	Partnership (10%)	3.3
	MS 7	Dessimination and Promotion (10%)	3.3
	MS 8	Integration with Municipal Solid Waste Management (20%)	6.6
III. Operational System (OS) (34%)	OP 1	Savers/ Customers (15%)	5.1
	OP 2	Kind of Waste (15%)	5.1
	OP 3	Operational Facilities (15%)	5.1
	OP 4	Waste Collecting and Management (12.5%)	4.25
	OP 5	Weighing and Recording (12.5%)	4.25
	OP 6	Health and Safety (15%)	5.1
	OP 7	Monitoring and Evaluation System (15%)	5.1

2.3 Determination of Point

Points is the result between the percentage weighting of indicators with the percentage weighting of components, or as in the following equation :

$$Point = \%\ weighting\ indicator\ x\ (\%\ weighting\ component\ x\ 100) \quad (1)$$

2.4 Determination of Score

The value is the result of times between the percentage weighting of indicators with sub points, or as shown in the following equation:

$$Score = \%\ weighting\ sub\ indicator\ x\ point \quad (2)$$

2.5 Minimum Score to See the Readiness of Waste Bank

Within each component, determined the magnitude of the minimum score that must be met by a waste bank to be developed into a city scale waste bank. The minimum score is later used as the minimum score to determine whether a waste bank is ready or not to be developed into a city scale waste bank. The minimum score is determined based on the accumulation of points is greatest in each component.

The minimum score on the quality of building construction component of 9.90 and at least must have a supporting building with sufficient area, particularly the warehouse waste bank. The magnitude of the minimum value in the component management system is of 19.80 and and at least must have institutional capital, must be, and integration with the municipal waste management. The magnitude of the minimum score on the component operational system is of 25.50 and at least must have a component of customer, the kind of waste, operational facilities, health and safety, as well as monitoring and evaluation. The minimum score of each component is further added, and obtained the value of 55.20. So a waste bank is said to be "ready" to be developed into a city scale waste bank when it has a score of > 55.20-100, and said to be "not ready" when it has a score of 0 - ≤ 55.20.

The assessment for each of the sub indicator of City Scale Waste Bank Indicators using the ordinal and Guttman scale. Ordinal scale is a scale of value classification and order or there is the sequence [8]. While the Guttman scale is classified as a single-dimensional, i.e. the scale that generates cumulative answers because grains are associated with each other [10]. With a scale of assessments that are done are Guttman firmly, i.e. "-no" or "Yes-No". So that the given value is 1 if present or Yes, and 0 if not. Self-assessment may be conducted through interviews, secondary data analysis, and observations. Here is a sample calculation of a waste bank readiness assessment to be developed into a city scale waste bank, namely:

1.) Score of sub indicator (example : sub indicator on indicator location of waste bank)

First sub indicator (Location not violate RTRW) :
Answer "violate" = 0
Answer "not violate" = 1 x score
= 1 x (%weighting sub indicator x point)
= 1 x 50% x 6,60
= 3,30

Second sub indicator (Land ownership clearly)
Answer "not clear" = 0
Answer "yes" = 1 x score
= 1 x (%weighting sub indicator x point)
= 1 x 50% x 6,60
= 3,30

2.) Score of indicator (example : indicator location of waste bank)

Score of indicator = Amount of score of sub indicator
= score of first sub indicator + score of second sub indicator
= 3,30 + 3,30 = 6,60

3.) Score of component (example : component quality of building construction)

Score of component = Amount of score of indicator
= score of indicator 1 + score of indicator 2 + score of indicator 3 + score of indicator 4 + score of indicator 5
= 6,60 + 6,60 + 9,90 + 4,95 + 4,95 = 33

4.) Total score
Total score = Amount of point of component
= 33 + 33 + 34 = 100

3 Results and Discussion

Recapitulation of Resik Waste Bank assessment can be seen in Table 5.

Resik Waste Bank achieved the point up to 23.37 for the buiding construction quality component, which means have a warehouse of waste bank. For the management system component, Resik Waste Bank achieved the point up to 28.38. However, in terms of institutional has not met the points required, because was financial management has not conducted independently, because Resik Waste Bank is under the Project Development Business Unit of PD Kebersihan, then in the process of drafting the budget plan costs (RAB) still spring hinge with the unit. And for the operational system component, Resik Waste Bank achieved the point up to 25.34. However, in terms of the kind of waste, health and safety, as well as monitoring and evaluation has not met the points required. Related kind of waste, there is no customers save the organic waste to Resik Waste Bank, and because kind of waste can be saved in Resik Waste Bank just inorganic waste. Related health and safety, there is no guideline or rules about it. Because the reason for felt discomfort, officer of separation, hauling and packaging did not use protective tools themselves. As well as the absence of a procedure for the implementation of the emergency condition. Related monitoring and evaluation, was implementationed with frequency of time over the past three months.

Based on the assessment, the result showed that Resik Waste Bank has a point of 77.09 supported by adequate buildings and operational facilities. However, it is necessary to have independent financial management, related regulations of health and safety, and monitoring evaluation conducted at least once a month.

Table 5 Recapitulation of Resik Wste Bank Assessment

Component	Indicator		Point
I.Quality of Building Costruction (CS) (33%)	CS 1	Location of Waste Bank (20%)	6.6
	CS 2	Building (20%)	6.6
	CS 3	Building Area (30%)	0
	CS 4	Warehouse (15%)	3.47
	CS 5	Office (15%)	6.7
II. Management System (MS) (33%)	MS 1	Institutional (20%)	5.78
	MS 2	Capital (20%)	6.6
	MS 3	Institutional Structure (10%)	2.64
	MS 4	Job Description of Officer (5%)	1.32
	MS 5	Human Resources (5%)	0.17
	MS 6	Partnership (10%)	1.98
	MS 7	Dessimination and Promotion (10%)	3.3
	MS 8	Integration with Municipal Solid Waste Management (20%)	6.6
III. Operational System (OS) (34%)	OP 1	Savers/ Customers (15%)	5.1
	OP 2	Kind of Waste (15%)	2.13
	OP 3	Operational Facilities (15%)	5.1
	OP 4	Waste Collecting and Management (12.5%)	4.25
	OP 5	Weighing and Recording (12.5%)	4.25
	OP 6	Health and Safety (15%)	1.28
	OP 7	Monitoring and Evaluation System (15%)	3.19
		Total	**77.09**

4 Conclusion

Conclusion that can be drawn, namely Resik Waste Bank is ready to be developed into a city-scale waste bank with a value of 77.09.

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