COST – BENEFIT ANALYSIS FOR WASTE MANAGEMENT PROJECT

(Case Study in Bank Sampah Malang)

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Human activities produce large amount of waste which require a good waste management and treatment.Thus, it results potential harm the human health and environment that pose by the bad waste management.There are several ways that already have done by people in the world in order to solve waste problem such as recyling without any systematic mechanism and final diposal. Furthermore, all of these ways are valued as uneffective ways in managing waste. Thus, government of Malang City proposes a waste management project named Bank Sampah Malang (BSM) in order to solve waste problem in Malang. Descriptive quantitative method is utilized to analyze the obtained information about benefit & cost and sensitivity of Bank Sampah Malang (BSM) and to measure its effectiveness from financial aspect and its impact to society. The collected data then analyzed by using NPV,Net B/C Ratio and sensitivity analysis.The findings reveals that Bank Sampah can earn capital gain from its operational activity as reflected on their profit and its other benefit. It also has passed requirement of NPV, Net B/C Ratio and sensitivity analysis in determining sustainbility of project. In sum, the project Bank Sampah Malang (BSM) has good level effectiveness in finance because it generates profit and it also results other benefit that can give positive impacts to society. Futhermore, project Bank Sampah Malang (BSM) must be continued to be exist.

Keywords: ***Bank Sampah Malang, Cost-Benefit Analysis, NPV, Net B/C Ratio,Sensitivity Analysis***.

A. INTRODUCTION

Human activities create the waste daily; thus, more population who do their activity will lead to more wastes that are generated (Purnama, 2011). Waste problem began to emerge at the recent time because the amount of land is increasingly limited as the result of high rates of population growth, rapid development, and technology advancement implementation in all sectors. Hence, waste problem becomes a major topic concerned by

governments in the world because it has potential to harm the human health and environment (Purnama, 2011).

Municipal solid waste has the potential to contaminate land, air, and water as well as negatively affect human health and environment conditions (EPA, 2014). It impacts on health by increasing the possibility to acquire chemical poisoning through chemical inhalation, congenital malformations, neurotic disease, and mercury toxicity from eating fish with high levels of mercury. Further, waste also affects environment by increasing a potential of greenhouse gas, climate change, and destruction of ozone layer due to non-biodegradable waste and uncollected waste can obstruct the storm water run-off resulting in flood (EPA, 2014).

Concerning those impacts, waste management is thus needed in every country in the world, including Indonesia. Malang as the second largest city in East Java, Indonesia has a number of city population of 840,843 in 2013 (BPS Kota Malang, 2013); therefore, it emerges several waste problems both on its volume and on its management in order to reduce the waste volumes. Based on *DinasKebersihandanPertamanan* (2014) the volume of waste in Malang is 26.204 m^3 per month in 2013.

Before 2011, the 3R (reduce,reuse and recycle) method of waste management that aims to minimize the amount of municipal solid was yet to be applied straightfrom source, in general people just threw their waste to the place that already prepared by RT/RW which is TPSthus, it would be transfered to the final disposal named *Tempat Pembuangan Akhir (TPA) Supiturang* which is managed by Dinas Kebersihan dan Pertamanan kota Malang. Therefore, the system of waste management in Malang has changed since 2011 due to the project arranged by the government of Malang city. This project is made by government as the implementation of Act No.18 in 2008 about waste

management and *Peraturan Daerah (Perda) No.10 in 2010* by issuing a policy to establish Bank SampahMalang (BSM) (APEKSI, 2014).

Bank Sampah Malang (BSM) is an incorporated institution that is initiated by the government of Malang City in cooperation with Corporate Social Responsibilityof *Perusahaan Listrik Negara (PLN)* East Java Branch (banksampahmalang.com, 2014). It was established on 26th of July, 2011 and inaugurated by Minister of Environment of Republic of Indonesia on 15th of November 2011 as a forum to foster, assist, buy and do marketing for the recycled product of waste management activities coming from the society in order to solve waste problem in Malang city as well as to build up the economic empowerment of the society by doing 3Rs (reduce, reuse and recycle) method and Reusable Sanitary Landfill as the last stage of waste management system (Kementrian Lingkungan Hidup Republik Indonesia, 2012).

As the project was made to solve one of public problems related to the waste problem, Bank Sampah Malang (BSM) needs to be assessed by using project management evaluation. It is important to examine the decision making not only for practical consideration as it can be a valuable component of the project process even when reliable valuation cannot be obtained but also for responding to the concerns of the impact and the cost resulted from that project (Tietenberg, 2006).

Based on that, the writer proposes a research entitled "***Cost-Benefit Analysis for Waste Management Project (Case Study in Bank Sampah Malang)"*** which is done by using financial analysis method, namely Cost–Benefit Analysis in order to exactly explain the financial side and the cost–benefit of the Bank Sampah Malang through the market price, the sensitivity analysis of Bank Sampah Malang (BSM) and its impact to society.

B. LITERATURE REVIEW

Public Finance

Public Finance is the branch of economics that studies the taxing and spending activities of government in order to make welfare for society (Rosen,2002). As its definition, all of public finance is about how government allocate its money for welfare of society. The money should be allocated into projet that can give welfare to society. Governmemnt need to make project and evaluate it based on its cost benefit in order to make the goals of welfare's society making. The use of cost benefit is really important in doing project evaluation because from this analysis, government will know how exactly effectiveness of project through financial and its economic analysis and how much exactly benefit and cost that should be spent out by government.

Project

Project is a sequence of activities which is planned as activities that has starting point and ending point by date through the use of particular input such as fund and labor in order to acquire the benefit and return from that project (Pudjosumarto, 1984).

Waste Management

Waste Management is one of the examples of project. Waste management itself is approved as the way to solve the waste problem in an area. Dealing with waste is an epitome of our dealing with nature as the other of society in general; thus, it has several frameworks emerged based on several theory. Waste minimization is issued as the first method of waste management.waste minimization requires careful planning, creative problem solving, changes in attitude, sometimes capital investment, and most important, a real commitment.The second method of waste management is Re-use. The process of re-use starts when there is a lack of the first waste management problem that happens if we

want to acquire another purpose of using our old stuff; thus, re-use is considered as the second preferred options after waste minimization

As the third of waste management method, there is an ongoing debate of the value of recycling According to (Pongrácz, 2002), recycling means the reprocessing in a production process of the waste materials for the original purpose, or for other purpose, including organic recycling but excluding energy recovery. As the last, waste management hierarchy has a disposal stage. The landfill or 'final storage' as it is sometimes referred to and critically viewed, as a very careless solution by merely dumping and covering the waste.

Project Evaluation

Project evaluation is a methodology for assessing the economic, social, environmental and financial impacts of the proposed, current, and past project. (Queensland Treasury, 1997).Project evaluation is important to do because it can save both time and resources by keeping participants of the project either comes from public sector or private sector focused on, and working towards, the ultimate goals of project.

On this research, the project evaluation will be used by writer to evaluate one of the projects made by government of Malang city like Bank Sampah Malang. The project evaluation consists of financial analysis with Cost benefit analysis as its tools. .

Cost-Benefit Analysis

Cost – Benefit analysis is widely used. In a project, we should understand a change in the net supplies of commodity from the public sector or private sector (Queensland Treasury, 1997). Based on (Naas, 1996), cost benefit analysis has 4 steps. Identification of relevant cost and benefit is the first stage of conduct a cost–benefit analysis. Next, to the second stage, the writer must think about the measurement of costs and benefits. It defines the value of costs and benefits as a demanding task that requires extra care and

creativity. The third stage is making a comparison of cost and benefit flows by accruing during the lifetime of a project. In the third phase of project analysis, the present value of future benefits and costs of a project must be calculated and compared to the present value of investment costs. The last stage on cost-benefit analysis, it is called as project selection. In the final stage of project analysis, projects are ranked in terms of at least one of the three project selection criteria including: NPV, Net BC/Ratio, and sensitivity analysis

Measurement of Benefit

Based on (Pudjosumarto, 1984), benefit can be categorized into three types of benefit, namely: direct benefit, indirect benefit, and intangible benefit. Direct benefit is the benefit resulted from a project and can be measured obviously. The example of direct benefits is when there is an output enhancement in a project. .Indirect Benefit is the benefit resulted from a project and cannot be measured easily or vague to be measured. Intangible benefit is the benefit that cannot be consumed directly by people and hardly to be measured by monetary value. The examples of intangible benefit are: environment changes,

Another theories about benefit comes from (Musgrave and Musgrave) in 1989. Based on (Musgrave and Musgrave, 1989), benefit is classified as rill and pecuniary benefit. Rill benefit is benefit that is resulted from a project and amis to be enjoyed by many people. Pecuniary benefit means that benefit is resulted from a project and aims to be enjoyed by one party which is external party of project.

Measurement of Cost

Evaluation should be based on the additional cost to the state of undertaking the particular project. Costs which would have been incurred anyway should be excluded.

The stream of costs should be covered by the life of the proposed capital item (Queensland Treasury, 1997).

Investment Criteria

As the part of a stage in cost-benefit analysis, investment criteria are needed to be measured as project selections which aim to examine the project that has been proposed or has been running whether or not accepted and continued. Investment criteria that are used are: Net Present Value (NPV), Net Benefit cost ratio (Net B/C Ratio), Internal rate of return (IRR), Payback Ration, and sensitivity analysis. Requirements for succesful project and need to be continued are NPV should be greater than 0 and Net B/C Ratio should be greater than 1.

Discount Rate

Costs and benefits of a project which is analyzed by using CBA rarely occur within a short time period. It is more often the case that at least some of the outcomes of a project occur over time. However, as the value of money changes over time – due to the effects of inflation etc. – the value of a cost or benefit in the future may not be representative of the actual worth of that cost or benefit in present terms. For this reason, it is necessary to discount the future values of costs and benefits occurring over time to a common metric – present value. This also allows researchers to calculate the net present value of a project (CBA Builder,2014).

C. RESEARCH METHODS

Decriptive Quantitative Method

The type of the research method utilized by the writer is descriptive quantitative method. It seeks to give the description about phenomena. Based on (Indriantoro and Supomo,2002), quantitative method concerns on the numbers as data for analysis while descriptive method means do research towards facts that happen on population.

Data Collection Method

Data used in this research are secondary data that collected from Bank Sampah Malang (BSM) and Dinas Kebersihan dan Pertamanan Kota Malang directly by the writer. The data are collected via online document of APEKSI 9th Edition through its website (www.apeksi.or.id). and collected from Bank Sampah Malang (BSM) official website (www.banksampahmalang.com)

Sample Collection Method

The writer uses purposive sampling as her sample collection method in this research. Purposive sampling is the deliberate choice of respondents due to the qualities the informant possesses. It is a non-random technique that does not need underlying theories or sets number of informant. Simply put, the researcher decides what needs to be known and sets out to find people or document that can and are willing to provide the information by virtue of knowledge or experience (Tongco, 2007).

Data Analysis Method

In this research, the data are analyzed through financial analysis which is use the cost-benefit analysis consisting of Net Present Value (NPV), Net B/C Ratio, and Sensitive Analysis. The financial analysis is about the price that is used. In financial analysis, the price that is used is the market price.

D. FINDINGS AND RESULTS

Bank Sampah Malang

Bank Sampah Malang is a platform to foster, assist, buy and market the result of waste management activities. This program is a way solve waste problem in Malang city and build up the economic empowerment of the society by doing 3R (reduce, reuse and recycle) method and Reusable Sanitary Landfill as the last stage of system in managing waste (Profil bank Sampah Indonesia, 2012).

Purpose of Bank Sampah Malang

Based on (APEKSI, 2014) *Bank Sampah Malang (BSM)* has several purposes which are environtmental aspect, social aspect, educational aspect, empowerment aspect and economic aspect.

Consumer of Bank Sampah Malang

Bank Sampah Malang (BSM) has two type of consumers that as n*asabah* (waste provider) and costumer (purchase the waste).The one that has waste and willing to get money from selling that waste called as *nasabah* and the one that needs waste is called *customer.*

Product of Bank Sampah Malang

According to banksampahmalang.com (2015) Bank Sampah Malang (BSM) has several types of products in saving that are offered to *nasabah* while the consumer of Bank Sampah Malang (BSM) only get the waste that has been treated by Bank Sampah Malang (BSM) as its product. The types of saving are Regular Saving, Saving for Education, Saving for Eid Day, Saving for Primary Needs, Saving for Social Project, and Saving for Environmental Sustainability.

Participating of Society

As *Nasabah,* they need to follow the procedure of Bank Sampah mechanism. Firstly, nasabah needs to weigh the waste in empowerment & collection division, and then they will get the saving books that filled up by administration division in order to choose the product of Bank Sampah Malang (BSM) as the last step for the *nasabah*. The next step is the responsible of production and operational division of Bank Sampah Malang (Malang) in managing the collected waste based on the waste management mechanism of Bank Sampah Malang (BSM). Society also attend the campaign that made by Bank Sampah Malang as its participating.

Mechanism of Bank Sampah Malang

As mention earlier, Bank Sampah Malang has 4 divisions in conducting its activities (banksampahmalang.com, 2015). They are empowerment & collection division, operational division, production division, and administration division. Each of divisions has its own job description and goals.

Waste Management of Bank Sampah Malang

Waste management of Bank Sampah Malang starts with waste pool done by Bank Sampah Malang to differ the type of waste; organic waste, recyclable waste, and the residue of those two types. The organic waste comes from plants or animal. It includes food waste, fruit and vegetables peels, flower trimmings commonly (Escholltoday, 2014). Recyclable waste is a waste that can be potentially processed using the recycling method to reduce the use of raw materials (Escholltoday, 2014). The last is the residue of those two types, which cannot be categorized either as organic waste or as recyclable waste.

After differentiation process, those wastes are processed into different methods. The educated households in BSM unit process organic waste to be organic fertilizer. While the recyclable waste is contained in Bank Sampah Malang (BSM) community and school units, which, then, is processed in Bank Sampah Malang (BSM) central unit either as homemade handicraft or as goods that can be re-sell to Industry. The last is managing of residue waste that cannot be categorized either as organic waste or as recyclable waste; those residue wastes are processed into final disposal through Reusable Sanitary Landfill that is managed by government.

Marketing strategies of Bank Sampah Malang

Bank Sampah Malang do their marketing by making campaign to society, making social media account and official website, the last is has media partnership with local media.

Waste Type of Bank Sampah Malang

The Type of waste in Bank Sampah Malang (BSM) are vary. There are 71 types of waste collected by Bank Sampah Malang (BSM) from *nasabah.* In this research, writer only use 6 type of waste because those are the amount of waste that frequently collected into Bank Sampah Malang (BSM) everyday. Those types waste are organic waste, P 13 (PET clear transparent plastics), P 14 (filthy transparent plastics), P 16 (colorful plastics), K 5 (magazine), K 6 (cardboard).

Benefit of Bank Sampah Malang

There are several benefits that resulted from Bank Sampah Malang (BSM). Those benefit is classified as rill benefit and pecuniary benefit. Rill benefit is benefit that achieved by all people and pecuniary is benefit that only stands for one party. Thus, both of those benefits are differed as tangible and intangible benefit either in direct ways or indirect ways. First benefit is rill direct benefit that is proxied by product that managed by BSM. Second benefit is rill direct intangible benefit that is proxied by beautiful environment. Third benefit is rill indirect tangible benefit which is proxied by environmental education and the last benefit is pecuniary benefit that is proxied by additional income for society. Below here the benefits of Bank Sampah Malang (BSM) from 2011 until 2014.

Table 4.1 Benefit of Bank Sampah Malang

No.	Benefit	2011	2012	2013	2014
1.	Product That Managed by BSM	388.000.000	624.700.000	723.800.000	909.200.000
2.	Beautiful Environment	34.680.000	56.324.000	64.950.000	74.394.000
3.	Environmental Education	500.000	1.800.000	600.000	500.000
4.	Additional lincome of Society	120.000	180.375.000	180.408	189.592
Total Benefit per Year		**423.300.000**	**863.199.000**	**789.530.408**	**984.283.592**
Total Benefits of Bank Sampah Malang (BSM)				**3.060.313.000**	

Source: Data Proceed, 2015

The table 4.1 illustrates the total benefit of Bank Sampah Malang (BSM) per year that has fluctuative trend calculation this is happens because of a lot of factors. One of them is the amount of participation of society. Even Bank Sampah Malang has more than 22.500 nasabah within 4 years but Bank Sampah Malang only has 7510 active nasabah that do saving frequently every month. This make the aount of benefit that comes from product taht managed, beautiful environment and additional income for society not maximum.

After explanation about one benefit to others, we can see the total of real benefit of Bank Sampah Malang (BSM) that resulted from calculate all benefits that got every year. In 2011, total Bank Sampah Malang is Rp. 423.300.000 while in 2012 is Rp.863.199.000. and it decrases to Rp. 789.530.408 in 2013. The last year is 2014, in this year total benefit of Bank Sampah Malang (BSM) is Rp.984.283.592. This table also shown us the whole total benefit of Bank Sampah Malang (BSM) from 2011-2014 which is Rp.3.060.313.000.

4.2 Cost of Bank Sampah Malang

No	Description	2011	2012	2013	2014
1.	Building Renovation	10.000.000			
2.	Office Inventories	47.552.500			
3.	Vehicle of BSM	35.000.000	142.500.000		
4.	Nasabah Giving	180.000.000	288.600.000	353.600.000	464.500.000
5.	Operational of BSM	94.180.000	148.900.000	352.100.000	435.150.000
Total Per Year		**366.732.500**	**580.000.000**	**705.700.000**	**899.650.000**
Total Cost Bank Sampah Malang (BSM)				**2.552.082.500**	

Source:Data Proceed, 2015

The research shows that total cost of Bank Sampah Malang is 2.552.082.500. The cost of Bank Sampah Malang in the first year is Rp. 366.732.500,00. Those cost is spent to support the program operational, such as building, office inventories, vehicle to collect waste, operational needs and nasabah saving. In the following years, Bank Sampah Malang annual cost is dynamic. In 2012, it spends about Rp. 600.000.000, 00; while in 2013 and 2014, it spends Rp.705.700.000, 00 and Rp. 899.650.000.

Net Present Value of Bank Sampah Malang

The result of NPV as about Rp.423.912.619.The data shows us that NPV of Bank Sampah Malang is more than zero which means that Bank Sampah Malang is great investment and can give the high rate of return. Therefore, theoretically, Project Bank Sampah Malang has fulfilled the requirement of project success, which is indicated with having NPV > 0 and it means that the project of Bank Sampah Malang should be continued.

Net B/C Ratio of Bank Sampah Malang

The B/C Ratio of Bank Sampah Malang is 1, 2059. It indicates that Bank Sampah Malang passes the requirement of successful project based on B/C Ratio theory, which B/C Ratio should be ≥ 1. It also indicates Bank Sampah Malang with 8 % discount rate is massive investment because the profit value is greater than the cost spent, therefore, Bank Sampah Malang should be developed as government project.

Sensitivity Analysis of Bank Sampah Malang

Sensitivity analysis is used to know the rate of project sensitivity towards price changing, discount rate and the potential impact. The measurement of sensitivity is an investment criterion of benefit-cost analysis, which is to know the project efficiency. There is an assumption from this parameter, which consider that price changing, benefit changing and discount rate.

If there is change in price, benefit and discount rate, NPV is changes. When the price increases as about 15 % from its beginning and discount rate is 12%, the NPV decrease from its beginning which is Rp. 423.912.619 .to Rp. 110.145.053 while next NPV increase to 767.929.257 because there is decreasing price as about 15 % and discount rate is 6 %. When the benefit increases as about 15 % and discount rate is 12%, the NPV increase from Rp. 4223.912.619 .to Rp. 836.841.758 while next NPV decrease to Rp. 142.821.108 because there is decreasing ben€efit as about 15 % and discount rate is 6 %. It means that Bank Sampah Malang project has high rate sensitivity towards increasing price and benefit. It indicates that Bank Sampah Malang Project is efficient by having NPV >0.

If there is change in price, benefit and discount rate, Net B/C Ratiois changes. When the price increases as about 15 % from its beginning and discount rate is 12%, the Net B/C Ratio decreases from its beginning which is 1,025 .to 1,051 while next

Net B/C Ratio increase to 1,416 because there is decreasing price as about 15 % and discount rate is 6 %. When the benefit increases as about 15 % and discount rate is 12%, the Net B/C Ratioincreases from 1,205 .to Rp. 1,390 while next Net B/c Ratio decrease to Rp. 1,0162 because there is decreasing benefit as about 15 % and discount rate is 6 %. It means that Bank Sampah Malang project has high rate sensitivity towards increasing price and benefit. It indicates that Bank Sampah Malang Project is efficient by having Net B/C Ratio >1.

E. CONCLUSION AND RECOMMENDATION

Conclusion

Based on findings and discussion of benefit cost analysis, it can be concluded the following that:

1. Bank Sampah Malang Project has more benefit for society, such as providing alternative money income from collecting waste.
2. Bank Sampah Malang can generate income from its operational activity as shown in the analysis and discussion.
3. Bank SampahMalang has high feasibility rate where the cash inflow of Net Present Value (NPV) is bigger than its present initial investment. Thus, it make the Net B/C Ratio of Bank Sampah Malang has passed the requirement to be successful project and needed to be continued.
4. Bank Sampah Malang has high rate result in sensitivity analysis that indicates that there are high sensitivity towards inputs. Thus, the project will be more efficient if there is decreasing in price or discount rate.

5. Project Bank Sampah Malang is found to be an effective project since it can provide benefit for government, give additional income for society and also education for society to love environment and do saving.
6. Bank Sampah Malang (BSM) still needs improvement in order to earn more profit.

Recomendation

Based on conclusion of benefit cost analysis, there are several formulated recommendations:

1. Based on the findings and conclusion, the government need to continue to develop Bank Sampah Malang project because it is proven as successful project and provides many benefit for society and government, such as capital gain, good government image, and green-minded society.
2. For future researchers that want to do similar research, they need to consider the time data collection. It will be better if the writer also take their internship time in Bank Sampah Malang, because it will make them easier in collecting data. Lastly, the future researchers also need to find different theory that can be used to improve the research analysis.

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