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Transportation Cost Analysis Using Activity-Based Costing in Waste Collection Distribution of ESWKA Waste Bank in Cilegon

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Abstract

In this study, the main problem encountered is the calculation to determine the actual operating costs in knowing the profit or deficit experienced by Bank Sampah Eswka is still not available. The ABC method is used to identify costs based on transportation operational activities for waste collection from Bank Sampah Unit (BSU) towards Bank Sampah Induk (BSI). The results showed significant efficiency in the calculation of operational costs with a difference in internal costs with a contract value in the range of IDR 993 to IDR 8,220. Thus, the use of the ABC method helps Bank Sampah Eswka to recognize the achievement of a high level of operational efficiency, which allows them to manage waste distribution and processing at a lower cost compared to contractors. This shows that the existing internal system is effective and efficient.

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INTRODUCTION

According to data from the Population Census of the Central Statistics Agency (BPS), it was recorded that the population in Indonesia in 2022 amounted to 275.5 million people. As a result of the increasing population, community consumption may increase the volume, type, or nature of waste generated by the community (Darmastuti S. , Cahyani, A, & S, 2021). Based on data from the National Waste Management System (SIPSN) in Indonesia in 2023 with a total waste generation of 24,478,825.86 tons/year. Waste is the residual material produced by an activity in various dimensions and scales such as industrial, household agency, or organizational waste as an activity by humans (Soemirat, 2014). In Law No.18 of 2008 which discusses waste management, waste is defined as the residue of daily human activities or natural processes in solid form and specific waste is waste that is

categorized based on its nature, concentration, and/or volume requiring special handling. Waste management that is managed less optimally will hurt the environment because waste has various characteristics ranging from easily decomposed due to natural processes to waste that isn't easy to decompose due to its nature such as plastic.

The definition of waste management presented in Government Regulation of the Republic of Indonesia Number 81 of 2012 concerns the Management of Household Waste and Similar Waste, Household waste is a systematic, extensive, and continuous activity, the purpose of which is disposal and processing. This waste management operation cannot be separated from supply chain operations (Yuliesti, Suripin, & Sudarno, 2020). The role of the supply chain in waste management is very important because it involves waste collection, waste sorting, pre-management, storage, transportation, and distribution in operational strategic decision-making involving supply chain activities (Mohammadi, Jämsä-Jounela, & Harjunkoski, 2019).

Waste management is a strategic object to be developed from a Supply Chain perspective because the process involves stages in the Supply Chain. Supply Chain Management is a supply chain, logistics network, and a coordinated operation consisting of organizations, human resources, functions, information, and resources that work together to move goods or services in physical form and also in practice from suppliers or service providers to customers (Arif, 2018). In its implementation, there are many obstacles in waste management such as a lack of public awareness to care more about the environment, inadequate supporting infrastructure, limited costs, and government policies.

Waste management should be the responsibility and collaboration of all parties involved such as the government, the community, and those who are competent in the field of waste management. Regulation of the Minister of Environment No.14 of 2021 which regulates waste management in waste banks. Based on this regulation, Waste Banks can be divided into two types based on their area coverage, namely Waste Bank Units (WBU) and Main Waste Bank (MWB). Waste Bank Unit (WBU) with a wide range of service coverage can reach administrative areas at the village levels. Main Waste Bank (MWB) with its service coverage area covers the administrative area of the district/city. Based on the Regulation of the Minister of Environment, ESWKA was established to become the main waste bank for waste management in Cilegon City, Banten.

ESWKA (Environment Sustainable Network Foundation) is a non-government organization (NGO) engaged in research, empowerment, and assistance to overcome environmental problems in Cilegon, Banten. The presence of ESWKA, with an innovative approach provides an answer to connect residents as waste producers with waste banks in more efficient and sustainable waste management. ESWKA has conducted various collaborations and partnerships with the government, communities, State-Owned Enterprises, and Private-Owned Enterprises. These State-Owned Enterprises and Private-Owned Enterprises contribute as capital suppliers or investors that support the operations of the ESWKA waste bank. The use of technology and digital platforms in its operations makes it easier for

ESWKA to manage waste starting from the process of recording, reporting, and transportation, which could increase operational efficiency and transparency.

The initiative taken by ESWKA to establish a waste bank is a good thing for environmental sustainability. Community waste collected at the Waste Bank Units (WBU) is then distributed to the Parent Waste Bank as shown in Figure 1. Distribution is one of the activities of distributing goods and services provided by providers. Distribution activities certainly cannot escape the transportation used to realize smooth distribution (Yustavia, Salomon, & Kristina, 2022).

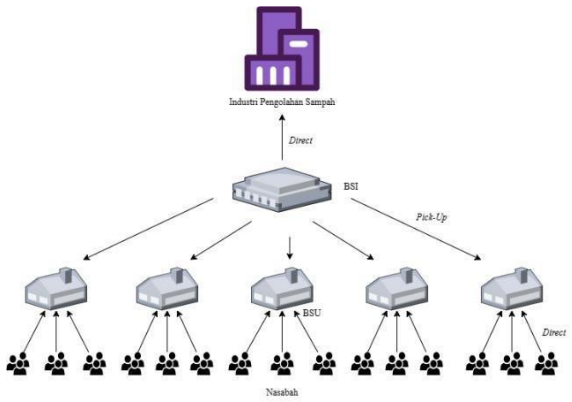

Figure 1. Waste Collection Supply Chain Network in Cilegon

The waste delivery process carried out by Eswka Waste Bank is categorized into three main activities, as shown in Figure 2, namely administrative activities, operational activities, and maintenance activities. These activities show the coordination between Waste Bank Units (WBU) and Main Waste Bank (MWB) in the waste management process. Administrative activities consist of the cost of checking the condition of trucks, the cost of checking waste, the cost of depreciating office equipment, the cost of depreciating buildings, the cost of human resources for office management, and the cost of WBU. Operational activities consist of salary costs of truck drivers, vehicle tax letter costs, fuel costs, and vehicle insurance costs. Meanwhile, maintenance activities consist of vehicle maintenance costs, tire changing costs, and vehicle washing costs. In addition, the cost of maintenance or maintenance activities is also included in the cost of washing the truck which will be washed after each waste delivery. The activity starts with MWB preparing the trucks to pick up the waste at each WBU. The WBU also checks the waste first to ensure that the waste is suitable for delivery according to the category in the MWB. After picking up the waste at the WBU, the truck will return to MWB to drop off the waste. Maintenance will be carried out to ensure that the trucks used to transport waste are in good condition.

The waste pick-up process from WBU to MWB involves various cost components such as transportation costs (Faisal, 2017). However, every agency is never free from problems in its operational process. One of the problems faced by ESWKA is the calculation of operational costs in waste

collection. As an operator, the Eswka Waste Bank is required to perform calculations to determine the actual operational costs and determine the profit or deficit experienced by the ESWKA Waste Bank. The calculation of these operational costs is carried out using the Activity-based Costing (ABC) method where costing is based on transportation operational activities or activities for waste collection from the Waste Bank Unit (WBU) to the Main Waste Bank (MWB).

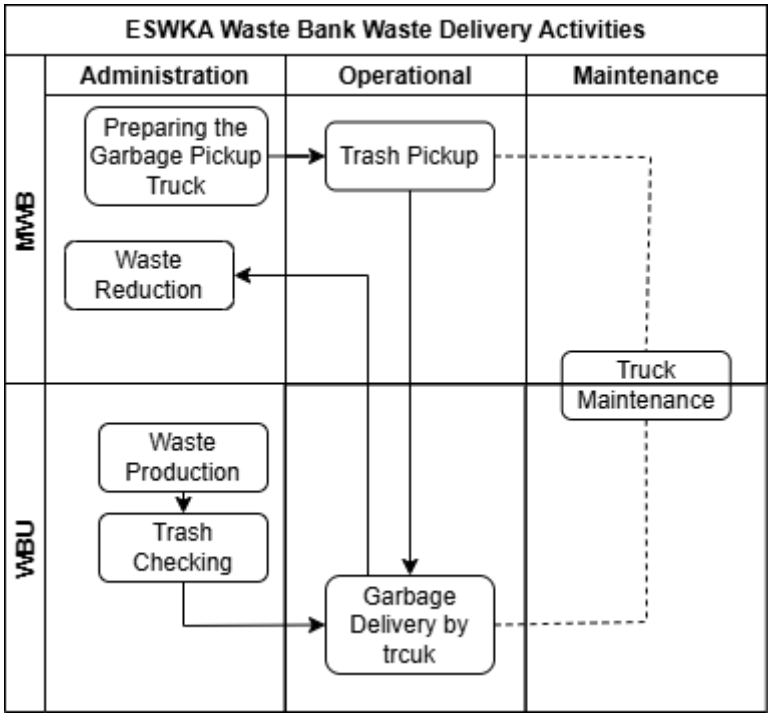

Figure 2. Swim Lane Diagram of Waste Delivery Process from WBU to MWB

Activity-based costing (ABC) is the accumulation of product costs by considering various cost drivers (Cindrawati, 2014). ABC is one of the alternatives used as one of the traditional distribution cost calculation methods. The traditional cost calculation method does not consider the increase in complexity and still allocates overhead costs based on the decreasing amount of labor or even does not take overhead costs into account. Hence, a more accurate method of calculating product costs is needed, namely ABC. Therefore, the purpose of this study is to analyze the difference in vehicle operating costs with the contract value provided by the company collected at the Waste Bank Unit and then picked up by the Parent Waste Bank.

The waste pickup process from WBU to MWB involves various cost components of transportation costs, namely vehicle operating costs. Vehicle Operating Costs (VOC) are the actual cost incurred that occurs when the vehicle is operated under normal conditions for a specific purpose. The main elements that can affect the value of VOC are fixed costs and variable costs (Wahab, 2014). Fixed costs on the vehicle include the initial capital cost of the vehicle, vehicle depreciation costs, vehicle

licensing fees, insurance costs, and vehicle crew costs or vehicle crew salaries. Variable costs include fuel costs, oil consumption, maintenance costs from tire usage, vehicle washing costs, spare parts, and maintenance costs. The amount of VOC depends on the size of the vehicle, vehicle type/brand, vehicle age, vehicle condition, and vehicle maintenance quality (Mandaku H. , 2022). However, every agency is never free from problems in its operational process. One of the problems faced by ESWKA is the calculation of operational costs in waste collection. As an operator, the ESWKA Waste Bank is required to perform calculations to determine the actual operational costs and determine the profit or deficit experienced by the ESWKA Waste Bank.

METHOD

This research employs a quantitative approach, aimed at thoroughly analyzing and describing various circumstances and conditions presented through numerical data obtained from systematic observations (Nararya, Daulay, & Aisyah, 2024). The study unfolds through a series of methodical processes, which include conducting interviews, processing data, and analyzing the research findings. To begin with, interviews play a crucial role in this research as they are designed to gather detailed information that is essential for advancing the study. These interactions provide insights and context, which are pivotal for a comprehensive understanding of the topic. Following the completion of the interviews, the gathered information undergoes a rigorous data processing phase. This step is focused on calculating the total operational costs of vehicles, utilizing the Activity-based Costing (ABC) method specifically within the framework of the ESWKA Waste Bank. Upon processing the data, a thorough analysis is undertaken to extract meaningful insights and conclusions. This analysis relies on both direct observations recorded during the research and the data collected from interviews. Ultimately, the research aims to deliver well-founded results that contribute to a deeper understanding of the operational costs and the effectiveness of the ABC method.

The calculation approach through Activity-based Costing is done by paying attention to how much cost is generated from each activity that occurs in a company. This is due to the assumption that every activity carried out by each resource in the company will cause costs. This is also based on how long and wide the range of activities carried out by these resources. The calculation of costs from activities that occur also involves a causal relationship that occurs between costs and cost objects (Cindrawati, 2014).

RESULTS AND DISCUSSION

The findings of this comprehensive study provide a detailed examination of the distribution activities carried out by ESWKA Waste Bank, which unfold in a series of methodical stages. The process initiates with a scheduled collection system operating at the various Waste Bank Units (WBUs), where waste is gathered routinely from the community. Following the collection, the gathered waste is

transported to the Main Waste Bank (MWB) at specified intervals, coordinated to match the volume of waste collected from the local population. As shown in Table 1, the data encapsulates the entire distribution process, highlighting the quantities of garbage disposed of from each WBU along with the distinct travel distances encountered during transport. This insightful data effectively answers the pivotal question regarding the effectiveness and efficiency of the waste management operations at ESWKA Waste Bank.

Table 1. Distribution Activity Data of Eswka Waste Bank

No.	Facility Name	Facility Type	Location	Distance of MWB - WBU (Km)
1	Simpati	Main Waste Bank (MWB)	Raden Sastradikarta St., Jombang, Cilegon, 42411 Banten	0
2	Sanggar Wuni Kreasi	Waste Bank Unit (WBU)	Kyai Haji Mudzakir Lingkungan Kubangsaron St., Ciwandan, Cilegon, 42445 Banten	9,8
3	Berkah	Waste Bank Unit (WBU)	40, Sunan Bonang Linkungan Kebanjiran St., Ciwandan, Cilegon, 42445 Banten	8,6
4	Sinar Lestari	Waste Bank Unit (WBU)	Waringin Kurung St., Kramatwatu, Serang, 42616 Banten	13,3
5	Menderma	Waste Bank Unit (WBU)	Gerem, Purwakarta, Cilegon, 42438 Banten	9,3
6	PPLP	Waste Bank Unit (WBU)	Kubangsari, Ciwandan, Cilegon, 42445 Banten	8
7	Warungkara Kepuh	Waste Bank Unit (WBU)	2014, Fatahillah Link Sak-Sak Asem St., Ciwandan, Cilegon, 42446 Banten	10,7
8	Gunung Sugih	Waste Bank Unit (WBU)	36, Sunan Kalijaga St., Ciwandan, Cilegon, 42447 Banten	14

A significant component of this analysis is the evaluation of transportation mileage, which is crucial in determining the financial implications and overall efficiency of waste distribution. The study meticulously analyzes how far waste vehicles must travel to deliver the collected waste to the processing facilities. Data presented in Table 2 illustrates notable variations in the average transportation mileage, which are dependent on the geographical locations of the waste processing facilities and the corresponding routes taken by the vehicles.

Table 2. Transposition Distance

Route	From MWB to WBU1	From MWB to WBU2	From MWB to WBU3	From MWB to WBU4	From MWB to WBU5	From MWB to WBU6	From MWB to WBU7
Distance Traveled (Km)	9,8	8,6	13,3	9,3	8	10,7	14
Collection Frequency per Day (Time)	1	1	1	1	1	1	1
Operating Days per Year (Day)	20	20	20	20	20	20	20
Mileage per Year (Km)	392	344	532	372	320	428	560

To thoroughly assess the financial feasibility of these transportation activities, the study utilizes a Rupiah/Km calculation, which quantifies the costs incurred for each kilometer traveled by the waste collection vehicles. The results of this analysis reveal a spectrum of costs per kilometer that are influenced by myriad factors, including the specific distances each WBU must traverse to reach the MWB. The average cost per kilometer provides invaluable insights into the expected expenditure that should be anticipated in the operational budget of ESWKA Waste Bank, as illustrated in Table 3. By gaining a deep understanding of these cost components, ESWKA Waste Bank can develop informed strategies aimed at reducing transportation costs. This finding supports the theory that underscores the importance of conducting thorough cost analyses within the waste management sector, emphasizing that efficient transportation cost management is just as vital as the collection and sorting processes for achieving operational efficacy and financial viability.

Table 3. Calculation Result of Rupiah/Km Eswka Waste Bank as MWB

No.	Cost Component	Cost of MWB - WBU1	Cost of MWB - WBU2	Cost of MWB - WBU3	Cost of MWB - WBU4	Cost of MWB - WBU5	Cost of MWB - WBU6	Cost of MWB - WBU7
Operational Activities								
1	Vehicle Depreciation Cost per Km (IDR)	18.950	21.595	13.963	19.969	23.214	17.356	13.265
2	Fuel Cost per Km (IDR)	834	834	834	834	834	834	834
3	Vehicle Letter and Tax Cost per Km (IDR)	4.676	5.328	3.445	4.927	5.728	4.283	3.273

4	Insurance Cost per Km (IDR)	5.953	6.783	4.386	6.273	7.292	5.452	4.167
5	Driver Salary per Km (IDR)	137.755	156.977	101.504	145.161	168.750	126.168	96.429
Total Cost of Operational Activities per Km (IDR)		168.169	191.518	124.133	177.165	205.819	154.094	117.968
Maintenance Activities								
8	Tire Usage Cost per Km (IDR)	345	345	345	345	345	345	345
9	Vehicle Washing Cost per Km (IDR)	5.102	5.814	3.759	5.376	6.250	4.673	3.571
10	Vehicle Maintenance Cost per Km (IDR)	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total Maintenance Activity Cost per Km (IDR)		6.447	7.159	5.104	6.721	7.595	6.018	4.916
General and Administrative Activities								
11	Office HR Management Cost per Km (IDR)	1.865,20	2.125,46	1.374,36	1.965,48	2.284,87	1.708,32	1.305,64
12	Office Operating Expenses per Km (IDR)	7.434,40	8.471,76	5.477,98	7.834,10	9.107,14	6.809,08	5.204,08
13	Office Equipment Depreciation Cost per Km (IDR)	2.512,38	2.862,94	1.851,23	2.647,45	3.077,66	2.301,06	1.758,66
14	Building Depreciation Cost per Km (IDR)	20.398,38	23.244,67	15.030,39	21.495,07	24.988,02	18.682,63	14.278,87
15	WBU Facility Cost per Km (IDR)	1.822,16	2.076,41	1.342,64	1.920,12	2.232,14	1.668,89	1.275,51
Total Cost of General Activities and Maintenance per Km (IDR)		34.032,52	38.781,25	25.076,60	35.862,23	41.689,84	31.169,97	23.822,77
Total Cost per Km (IDR)		208.648	237.458	154.314	219.749	255.104	191.282	146.707
Total Cost per Km for 15 fleets (IDR)		13.910	15.831	10.288	14.650	17.007	12.752	9.780

Additionally, the research delves into a comparative analysis of costs relative to contract values, which plays a critical role in assessing the operational efficiency and effectiveness of Bank Sampah Eswka as a non-profit entity. Within this context, the term "cost of goods" pertains to the expenses associated with the delivery of services or the execution of programs, commonly referred to as contract value. By engaging in this cost comparison, the study investigates whether the internal operating costs incurred by the organization are more or less than the values provided by its funding sources or investors. The findings reveal that the internal vehicle operating costs of ESWKA Waste Bank can be favorably compared to the contract values offered by investors. As depicted in Table 4, the data indicates that investors provide superior contract value per kilometer travel. This highlights the organization's achievement of a high level of operational efficiency, as it demonstrates the ability to manage waste distribution and treatment at costs lower than the value of the contracts. This ultimately underscores the effectiveness and efficiency of the internal systems employed by ESWKA Waste Bank, showcasing its ability to operate successfully in the realm of waste management.

Table 4. Comparison of Cost with Contract

Description	From MWB to WBU1	From MWB to WBU2	From MWB to WBU3	From MWB to WBU4	From MWB to WBU5	From MWB to WBU6	From MWB to WBU7
Number of Fleets	105 fleets						
Distance Traveled (Km)	392	344	532	372	320	428	560
Contract Value per Km (IDR)	18.000	18.000	18.000	18.000	18.000	18.000	18.000
Operating Cost per Km (IDR)	13.910	15.831	10.288	14.650	17.007	12.752	9.780
Difference between Contract Value and Operating Cost (IDR)	4.090	2.169	7.712	3.350	993	5.248	8.220

CONCLUSION

Based on the results of the study shows that ESWKA Waste Bank experiences profits from all Waste Bank Units (WBU). At WBU-1, Eswka Waste Bank experienced a profit of IDR 4,090, at WBU-2 of IDR 2,169, at WBU-3 of IDR 7,712, at WBU-4 of IDR 3,350, at WBU-5 of IDR 993, at WBU-6 of IDR 5,248, and at WBU-7 of IDR 8,220. In this research, ESWKA Waste Bank got the biggest profit from WBU-7, namely Warungkara Kepuh which is located on 2014, Fatahillah Link Sak-Sak Asem St., Ciwandan, Cilegon, 42446 Banten. This also explains that the profit from the company contract must also be paid attention to several activities that cause costs to the company. The suggestion in this research is that further research can consider several other activities that cause costs that cause the

company's costs to increase. In addition, further research can also provide research using methods that are supported by analysis using supporting software.

REFERENCES

Arif, M. (2018). *Supply Chain Management.* Deepublish.

Cindrawati, S. D. (2014). Penerapan Activity Based Costing System Sebagai Dasar Menentukan Harga Pokok Kamar Hotel (Studi Kasus Pada Hotel Pelangi Malang Periode 2012. *Jurnal Administrasi Bisnis*.

Darmastuti, S., Cahyani, I. P., & Afrimadona, S. A. (2020). Pendekatan Circular Economy Dalam Pengelolaan Sampah Plastik. *Jurnal Pengabdian Kepada Masyarakat (Indonesian Journal of Society Engagement), 1(2), 1–18.*, 1(2), 1–18.

Darmastuti, S., Cahyani, I. P., A, A., & S, A. (2021). Pendekatan Circular Economy Dalam Pengelolaan Sampah Plastik di Karang Taruna Desa Baros, Kecamatan Baros, Kabupaten Serang. *Indonesian Journal of Society Engagement*, 1(2), 1–18.

Darmastuti, S., Cahyani, I. P., Afrimadona, A., & Ali, S. (2021). Dalam Pengelolaan Sampah Plastik di Karang Taruna Desa Baros, Kecamatan Baros, Kabupaten Serang. Indonesian Journal of Society Engagement. *Indonesian Journal of Society Engagement*, 1(2), 1–18.

Faisal, H. (2017). Analisis Biaya Transportasi Massal Menggunakan Metode Activity Based Costing (ABC) di PT Mayasari Bakti Sebagai Operator Transjakarta.

Mandaku, H. (2022). Analisis Biaya Operasional Kendaraan (BOK) Sebagai Dasar Penentuan Tarif Sewa Transportasi Barang di Provinsi Maluku. ALE Proceeding, 5, 46–52. *ALE Proceeding, 5, 46–52.*, 5, 46–52.

Mohammadi, M., Jämsä-Jounela, S. L., & Harjunkoski, I. (2019). A multi-echelon supply chain model for sustainable electricity generation from municipal solid waste. *IFAC-PapersOnLine*, 52(1), 610–615. .

Nararya, H. L., Daulay, A. N., & Aisyah, S. (2024). Implementasi Metode Activity Based Costing (ABC) dan Economic Oorder Quantity (EOQ) dalam Pengendalian Bahan Baku di Konfeksi Erstore Medan. *Jurnal Manajemen Terapan dan Keuangan*.

Soemirat, J. (2014). *Kesehatan Lingkungan Yogyakarta : Gadjah Mada University Press.* Yogyakarta: Gadjah Mada University Press.

Wahab, W. (2014). Sistem Transportasi-Biaya Operasional Kendaraan. Padang. *ITP*.

Yuliesti, K. D., Suripin, & Sudarno. (2020). Strategi Pengembangan Pengelolaan Rantai Pasok dalam Pengolahan Sampah Plastik. *Jurnal Ilmu Lingkungan. Program Studi Ilmu Lingkungan Sekolah Pascasarjana UNDIP*, 18(1), 126-132.

Yustavia, A., Salomon, L., & Kristina, H. J. (2022). Analisis Penentuan Rute Distribusi Optimal dengan Pendekatan Manajemen Transportasi dan Distribusi di CV. Expedisi Mitra Mandiri. *Jurnal Mitra Teknik Industri*, Vol.1, No.2, 126-134.