

Evaluation of Waste Transportation Routes at Gayamsari and East Semarang Subdistrict

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Abstract. Gayamsari and East Semarang Subdistrict are two subdistricts in Semarang City which are located side by side. According to the policy of Semarang City development in 2011-2031, Gayamsari Subdistrict has a function as an environmental center development, while East Semarang Subdistrict has the main function as office, trade and service. Preliminary studies show that in these two subdistricts the resulting of waste generation in several locations of Temporary Disposal Sites can not all be transported to Jatibarang Final Disposal Site. The purpose of this research is to examine and evaluate the existing condition of waste transportation routes in Gayamsari and East Semarang Subdistrict. This research uses survey research method, using interview, observation, documentation, and routing. Analytical techniques used are quantitative analysis and qualitative analysis. The result of this research shows that in Gayamsari and East Semarang Subdistricts, the level of service of waste transportation has not been optimum since in some locations of the Temporary Disposal Site is still found waste container which is not enough to accommodate the waste and the route far enough to the final disposal place.

Keywords: waste transportation route; Gayamsari; East Semarang.

1 Introduction

The increasing number of population and the increasing of society economic activity in Semarang City have an impact on the increasing amount of waste generation, as happened in Gayamsari and East Semarang Subdistrict. In order to prevent environmental problems, a good waste transport system is needed. The increasing quantity of waste generation, then the transportation system will become more complicated [1]. Important factors in the waste transport system, including quantity, type of equipment, distance, and labor needs [2]. In addition to this, waste transportation time is also an important thing in the waste transportation system [3].

Data obtained from DLH Semarang City [4], in the year 2015 waste produced by residents Gayamsari Subdistrict amounted to 286,85 m³ every day. While the waste transport capacity in the District Gayamsari is only 129,08 m³ per day. This means that the percentage of waste transportation service in Gayamsari sub district only reaches about 45%. In East Semarang Subdistrict, waste production is 237,455 m³ per day, while its transportation capacity is only 189,361 m³ per day. So that the percentage rate of only 79.7% transportation services. Whereas the target of waste management system in the field of transportation according to the National Medium Term Development Plan 2014-2019 is 100%, so the Government of Semarang City, especially in Gayamsari and East Semarang Subdistrict need to

make efforts to improve waste service, especially in the field of waste transportation.

Considering the phenomena occurring in Gayamsari and East Semarang Subdistricts, an evaluation of the waste transportation route in the two sub-districts is needed, to increase the percentage of services in the field of current waste transportation to obtain the most optimum route [5].

The purpose of this paper is to examine and evaluate the existing condition of waste transportation routes in Gayamsari and East Semarang Subdistrict, so that it can be found a better waste transportation route (effective and efficient) in order to create low carbon society in development process.

2 Research method

This research uses survey research method, using interview, observation, documentation, and routing. Research site located in Gayamsari and East Semarang Subdistrict.

All garbage trucks in these two subdistricts are used as samples, 5 trucks in Gayamsari Subdistrict and 6 trucks in East Semarang Subdistrict.

Samples in Gayamsari Subdistrict were taken from 11 temporary disposal sites, that located in 7 urban villages, ie.: Pandean Lamper, Gayamsari, Siwalan, Sambirejo, Sawahbesar, Kaligawe, and Tambakrejo.

Samples in Semarang Timur Subdistrict were taken from 12 temporary disposal sites, that located in 10 urban villages, ie.: Kemijen, Rejomulyo, Mlatibaru,

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Mlatiharjo, Kebonagung, Bugangan, Sarirejo, Rejosari, Karangturi, Karangtempel.

3 Result and discussion

3.1 Existing condition of waste transportation service in Gayamsari Subdistrict and East Semarang Subdistrict

Based on data from the Central Bureau of Statistics [6], Gayamsari Subdistrict which has wide area 5,25 km² consists of 7 villages, 62 RW, 444 RT, and the amount of population at the end of 2016 is 74.122 people, resulting in a total amount of waste about 350,23 m³ per day, it's only can be transported as big as 276,80 m³ per day, or it is only served around 79%, with the percentage composition of services as follows:

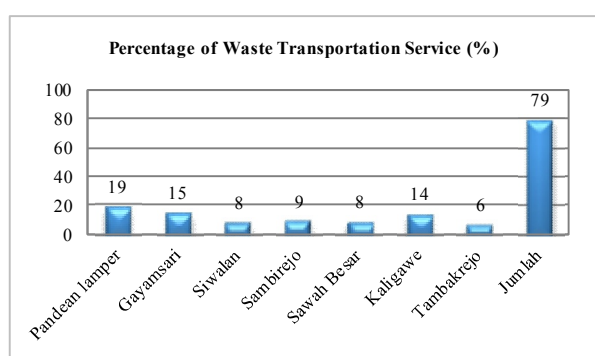


Fig. 1. Percentage of Waste Transportation Service in Gayamsari Subdistrict

Semarang Timur Subdistrict, with total area of 7,70 km², consists of 10 villages, 77 RW, 574 RT, and the amount of population at the end of 2016 is 76.574 people [7], resulting in a total amount of waste about 237,455 m³ per day, it's only can be transported as big as 189,361 m³ per day, or it is only served around 79,7%, with the percentage composition of services as follows:

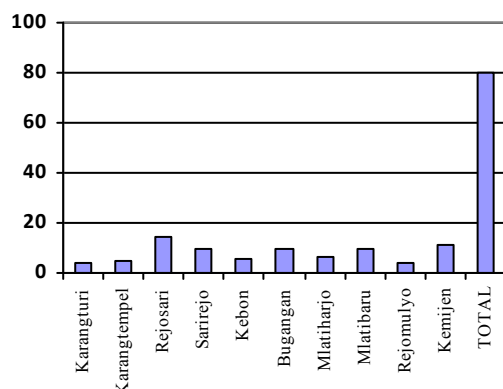


Fig. 2. Percentage of Waste Transportation Service in East Semarang Subdistrict

3.2 Evaluation of Waste transportation route

Enri Damanhuri states that one of the procedures for determining an effective and efficient transport system in a waste transport operation should be to use the shortest

possible transport route and with the smallest possible obstacles [8].

3.2.1 Waste Transportation Route at Gayamsari Subdistrict

The existing trucking route from the Environment Agency of Semarang City in Gayamsari Subdistrict can be seen in the following table:

Table 1. Existing Waste Transportation Route From Gayamsari Subdistrict to TPA Jatibarang

Truck Number	Temporary Disposal Site	Route
1	PLTG	Jl. Majapahit-Jl.Lamper Tengah-Jl.Tentara Pelajar-Jl.Sriwijaya-Jl.Veteran-Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati- TPA Jatibarang
	Kimar	Jl.Brigiend Katamso-Jl.Kompol Maksu-Jl.Sriwijaya-Jl.Veteran-Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati-TPA Jatibarang
2	Karangingas	Jl.Soekarno Hatta-Jl.Dr Cipto-Jl.Brigiend Katamso-Jl.Kompol Maksu-Jl.Sriwijaya-Jl.Veteran-Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati-TPA Jatibarang
	Kaligawe	J.Kaligawe Raya-Jl.Raden Patah-Jl.Dr Cipto-Jl.Brigiend Katamso-Jl.Kompol Maksu-Jl.Sriwijaya-Jl.Veteran-Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati-TPA Jatibarang
3	Sawah Besar	Jl.Soekarno Hatta-Jl.Dr Cipto-Jl.Brigiend Katamso-Jl.Kompol Maksu-Jl.Sriwijaya-Jl.Veteran-Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati-TPA Jatibarang
	Siwalan	Jl.Gajah Raya-Jl.Lamper Tengah-Jl.Tentara Pelajar-Jl.Sriwijaya-Jl.Veteran-Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati-TPA Jatibarang
	MAJT	Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati-TPA Jatibarang
4	Gempolsari	Jl.Lamper Tengah-Jl.Tentara Pelajar-Jl.Sriwijaya-Jl.Veteran-Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati-TPA Jatibarang
5	Sambirejo	Jl.Gajah Raya-Jl.Lamper Tengah-Jl.Tentara Pelajar-Jl.Sriwijaya-Jl.Veteran-Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati-TPA Jatibarang
	Tambakrejo	J.Kaligawe Raya-Jl.Raden Patah-Jl.Dr Cipto-Jl.Brigiend Katamso-Jl.Kompol Maksu-Jl.Sriwijaya-Jl.Veteran-Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati-TPA Jatibarang
	Pasar Waru	Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati-TPA Jatibarang

The waste transport route in Table 1 is the usual garbage route passed by garbage trucks from Gayamsari Subdistrict to TPA Jatibarang. The distance and waste transportation time of the existing route can be seen in Table 2 below:

Table 2. Distance and Waste Transportation Time of Existing Route in Gayamsari Subdistrict

Truck Number	Temporary Disposal Site	Distance (km)	Time (minute)
1	PLTG	27,45	90
	Kimar	27,3	85
2	Karangingas	34,26	100
	Kaligawe	37,33	110
3	Sawah Besar	35,81	105
	Siwalan	30,55	104
	MAJT	30,51	103
4	Gempolsari	27,1	90
5	Sambirejo	29,82	92
	Tambakrejo	35,17	98
	Pasar Waru	36,14	101

The distance and time in Table 2 is based on the existing route from the Environment Agency of Semarang City. The furthest remaining transport route is on the truck number 2. The distance of haul on the existing route can still be streamlined by changing the shorter route lanes and fewer traffic constraints. More efficient transport routes can be seen in Table 3 below :

Table 3. Waste Transportation Route After Efficiency

Truck Number	Temporary Disposal Site	Route
1	PLTG	Jl.Majapahit-Jl.Brigjend Katamso-Jl.Admodirono-Jl.Singosari Raya-Jl.Sriwijaya-Jl.Veteran-Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati-TPA Jatibarang
	Kimbar	Jl.Brigjend Katamso-Jl.Admodirono-Jl.Singosari Raya-Jl.Sriwijaya-Jl.Veteran-Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati-TPA Jatibarang
2	Karangingas	Jl.Soekarno Hatta-Jl.Dr Cipto-Jl.Brigjend Katamso-Jl.Admodirono-Jl.Singosari Raya-Jl.Sriwijaya-Jl.Veteran-Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati-TPA Jatibarang
	Kaligawe	Jl.Kaligawe Raya-Jl.Raden Patah-Jl.Dr Cipto-Jl.Brigjend Katamso-Jl.Admodirono-Jl.Singosari Raya-Jl.Sriwijaya-Jl.Veteran-Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati-TPA Jatibarang
3	Sawah Besar	Jl.Soekarno Hatta-Jl.Dr Cipto-Jl.Brigjend Katamso-Jl.Admodirono-Jl.Singosari Raya-Jl.Sriwijaya-Jl.Veteran-Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati-TPA Jatibarang
	Siwalan	Jl.Gajah Raya-Jl.Majapahit-Jl.Brigjend Katamso-Jl.Admodirono-Jl.Singosari Raya-Jl.Sriwijaya-Jl.Veteran-Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati-TPA Jatibarang
	MAJT	Jl.Gajah Raya-Jl.Majapahit-Jl.Brigjend Katamso-Jl.Admodirono-Jl.Singosari Raya-Jl.Sriwijaya-Jl.Veteran-Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati-TPA Jatibarang
4	Gempolsari	Jl.Majapahit-Jl.Brigjend Katamso-Jl.Admodirono-Jl.Singosari Raya-Jl.Sriwijaya-Jl.Veteran-Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati-TPA Jatibarang
5	Sambirejo	Jl.Gajah Raya-Jl.Lamper Tengah-Jl.Tentara Pelar-Jl.Sriwijaya-Jl.Veteran-Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati ke TPA Jatibarang
	Tambakrejo	J.Kaligawe Raya-Jl.Raden Patah-Jl.Dr Cipto-Jl.Brigjend Katamso-Jl.Admodirono-Jl.Singosari Raya-Jl.Sriwijaya-Jl.Veteran-Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati-TPA Jatibarang
	Pasar Waru	J.Kaligawe Raya-Jl.Raden Patah-Jl.Dr Cipto-Jl.Brigjend Katamso-Jl.Admodirono-Jl.Singosari Raya-Jl.Sriwijaya-Jl.Veteran-Jl.Kaligarang-Jl.Simongan-Jl.Untung Suropati-TPA Jatibarang

Looking at the results in Table 3, there was a change of waste transport route on the road passed by garbage truck through **Admodirono** Road and **Singosari Raya** Road to go to **Sriwijaya** Street where this path is a road with little roadblock (traffic jam and less traffic light). The distance and time of transporting waste through the efficient routes can be seen in Table 4 below.

Table 4. Distance and Waste Transportation Time After Efficiency

Truck Number	Temporary Disposal Site	Distance (km)	Time (minute)
1	PLTG	26,8	69
	Kimbar	26,65	67
2	Karangingas	33,16	81
	Kaligawe	36,69	90
3	Sawah Besar	35,16	85
	Siwalan	29,63	78
	MAJT	29,61	78
4	Gempolsari	26,6	67
5	Sambirejo	27,68	78
	Tambakrejo	34,49	81
	Pasar Waru	35,46	85

The difference between the distance and time of the truck transport can be determined by comparing the distance and time of the existing route with the distance and time of the efficiency route. The difference between the distance and time of the existing route with the efficiency route can be seen in Table 5 below :

Table 5. Distance and Time Difference After Efficiency

Truck Number	Temporary Disposal Site	Difference	
		Distance (km)	Time (minute)
1	PLTG	0,65	21
	Kimbar	0,65	18
2	Karangingas	1,2	19
	Kaligawe	0,65	20
3	Sawah Besar	0,65	20
	Siwalan	0,92	26
	MAJT	0,9	25
4	Gempolsari	0,5	23
5	Sambirejo	2,14	14
	Tambakrejo	0,68	17
	Pasar Waru	0,68	16

The result of distance and time difference calculation in Table 5 shows that the largest distance difference in truck with number 5 serving TPS Sambirejo to TPA Jatibarang has distance of 2.14 km. While the largest time difference of 26 minutes is on truck number 3 that serves TPS Siwalan to TPA Jatibarang.

3.2.2 Waste Transportation Route at East Semarang Subdistrict

The existing trucking route from the Environment Agency of Semarang City in East Semarang Subdistrict can be seen in the following table:

Table 6. Existing Waste Transportation Route From East Semarang Subdistrict to TPA Jatibarang

Truck Number	Temporary Disposal Site	Route
1	Pasar Rejomulyo	Jl. Pengapon-Jl. Raden Patah-Jl. Widoharjo-Jl. Dr. Cipto-Jl. Kopol Maksum-Jl. Sriwijaya-Jl.Veteran-Jl.Kaligarang, Jl.Simongan-Jl.Untung Suropati-TPA Jatibarang
	Manisharjo	Jl. Raden Patah-Jl. Widoharjo-Jl. Dr. Cipto-Jl. Kopol Maksum-Jl. Sriwijaya-Jl.Veteran-Jl.Kaligarang, Jl.Simongan, Jl.Untung Suropati- TPA Jatibarang
	Pasar Waru	Jl. Kaligawe Raya-Jl. Raden Patah- Jl. Widoharjo-Jl. Dr. Cipto- Jl. Kopol Maksum-Jl. Sriwijaya, Jl.Veteran- Jl.Kaligarang, Jl.Simongan-Jl.Untung Suropati- TPA Jatibarang
2	Pasar Dargo	Jl. Dargo-Jl. Dr. Cipto- Jl. Kopol Maksum- Jl. Sriwijaya- Jl.Veteran- Jl.Kaligarang- Jl.Simongan- Jl.Untung Suropati- TPA Jatibarang
	Pasar Karimata	Jl. Pancakarya- Jl. RA. Kartini- Dr. Cipto- Jl. Kopol Maksum- Jl. Sriwijaya- Jl.Veteran- Jl.Kaligarang - Jl.Simongan-Jl.Untung Suropati, TPA Jatibarang
3	Rumah Pempa	Jl. Barito- Jl. RA. Kartini- Dr. Cipto- Jl. Kopol Maksum- Jl. Sriwijaya- Jl.Veteran- Jl.Kaligarang- Jl.Simongan- Jl.Untung Suropati- TPA Jatibarang
4	Mlatiharjo	Jl. Barito-Jl. Citarum- Jl. RA. Kartini- Dr. Cipto- Jl. Kopol Maksum- Jl. Sriwijaya- Jl.Veteran- Jl.Kaligarang- Jl.Simongan- Jl.Untung Suropati- TPA Jatibarang
5	Karang Tempel	Jl. Barito- Jl. Halmahera Raya- Dr. Cipto- Jl. Kopol Maksum- Jl. Sriwijaya- Jl.Veteran- Jl.Kaligarang- Jl.Simongan- Jl.Untung Suropati- TPA Jatibarang
	Mlatibaru	Jl. Indragiri- Jl. Raden Patah- Jl. Widoharjo- Jl. Dr. Cipto- Jl. Kopol Maksum- Jl. Sriwijaya- Jl.Veteran- Jl.Kaligarang- Jl.Simongan- Jl.Untung Suropati- TPA Jatibarang
6	Tirtoyoso I	Jl. Barito- Jl. RA. Kartini- Dr. Cipto- Jl. Kopol Maksum- Jl. Sriwijaya- Jl.Veteran- Jl.Kaligarang- Jl.Simongan- Jl.Untung Suropati- TPA Jatibarang
	Tirtoyoso IV	Jl. Barito-Jl. Citarum- Jl. RA. Kartini- Dr. Cipto-Jl. Kopol Maksum- Jl. Sriwijaya- Jl.Veteran- Jl.Kaligarang- Jl.Simongan- Jl.Untung Suropati- TPA Jatibarang
	Bugangan	Jl. Barito- Jl. RA. Kartini- Dr. Cipto- Jl. Kopol Maksum- Jl. Sriwijaya- Jl.Veteran- Jl.Kaligarang- Jl.Simongan- Jl.Untung Suropati- TPA Jatibarang

The waste transport route in Table 6 is the usual garbage route passed by garbage trucks from East Semarang Subdistrict to TPA Jatibarang. The distance and waste transportation time of the existing route can be seen in Table 7 below :

Table 7. Distance and Waste Transportation Time For Existing Route in East Semarang Subdistrict

Truck Number	Temporary Disposal Site	Distance (km)	Time (minute)
1	Pasar Rejomulyo	34,4	79,8
	Manisharjo	32,8	81
	Pasar Waru	35	79,2
2	Pasar Dargo	29,4	81
	Pasar Karimata	28,4	87,6
3	Rumah Pempa	28	82,8
4	Mlatiharjo	32,4	79,8
5	Karang Tempel	26	84,6
	Mlatibaru	33,8	79,2

Truck Number	Temporary Disposal Site	Distance (km)	Time (minute)
6	Tirtoyoso I	29,8	83,4
	Tirtoyoso IV	29,6	79,8
	Bugangan	30	86,4

The distance and time in Table 7 is based on the existing route from the Environment Agency of Semarang City. The furthest remaining transport route is on the truck number 1. The distance of haul on the existing route can still be made more efficient by changing the shorter route lanes and fewer traffic constraints. More efficient transport routes can be seen in Table 8 below :

Table 8. Waste Transportation Route in East Semarang Subdistrict After Efficiency

Truck Number	Temporary Disposal Site	Route
1	Pasar Rejomulyo	Jl. Pengapon- Jl. Raden Patah- Jl. Widoharjo- Jl. Dr. Cipto- Jl. Brigjend Katamso- Jl.Admodirono- Jl.Singosari Raya- Jl. Sriwijaya- Jl.Veteran- Jl.Kaligarang- Jl.Simongan- Jl.Untung Suropati- TPA Jatibarang
	Manisharjo	Jl. Raden Patah- Jl. Widoharjo- Jl. Dr. Cipto- Jl. Brigjend Katamso- Jl.Admodirono- Jl.Singosari Raya- Jl. Sriwijaya- Jl.Veteran- Jl.Kaligarang- Jl.Simongan- Jl.Untung Suropati- TPA Jatibarang
	Pasar Waru	Jl. Kaligawe Raya- Jl. Raden Patah- Jl. Widoharjo- Jl. Dr. Cipto- Jl. Brigjend Katamso- Jl.Admodirono- Jl.Singosari Raya- Jl. Sriwijaya- Jl.Veteran- Jl.Kaligarang- Jl.Simongan- Jl.Untung Suropati- TPA Jatibarang
2	Pasar Dargo	Jl. Dargo- Jl. Dr. Cipto- Jl. Brigjend Katamso- Jl.Admodirono- Jl.Singosari Raya- Jl. Sriwijaya- Jl.Veteran- Jl.Kaligarang- Jl.Simongan- Jl.Untung Suropati- TPA Jatibarang
	Pasar Karimata	Jl. Pancakarya- Jl. RA. Kartini- Dr. Cipto- Jl. Brigjend Katamso- Jl.Admodirono- Jl.Singosari Raya- Jl. Sriwijaya- Jl.Veteran- Jl.Kaligarang- Jl.Simongan- Jl.Untung Suropati- TPA Jatibarang
3	Rumah Pempa	Jl. Barito- Jl. RA. Kartini- Dr. Cipto- Jl. Brigjend Katamso- Jl.Admodirono- Jl.Singosari Raya- Jl. Sriwijaya- Jl.Veteran- Jl.Kaligarang- Jl.Simongan- Jl.Untung Suropati- TPA Jatibarang
4	Mlatiharjo	Jl. Barito-Jl. Citarum-Jl. RA. Kartini-Dr. Cipto- Jl. Brigjend Katamso- Jl.Admodirono- Jl.Singosari Raya-Jl. Sriwijaya- Jl.Veteran- Jl.Kaligarang- Jl.Simongan- Jl.Untung Suropati- TPA Jatibarang
	Karang Tempel	Jl. Barito-Jl. Halmahera Raya- Jl. Dr. Cipto- Jl. Brigjend Katamso- Jl.Admodirono- Jl.Singosari Raya- Jl. Sriwijaya- Jl.Veteran- Jl.Kaligarang-

6		Jl.Simongan-Jl.Untung Suropati- TPA Jatibarang
	Mlatibaru	Jl. Indragiri- Jl. Raden Patah- Jl. Widoharjo- Jl. Dr. Cipto- Jl. Brigjend Katamso-Jl.Admodirono- Jl.Singosari Raya-Jl. Sriwijaya- Jl.Veteran- Jl.Kaligarang- Jl.Simongan- Jl.Untung Suropati- TPA Jatibarang
	Tirtoyoso I	Jl. Barito- Jl. RA. Kartini- Dr. Cipto- Jl. Brigjend Katamso- Jl.Admodirono- Jl.Singosari Raya- Jl. Sriwijaya- Jl.Veteran- Jl.Kaligarang- Jl.Simongan- Jl.Untung Suropati- TPA Jatibarang
6	Tirtoyoso IV	Jl. Barito-Jl. Citarum- Jl. RA. Kartini- Dr. Cipto- Jl. Brigjend Katamso- Jl.Admodirono- Jl.Singosari Raya- Jl. Sriwijaya- Jl.Veteran- Jl.Kaligarang- Jl.Simongan- Jl.Untung Suropati- TPA Jatibarang
	Bugangan	Jl.Simongan- Jl.Untung Suropati- TPA Jatibarang

Looking at the results in Table 8, there is a changing of route of waste transportation which is choosing the shortest route by considering the flow of traffic. Shortest route selection is done by cutting the existing path by cutting Jalan Sriwijaya. The shortest route has a difference of one kilometer from the existing route. The distance difference is very good, because it avoids the point of congestion that is in the market area of Peterongan. The distance and time of transporting waste through the efficient route can be seen in Table 9 below :

Table 9. Distance and Waste Transportation Time After Efficiency in East Semarang Subdistrict

Truck Number	Temporary Disposal Site	Distance (km)	Time (minute)
1	Pasar Rejomulyo	33.4	58.8
	Manisharjo	31.8	63
	Pasar Waru	34	60.6
2	Pasar Dargo	28.4	54.6
	Pasar Karimata	27.4	52.8
3	Rumah Pompa	27	51.6
4	Mlatiharjo	31.4	55.2
5	Karang Tempel	25	49.8
	Mlatibaru	32.8	52.8
6	Tirtoyoso IV	28.6	50.4
	Tirtoyoso I	28.8	55.8
	Bugangan	29	54.6

The difference between the distance and time of the truck transport can be determined by comparing the distance and time of the existing route with the distance and time of the efficiency route. The difference between the distance and time of the existing route with the efficiency route can be seen in Table 10 below :

Table 10. Distance and Time Difference in East Semarang Subdistrict After Efficiency

Truck Number	Temporary Disposal Site	Difference	
		Distance (km)	Time (minute)
1	Pasar Rejomulyo	1	21
	Manisharjo	1	18
	Pasar Waru	1	18.6
2	Pasar Dargo	1	26.4
	Pasar Karimata	1	34.8
3	Rumah Pompa	1	31.2
4	Mlatiharjo	1	24.6
5	Karang Tempel	1	34.8

Truck Number	Temporary Disposal Site	Difference	
		Distance (km)	Time (minute)
6	Mlatibaru	1	26.4
	Tirtoyoso I	1	27,6
	Tirtoyoso IV	1	29,4
	Bugangan	1	31.8

The result of distance and time difference calculation in Table 10 shows the result of the same distance difference, which is 1 km on all garbage trucks. While the largest time difference of 34.8 minutes is on trucks number 2 and number 5 that serve TPS Pasar Karimata and TPS Karang Tempel to TPA Jatibarang.

Conclusion

The existing condition of waste transportation system in Gayamsari and East Semarang Subdistricts can still be improved because the percentage of waste transportation service only reaches about 79%. Effective and efficient waste transport system services are carried out with the change of shorter haulage routes and less traffic constraints, with the selection of the route with the consideration of traffic flow that is not crowded and wide access road. The shortest route and the fastest time selection is the first step to start a better waste transport system in these two districts.

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