

The Analysis Performance of Solid Waste Management at Tomohon City Indonesia

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Abstract: *The increasing amount of population along with various activities in Tomohon City causes the amount of waste to increase. Therefore, it requires the performance study of waste management. This research aims to analyze the waste management performance against production volume and waste service reach, normative standard, and public perception or opinion in Tomohon City. The research method utilizes action research approach, combined with observation based data collection and solid interview. As for society perception study, sample determination uses Stratified Random Sampling from Slovin formula. Sample dispersion to acquire data from respondent is performed by sampling incidental. The research outcome shows that waste production in Tomohon, based on total residents, reaches 236,55 m³/day while the ideal waste service rate supposedly transported for residential area and non residential area is 129,11 m³/day. transported waste up to now reaches 78 m³/day, therefore the performance of waste management only reaches 60,41%. Analysis of personnel and devices of waste management shows imbalance out of existing condition and analysis outcome. According to public opinion, waste management performance analysis is less favorable, unsuitable to public expectation and satisfaction. Waste management performance according to public perception is at the average score of 2,47. This matter shows that the performance of waste management is yet entirely effective. Low waste management performance is caused by less optimized waste transporting devices, very few waste collector force, and quite a number of society members paying less concern toward waste management.*

Key words: *Waste Production, Waste Service, Public Perception.*

I. Introduction

Population growth is very influential to waste volume consumed by public. Waste produced by urban society, either in residential or non residential area in Tomohon City up to now, starts presenting negative impact. It is notable that there are waste pilling on public street and public acces, empty land sites, drains including around “Beriman” market complex as the shopping center for Tomohon City society.

Environmental issue generally occurs in urban area is poor urban waste management. Waste as leftover of human activities must be well managed to avoid it from causing various issues to human lives as well as to obstruction on environment such as pollution, disease spreading, aesthetic degrading, and germs carrier. Waste management among cities in Indonesia up to now has not reached optimum result. Many obstacles are still get in the way in performing such waste management, either obstacle in economy, social and culture, as well as application of technology (Nuryani, et al, 2003).

Issue of waste management becomes intense in urban area due to its occurring complexity and high amount of population rate, therefore waste management is oftenly prioritized to handle in urban area. The problem oftenly appears in handling the keep rising waste management is the high operational cost and it is more difficult to find appropriate space for dumping site, that’s why bad impact towards the environment oftenly occurs while managing urban waste (Himawanto, et al, 2010). On the other hand, attitude and lifestyle of the community tend toward the acceleration of waste occurrence that burdens the cleaning service management. Limitedness of resource, budget, and waste dump vehicle causes the cleaning service management is yet to be capable to handle all produced waste. The keep rising population growth plus more consumptive lifestyle are definitely followed by the increasing of waste production (Praditya, 2012). On of the approach towards the community in order to assist government program concerning sanitation is to accustom the community toward the behavioural conduct appropriate to waste program, that is by changing the community perception considering orderly swift and prevalent waste management, and by changing the community habit considering poor waste management and factors of social, structure, and local culture.

The current population of Tomohon City is 95.111 people comprising 48.528 males and 49.583 females that are spread out in five subdistrict and 44 villages; population growth per year is 3,31% since 2000 (Anonim, 2012). City population keeps generating massive burdens to Tomohon City during the preparation of new infrastructure in the field of education, health, and other service, therefore this circumstance is as well providing more burdens to city administration. The keep rising population followed by more advanced city activities generates impact of massively increasing and varying waste/dump (Leuhery, 2011). Waste management service that is also included in public service aims to serve the community on every waste management conducted. Waste management service requires a well performance so that waste management system runs effectively and efficiently as well as providing satisfaction for the public (Hartanto, et al, 2009). Public perception is extremely needed toward an ordered swift and prevalent solid waste management (trash), factors of social, structure, and local culture as well as habit in waste management (Aryenti, 2011). Nevertheless, urban waste handling oftenly becomes ineffective as the result of government inavailability concerning the cost, amount of personnel as well as amount of available devices (Himawanto, et al, 2010).

Research on waste management based on public perception is performed by (Yogiesti, et al, 2010) to identify waste characteristics and operational performance within the perception and preference of Kediri City community by building composter units. (Sartika, 2010) states that the implementation of the designed management model much depends on public attitude in treating the waste. Long range strategy that involves full public participation in managing household waste has been pioneered by environment concerned community group (Surjandari, et al, 2009). In addition, the aspect of public participation in waste management prospect that is viewed from public perception is very good for environment aesthetic as well as the involvement in socialization towards the public (Saribanon, et al, 2009). It is also required to identify the existence of solid waste system in determining the needs, establishing the procedure to perform and monitor the more effective and sustainable waste management program (Katonika, 2009). It is also stated that the improvement of public service must be performed by waste transportation management system refinement that is based on time, route, and amount of armada. If the transportation system refinement can be performed, then hopefully the performance of waste transporting can provide assistance in handling the issue of waste pilling (Pratama, et al, 2012).

This research aims to analyze the performance of waste management against production volume and waste service reach, normative standard, and public perception or opinion in Tomohon City. This matter tends to be basic consideration of Tomohon City Administration, particularly to Board of Landscapes, Parks, and Wastes to improve the system of waste management and countermeasure.

II. Research Method

This research utilizes action research method where this method aims to develop the most efficient work method (Sugiyono, 2011). Data analysis process is conducted by quantitative descriptive approach. This research data are primary and secondary data. Primary data are acquired from City Board of Landscapes, Parks and Wastes of Tomohon City through UPT (Technical Performance Unit) for Wastes as well as from Statistic Center Agency of Tomohon City that is related to waste management of Tomohon City through observation and interview. The secondary data are processed or analyzed primary data. This data is in forms of tables outlining and explaining the existing condition of waste management in Tomohon City. This secondary data are acquired from the public and waste/cleaning service staff related to waste management on research location.

III. Data Analysis Method

- 1. Analysis on waste production volume and waste service reach.** To reach the waste service reach in Tomohon City, Indonesian National Standard analysis is employed, where the rate of occurrence for small city is 2,5 – 2,75 liters/person/day or 0,625 – 0,70 kg/person/day (SK SNI S-04-1993-03). Determination on service reach is based on minimum density region of 50 people/ha.
- 2. Waste management performance analysis based on normative standard.** In analyzing performance rate of waste management in Tomohon City quantitatively, it can be viewed by analyzing the occurrence of transported waste, amount of serviced population and population density in each subdistrict. Analysis on serviced population is oriented on the amount of population within developed area. Analysis on serviced region width is based on developed region width. The method used is quantitative descriptive analysis technique to build a description toward a certain condition objectively by being compared to normative standard or ideal condition (Sugiyono, 2011).

This research is conducted to compare normative standard as well as ideal condition, so the waste management performance can be viewed vividly (Hartanto, et al, 2009). This matter is to differ with previous research, such as research from (Jafari and Mirhousaini, 2010) concerning waste management viewed from public point of view, or research conducted by Fitria (Fitria and Suprayogi, 2009) examining determination of waste collecting and transporting truck route by employing Vehicle Routing Problem.

3. Study on waste management performance based on public perception. Study on waste management performance in Tomohon City based on public perception utilizes quantitative descriptive analysis technique (Sugiyono, 2011). This technique is utilized to ascertain the waste management performance based on public perception. The performance assessment is by the following indicators, (1) cleanliness condition on main road, cleanliness on drainage, cleanliness on market area, city park and stores area, cleanliness on garbage dump site, (2) facilities condition on garbage dump site, collector tools condition, amount of collector tools, time/frequency of transporting, condition of transporting vehicle, (3) condition of cleaning service staff on quality of cleaning service staff and amount of cleaning service staff, (4) response on complaints.

The population of this research is families with entire symptoms, natures, and characteristics of waste management from their households in five subdistricts with the total families of 19.009 (Anonim, 2012). The sampling is determined by stratified random sampling that is grouped based on source of waste. The amount of sampling measure required is calculated by using Slovin formula (Umar, 2003) as follows:

$$n = \frac{N}{Nd^2 + 1} = \frac{19.009}{(19.009 \times (0,1)^2) + 1} = 99,48 \text{ rounded to } = 99 \text{ samples}$$

Where: n = sampling measure, N = population measure, and d = level of significant is determined 10 %. Sampling in this research can be seen on Table 1.

Table 1. Measure Of

No.	Subdistrict	Population		Sample Amount
		Amount	Proportion	
A. Residence				
1.	Tomohon Selatan	3.461	0,1821	18
2.	Tomohon Tengah	2.223	0,1169	12
3.	Tomohon Barat	4.335	0,2280	23
4.	Tomohon Timur	2.786	0,1466	15
5.	Tomohon Utara	2.329	0,1225	12
B. Non Residence				
1.	Tomohon selatan	867	0,0456	5
2.	Tomohon Tengah	695	0,0366	4
3.	Tomohon Barat	889	0,0468	5
4.	Tomohon Timur	731	0,0385	4
5.	Tomohon Utara	693	0,0365	4
Total		19.009	1,0000	99

Each Sub Sample According To Work Part/Unit (n = 99)

Source: (Anonim, 2012) and Calculation Result, 2013.

Sample spreading is as the measure of each sample (table 1), then sampling incidental technique is performed to acquire data from respondents.

Furthermore “Likert Scale” is employed in data analysis by establishing scale and scoring (Sugiyono, 2011). The scale within the research uses interval 1 to 4, they are poor (1), less good (2), quite good (3), and good (4). According to (Simamora, 2004), in order to deal with fraction number, numeric scale is elaborated by finding the scale range (RS) with the following formula:

$$RS = \frac{m - n}{b} = \frac{4 - 1}{4} = 0,75 \text{ (Simamora, 2004)}$$

Along with the range of 0,75, then the numeric scale is (1) Poor/bad: 1 to 1 + 0,75 = 1 – 1,75, (2) Less good: > 1,75 to 1,75 + 0,75 = > 1,75 – 2,5, (3) Quite good: > 2,5 to 2,5 + 0,75 = > 2,5 – 3,5 and (4) Good: > 3,25 to 4 = >3,25 – 4.

IV. Result And Discussion

Waste Production Analysis and Waste Service Reach in Tomohon City

Waste production analysis is performed by Indonesia National Standard (SNI) analysis to find out the amount of waste production generated, either from residential or non residential area. Waste service reach analysis is performed to find out which subdistrict needs waste service according to waste production generated and its population density.

Waste production in Tomohon City can be calculated based on total population multiplied by the amount of average waste occurrence per person per day. Average waste occurrence per person per day according to SK SNI S-04-1993-03 concerning waste occurrence on small city and medium city in Indonesia is 2,5 – 2,75 liter/person/day. the amount of waste occurrence of a city is determined by several factors such as population growth, community social activities and income per capita (Wardhana, 2007).

The current population of Tomohon is 95.111 people (Anonim, 2012) with the assumption on waste occurrence of 2,5 liters/person/day (SK SNI S-04-1993-03), then waste production in Tomohon City sourced

from residential area reaches 236,55 m³/day. The amount of waste production detailed in every subdistrict for research sampling in Tomohon City is shown on Table 2.

Table 2. Waste Production in Tomohon City

No.	Subdistrict	Total Population (people)	Area Width (Ha)	Developed Width (Ha)	Net Density (people/Ha)	Waste Production (M ³ /day)
1.	Tomohon Utara	26.874	3.223,00	768,45	346	67,18
2.	Tomohon Selatan	22.672	3.097,27	794,25	342	56,69
3.	Tomohon Tengah	18.771	2.740,00	556,95	300	46,95
4.	Tomohon Barat	15.863	3.088,00	472,65	269	38,40
5.	Tomohon Timur	10.931	1.187,00	265,95	198	27,33
Total		95.111	13.335,27	2.858,25		236,55

Source: (Anonim, 2012) and Calculation Result, 2013.

Waste production generated by each subdistrict according to Table 2 shows that subdistrict of Tomohon Utara generates the most waste production for 67,18 m³/day, followed by Tomohon Selatan subdistrict for 56,69 m³/day, Central Tomohon subdistrict for 46,95 m³/day, Tomohon Barat subdistrict for 38,40 m³/day, the least one is Tomohon Timur subdistrict for 27,33 m³/day. total production of waste generated in Tomohon City is 236,55 m³/day.

Waste Management Performance Analysis based on Normative Standard

Quantitative waste management performance can be measured by on waste service rate, that is the transported waste occurrence, amount of serviced residents, serviced area width, amount of personnels, and waste management devices.

The amount of transported waste in Tomohon City can be acquired from observation on field toward waste transport operational vehicle heading to Final Dump Site (TPA) in Taratara. Based on field observation and interview with cleaning service staff, currently there are five unit of Dump Truck volume 8 m³ and 1 Arm Roll Truck volume 6 m³ in order to handle waste in Tomohon City. There are 4 Dump Truck in Tomohon City, each of which operating 2 round trip every day, whilst on Sunday there's only 1 Dump Truck operating in 1 round trip.

Arm Roll Truck vehicle operates in 1 round trip per day, similar to Dump Truck for transporting waste in residential and non residential area, and the collection of waste inside the container is performed by Arm Roll Truck and the transport is once a day. According to such data, it's been analyzed that the amount of transported waste to Taratara Final Dump Site in average every day is 78 m³. Based on the result of the analysis and according to data from Board of Landscapae, Parks and Wastes of Tomohon City, the complete calculation can be seen on Table 3.

Table 3. Amount of Transported Waste to Final Dump Site

No.	Transporting Vehicle	Round Trip/day	Volume (m ³)	Work day per month	Volume of transported waste	Notes
1	Dump Truck (DB 8005 GM)	2	8	26	416	Except Sunday
2	Dump Truck (DB 8013 GM)	2	8	26	416	Except Sunday
3	Dump Truck (DB 8014 GM)	2	8	26	416	Except Sunday
4	Dump Truck (DB 8029 GM)	2	8	26	416	Except Sunday
5	Dump Truck (DB 8012 GM)	1	8	26	208	Except Saturday
6	Armroll Truck (DB 8004 GM)	1	6	26	156	Except Sunday
					Transported waste every month	2.028
					Transported waste every day	78
					Total of transported waste with compaction factor assumption (1,5)	117

The amount of transported waste as shown on Table 3 is wasted from current service area that comprising residential and non residential are of five subdistricts, where the transported waste every day is 78 m³.

Parameter or measuring point used as base point to find out how far the waste management service rate is, is determined based on waste service priority standard, that is population density rate and service importance scale. According to P3KT in (Waluyo, 2003), the criterias to determine waste service are:

- 1) Residential area
 - Area with population density of > 150 people/ha requires 100 % service rate.
 - Area with population density of 100 – 150 people/ha requires 75 % service rate.
 - Area with population density 50 – 100 people/ha requires 50 % service rate.
- 2) Commercial areas generally requires 80 % waste service rate, shortcut road and parks require 100 % service rate, and markets must have 100 % service rate.

According to the above standard, then up to 5 districts comprised for waste service (Table 2), while in Table 4. It is spelled out in detail the ideal waste service rate for Tomohon City according to calculation result based on normative standard.

Table 4. Ideal Condition of Waste Service Rate of Tomohon City

No.	Subdistrict	Total Population (People)	Developed Width (Ha)	Population Density (People/ha)	Service Rate (%)	Serviced Population (people)	Service Volume (m3/day)
1	Tomohon Selatan	22.672	794,25	340	50	11.340	28,48
2	Tomohon Tengah	18.771	556,95	300	50	9.387	23,48
3	Tomohon Utara	26.874	768,45	346	50	13.441	33,62
4	Tomohon Barat	15.863	472,65	260	50	7.944	19,86
5	Tomohon Timur	10.931	265,95	198	50	5.466	13,67
Total		95.111	2.858,25			47.578	119,11

Source: (Anonim, 2012) and Analysis Result, 2013

Based on Table 4, area with population density rate of 50 – 100 people/ha requires 50 service rate (Waluyo, 2003). From Table 4, it is as well found out that the average service rate for residential waste that is supposed to be transported is 119,11 m3/day. Beside residential waste, the amount of transported non residential waste is estimated to be 10 m3/day by referring to interview result with Waste UPT (Technical Performance Unit) of Board of Landscapes, Parks and Wastes of Tomohon City. The total waste production that is supposed to be transported to TPA is 129,11 m3/day. If it is compared to waste occurrence currently available to be transported to TPA Taratara, which is 78 m3/day, then it is possible to find out the waste service rate of Tomohon City, which is $(78/129,11) \times 100\% = 60,41\%$. From such calculation, it is to be concluded that the performance of waste service quantitatively in Tomohon City reaches 60,41%. Along with such quite high waste service rate, it can be concluded that the serviced area has been well served.

From Table 4, the developed area width in Tomohon City is 2.858,25 ha, while based on waste service, the waste service area that comprises 5 subdistricts has 2.858,25 ha of developed area width. Analysis of serviced area width is about the area that has acquired waste service with developed area width of 2.858,25 ha. From such data, the percentage of service area is $(2.858,25/2.858,25) \times 100\% = 100\%$.

Based on the above calculation, then it can be concluded that the result of waste management performance in Tomohon City is as on Table 5.

Table 5. Waste Management Performance in Tomohon City

No.	Parameter	Ideal (Analysis Result)	Existing	Achievement Percentage
1	Transported Waste	129,11 m3/day	78 m3/day	60,41%
2	Serviced Area Width	2.858,25 ha	2.858,25 ha	100,00%

Source: Analysis result, 2013.

Based on analysis on Table 5, then the performance of waste service in Tomohon City reaches 60,41% or in other words it hasn't reach the target according to government standard of good waste management service priority scale.

The performance of waste management in Tomohon City basically can be analyzed from inter supporting and interacting components. One of the factor that put impact on performance result is the number of waste facilities and number of personnel. Number of waste facilities in Tomohon City currently comprises 5 Dump Truck, 1 Arm Roll Truck, 4 Waste Motor and one waste container. The number of cleaning service staff in Tomohon City currently comprises 35 sweeper or waste collector, and 46 transporters.

According to SK SNI T-12-1991-03, the need of tools as well as personnel in waste management for every 2.000 houses is 16 Waste Motor, one Dump Truck or one Arm Roll Truck with 3 containers. The number of personnel required for waste collector is 16 people and 8 people as transporters. Based on waste service in Tomohon City, the target for serviced residents is 47.578 (Table 4). If every house has 5 family members in average, then the amount of houses in Tomohon City that are supposed to be serviced is $47.578/5 = 9.515,6$ or rounded to be 9.516 houses. The number of personnel and number of waste management tools in Tomohon City can be analyzed as follows.

1. If every 2.000 houses need 16 waste collectors, then for 9.516 houses need waste collectors of $(9.516/2.000) \times 16 = 76$ people. The amount of collectors or sweepers currently is 35 people and 4 motor drivers. This amount only reaches 45,05% whilst the amount of collecting tools of Waste Motor is 4 units, then the achievement rate is $(4 \text{ people}/76 \text{ people}) \times 100 = 5,26\%$. The amount of waste motors is supposed to be $(9.516/2.000) \times 4 = 19,03$ motors.

2. Every 2.000 houses require 8 people as waste transporters, then in order to service 9.516 houses, it needs $(9.516/2.000) \times 8 = 38$ people. The transporters currently exist is 46 people, then it can be concluded that currently it reaches $(46/38) \times 100 = 121,05\%$.
 3. The amount of waste transporter vehicles for every 2.000 houses is 1 Arm Roll Truck with 3 containers. Therefore, along with the service priority of 9.516 houses, then it needs 5 Arm Roll Truck along with 14 containers. The amount of Arm Roll Truck currently existing in Tomohon City is 1 unit with 1 unit of container. Therefore the achievement rate is $(1/5) \times 100 = 20\%$ for Arm Roll Truck, and as for the container it reaches $(1/14) \times 100 = 7,14\%$.
 4. The need for Dump Truck for every 2.000 houses is one unit, therefore in order to service 9.516 houses it requires 5 units of Dump Truck. The amount of Dump Truck currently existing is 5 units, therefore so far it reaches 100%.
- Percentage result of waste tool providing and number of cleaning service staff can be seen completely on Table 6.

Table 6. Analysis on Personnel Number and Waste Management Tools

No.	Personnel and Type of Tool	Existing Condition	Ideal (Analysis Result)	Percentage
1	Waste transporters	46	38	121,05
2	Dump Truck	5	5	100,00
3	Waste collectors on roads	35	76	46,05
4	Collector tool (Waste Motor)	4	19	21,05
5	Transport Vehicle (Arm Roll Truck)	1	5	20,00
6	Container	1	14	7,14

Source: Analysis Result, 2013.

From the analysis result on this Table 6, it can be concluded that the amount of waste transporters is excessive, that is 121,06%. This result shows that the amount of waste transporters needs to be reduced for as many as 8 people. As for waste transport vehicle (Dump Truck), it is relevant to the analysis result, that is 100 %, so additional waste transport vehicle is unnecessary. Waste collectors based on analysis is 46,05% and the analysis result shows the necessity for additional waste collectors of 39 people. The collector tool (Waste Motor), based on the analysis, is 21,05%. It ideally needs addition for as many as 15 units of waste motors to ease in reaching waste collection and transport. The transport vehicle (Arm Roll Truck), based on analysis, is 20,00%. It's ideally needs addition of 4 units. The container, based on analysis, is 7,14%, its ideal condition is supposed to be 5 units, therefore it needs addition of 4 units.

Up to now, the activity of waste transporting uses 5 units of Dump Truck and 1 units of Arm Roll Truck and each has more than one transporting route. From the existing condition, time period of waste transport vehicle from the residence and waste dump site (TPS) to the Final Dump Site (TPA) Taratara, out of ± 13 km of distance, is approximately 6 hours on each round trip. The ideal/effective average speed condition will be different on different area (Maryono and Wahyudi, 2007). Based on observation result on waste vehicle, every Dump Truck only operates 1 round trip per day within Dump Truck work hours from 04.00 WITA to 10.00 WIT, therefore it's difficult to operate more than one round trip.

By considering such condition, transport pattern arrangement can still actually be conducted, so that every Dump Truck can operate 2-3 round trip. This matter can be conducted by adding collectors armada and additional waste dump site (TPS) and transport frequency, so the transport by using Dump Truck becomes more efficient and effective. Waste pattern transport by Arm Roll Truck follows the same route as Dump Truck along with container existing in ex rindam office complex. This matter shows that waste transport with Arm Roll Truck is insufficient since its transport pattern is still door to door, whereby every Arm Roll Truck is capable to provide service for 3-4 containers every day.

From the above condition, it can then be concluded that the amount of 5 Dump Truck and 1 Arm Roll Truck causes operational waste transport service reach becomes quite high, that is 2-3 round trip per day, however on the other side the frequency is quite long.

Waste Management Performance Analysis Based on Public Perception: Aspects analyzed in this research as shown on Table 7 to Table 11 is cleanliness condition, facilities, personnel and customer complaints. Public perception analysis toward waste management performance is conducted by average point/score calculation acquired from variables of cleanliness condition, facilities condition, cleaning service staff, and response on waste service complaints. The result of scoring in each table is performed based on scoring interval of Likert Scale (Sugiyono, 2011).

1. Cleanliness Condition

Cleanliness condition as performance indicator of waste management is performed by sweeping staff, collection staff, and waste transport staff, and comprising the condition on main roads, drainage system, markets and

stores, as well as condition on Waste Dump Site (TPA). Cleanliness condition according to public perception is shown on Table 7.

Table 7. Public Perception on Cleanliness Condition

Cleanliness Condition	Score	Sample Frequency	Percentage	Scoring value
Dirty	1	16	15,91	0,16
Less clean	2	35	35,61	0,71
Quite clean	3	37	37,37	1,12
Clean	4	11	11,11	0,44
Total		99	100,00	2,44

Cleanliness condition on main roads in Tomohon City according to public perception: 37,37% respondent state it is quite clean, 35,61% respondent state it is less clean, 15,91% respondent state it is dirty, and 11,11% respondent state it is clean.

According to Table 7, score calculation of public perception toward cleanliness condition on main roads is 2,90 for the total score, then based on numeric scale it is within the category of less good. From interview result with cleaning service staff, main roads such as Tomohon-Manado main road and stores area acquire waste collection service every day. Besides, sweeping is applied on main roads every day, which makes the cleanliness condition on these main roads is quite clean. Community uses the drainage system as place for dumping waste, that’s why it seems that the drainage system is less clean. Its indication is the drainage in sidewalk of Walian Satu village frequently corked when rainfall volume is quite high. Cleanliness condition on surrounding areas of markets, city park and stores show that there are still many pilling wastes. The less clean TPS condition affects the waste transport performance. Based on observation on cleanliness condition, there are still many less clean TPS showed by the hampered garbage outside the TPS. Some part of community still dump the waste out of the applied provisions, the waste is not put inside the TPS, it is put outside instead. With such condition, waste on TPS can not be directly removed and it takes longer time since the staff has to clean and put in all waste inside the TPS. This matter causes the time for waste transporting by Arm Roll Truck or Dump Truck becomes longer and it is therefore inefficient.

2. Condition of Facilities

The assessment on waste management based on condition of facilities comprises: amount of TPS, time of waste collection, condition of waste collection tools, amount of waste collection tools, and frequency of waste transport. Public perception on TPS condition is shown on Table 8.

Table 8. Public Perception on Facilities Condition

Condition of Waste Facilities	Score	Sample Frequency (people)	Percentage	Scoring value
Poor	1	13	13.01	0.13
Less Good	2	36	36.62	0.73
Quite Good	3	39	38.89	1.17
Good	4	11	11.49	0.46
Total		99	100.00	2.49

It is to conclude that the condition of waste facilities in Tomohon City according to public perception is: 38.89% respondent state that it is less good, 36.62% respondent state it is quite good, 13.01% respondent state that it is poor, and 11.49% respondent state that it is good.

Based on Table 8 the total score acquired from scoring of people perception toward waste facilities is 2.49%, then according to numerical scale it is in the category of less good. Based on field observation, many TPS are damaged and their existing allocation is still insufficient, only in several areas, which means its allocation is insufficient to its function. Based on field observation, time for waste collection is conducted once in 2-3 days, except for stores area it is conducted every day. Besides, there still many community members that have not acquire regular waste service. Concerning the providing of waste collection tools, according to the observation and public interview, there are many waste service not evenly applied, particularly on location with narrow road.

However, the condition of waste collection tools are still in good shape without any damage that could cause obstruction during waste collection. Generally, waste collection tools either Waste Motor, Dump Truck and Arm Roll Truck are still less than 10 years old and under regular maintenance by Board of Landscapes, Parks and Wastes of Tomohon City.

3. Condition of Cleaning Service Staff

The balance between amount of serviced residents and amount of personnel or cleaning service staff is very required in waste management. Besides, it needs to be supported by personnel ability in providing waste service

to the community. The work assessment indicators for cleaning service staff are the quality of cleaning service staff as well as amount of existing cleaning service staff.

Public perception toward the ability of cleaning service staff is shown on Table 9.

Table 9. Public Perception Toward The Condition of Cleaning Service Staff

Condition of Cleaning Service Staff	Score	Sample Frequency (people)	Percentage (%)	Scoring value
Poor/unhandy	1	11	11.11	0.11
Less good/less handy	2	32	31.82	0.64
Quite good/quite handy	3	45	45.45	1.36
Good/handy	4	12	11.62	0.46
Total		99	100.00	2.58

Public perception toward condition of cleaning service staff is: 45.45% respondent state quite good/quite handy, 31.82% respondent for less good/less handy, 11.62% state good/handy, and 11.11% state poor/unhandy.

Based on Table 9, the scoring from public perception toward condition of cleaning service staff reaches a total score of 2.58, then according to numerical scale it is in category of quite good. Based on interview with cleaning service staff on residential area, most of them perform waste collection on shortcuts and other places with rotation system. Such condition causes there isn't any cleaning service staff handling waste of the residential area. Besides, the amount of waste collection tools, only 4 units of waste motors, is very insufficient, causing waste service reach very limited (Utami and Dharmawan, 2008).

4. Response on Waste Service Complaints.

Service on public complaints and objections is one form of public service in order to increase waste management performance. Therefore in order to serve maximally, there must be a sensitive response from the government concerning complaint service (Irman, 2005).

Public perception toward response on public complaints concerning waste service is shown on Table 10.

Table 10. Public Perception toward Response of Waste Service Complaint

Response on Waste Service Complaint	Score	Sample Frequency (people)	Percentage (%)	Scoring Value
Slow	1	25	25.25	0.25
Less Rapid	2	36	36.36	0.73
Quite Rapid	3	26	26.26	0.79
Rapid	4	12	12.12	0.48
Total		99	100.00	2.25

Public perception toward response of waste service complaint is: 36,36% respondent state less rapid, 26,26% respondent state quite rapid, 25,25% respondent state slow and 12,12% state rapid.

According to Table 10, scoring calculation on public perception toward response of waste service complaint reaches a total score of 2,25, then based on numerical scale it is in the category of less good/less rapid. This matter occurs because not all complaints presented to the government are provided with rapid response.

Performance of waste management in Tomohon City according to public perception for each of the variable within this research can be presented on Table 11.

Table 11. Public Perception Toward Performance Indicator of Waste Management in Tomohon City

No.	Variables	Average Score	Category
1.	Cleanliness condition on main roads, drainage, markets area, city park and stores area and TPS	2.44	Less Good
2.	Condition of facilities (Condition of TPS, amount of TPS, TPS allocation, waste collection time, condition of waste collection tools, condition of waste transport vehicle)	2.49	Less good
3.	Condition of cleaning service staff (quality and amount of cleaning service staff)	2.58	Quite good
4.	Response on waste service complaints	2.25	Less good
		2.44	Less good

Waste management performance in Tomohon City within numeric range of scale is at the scale of less good that is 2.44. However the condition of cleaning service staff is at the scale of quite good that is 2.58, while condition of cleanliness, facilities, and complaints on waste service from the public are at the category of less good. Therefore, there must be escalation on quality and quantity of cleanliness condition, waste collection tools, time/frequency of transport, waste transport vehicle condition and quality of cleaning service staff (Sudiran, 2005).

V. Conclusion

1. Waste production volume in Tomohon City compared to the amount of population is 236.55 m³/day. Along with the rapid population activities, it is necessary to provide a maximum waste management service.
2. Total production of residential and non residential waste that is supposedly transported or serviced is 129,11 m³/day. The amount of existing waste occurrence ready to transport up to now is 78 m³/day, therefore the performance on waste transport reaches 60,41%. With such condition, the performance of waste transport is still ineffective.
3. Waste management performance according to public perception is at the average score of 2.44. Based on numerical scale, this matter is at less good scale range. This matter shows that waste management performance isn't entirely effective.

From those factors, it can be concluded that the low performance of waste management in Tomohon City is caused by the less optimized waste management system.

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