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## Waste Management Analysis Of South Tangerang City (Alternative Review of Solving Waste Management Problems in Urban Areas)

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### Abstrak

Kota Tangerang Selatan sebagai kota Otonom yang terbentuk pada tahun 2006 terus melakukan pembangunan di berbagai bidang. Aktivitas perekonomian Kota Tangerang Selatan yang berkembang baik turut menyebabkan peningkatan jumlah sampah yang di hasilkan dari kegiatan masyarakat selain itu juga di tambah dengan pertumbuhan penduduk. Masalah kebersihan terutama persampahan masih menjadi masalah yang serius di Tangerang Selatan. Tanggung jawab pengelolaan sampah bukan saja berada pada pemerintah tetapi juga menjadi tanggung jawab masyarakat. Setiap orang bertanggung jawab dalam pengelolaan sampah rumah tangga atau sejenis sampah rumah tangga wajib melakukan pengurangan atau pengangan sampah dengan cara yang berwawasn lingkungan.

Kata Kunci: *Pengelolaan Sampah, Sampah, Wawasan Lingkungan*

### Abstract

South Tangerang City as an Autonomous city formed in 2006 continues to develop in various fields. The well-developed economic activities of South Tangerang City have also caused an increase in the amount of waste generated from community activities in addition to population growth. Hygiene problems, especially garbage, are still a serious problem in South Tangerang. The responsibility of waste management is not only with the government but also the responsibility of the community. Everyone responsible for managing household waste or a type of household waste is obliged to reduce or handle waste in an environmentally mindful way.

Keyword: *Environmentally Mindful Way, Waste, Waste Management.*

## INTRODUCTION

South Tangerang City as an Autonomous city formed in 2006 continues to develop in various fields. The well-developed economic activities of South Tangerang City have also caused an increase in the amount of waste generated from community activities in addition to population growth. South Tangerang City is famous for its culinary tourism, this can be seen from the growth of places to eat that increased before the Covid 19 pandemic, namely between 2019 – 2020 there was an increase in the tourism sector (Artika & Chaerul, 2020). This tourism activity in addition to improving the economy of the city of South Tangerang also contributes to waste generation. The rate of population growth based on BPS data increased in 2019 by 1.33%, but when the Covid-19 pandemic entered, the population growth was stable at 0.47%.

Table 1: Total Population of South Tangerang City in 2019-2021

Year	Number of Inhabitants	Growth rate (%)
2019	1.279.052	1,33
2020	1.354.350	0,47
2021	1.365.688	0,47

Source: BPS Kota Tangerang Selatan

Hygiene problems, especially garbage, are still a serious problem in South Tangerang. The responsibility of waste management is not only with the government but also the responsibility of the community. Everyone responsible for managing household waste or a type of household waste is obliged to reduce or handle waste in an environmentally mindful way (Wildanurrizal, 2014). Local governments are tasked with ensuring the implementation of good and environmentally sound waste management.

According to South Tangerang City Regional Regulation No.3 of 2013 article 27 that waste processing is carried out by changing the characteristics, composition and amount of waste carried out at TPST and / or TPA. This is to reduce waste generation that occurs in the landfill. Currently, the city of South Tangerang has a Cipeucang landfill which has a capacity of 300-400 tons, while the waste transported to the Cipeucang landfill reaches 500-950 tons per day. This leads to uncontrolled waste generation. The location of the Cipeucang landfill that is not in accordance with the designation, which is on the edge of the Cisadane River, causes river water pollution. The high generation of garbage caused landslides into the Cisadane river body in 2020, causing pollution of the Cisadane river which is used as raw water for PDAM South Tangerang. To deal with waste generation at the Cieucang landfill, the South Tangerang City Government plans to build a Waste Power Center (PLTSa) which is expected to reduce waste generation and can also be used by local residents, especially residents affected by pollution every day (Armadi et al., 2020).

Table 2: The amount of waste produced by South Tangerang City

Year	Daily Garbage Generation (tons)	Annual Waste Generation (tonnes)
2019	1.031,26	376.411,56
2020	1.070,56	390.753,87
2021	972	354.780
TOTAL	3.073.83	1.121.945,43

Source: <https://sipsn.menlhk.go.id/sipsn/public/data/timbulan>

The high generation of waste produced compared to the capacity of the Cipeucang landfill which is only able to accommodate 400 tons per day, good waste management is needed which is supported by improvements and improvements in waste management facilities and infrastructure. This will have an impact on financing which will certainly increase as well (Darmawan et al., 2020). By using Causal Loop Diagram that relates the number of population, the role of the government and waste generation is expected to explain the management system in the city of South Tangerang so that the main problems in waste management in the city of South Tangerang can be known.

Some of those related to waste management in South Tangerang include:

1. The population of South Tangerang city with an insignificant increase but still affects the amount of waste generation, which produces and participates in managing waste.
2. The South Tangerang city government as a policy maker influences the establishment of programs for waste management.
3. DLH South Tangerang city as a party that manages waste from transportation to management from the beginning to the landfill is included in the management of the Waste Bank.
4. Volume of waste and availability of landfill.

The volume of waste is the amount produced from community activities

The availability of landfill land is the capacity of landfill land capable of accommodating waste from the city of South Tangerang.

## RESEARCH METHOD

The problem of waste management in South Tangerang City is influenced by various complex variables. The problem of garbage accumulation is a shared responsibility between the government and the community. The high landfill is inseparable from the number of people who

consume goods and services every day and the lack of waste management from each household. Many variables that affect waste management will be identified causal relationships in the CLD model (Retnowati et al., 2021). The use of the CLD model is expected to understand the factors that affect waste management through causal relationships between various variables that influence it. The results of the CLD explanation are expected to produce estimated solutions and recommendations in the process of formulating waste management strategies.

RESULTS AND ANALYSIS

CLD validation in the manufacturing process has referred to the literature in South Tangerang City Regional Regulation No.3 of 2013 which was updated with South Tangerang City Regional Regulation NO. 13 of 2019 concerning Waste Management. By using literature from research related to waste management as library reference material in the preparation of CLD, besides that articles from trusted media also become library material in CLD (Samsuri, Maulana, 2019).

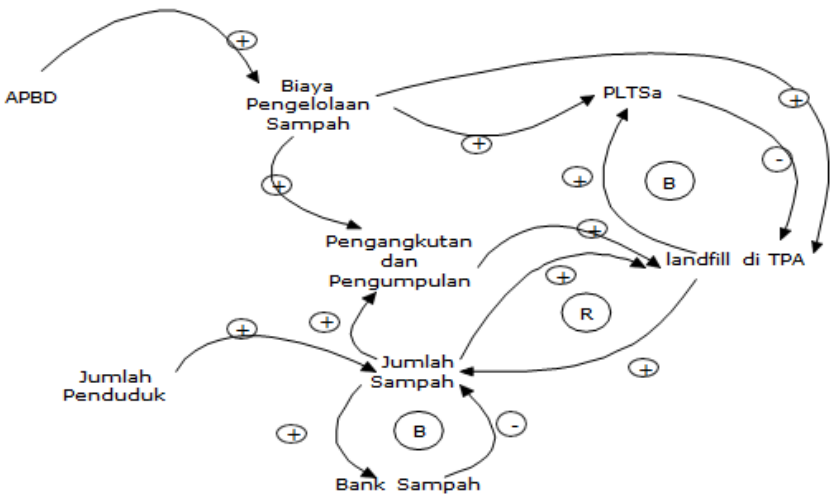


Figure 1 Causal Loop Diagram of waste management process in South Tangerang City

The large population will affect the volume of waste produced, If the community is aware to manage by sorting waste to be deposited into the waste bank then this can reduce the amount of waste produced and can increase community income. The amount of waste produced will be generated at the Cipeucang landfill if the landfill capacity is added will affect the amount of waste produced at certain times, for example during Ramadan, the volume of waste increases because the consumption of goods increases. The large amount of waste will affect the need for transportation and collection to be sent to landfill (Purwono et al., 2022). The South Tangerang city government based on South Tangerang City Regional Regulation No. 13 of 2019 to reduce waste generation in the Cipeucang Landfill will be built a Waste Power Plant (PLTSa) so this can reduce the generation of waste in the landfill. The amount / volume of waste generation in the landfill will affect the performance of the PLTSa. If the waste generation in the landfill has been

managed properly, it can reduce the burden on PLTSa. The South Tangerang City Government through its APBD will distribute waste management funds that can finance the construction and operation of PLTSa. In addition, waste management costs will also be used for landfill operations and maintenance, as well as waste transportation and collection costs (Breemer, 2021).

After building the CLD structure, it is then translated into SFD (Stock Flow Diagram) structure using Powersim studio. The following is the structure of SFD waste management in the city of South Tangerang.

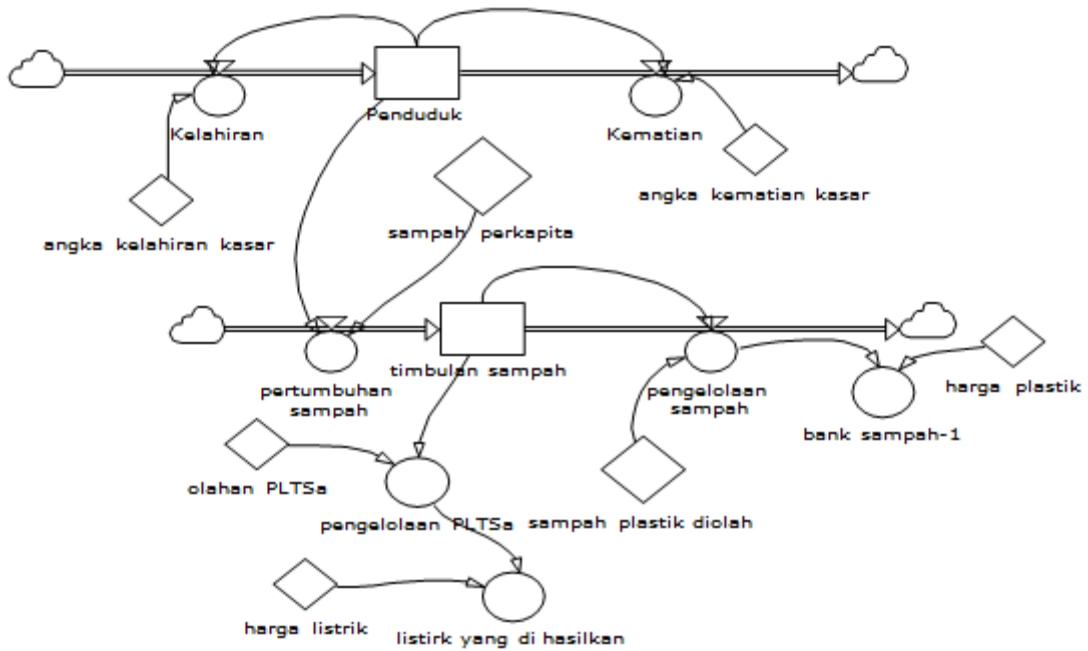


Figure 2: the structure of the waste management system above by planning to build a Waste Power Plant with a capacity of Manage 100 tons / day so that every day waste generation will be reduced by 100 tons / day plus the existence of waste management using waste banks that are able to reduce 139 tons per day (Zalukhu & Mirwan, 2018) . While the existing waste management is waste sorting at the Waste Bank, but waste is still increasing along with population growth as illustrated in the following diagram?

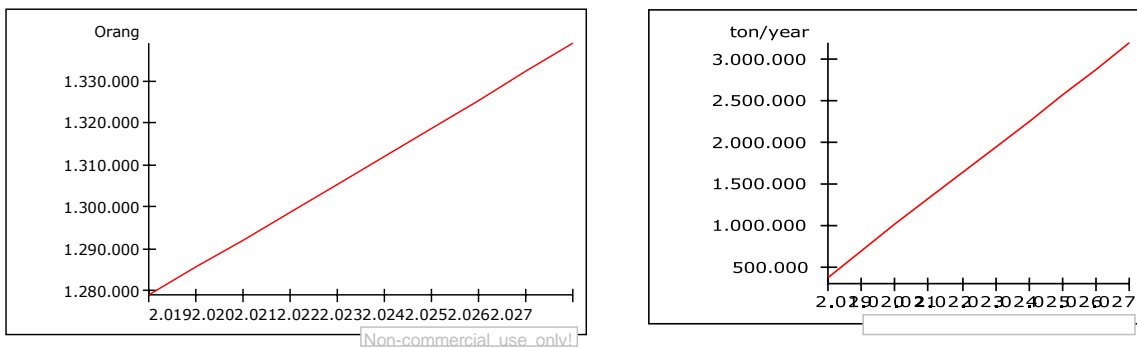


Figure 3: Population growth with increased waste generation

An increasing population will result in increased waste generation. Based on the information of the Ministry of Environment and Forestry that each resident produces 0.68 kg per day, if calculated on average / year it will produce 87,600 tons per year. With the growth of waste generation that continues to increase and limited landfill capacity, a better management system is needed so that it can reduce waste generation in the city of South Tangerang (Chotimah et al., 2022).

### Model Structure Validation

Model structure validation is the extent to which the similarity of the model structure approaches the real structure. Validation is a must in model creation. At the model simulation stage, visual validation of simulation behavior and statistical validation are carried out to measure deviations from simulation data from reference data. The mean deviation test of simulated data against the average reference data or variance deviation test is the absolute variance error (AVE) test. The maximum fault tolerance limit that can be accepted with the AME test is 30% (if the model is a real scale where many variables we cannot control).

General Formula calculates AME:

$$\text{AME: } \frac{|x_s - x_r|}{x_r} \times 100\%$$

Description:

$x_s$  = mean of simulation data

$x_r$  = mean of reference data

The  $| |$  sign means the absolute price used to eliminate the minus sign of the reduction result.

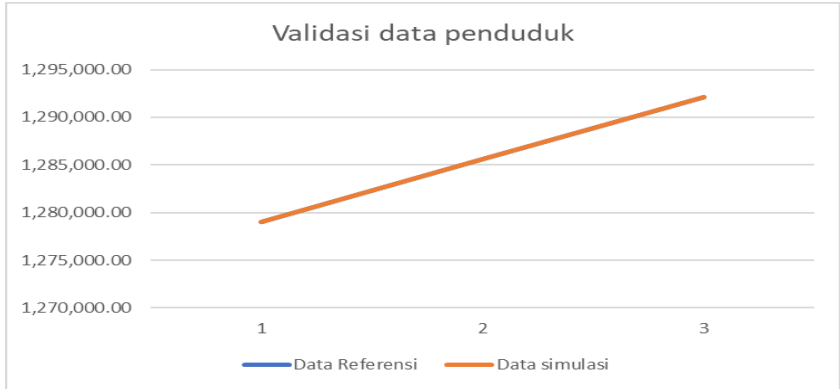
The following table shows measuring model validation with AME test for population data and waste generation data

Table 3: model validation with AME test for Population

Year	Reference Data	Simulation Data
2020	1,279,052.00	1,279,052.00

2021	1,285,575.17	1,285,575.17
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Figure 4: Reference Population data Validation Curve with Simulated Data



AME test results of 0% or less than 30% indicate that the population data generated from the model simulation is valid. As for the waste generation simulation test, the AME is 8%, so it is still said to be valid because it is still below 30% as in the following table.

Table 4: model validation with AME test for Waste Generation

Year	Reference Data	Simulation Data
2019	376,412	376,412.00
2020	390,754	405,761.09
2021	354,780	434,995.07
Average	373,982.00	405,722.72
	AME	8%

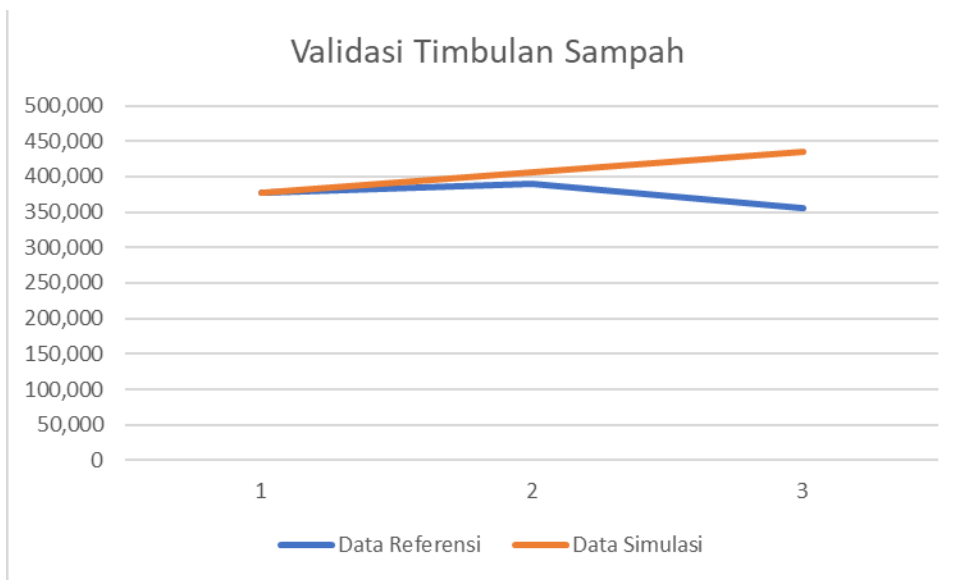


Figure 5: Waste Generation data validation curve Reference with Simulated Data

Waste generation is continuously high with a capacity that has exceeded the limit, so in 2020 there was pollution of the Cisadane river which is adjacent to the Cipeucang landfill. The garbage buffer wall collapsed and a lot of garbage fell into the Cisadane River. For this reason, the South Tangerang City government plans in the next few years to improve and reduce waste generation in Cipeucang with 3 scenarios, namely: construction of PLTSa, Sending Some of the waste to the Serang Landfill and Increasing the Capacity of Waste Bank management, Here are SFD images of the three scenarios (Fadilla & Kriswibowo, 2022)

Model Scenario 1: Garbage Bank

The South Tangerang city government currently has 313 waste banks in 7 sub-districts and is able to manage 2,816 tons of non-organic waste in 2013 (Ahmad Rivai, DLH Tangsel City, 2021). The Tangsel City Government has a target so that in 2022 waste can be reduced by adding waste banks with more distribution. Here is the model with SFD waste management with the addition of waste banks:

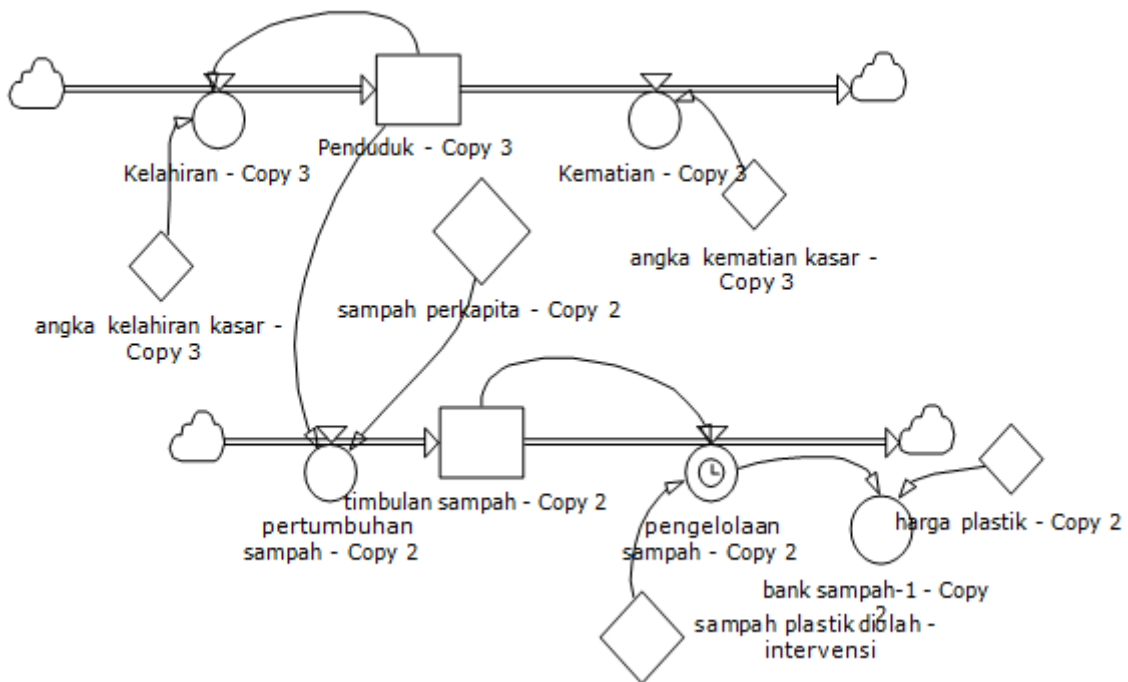


Figure 6: Model of Scenario 1 with Waste bank addition intervention

The Waste Bank will be increased to 2% which was previously 0.63%, with the addition of the waste bank expected to reduce the amount of waste generation. The results of modeling scenario 1 in the waste generation table per scenario, waste generation shows a decrease in 2024, this is because the implementation of adding waste banks will be carried out in 2024. The decrease in waste generation that occurs is still not too significant.

The Scenario 2 model is the addition of the Cilgowong Serang landfill land fill location.

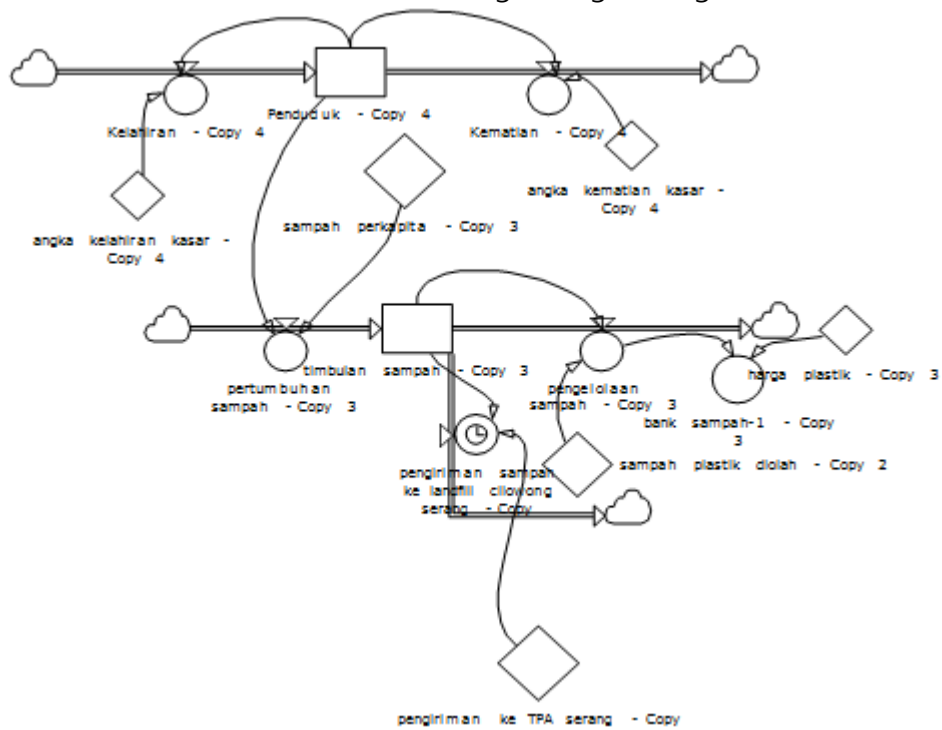


Figure 7: Model Scenario 2 by sending part of the waste to Cilowong landfill, Serang

To be able to significantly reduce waste generation, the South Tangerang city government coordinates with the city of Serang to be willing to accommodate some of the waste from the city of South Tangerang. It is expected that Serang City has provided land in 2025 so that the south Tangerang city government can immediately improve the condition of the Cipeucang landfill whose retaining wall has partially collapsed into the Cisadane River. The South Tangerang city government will send 30% of waste to the CiLowong landfill. From the visual chart, it can be seen that with scenario 2, the reduction in waste generation occurs very significantly, but this if the generation in the Cilowong attack landfill is not managed, it is like moving the problem to another place which results in the Cilowong landfill, the waste generation will increase.

Scenario Model 3.

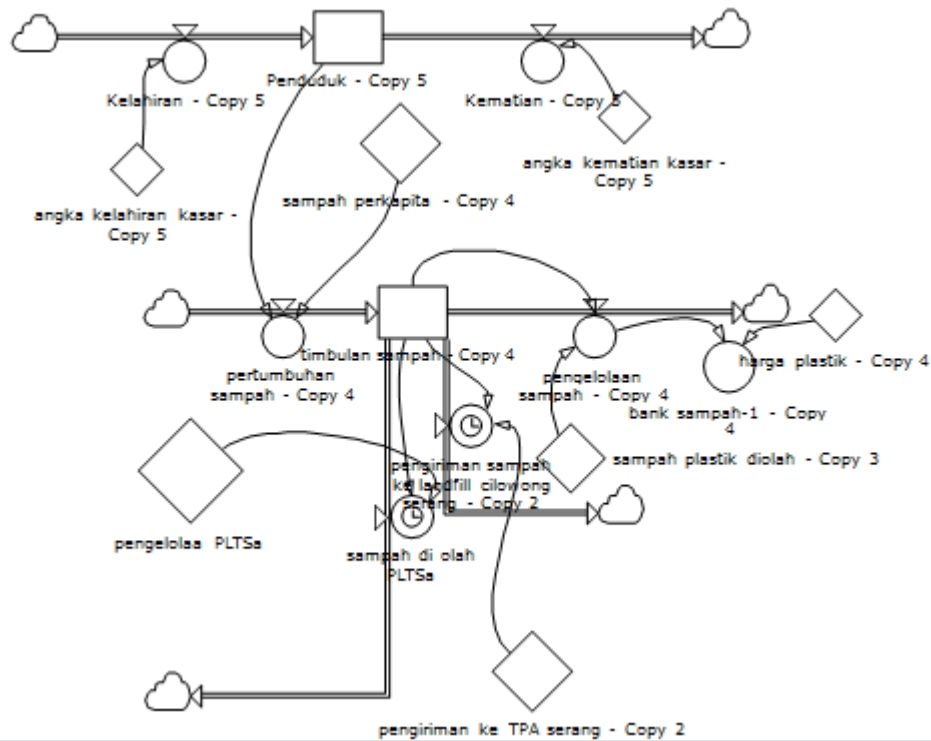


Figure 8 : Model of Scenario 3 of PLTSa construction while still sending waste to Cilowong landfill

In scenario 3, the South Tangerang city government will add a Waste Power Plant in 2027 while still sending waste to the Cilowong Serang landfill. The graph shows a decrease in generation following a decrease in the amount of generation from the results of sending waste to the Civacong landfill. The benefits of PLTSa in addition to reducing waste generation also produce electricity from the waste generation that can be used by the surrounding community. One PLTSa is capable of managing waste as much as 1500 tons per day or 18000 tons per year. This figure is expected to reduce waste generation although not significant but environmentally very environmentally friendly and sustainable. This PLTSa program is a program of the President of the Republic of Indonesia to overcome waste and maintain the environment to be sustainable.

Table 5: Number of Garbage Generated per scenario.

Year	No Intervention	Scenario-1	Scenario-2	Scenario-3
2,019	376,412	376,412	376,412	376,412
2,020	405,761	405,761	405,761	405,761
2,021	434,995	434,995	434,995	434,995
2,022	464,115	464,115	464,115	464,115
2,023	493,121	493,121	493,121	493,121
2,024	522,015	515,259	522,015	522,015
2,025	550,797	537,025	394,193	394,193

2,026	579,469	558,426	305,593	305,593
2,027	608,030	579,470	244,202	213,643
2,028	636,483	600,163	201,686	159,123
2,029	664,827	620,514	172,264	126,825
2,030	693,064	640,529	151,925	107,721

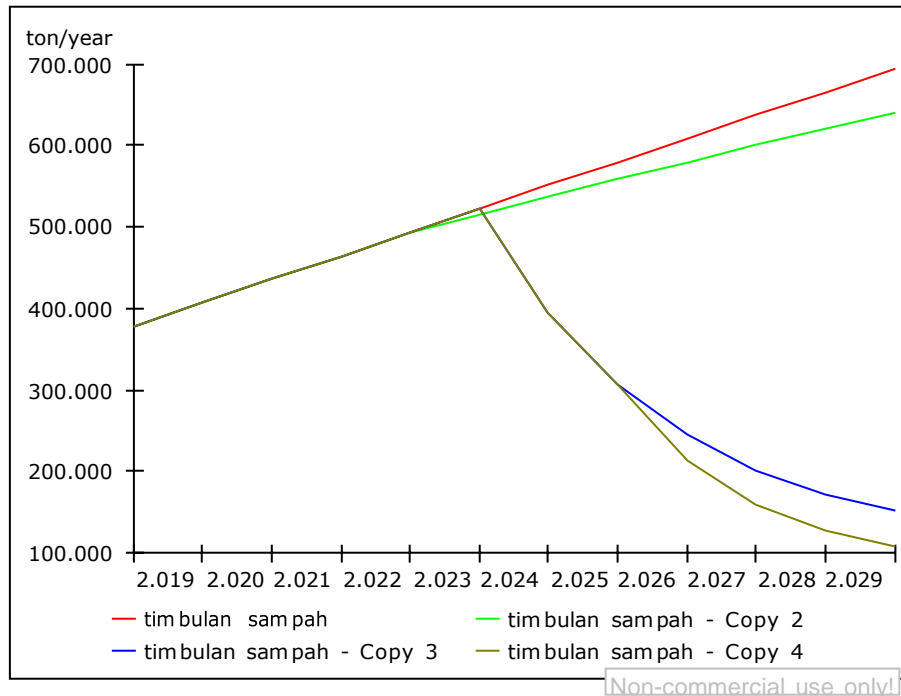


Figure 9: Waste Generation Curve for each scenario

Description:

Copy 2: For Scenario 1

Copy 3: For Scenario 2

Copy 4: For Scenario 3

## CONCLUSION

The South Tangerang City Government as a policy maker has prepared a waste management program so that waste in South Tangerang City can be handled properly and does not cause pollution. The management program requires a long process, both in terms of administration, preparation of required documents and costs.

In scenario 1, by increasing the number of waste banks, this can not only reduce waste generation, although it is not significant, but can improve the welfare of the community as waste bank users.

In scenario 2 the waste is reduced very significantly by sending waste to the Cilowong

landfill, Serang but the Serang city government and South Tangerang city must consider the social impact with the addition of waste means additional pollution in the area around the landfill and the affected are the community around the Cilowong landfill. The two city governments must also work together in landfill management so as not to cause environmental degradation. One of the waste processing programs in Serang City that must also be carried out by South Tangerang City is by fermenting waste which can shrink waste but still needs further processing.

In scenario 3, the government continues to send waste to the Cilowong landfill in addition to the operation of the PLTSa. The advantage of this PLTSa in addition to reducing waste generation also produces electricity which will later become income for the South Tangerang city area.

#### REFERENCES

- Armadi, M., Suarna, W., Sudarma, M., Sudiana Mahendra, M., & Sudipa, N. (2020). Model Pengelolaan Sampah Berbasis Masyarakat Di Kota Denpasar. *ECOTROPHIC: Jurnal Ilmu Lingkungan (Journal of Environmental Science)*, 14(2), 131. <https://doi.org/10.24843/ejes.2020.v14.i02.p04>
- Artika, I., & Chaerul, M. (2020). Model Sistem Dinamik untuk Evaluasi Skenario Pengelolaan Sampah di Kota Depok. *Jurnal Wilayah Dan Lingkungan*, 8(3), 261–279. <https://doi.org/10.14710/jwl.8.3.261-279>
- Breemer, J. (2021). Model Pengelolaan Sampah Dengan Pendekatan Edukasi di Kota Kendari. *Jurnal Formasi*, 6(2), 27–36.
- Chotimah, H. C., Iswardhana, M. R., & Rizky, L. (2022). Model Collaborative Governance dalam Pengelolaan Sampah Plastik Laut Guna Mewujudkan Ketahanan Maritim di Indonesia. *Jurnal Ketahanan Nasional*, 27(3), 348. <https://doi.org/10.22146/jkn.69661>
- Darmawan, A., Soesilo, T. E. B., & Wahyono, S. (2020). Model Optimasi Pengelolaan Sampah Di Tpa. *Jurnal Ilmiah Pendidikan Lingkungan Dan Pembangunan*, 21(02), 13–29. <https://doi.org/10.21009/plpb.212.02>
- Fadilla, A. A., & Kriswibowo, A. (2022). Model Integrated Sustainable Waste Management dalam Pengolahan Sampah di Pusat Daur Ulang Jambangan Kota Surabaya. *Jurnal Administrasi Publik Dan Pembangunan*, 4(2), 60. <https://doi.org/10.20527/jpp.v4i2.5744>
- Purwono, P., Rabiatal, W., & Suyanto, E. (2022). Strategi Pengelolaan Sampah Rumah

- Tangga dengan Model Sirkular di Wilayah Perkotaan Purwokerto Household Waste Management Strategy with Circular Model in Purwokerto. *Buletin Kesehatan Lingkungan Masyarakat*, 41(2), 108–115. <https://ejournal.poltekkes-smg.ac.id/ojs/index.php/keslingmas>
- Retnowati, D., Fudhla, A. F., & Yani, A. (2021). Pemodelan Systems Dynamics pada Penanganan Sampah di Desa Penambangan Kabupaten Sidoarjo. *Jurnal Teknik Industri*, 11(3), 243–249. <https://doi.org/10.25105/jti.v11i3.13076>
- Samsuri, Maulana, L. H. (2019). MODEL PENGELOLAAN SAMPAH PERKOTAAN ( Survey Pada Pengelolaan Persampahan Kota Bogor ) URBAN WASTE MANAGEMENT MODEL ( Survey on Waste Management in Bogor City ) Program Management Studies Faculty of Economics , University of Djuanda Model Pengelolaan Sampa. *Visionida*, 5(2), 54–61.
- Wildanurrizal. (2014). Perancangan Model. *Perancangan Lingkungan*, 1(1), 7. <https://jurnal.untirta.ac.id/index.php/jti/article/view/2313>
- Zalukhu, S. A., & Mirwan, M. (2018). Analisis Model Dinamik Dalam Pengangkutan Sampah Di Kota Bangkalan. *Jurnal Envirotek*, 10(1), 28–36. <https://doi.org/10.33005/envirotek.v10i1.1165>