Government Policy Revitalization Model in the Zero Waste Concept of Community Participation-Based Urban Waste Management in Purwokerto - Central Java - Indonesia.

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Abstract
The Government of Banyumas Regency has implemented waste processing technology to minimize the amount of waste (zero waste) with an Integrated Waste Treatment Facility (*TPST*), Hangar System, *Salinmas* and *Jeknyong* aplication, but it has not been successful and requires community participation. The government policy model for waste management at the Purwokerto City Recycling Center needs to be developed so that it can answer and solve the problems faced. This study aims to (1) Formulate a government policy revitalization model in waste management with zero-waste concept based on community participation in Purwokerto City with a hangar system and Recycling Centers based on the *Salinmas* and *Jeknyong* programs to support Banyumas as a zero waste regency, (2) Find the obstacles faced by the community in waste management through the *Salinmas* and *Jeknyong*-based Recycling Center hangar system to support Banyumas as a zero waste and green city. The research uses quantitative methods. Respondents included academics, bureaucrats, Regional Legislative Councils, Community Sponsored Groups, Recycling Center administrators, Environmental Agency, the community, and waste bank administrators, using a purposive sampling technique and Analytical Hierarchy Process (AHP). The results show that existing government policies regarding waste are considered to pay little attention to sustainable environmental management aspects. The government policy model in waste management with zero waste concept based on community participation consists of three sub-models, namely (1) the population sub-model; (2) the household waste volume sub-model, and (3) the community participation sub-model. These three sub-models are then integrated into the community participation model in waste management as an effort to minimize the amount of household waste disposed of in the Recycling Center. Thus, it can extend the life of the Recycling Center, reduce environmental pollution, and zero waste. Obstacles that arise are inter-agency coordination at the planning stage is still not optimal, and sectoral ego.

Keywords: Policy; zero waste management; participation

Introduction

The problem of Purwokerto City is a complex problem that cannot be handled partially on a project basis, but must be comprehensively through careful planning with a far-reaching vision and political will from the government (political will).

Efforts to create a zero-waste city are not only the government's task, but must be proposed, planned, and implemented with the full support of the community. Goodwill and political will from the government towards the desire to create a dignified, humane, and zero-waste city, must be accompanied by the enthusiasm of the people in implementing, monitoring, and evaluating success through urban waste management (Bello, Hafis, 2018).

The problem of waste management is actually not a matter of technology, but the implementation of the technology itself, which is related to social aspects that can cause social problems. Social problems arise in the form of (a) the low collective awareness of the community regarding waste management, although this does not mean that it cannot change. Social problems arise due to (b) low level of community involvement, and (c) the process of internalization since the beginning of the development of a program. For this reason, a study of social aspects related to efforts to foster community participation in waste management needs to be carried out immediately (Alfian et.al, 2020).

Local government policies (goodwill and political will) in waste management are still considered not optimal, especially in building a community participation-based waste management system in an integrated and sustainable manner. The related agencies in responding to the waste problem always return to technical issues, budget constraints, and limited infrastructure, without talking about the human aspect (Gultom, 2003).

Government policies (goodwill and political will) regarding waste are considered to pay little attention to sustainable environmental management aspects. In general, waste management in various regions only refers to the instant waste management paradigm with an end-of-pipe approach. Waste management only pays attention to the Recycling Center (*PDU*), without going through the process at the source through 3R pattern. Waste that exists and comes from the community is generally not processed and carried out economic utilization activities. This causes waste to accumulate and not all can be transported to the Recycling Center (Yogisti, 2012).

According to the policy (goodwill and political will) in waste management, almost all waste generally ends up in the Recycling Center, causing its burden to become very heavy and its lifespan to decrease faster. In addition, efforts have not been made to seriously reduce the volume of waste from the waste generator, including the separation of hazardous toxic waste (Fitri. et. al, 2021).

Purwokerto City, strives to become a city that implements zero waste in waste management. It is time for the old paradigm of waste management, namely the end-of-pipe approach, has changed to zero waste. Based on this problem, it can be formulated as "what is the government policy revitalization model in the zero waste concept of community participation-based household waste management in Purwokerto City, Central Java?" The purpose of this research is to build a revitalization model for government policies in the zero-waste concept of community participation-based waste management in Purwokerto City.

Research Methodology

This research was carried out in the Purwokerto City Region, Banyumas Regency, covering 4 sub-districts as a source of waste with 12 Recycling Centers. This research concerns the implementation of policies and government policy revitalization models in the waste management system with zero waste concept in Purwokerto City. This research includes (a) the existing condition of waste management in Purwokerto City in terms of the sub-system, (b) **the population sub-model**, (c) **the sub-model of the amount of domestic waste** generated by residents of Purwokerto City, (d) **the sub-model of community participation** in zero waste concept of household waste management. The four sub-models are made partially based on the equations that correspond to each of these sub-models, then the three

sub-models are integrated into a model for reducing the volume of waste disposed of at the Recycling Center through participation. Furthermore, alternative model recommendations of government policy strategy in community participation-based waste management The model built for system study is a mathematical model using Powersim software (Morrissey et al, 2004).

This study uses primary and secondary data. Primary data is collected by conducting (a) interviews with respondents, observations, (b) focus group discussion, and (c) participants as observations. Secondary data collection was carried out by collecting data from the Public Works Agency, Environmental Agency, Hangar (the waste sorting site that is independently managed by the community), Community Sponsored Groups (*KSM*), communities, Recycling Center (*PDU*), and the results of previous research. The informant collection technique used purposive sampling. To decide on the key elements in the formulation of the policy revitalization model, an analysis was carried out using AHP, Expert Choice, taking waste experts such as academics, bureaucrats, members of the Regional Legislative Councils, Community Sponsored Groups, Investors, and the community.

Government Policy Revitalization Model Analysis with the AHP Method
Priority determination of government policies alternative model in zero waste concept of household waste management based on community participation in Purwokerto City using the AHP method through interviews with stakeholders. Things that need to be considered in solving a problem in the AHP method are decomposition, comparative formulation, priority synthesis, and logical consistency.

In the AHP method, a score is determined that influences the selection of criteria, based on the role of stakeholders which include economic, social, and environmental stakeholders. The score for each level is based on the results of interviews with stakeholders involved in determining alternative household waste management policies in Purwokerto city to support a zero-waste city. Stakeholders involved are the government, entrepreneurs (investors), scavengers, waste banks/ Community Sponsored Groups, academics, Regional Legislative Councils, hangars, and the community.

The Data Analysis Results of Interest Level
The data analysis results of interest level assessment of each stakeholder group (level 2) on aspects (level 3) based on the results of the AHP process.
The assessment results of the interest level can be seen in Table 1 below.

Table 1 Priority rating of stakeholder groups

No	Pemangku Kepentingan	Bobot Kepentingan	Prioritas
1	Pemerintah (PEMDA)	0,261	2
2	Pengusaha /Investor swasta	0,126	4
3	Hanggar (PDU)	0,057	5
4	Bank Sampah/KSM	0,153	3
5	Masyarakat	0,402	1

Analysis results of expert opinion using the AHP method show that the most influential stakeholder in determining alternative models of government policy in household waste management with zero waste concept based on community participation in Purwokerto City is the community with a score of 0.402, the second priority stakeholders are Regional Government (PEMDA) with a score of 0.261, the third priority stakeholders are the Garbage Bank/ Community Sponsored Groups with a score of 0.153, then the fourth priority stakeholder is private entrepreneurs/investors with a score of 0.126 and stakeholders with the lowest role is the hangar with a score of 0.057 (Suyanto, 2014)

Based on the results of the assesment, it can be concluded that stakeholders have the highest role in determining alternative models for the revitalization of waste management policies with the zero-waste concept in Purwokerto City, namely the community. The results of the study show that the community is a stakeholder who has an important role in household waste

management. Communities with their participation are very important, because they are a source of waste and there are many of them, while the number of leaders is limited. It is very important to empower the community to be able to carry out various efforts in managing household waste.

Good cooperation and coordination between stakeholders are needed to avoid "clashes" in household waste management in Purwokerto City. The existence of this cooperation and coordination will result in a policy that benefits all stakeholders in managing household waste to support the green city of Purwokerto. The results of the AHP process regarding assessment can be seen in Table 2 below.

Table 2. Rating Value at the Criteria Level of Each Stakeholder

No	Pemangku Kepentingan (level 2)	Aspek Kriteria (level 3)	Bobot (Nilai)
1.	Pemerintah (Pemda)	Kota Bersih dari Sampah	0,243
		Pendapatan	**0,659**
		Biaya	0,098
2.	Pengusaha/Investor swasta	Kota Bersih dari Sampah	0,245
		Pendapatan	**0,649**
		Biaya	0,106
3.	Hanggar (PDU)	Kota Bersih dari Sampah	0,283
		Pendapatan	**0,624**
		Biaya	0,093
4.	Bank sampah/KSM	Kota Bersih dari Sampah	0,219
		Pendapatan	**0,689**
		Biaya	0,091
5.	Masyarakat	Kota Bersih dari Sampah	0,194
		Pendapatan	**0,706**
		Biaya	0,100

Analysis results of stakeholder opinion at the criteria level (third level) using the AHP method with Experchoice software show that the interest rate income is the first priority chosen by all stakeholders in household waste management to support green cities. Based on the table above, Government stakeholders have a score of 0.659, Entrepreneurs or private investors have a score of 0.649, Hangars (Recycling Centers) have a score of 0.624, Garbage Banks/ Community Sponsored Groups have a value of 0.689 and Community stakeholders have a score of 0.706.

Furthermore, the analysis of AHP results regarding the Combined Rating Value at Aspect Level can be seen in Table 3 below.

Table 3 Rating Value at Criteria Level

No	Kriteria (Level 3)	Bobot (Nilai)	Prioritas
1.	Kota Bersih dari Sampah	0,222	2
2.	Pendapatan	0,679	1
3.	Biaya	0,098	3

Table 3 shows that the revitalization model for the household waste management policy with the zero concepts in Purwokerto tends to emphasize income criteria aspects for the benefit of waste management in particular and the environment in general in the City of Purwokerto. Besides that, it also tries to avoid the occurrence of social conflicts in Purwokerto City in community participation-based waste management. Also, pay attention to the criteria of a clean city and the cost of managing it. This is important so that there are no conflicts of interest between stakeholders in household waste management.

Government Policy Revitalization Model Alternative in Zero Waste Concept of Household Waste Management Based on Community Participation in Purwokerto City.
Efforts to realize the implementation of household waste management policies that support zero waste must be carried out in an integrated manner, starting with the support of various legal instruments, government regulations, and statutory regulations. Waste management policies can provide legal certainty in planning and utilization for Regional Governments, private entrepreneurs/investors, hangars, waste banks/ Community Sponsored Groups, and the community. According to Helmi (2002), the basis of the new policy in household waste management is community participatory, decentralized, and refers to the principles of economic efficiency, welfare, justice, and sustainability (sustainable).

Based on the policy analysis, there are two stages of analysis, namely (a) alternative policy development and (b) alternative policy analysis. Alternative policy development is a process of creative thinking to create new ideas that influence the system to achieve the desired goals, either by changing the parameters or the structure of the model. Meanwhile, alternative policy analysis is carried out to choose the best policy from several alternative policies, taking into account changes from the old system to the new system as well as better changes in the future (Devi, 2011).

The priority value of alternative household waste management policies can be seen in Table 4 below.

Table 4 Priority Value of Alternative Household Waste Management Policies in Purwokerto City.

No	Alternatif	Bobot	Prioritas
1.	Penegakan Hukum	0,129	3
2.	Pola 3R (*reduce, reuse, recycle*)	0,388	2
3.	Partisipasi *Green Community*	0,407	1
4.	Pemilahan Sampah Rumah Tangga	0,076	4

Table 4 shows that community participation in household waste management with zero waste concept is the first priority with a score of 0.407, the second priority is the application of the 3R pattern, namely reduce, reuse, and recycle with a score of 0.388, the third priority is law enforcement with a score of 0.129 and the last priority is sorting household waste with a score of 0.076.

The Result of the AHP Analysis is Community Participation
It is necessary to improve public awareness to increase community participation in household waste management, by first increasing their capabilities through capacity development in the environmental sector. This is in line with Bloom's (1971) and Checkland's (1990) statement that:
".... Increasing people's knowledge will change their mental attitude and behavior and this change can be a driving force in participating...."
Community participation in handling household waste is very necessary, especially in the collection process. This is in line with the views of Hanna and Munasinghe (1995); Ostrom (1992); Mitchel, Setiawan, and Rahmi (1997), and Ife (1986) stated:
"..... community participation will emerge with several driving factors, including motives and rewards, availability of facilities and infrastructure, moral and cultural encouragement...".
Communities that do not have access to services and do not have enough space to process household waste tend to dispose of their household waste in any place and burn waste openly. A new paradigm in waste management must be understood and followed, such as waste that can be reduced, reused, and recycled. Actually, this is not something new because it has been carried out by many countries and has succeeded in significantly increasing the efficiency of waste management, by reducing waste from the source, thereby reducing the burden on waste management.

Government policy revitalizing models in zero waste concept of household waste management in Purwokerto which can be implemented include the following: (1) Reducing household waste from waste-producing sources. The potential for waste reduction at the source can reach 50%

of the total volume of waste generated. Waste reduction can be carried out in several steps, namely (a) increasing public understanding of waste that has economic value, (b) increasing public understanding of involvement in the Garbage Bank/Community Sponsored Group, (c) increasing public understanding of the 3R pattern, (d) increasing understanding of the importance of one of the local wisdom, namely *kerigan* (community work) as social capital in waste management, (e) implementing an incentive and disincentive system in implementing the 3R pattern in household waste management, (f) strict law enforcement for violators in waste management, (g) increasing green community participation in household waste management, (h) encouraging cross-sectoral coordination in waste management between government institutions and Community Sponsored Groups (waste banks). (2) Increasing public understanding of the 3R pattern. Reducing household waste can be done by increasing public understanding of the 3R pattern (reduce, reuse and recycle) and safeguarding household waste *B3* (toxic and hazardous materials).

The campaigns carried out continuously can build a social commitment. One of the ways to reduce waste from its source is the 3R mechanism. Reduce is an effort that is expected to reduce the consumptive lifestyle and always use Eco-friendly non-disposable materials. Reuse is an effort to utilize waste material through repeated reduction so that it does not immediately become waste. Recycle is an effort to handle waste generated from home, and is carried out by sorting and utilizing/processing it on-site. Implementation of incentive and disincentive systems in waste management. Efforts to reduce trash at waste sources need to be supported by regulations regarding the provision of incentives that can encourage and motivate the community to always carry out waste management activities with the 3R pattern. These incentives include (a) reducing waste retribution fees, (b) giving coupons vouchers for spending on goods that support the 3R program including eco-friendly bags, and (c) giving awards for waste management at the village level. The management of incentive and disincentive mechanisms implementation must begin with the readiness of an adequate city waste management system. (4) Coordination between Environmental Agency (*DLH*) and Public Works Agency and Garbage Bank.

AAHP analysis Result: The Second Priority is the Improvement of the 3R Pattern (Reduce, Reuse, Recycle).

The idea of zero waste concept is the approach and application of integrated urban waste management systems and technology. The goal of this concept is to carry out regional-scale urban waste management so as to reduce the volume of waste to a minimum, and to create a small recycling industry managed by the local community or government. The zero waste concept is the application of the 3R principles (reduce, reuse and recycle), as well as processing waste as close as possible to the source of waste to reduce the burden of transportation.

The 3R pattern needs to be encouraged in order to support an integrated waste management system with the waste to clean which involves community participation as an effort towards zero waste or non-profit.

The orientation of household waste management with the zero waste concept includes (a) an integrated household waste management system; (b) community participation in waste management; (c) waste composting technology; (d) plastic and paper waste recycling; (e) garbage burning technology and incinerators; (f) organic and non-organic waste processing technology; (g) opportunities and challenges in the organic waste business through the Garbage Bank, (h) Garbage counting technology in the hangar.

AHP Analysis Result: The Third Priority is Law Enforcement

Law is a sure guide, positive and directive for program goals to be achieved. All aspects of life are regulated and must comply with legal principles so that an organized, orderly, and discipline society can be created. Law is seen not only as a regulator of public order but also as a means of renewing and changing society towards a better life (Siahaan 2004). In general, the cleanliness condition of Purwokerto City is still not optimal, some of the reasons are low knowledge, attitude, and behavior toward clean and healthy living from an early age and the

failure to apply legal sanctions. The community is most likely not fully aware of the existence of waste management provisions, including the existence of legal sanctions that apply to those who violate them.

Improving the household waste management system can be done by enforcing the law and completing existing government regulations. Therefore, several things are enforced, namely:
1. Law enforcement and imposition of sanctions on waste management violators as an effort to develop the community, apparatus, and related stakeholders.
2. Completing and improving legal products required for the implementation of waste management.
3. Weak law enforcement against waste disposal offenders is a challenge for law enforcement officials in implementing regional regulations so that they can be implemented seriously without exception or indiscriminately.

System Analysis Model of Government Policy Dynamics in Participation-Based Household Waste Management.

The household waste management model by optimizing community participation based on zero waste consists of three sub-models, namely (1) the population sub-model; (2) the household waste quantity/volume sub-model, and (3) the community participation sub-model. The three sub-models are then integrated into a model of community participation in waste management by minimizing the amount of household (domestic) waste that is disposed of in the Recycling Center. Thus, it can extend the life of the Recycling Center and reduce pollution in the surrounding environment (Mujiburraahmad, 2014).

Modeling is needed to make it easier to estimate the effectiveness of efforts to increase green community participation in household waste management that must be managed by the Regional Government. The waste management model with the zero-waste concept based on community participation in Purwokerto City, consists of three sub-models including (1) sub-model of Purwokerto City population; (2) sub-model of the amount community waste production in Purwokerto City and (3) sub-model of community participation in household waste management. The three sub-models are then integrated into a model of community participation in the zero-waste concept of household waste management by reducing the amount of household waste disposed of in the Recycling Center (Suyanto, 2014).

The community paradigm began to change, where previously people thought that waste was something useless, but now it has become something that has economic value. The results of saving trash in the waste bank are very helpful for the community economically and also environmentally. Economically, the results of the waste savings are used to pay for PLN, PDAM, and daily needs, some are used as a quarterly incentive for employees. When observing the development of garbage banks, in Malang City a garbage insurance clinic has been established that can be used as health insurance for the community. **This trash insurance clinic** was initiated by a 24-year-old doctor named dr. Gamal Albinsaid. At the clinic, people can receive treatment by depositing Rp. 10,000.00/day and can be treated for primary diseases (Suyanto et.al, 2022).

Population Sub-system or Sub-model of Purwokerto City

The population of Purwokerto City in 2020 is 233,846 people, with a growth rate of 0.43%. So in 2023, the population will be 243,341 people. In the population sub-system, population variables are influenced by population growth and are limited by the support capacity of the population (Yuni et.al, 2020).

Estimates or predictions in 2025, with a growth rate of 1.5%, the population of the city of Purwokerto is still below the ideal support capacity (ideal support capacity conditions for Purwokerto city, if the population density is in the range of 75 people/ha or a population of 289,425 people). The population density of Purwokerto City in 2025 is around 74 people/Ha with a population of 284,974 people.

Based on the simulation results of the Purwokerto City population from 2010 to 2025, it can be presented in Figure 1 as follows.
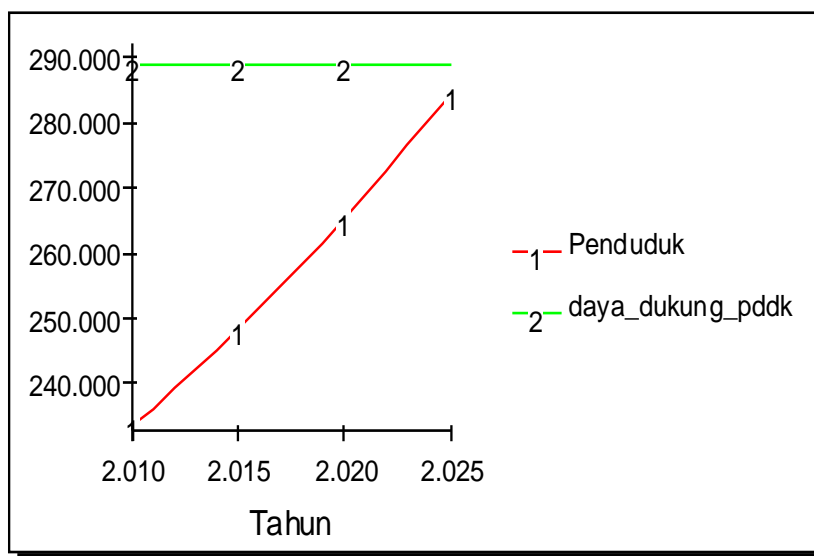
Figure 1 Simulation results of Purwokerto City population in 2010 - 2025

Figure 1 shows that the support capacity tends to remain the same, while the population from 2010 to 2025 is predicted to continue to increase. In fact, it is estimated that in 2025 it will approach the maximum support capacity limit.

Table 5. Comparison of Population Growth Empirical/reference data and Simulation Data for the 2010-2025 period (in units of person)

Tahun	Data Penduduk Empirik/ Referensi (jiwa)	Data Simulasi (jiwa)
2010	233.846	233.846
2011	239.641	236.680
2012	242.460	239.583
2013	243.341	242.558
2014	247.648	245.607
2015	250.778	248.734
2016	253.909	251.940
2017	257.039	255.230
2018	260.170	258.606
2019	263.300	262.072
2020	266.430	265.632
2021	269.561	269.289
2022	272.691	273.047
2023	275.822	276.911
2024	278.952	280.885
2025	282.082	284.974
	239.822	238.167
AME	0,69	

Based on Table 5, it can be studied as follows, the comparison of population growth between the reference/empirical data and the simulation data is shown in Figure 2 below.
A comparison of the Purwokerto city population in the period 2010 - 2013, based on the data from reference and simulation results population, can be seen in Figure 2 below.
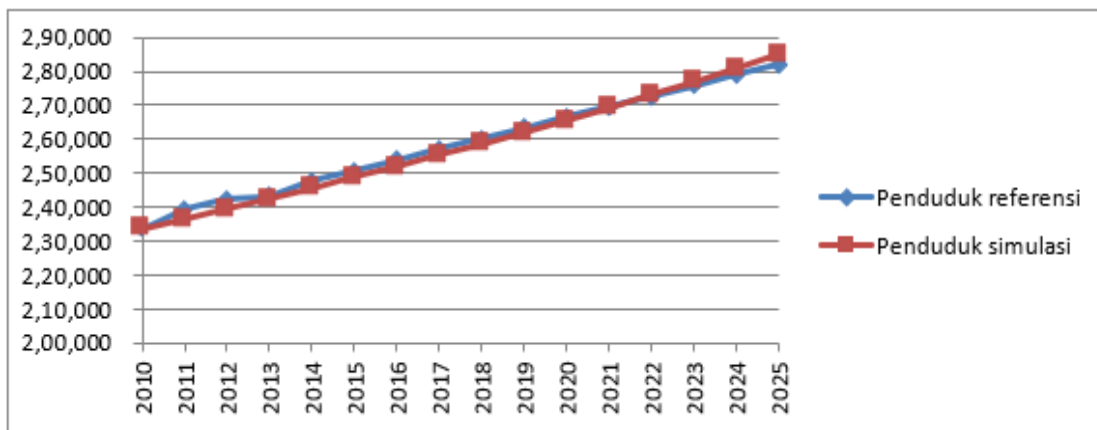
Figure 2. Comparison of Population based on Reference Data and Simulation Data (2010-2025)

Population growth model behavior resulting from this model, shows similar behavioral tendencies. If calculated, the AME value is 0.69%. So, it can be said that this model is valid. Model behavior is presented in Figure 2.

Household Waste Sub-system or Sub-model

In the household waste sub-system or sub-model, the variable that affects the increase in the volume of waste is waste generated by residents (household waste). This indicates that there is a correlation between the model, where if the population increases, the amount of waste will also increase, and vice versa. Thus, it can be said that there is a positive correlation between the two variables. Based on the calculation results, the average amount of waste generated in Purwokerto City is 0.4289 m3/person/year. In this model, it is assumed that everyone produces waste and does not differentiate between the ages of the population in producing waste.

Therefore, in order to be able to model the real condition, it is necessary to conduct a validation test on the waste management participation model with zero waste concept in Purwokerto City. If the behavior of the population growth model and the production of waste generated in Purwokerto City from 2010 to 2025 is as shown in Figure 3, it will produce a similar trend as follows.
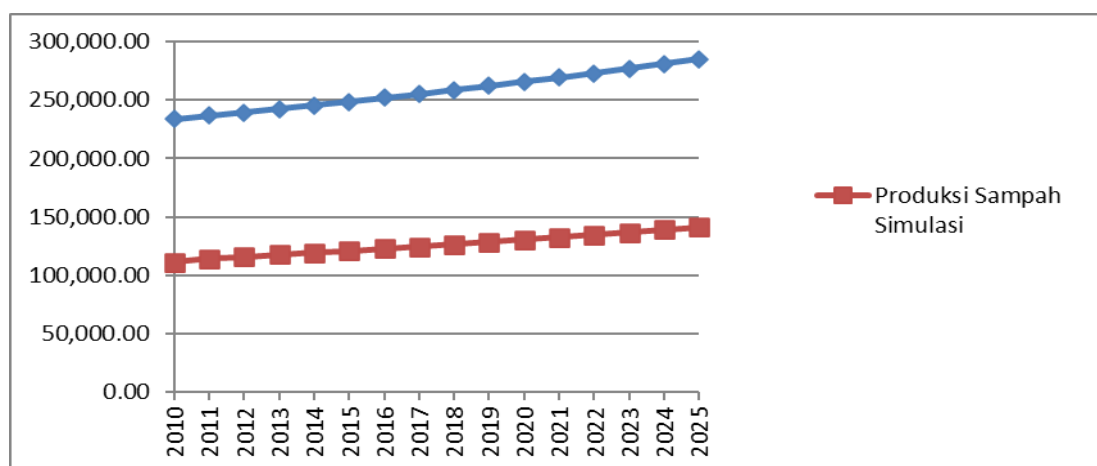

Figure 3 Comparison of population and waste production in Purwokerto City from 2010 to 2025.

Starting in late 2010, the people of Purwokerto City began to participate in managing waste, in the form of an institutional waste bank (PAS) and the following year the Berkoh independent waste bank was established in collaboration with State Islamic College (*STAIN*) then Environmental Agency (DLH) also formed an independent waste bank around Satria Stadium

Purwokerto. The ratio of household waste that can be used in waste management at the Garbage Bank, is recorded to be around 65% to date, while the remaining 35% cannot be utilized by the community. In fact, starting in 2020, around 5 hangars have been built in Purwokerto and until now it continues to grow. Detail regarding the income of waste banks in Purwokerto City based on the simulation results using the Powersim software dynamic system can be seen in Table 7.

Table 6. Simulation Results of the Total Amount of Waste generated (m3), collected in the Waste Bank

Tahun	Sampah	Bank_Sampah	penghasilan
2010	111.198,00	0,00	0,00
2011	114.095,41	820,43	973.029,98
2012	115.852,87	15.235,67	18.069.509,3
2013	117.500,27	31.687,60	37.581.499,3
2014	119.173,12	49.112,46	58.247.374,6
2015	120.891,07	67.078,09	79.554.618,1
2016	122.658,57	85.415,56	101.302.857
2017	124.478,13	104.062,12	123.417.678
2018	126.352,14	122.997,56	145.875.103
2019	128.283,07	142.218,75	168.671.438
2020	130.273,55	161.729,59	191.811.292
2021	132.326,36	181.536,97	215.302.847
2022	134.444,47	201.649,23	239.155.991
2023	136.631,03	222.075,55	263.381.603
2024	138.889,40	242.825,70	287.991.282
2025	141.223,18	263.910,01	312.997.269

Garbage Sub-system or Sub-model Validation Test

Furthermore, in testing the performance/output validity of the household waste management sub-model, a comparison of empirical data with simulated data on household waste production is carried out. The sub-model is listed in Table 7 and Figure 6 below.

Table 7. Comparison between Empirical and Simulation data on Waste Production

Tahun	Data Empirik/ Referensi (m3/tahun)	Data Simulasi (m3/tahun)	Rata-rata Sampah	Pemilahan Sampah Organik	Pemilahan sampah An-Organik	Laju Timbunan Sampah
2010	111.198,00	111.198,00	0,4755	277.338,20	38.048,01	38.224,98
2011	116.855,00	114.095,40	0,4882	342.090,00	36.950,37	38.402,47
2012	116.855,00	115.852,90	0,4820	407.142,50	65.310,19	39.513,28
2013	117.764,00	117.500,30	0,4839	474.076,60	77.246,90	40.272,71
2014		119.173,10				
2015		120.891,10				
2016		122.658,60				
2017		124.478,10				
2018		126.352,10				
2019		128.283,10				
2020		130.273,50				
2021		132.326,40				
2022		134.444,50				
2023		136.631,00				
2024		138.889,40				
2025		141.223,20				
Mean	115.704	114.662	0,4824			
AME		0,91				

Community Participation Sub-system or Sub-model
People who want to participate in household waste management must first become members of a waste bank. Based on the data, initially, the number of waste bank members in Purwokerto City was recorded at 286 people, and now it has increased. This community participation is modeled operationally in terms of the number of people who become garbage bank members/customers.

If the simulation time is extended to 2025, the number of garbage bank members can be seen in Figure 4 below. The number of people who become garbage bank members will affect the amount of waste that can be utilized or managed in the Purwokerto City garbage bank.
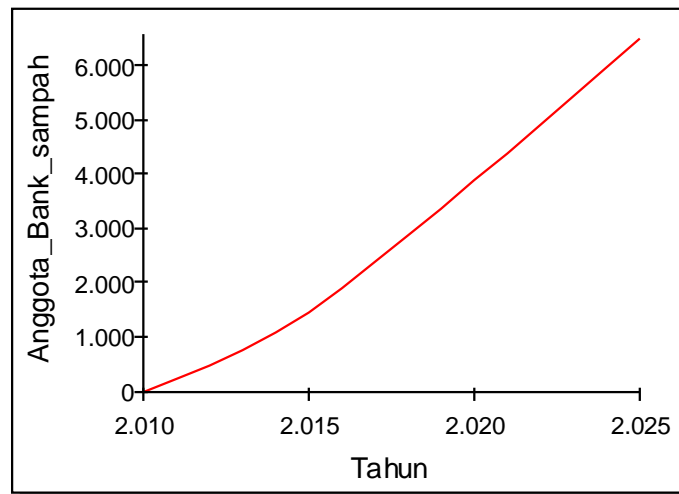

Figure 4 Simulation results of Waste Bank Members for 2010 – 2025

Dynamic System Tendency Analysis
System tendency analysis is shown to exploit the behavior of the system in the long term going forward, through model simulation (Saribanon 2007). In this study, the behavior of the waste management system simulation was determined for 15 (fifteen) years, starting from 2010 – 2025. The researchers' considerations in determining the establishment of a 15-year simulation are based on the consideration that this period of time is a period that is considered appropriate and "strategic" in household waste management in Purwokerto City.

The simulation operationalizes several variables, namely (a) residents producing household waste; (b) the volume of household waste disposed of in landfill (*TPA*); (c) Community participation as indicated by the number of members of the Garbage Bank and the amount of waste managed by the Garbage Bank and hangar by each Community Sponsored Groups in Purwokerto City.

The increase in the amount of waste is due to the increasing amount of household waste that is not managed by the community and is directly disposed of in the Recycling Center, so the capacity of the waste in the Recycling Center is getting lower and causing its lifespan is getting shorter. However, after the community participation program was carried out in the 3R pattern and with community involvement in the waste bank, the amount of waste that goes into the Recycling Center decreased, thereby extending its life and reducing environmental pollution around it (Purwono, 2022).

Community Participation Model Intervention in Waste Management with Zero-Waste Concept
Modeling using a dynamic system requires the intervention of a model. This intervention can be carried out in two ways, namely as follows: (1) structural intervention is an intervention carried out by changing the structure of the model; and (2) functional intervention is an intervention carried out by increasing the value of certain variables into the participation model in waste management (Suyanto Edy, 2015).

The activities carried out in the participation model intervention in household waste management include the following activities:

1. Conducting **training** activities (including workshops), with the aim that through the training provided to the community, they are able to utilize household inorganic waste, so that more inorganic waste can be sold or utilized. With intervention in the form of training activities, it can increase the amount/volume of waste that can be used or sold by waste banks in Purwokerto City.
2. Carry out **promotional** activities (in the form of leaflets, brochures, banners, billboards, films, and so on) in order to increase community participation in household waste management. This activity is carried out actively and continuously to attract the public attention so that they have the awareness to become members/customers of the trash bank. If the promotion is carried out continuously in a very active and innovative way, it will attract people to become members of the waste bank. Thus, it will increase community participation in household waste management to become members of the waste bank.

In the following, pictures of waste that can be utilized by a garbage bank are presented, if training is given to the community on household waste management for the period 2010 to 2025 as shown in Figure 5 and Figure 6.
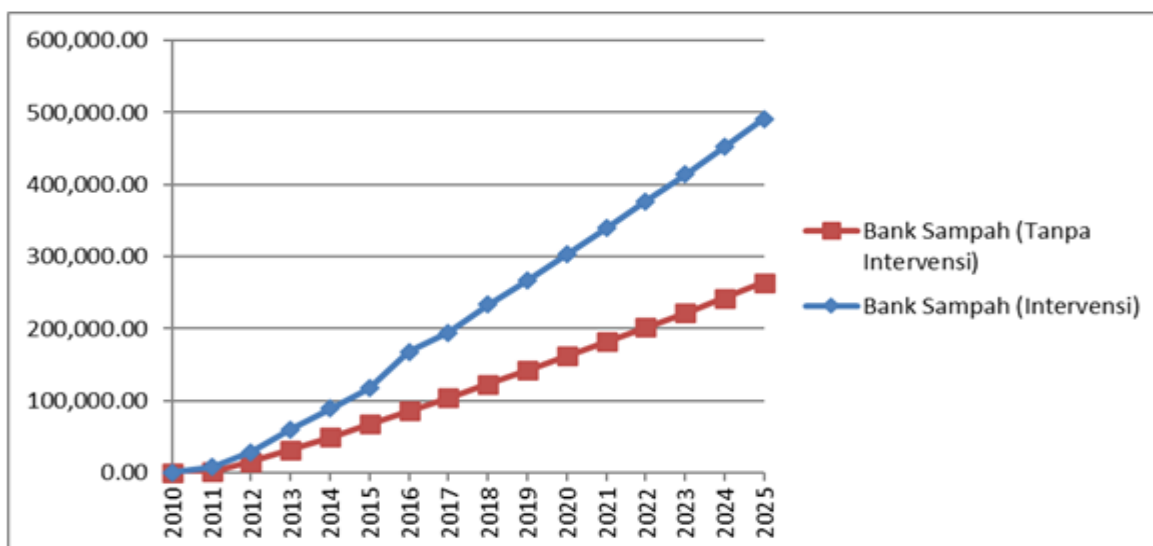

Figure 5. Waste that can be Utilized by the Garbage Bank, If a Training Intervention is carried out
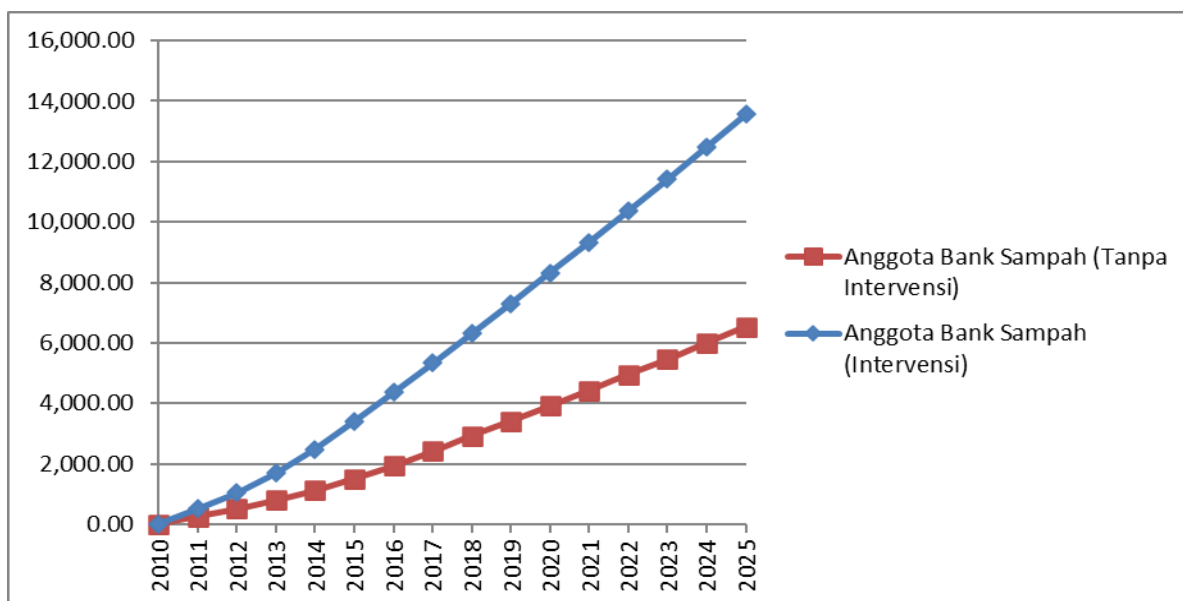

Figure 6. Members of the Garbage Bank Without Intervention and With Intervention

The following is presented waste in the Garbage Bank and its members.

Table 8. Waste in the Garbage Bank **Without and With Intervention**

Tahun	Bank Sampah (m3)		Anggota Bank Sampah (orang)	
	Tanpa Intervensi	Intervensi	Tanpa Intervensi	Intervensi
2010	0,00	0,00	0,00	0,00
2011	820,43	8.040,21	257	514
2012	15.235,67	28.187,18	518	1.035
2013	31.687,60	59.653,73	800	1.681
2014	49.112,46	88.948,34	1.132	2.473
2015	67.078,09	116.926,40	1.507	3.416
2016	85.415,56	167.959,20	1.943	4.371
2017	104.062,10	194.208,90	2.427	5.338
2018	122.997,60	232.943,20	2.917	6.318
2019	142.218,80	266.519,00	3.413	7.311
2020	161.729,60	303.321,90	3.917	8.318
2021	181.537,00	339.401	4.427	9.338
2022	201.649,20	376.653,20	4.944	10.372
2023	222.075,60	414.205,90	5.468	11.420
2024	242.825,70	452.500,00	6.000	12.484
2025	263.910,00	491.355	6.539	13.562

For the purposes of the modeling above, it is very necessary to have a flow chart showing the government policy revitalization model in participation-based waste management with zero waste concept before intervention and a flow chart after or with intervention.

Conclusion

Based on the description in the discussion and analysis, it can be concluded as follows: The government policy revitalization model for zero waste management is to (a) increase the formation of hangars in each village, (b) establish more Garbage Banks in each neighborhood unit (*RT*) in order to support zero waste, (c) coordinate at every stage from planning to implementation, and increasing monitoring and evaluation because so far it has not been considered optimal and had not significantly boosted the effectiveness of waste management. There are several field constraints that arise in inter-agency coordination at the planning stage, including: There is no agreement that household waste management is one of the priority aspects that will be handled by the Government of Banyumas Regency within the current planning year. Public awareness in general is still not optimally developed.

REFERENCES

Alfian Nurin. Muslihudin. Edy Suyanto. 2020. Partisipasi Masyarakat dalam Pemanfaatan Sampah Plastik Menjadi Paving Block di UD " Wong Cilik" Desa Jetis Kecamatan Kemangkon Purbalingga. Jurnal Nasional Terkareditasi Sinta 3. *Jurnal Analisia Sosiologi UNS*. Volume 09. No.02. Oktober 2020. ISSN: 2338-7572.

Alfian Nurin. Muslihudin. Edy Suyanto. 2020. Proses Pengolahan Sampah Plastik Paving Block di Desa Jetis Kecamatan Kemangkon, Kabupaten Purbalingga. *Jurnal Nasional READ (Research of Empowermen and Development)*. Volume 09. No.02. Oktober 2020. ISSN: 2745_4746.

Bello, Hafis. 2018. Impact of Changing Lifestyle on Municipal Solid Waste Generation in Residential Areas: Caase Study of Qatar. *International Journal of Waste Resources*, 8:2.DOI: 10.4172/2252-5211.1000335.

Damanhuri, Padmi, 2019, *Pengelolaa Sampah Terpadu*. Edisi Kedua, ITB Press, Bandung.

Das S, et al, 2019. Solid waste management: Scope and the chalenge of sustainability. *Journal of Cleaner Production.*

Devi. 2011. Penerapan Sistem 3 R dalam Pengelolaan Sampah Rumah Tangga. *Jurnal Ilmu Lingkungan*. Vol. 6No.3. April 2007 : 62-72. Semarang: Universitas Diponegoro.

Dhokhikah, Y. Et.al, 2015. Community participation in household solid waste reduction in Surabaya, Indonesia, Resources, *Conservation and Recycling Journal*.

Fatah A., 2013. Konsep Pengelolaan Sampah Berbasis Teknologi. *Jurnal Ilmu Lingkungan* Volume 11, Isue !: 84-91, 2013. ISSN 1829-8907.

Fitri Irawati. Edy Suyanto. BudiajiAbdul Chaliq. 2021. Female student experience in preventing scabies. *Journal International Journal of Public Health Science. (IJPHS)*. Volume 10. No.3. September 2021. Pp. 581-589. ISSN 2252-8806.DOI: 10 1159/ijphs.v.10i320580.

Hidayat, Kiranamahsa, and Zamal, 2019. *A Study of Plastic Waste Management Effectiveness in Indonesia Industries.* AIMS Energy, 7 (3): 350-370. ITB. Bandung.

Hendra Y., 2016. Perbandingan Sistem Pengelolaan Sampah di Indonesia dan Korea Selatan: Kajian 5 Aspek Pengelolaan Sampah, Aspirasi : *Jurnal masalah-masalah Sosial,* Volume 7 Isue 1: 77-91, 2016, ISSN 2541-2213.

Gultom. 2003. Pengelolaan Sampah Padat Perkotaan Secara Terpadu. Jakarta:*Jurnal Limbah.* Vol.8 No.1, Februari 2003: 15-26.

Kholill. 2008. Pengembangan Model Kelembagaan Pengelola Sampah Kota dengan Model ISM (Studi Kasus di Jakarta Selatan). *Jurnal Trnasdisiplin Sosiologi, Komunikasi dan Ekologi Manusia.* Bogor: FEMA IPB. Vol.2 No. 4, Oktober 2009: 37-47.

Kartodihardjo H. 2011. Kepemerintahan dan kebijakan Kehutanan: Soal diskursus dan reduksi Ilmu Pengetahuan. S.Ps. IPB. Bogor.

Kholill. 2008. Pengembangan Model Kelembagaan Pengelola Sampah Kota dengan Model ISM (Studi Kasus di Jakarta Selatan). *Jurnal Trnasdisiplin Sosiologi, Komunikasi dan Ekologi Manusia.* Bogor: FEMA IPB. Vol.2 No. 4, Oktober 2009: 37-47.

Kuswartojo T. 2006. Asas Kota Berkelanjutan dan Penerapannya di Indonesia. Jakarta: *Jurnal Teknologi Lingkungan.* Vol. 7 No.1. Juni 2006: 1-6.

Kristiyanto T. 2007. Pengelolaan Persampahan Berkelanjutan Berdasarkan Peran Serta Masyarakat Kota Kebumen [Thesis]. Semarang: Universitas Diponegoro.

Yogiesti. 2012. Pengelolaan Sampah Terpadu Berbasis Masyarakat di Kota Kediri. *Jurnal -agriunhas.com/index.php.* Vol.12. No.2, Januari 2012: 12-22. Makasar: Lembaga Penelitian Universitas Hasanudin.

Morrissey A and J. Browne. 2004. *A methodology for summunity based waste management decisions. The Journal of Solid Waste Technology and Management.* Vo.30 No.3, Januari 2004: 170-182.

Tchobanoglous, George and Frank Kreinth. 2020. Handbook of Solid Waste Management. Nd ed. Mc Graw_hill.

Yuni Tristanti, Eko Hendarto, Edy Suyanto. 2020. Dinamika Pengelolaan Sampah: Studi Kasus Sistem Hanggar di Kabupaten Banyumas. *Jurnal Nasional READ (Research of Empowermen and Development).* Volume 01. No.02. Oktober 2020. ISSN: 2745_4746.

Romaningsih & Asparin. 2017. Analisis Sistem Pengelolaan Sampah Medis Puskesmas Perawatan di Kabupaten Merangin. *Jurnal Kesmas Jambi*, Volume 1 (2), 35 -45.50000500206.

Rijatno. 2010. Kajian Minimisasi Dalam Pengelolaan Sampah Perkotaan. Jakarta: *Jurnal Tarumanegara*.ac.id/index.php/ts/article/view/564.Vol.11No.3. Maret 2011: 75-99.

Rini P., Samudro.G., dan Hadiwidodo.M, 2016. Perencanaan Sistem Pengelolaan Persampahan Pelayanan TPA Semali kabupaten Kebumen. *Jurnal Tekhnik Lingkungan,* Vol. 5 No.4 UNDIP. Semarang.

Saribanon N. 2007. Perencanaan Sosial Partisipatif Dalam Pengelolaan sampah Permukiman Berbasis Masyarakat (Kasus Di Kotamadya Jakarta Timur). [Disertasi]. Bogor: Institut Pertanian Bogor.

Sahely H, Kennedy CA. and Adams BJ. 2005. *Developing sustainability Criteria for urban infrastruktur system.* Canadian Journal of Civil Engineering. 32 (1): 72-85.

Surjandari. 2009. Pengelolaan Sampah Untuk Mengurangi Beban Penumpukan. Surabaya.

Jurnal Teknik Industri. Vol. 11. No.2, Mei 2009: 35-47. Surabaya: Universitas Petra Press.

Soetarto E. 2009. *Paradigma Kritis dalam Kebijakan Sosial.* Bogor: Brighten Institute Press.

Salkin, I.F., Krisiunas, E., & Turnberg, W.L. 2000. Medical and Infectious Waste Management. *In Journal of the American Biological Safety Assosiaation* ; Vol. 5 Isue 2. Pp. 54-69.: //doi.org/10.117/1091530.

Suyanto, Edy. Lestari Soetji. Rini Wd. Fx Wardyono. 2022. Community Soscial Solidarity Model Strategies For Maintaining Mental Health Due To The Impactt of The Covid-19 Pandemic Based On The Local Wisdom Of The Banyumas Community- Central Java_ Indonesia. *Journal International NeuroQuantology*, Juli 2022. DOI: 10.14704/nq.2022.20.7.NQ33344. e ISSN 1300-5150.

Suyanto, Edy. Endratmo, Sumardjo. Hartrisari. 2015. Model Partisipasi Green Community dalam Perumusan Kebijakan Green Waste Mendukung Kota Hijau Purwokerto. Jurnal Nasional Terakreditasi. *Jurnal Mimbar: Sosial Pembangunan.* Volume 31 No.1 Tahun 2015. Shinta Valid. Bandung.

Suyanto. Edy, 2014. *Model Partisipasi Green Community dalam Perumusan Kebijakan Green Waste Lintas Rumah Tangga Mendukung Kota Hijau Purwokerto.* Disertasi. IPB. Bogor.

Marimin. 2005. Teknik dan Aplikasi Pengambilan Keputusan Kriteria majemuk. Jakarta : Gramedia Widiasarana Indonesia.

Mulyo H. 2010. Model Pengembangan Kelembagaan Pengelolaan Persampahan Kota Berbasis Partisipasi Masyarakat (Studi Kasus Kota Bandung). [Disertasi]. Bogor: Institut Pertanian Bogor.

Mujiburrrahmad, F. 2014. Hubungan Faktor Individu dal Lingkungan Sosial dengan Partisipasi Masyarakat dalam Pengelolaan Sampah Rumah Tangga (Kasus Kampung Sengked, Kecamatan Dramaga, Bogor). *Jurnal Agrisep*, 15 (1), 47-66. Bogor.

Naimah, Siti. 2012. Dekomposisi Limbah Plastik *Polypropylene* Dengan Metode Pirolisis. *Jurnal Sains Materi Indonesia*. Vol.13 No.3 balai Besar Kimia dan Kemasan Komenperin. Jakarta Timur.

Purwono, Wiwik, Edy Suyanto. 2022. Strategi Pengelolaan Sampah Rumah Tangga Dengan Model Ekonomi Sirkuler di Wilayah Perkotaan Purwokerto.*Jurnal Buletin KeslingMas. Buletin Kesehatan Lingkungan Masyarakat Banyumas.* Vol. 41 No.3 September 2022. E-ISSN : 2655-8033.

Taufick, H. 2021. Pengaruh pandemi Covid-19 Terhadap karakteristik Sampah Padat Pada Kawasan Summerecon Serpong. *Jurnal Teknologi dan Desain Universitas Pradita*, Vo.2pp 94-103.

Wheeler SM.2000. Planning For Metropolitan Sustainability. *Journal of Planning Education and Research (JPER)*.Vol. 10 No. 20, Februari 2012 :133-145.

Zain AFM, Syahbana, G.2011. *Green Policy* makalah disampaikan pada *Workshop Green City* 2011. Perundang-undangan Bidang Penataan Ruang dan konsep Rencana Aksi Hijau. Bogor: IPB International Convention Cenre