

Toward Green, Clean and Sustainable Environment

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Abstract - The purpose of this paper is to create an appropriate waste management model for UNISSULA that proclaim a clean, green and sustainable environment based on waste processing for economic value and ecological environment. A brief overview of the concept includes development of management system of regional waste, education & waste management & WMS training, waste handling, waste processing and utilization of waste processing products. However, UNISSULA's concept has some weaknesses that must be overcome in order this concept could be running well such as: capacity of garbage, area, infrastructure (garbage fleet) and smart cards and automatic container system. It is therefore, needed cooperation with Semarang City Government' that is by collaboration concept of UNISSULA with Semarang City Government's concept to ensure the input capacity, and people support. As a result, the creation of a vicious circle of urban rubbish management namely, economic stimulation, clean environment, government income and people income and economic structure. Besides that, this concept is expected to improve economic citizen through economic value added of waste. The next is expected to change the culture, urban lifestyle, green behavior, clean environment, transportation and income, and farming, fruits and vegetables industry.

Keywords: *Waste Management, Value added, Clean Environment, Sustainable Growth.*

1. Introduction

The purpose of this paper is *UNISSULA* to create the concept of clean environment and clean and green biosystem based on waste processing for economic value and ecological environment. So *UNISSULA* designed the concept based on the paradigm that waste can be a treasure, awareness, mastery of science and concrete examples of waste processing and vision of mission *UNISSULA*. Therefore, it is designed a model of waste treatment system based on economic value and ecosystem.

Beside that, the problem of tidal flood in Semarang city is still a crucial issue because until now it is still unsolved. One of its efforts is by making dike and pump system to pump water into the sea. This pump system has been implemented in several rivers in

Semarang such as banger river, grace river and river kemuning. Although this system can solve the problem, the waste problem is feared to disrupt the sustainability of the system, since garbage can enter the river which can cause disruption of the pump system. Therefore, it should be thought of the concept of integrated waste management that can solve the problem of waste in the city of Semarang.

Waste management is not only done in Semarang, but must be comprehensive to all parts of Semarang city which has a huge waste capacity. There are several known waste management models such as in Bandung, Surabaya and Curitiba, Brazil. However, some methods are still not optimal. So that required collaboration of several interrelated concepts between processes, activities and economic benefits that are backed up by ICT. For this paper aims to integrate the concept of waste management by UNISSULA Semarang with the concept of Global Waste Management System.

2.The Existing Model of Waste Management

Model of waste management has been applied in many countries, the following is the existing model of waste management:

2.1 Surabaya and Bandung Model

Surabaya and Bandung model known as waste recycling to compost, the waste processing model is transformed into output in the form of compost fertilizer with the process of waste sorted according to its type, for wet garbage such as leaves, wet food, and animal waste mixed with the soil and then used as fertilizer. All these processes still use manual methods and require relatively long time. The garbage collection model of the population uses self-help methods based on awareness.

2.2 Curitiba, Brazilia

Brazilian Curitiba Model made several innovations to overcome its garbage problem "Garbage that is not garbage" which recycles 70% of Curitiba city waste, Brasilia. Innovations include:

- a. The Garbage Purchase: because initially the city of Curitiba is not enough to build a waste processing plant, the government conducts a campaign of waste selection according to its type.
- b. The Green Exchange: the activity of this innovation is collecting, sorting and exchanging household waste with daily necessities and vegetables and fruit.
- c. Free Open University for environment: the university provides free education and environmental protection for the general public.
- d. All Clean: the government provides funds for areas with large amounts of garbage but is difficult to reach by the system to be cleaned by unemployed, retired, homeless and former drunks.
- e. As a result the adoption of the model; green city, clean environment can be achieved as a culture in the society. The major of the city was granted an award the most

sustainable environment city for 2010 to 2015 by International Environment and Culture Institutions based on Swiss.

3. UNISSULA's Concept

3.1 A Brief Overview of the Concept.

UNISSULA already has a suitable concept in order to realize ecosystem and green system in recycling waste processing system to become energy and economic value. The concepts that are owned by UNISSULA has five steps are as follows:

Firstly, Development of Management System of Regional Waste: Handling and processing of waste areas requires both general and specific guidance to guarantee and ensure that waste management is systematically, structured and well executed. Therefore it is necessary to prepare a document of Waste Management System (SML) which includes the System Manual with SOP.

Secondly, Education & Training Waste Management & WMS: Waste handling and processing requires awareness, commitment, intelligence and skill at the level of policy makers and those who are entrusted by institutions or parties directly involved with waste management. Education is needed in the awareness and training framework for the mastery of waste management and especially in the implementation of WMS.

Tirdly, Waste Handling: Implementation of waste handling includes waste segregation activities in waste generation area (household and public area) and construction of integrated wastewater treatment plant with the following details: (a) Separation of waste with smart garbage containers (Procurement of smart garbage container facilities that separates 5 types of waste materials, Placement of smart garbage containers in public areas, Garbage patrol). (b) Integrated Waste Treatment Plant Development Area (Installation of non-trash incineration, Installation of biomass storage & processing, Installation of storage & manufacture of microbacter, Storage & leaching installation, Installation of storage & waste plastic processing & paper, Electronic storage & waste processing installation, Installation of wudhu water treatment, Installation of animal waste (kohe) & faeces for clean renewable energy).

Fourthly, Waste Processing: Waste processing requires a mechanical process by using special machines combined with appropriate technology. Meanwhile, for the manufacture of organic feed requires the building installation of feed house. The activity plan undertaken in the following waste treatment items: (a) Organic Foundry Housing, (b) Procurement Of Organic Waste Processing Machinery (The flotation machine, Granule printing machine, and Biomass counter machine). (c) Procurement Of Inorganic Waste Processing Machinery (Plastic counter, Paper fuser, Pulp making machine), (d) Development Of Biogas Installation, (e) Constructions Of Wudu Water Purification Environmentally Friendly Installations.

Fifth, Utilization Of Waste Processing Products: All the results of waste processing both organic and inorganic will be utilized as much as possible in order to generate added value to stakeholders especially to the ummah, namely to: (a) Implementation of

Integrated Organic Farming (IOF) (The product of organic waste processing in the form of fertilizer and feed will be utilized for IOF implementation in Quran Garden program and increasing wakaf land productivity of YBWSA. While processed products of an-organic waste directly marketed) (b) Meet Market Demand & Empowerment Dhuafa Marginal Agriculture sector (The advantages of organic waste processing products (fertilizer, microbacter, and feed) including clean energy sources will be utilized with two patterns: first, the pattern of business that is marketed by the principles of sharia. Second, the social pattern that is to subsidize poor people in the marginal agricultural sector through empowerment program LAZIS Sultan Agung).

3.2 Key Performance Indicators

Key performance indicators include five programs: Preparation of Waste Management System, Education and training system waste management, Handling Waste, Organic Waste Processing, Inorganic Waste Processing, Utilization of waste treatment result described as follow:

Table 1. Performance Indicator Programs

No	PROGRAM	PERFORMANCE INDICATORS	ACHIEVEMENT INDICATORS
1	Preparation of Waste Management System	Formation of WMS Compiler Team	Compiled YBWSA WMS document
2	Education & training waste management & SML	Training <i>waste management</i>	Implementation of waste management training for all stakeholders related to waste handling
		Training on Waste Management System	Implementation of WMS training for all stakeholders related to waste management
3	Handling waste	Separation of waste with smart containers	90% of the waste generation area has been separated in the clever garbage container
		Construction of integrated waste installations	Wake up six (6) types of waste storage / treatment installations
4	Organic Waste Processing	Development of organic food processing house	Wake up one (1) organic food processing house
		Procurement of organic waste processing machinery	There are three (3) types of organic waste processing machines available
5	Inorganic Waste Processing	Procurement of inorganic waste treatment machinery	Three (3) types of inorganic waste treatment machines are available
6	Utilization of waste treatment results	Implementation of the program IOF Quran garden, YBWSA waqf land, and the village of Patronage	IOF implementation of 100% and yield productivity is more marketed

3.3 Action Plan

a. Starting Action Plan

There are five programs to start action plan: Procurement, Sampling, Development, Utilization and Training described as follow:

Tabel 2. Starting Action Plan

1	2	3	4	5
PROCUREMENT	SAMPLING	DEVELOPMENT	UTILIZATION	TRAINING
<ul style="list-style-type: none"> Leachate treatment container Microbial processing container Household inorganic trash container Open-ended smart garbage container 	<ul style="list-style-type: none"> Handling YBWSA Household Waste Samples handling PUMANISSA culinary waste Handling of campus biomass waste 	<ul style="list-style-type: none"> Installation of temporary biomass reservoirs Unused garbage burning installation 	<ul style="list-style-type: none"> Fertilizing the Garden of Quran & organic mikro green Packaging of leachate products & organic mik robes 	<ul style="list-style-type: none"> Waste Management Waste Management System (WMS)

b. Halalan Thoyyiban Supply Chain Product

-Upstream

- Organic (Urban) Farming yang meliputi: Quranic Garden Park, Herbs, fruits & vegetables, Micro greens, Organic Farms & Fishing
- Slaughter House Certificate SJH HAS 23000 LP POM MUI
- Halalan Thoyyiban Product Factory

-Downstream (Organic Halalan Thoyyiban Sharia Market)

- Organic Farm Store
- Organic Fresh & Healthy Product yang meliputi: Abasa Salad, Organic Fresh & Healthy Juice, Organic Fresh & Healthy Salad
- Halalan Thoyyiban Cullinary Market
- Halalan Thoyyiban Organic Herbs Medicine

3.4 Team and Operation Management

Table 3. Team Program Routine in the Garden Quran YBWSA

No	PROGRAM	PERFORMANCE INDICATOR	ACHIEVEMENT INDICATORS
1	Jumat Bersih Hijau Sehat (JBHS) / Friday clean green healthy	Implementation of environmental thaharah in congregation	Regular maintenance & environment of the area four times a month in congregation
2	Agricultural Management Quran Garden	Farming crops with integrated eco-organic farming methods	Planting daily crops based on al-Quran and food crops on unproductive land areas
3	Quran Garden Farm Management	Farmed livestock with integrated eco-organic farming method	Daily breeding of laying & broiler livestock in unproductive land area

No	PROGRAM	PERFORMANCE INDICATOR	ACHIEVEMENT INDICATORS
4	Integrated management of regional waste	Waste management area with waste management method	Periodic processing of organic & inorganic waste in the area into fertilizer, feed, and energy
5	Marketing of Quran garden products	The implementation of marketing of Quran garden products in sharia	Marketing of all products and agricultural products, livestock and waste treatment

Waste Separation and Processing will depicted as follow:



Fig. 1. Waste Separation and Processing

3.5 Infrastructure of Installation of Integrated Waste Processing

a. Education and Training of Integrated Waste Processing



b. "School/Vocations/WasteCampus"



4. The Shortcoming of UNISSULA's Concept

4.1 Waste Capacity

Garbage collected from campus UNISSULA approximately 500 kg per day, while to realize the concept is needed up to 1000 tons per day, therefore UNISSULA can cooperate with PEMDA Semarang City through RW (Rukun Warga) around Semarang city. So the waste input capacity can reach approximately 1000 tons as the following table:

Table. 4. Waste Capacity

No	Kecamatan	Sampah Pasar (KG)	Hotel dan Restorant (Kg)	Pabrik Kg	Rumah Tangga (TON)
1	Semarang Utara	1.509	310	190	70,4
2	Semarang Tengah	2.723	500	90	36
3	Semarang Selatan	1.006	420	210	40
4	Semarang Barat	1.890	310	320	89
5	Semarang Timur	2.098	309	330	55
6	Pedurungan	1.490	210	180	101
7	Genuk	2.100	190	390	110
8	Cayamsari	1.750	189	270	150
9	Banyumanik	1.998	230	265	81
10	Gajahmungkur	1.670	280	190	42
11	Candisari	1.455	300	200	46
12	Gunungpati	1.320	109	195	29
13	Mijen	1.190	119	90	32
14	Ngaliyan	1.300	120	95	40
15	Tembalang	1.580	218	115	89
16	Tugu	1.230	100	200	21
Jumlah		26.309,0	###	3.330,0	1.031,4
Per Day: (TONS)					1.064,60

Source: Statistic of Semarang Bureau

With such cooperation, the community will automatically be stimulated to collect the garbage from the surrounding environment and then deposit it to the garbage collection location nearest to the house through electric automatic waste system (smart garbage container). So that in this weakness (problem) can be resolved.

4.2 Area

The availability of vacant land in UNISSULA is very minimal, but to realize an optimal garden qur'an required a large area. Therefore, extensive land is needed as a medium to grow fruits and vegetables, livestock and energy reconciliation (fertilizer). Therefore, it is expected that in cooperation with the Government of Semarang City which has vacant land in some areas around Semarang about 300 ha of weakness the amount of land can be overcome.

4.3 Infrastructure (garbage fleet)

The new concept of UNISSULA has not / does not have a garbage truck that is used as a means of collecting garbage from various campus locations UNISSULA, in collaboration with the Government of UNISSULA can utilize the idle fleet that is widely available in the local government to transport garbage because it is already there cooperative contract.

4.4 Smart Card and Automatic Container System

In addition to the above three disadvantages, UNISSULA does not have a smart card system that is combined Automatic Container System that allows the owner of the garbage every time you enter the garbage in the container, the card will automatically fill the voucher of the heavy amount of garbage. If the above concept is applicable, it can solve some problems easily. Smart cards combined with automatic container system are drawn as follows:



Fig. 2. Automatic Waste Box and Smart Card System

With the concept of garbage collection can be done easily described as follows:

Firstly: Someone who collects garbage by putting it into smart box garbage then smart card will automatically filled as much as the garbage voucher that is entered into smart box garbage. the full garbage garbage box will send the signal to the garbage truck with the help of GPS (Geo PositioningSystem) installed in the box, so the garbage truck will know which box is full of garbage and taken, Waste is not allowed to accumulate in this concept.

Secondly: The results of garbage collection stored in smart card can be used for everyday purposes, i.e: (a) For transportation (commuter, BRT, Busway payments), (b) For the student the smartcard can be used to pay tuition fee, (c) For college students can use it for laptop purchase installment as it has been run in Brazil, (d) For housewives can use it to buy fresh fruits, vegetables, rice and fish produced from gardens and land managed from this concept, (e) In terms of energy, farmers can be helped by the cheap price of compost fertilizer produced from this concept. While the mechanism of waste management into organic fertilizer depicted as follows:



Fig. 3. Benefits of Collecting Waste

The picture above illustrates some of the benefits of garbage collection being converted into smart cards. These benefits can be felt by all people, from for children to adults. In addition to being used for transactions, this concept can create a clean environment and have economic value.

5. Some Important Keywords in the Propose Model and Mechanism

In the sub chapter we will discuss the keywords of propose Model, the Other Benefit, the vicious cycle or Urban rubbish management, Change of Waste Management, Changing Citizens' Economic and Towards sustainable Pump System as follow:

5.1 Keywords in the Propose Model

- Households, traditional markets, hotel restaurants: these institutions as waste producers
- Electronic Rubbish Box: as a waste storage medium of the population that provides convertible technology from waste weight (kg) to digital value
- ICT, Trucks, Central Processing Unit (CPU), Plants Of Rubbish: these equipments for efficiency support
- Semarang Vegetables and Fruits Plantation: Plantation owned by Semarang City by employing the idle lands
- Fertilizer Organic, Selected Rubbish: output in the form of fertilizer to help farmers vegetables and fruits
- Digital Smart Card (WASTE): waste digital start in the automatic Smart Card can be able to redeem vegetables, fruits, transportations fee, laptop installment, tuition fees, and *sembako*.

5.2 The Other Benefit to the Semarang Polder System

The program will beneficial, If the concept is running well in the society. Besides that, it will also benefit the cleanliness of the river from waste, because waste is a valuable commodity hunted by the community, every piece of waste is valuable, so it can make the environment and river clean -clean and green city. Moreover, If this waste management system can be implemented properly, it is expected that each rubbish has economic value as described above. As a result of rubbish become target by inhabitant because they consider the rubbish should insert in the Smart Card. That possible to redeem any valuable things i.e.: Fruits, vegetable, tuition fees, laptop installment, transportation payment, etc.

So that unmanageable garbage problems and pollute the river that is feared to disturb the sustainability pump system can be avoided. So the problem as the following picture can be avoided.

5.3 The Vicious Circle of Urban Rubbish Management

The vicious cycle of urban rubbish management include Clean Environment, economic stimulation, Government income and people income and economic Activity displayed as follow:

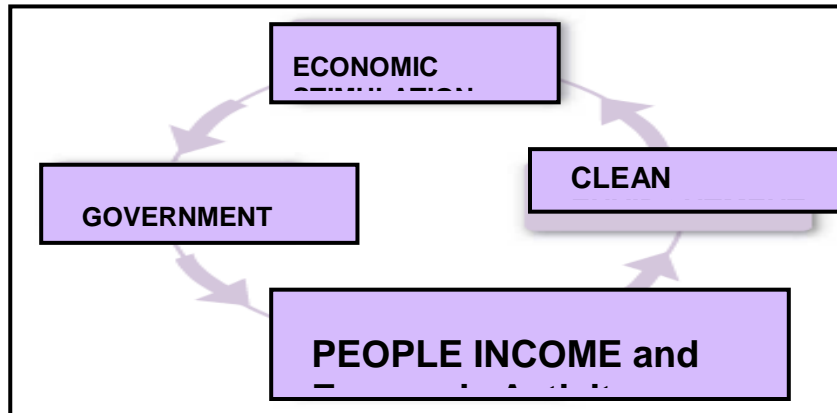


Fig. 4. The Vicious Circle of Urban Rubbish Management

5.4 Change of Waste Management Concept

Change of waste management include Visi and Mission, Welfare Society, Clean Environment, Community Habbits, Concept of Life and Education People described as follow:



Fig. 5. Change of Waste Management Concept

The most important thing in this concept is the creation of green and clean environment. This becomes important because with no cost to be issued by the local government of Semarang City, the garbage in the neighborhood becomes the public struggle to be a smart card voucher. In addition to realize the clean and green environment the key required vision and mission that clearly dr the government that has welfare society, educating people to improve the concept of life through community habbits.

5.5 Changing Citizens' Economic

Besides to solve the problem of Tidal Flood Problem, integrated waste management is expected to improve economic citizen through economic value added of waste. The next is expected to change the culture, urban lifestyle, green behavior, clean environment, transportation and income, and farming, fruits and vegetables industry. The integration of this system requires a system approach involving various stakeholders, including people, government, communities, universities, scholars, and NGOs. Who are working together to develop and implement the model. The above description will be described as in fig. 6 as folow:

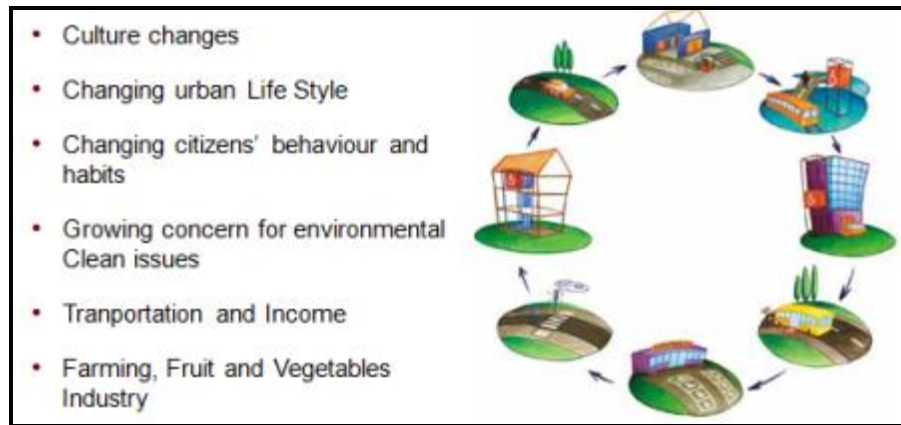


Fig. 6. Changing Citizens' Economic

5.6 Sustainable Pump System



Fig. 7. Sustainable Pump System

6. Conclusion

Waste problem in Semarang city especially UNISULA campus is expected to be overcome by the concept of collaboration between the concept of UNISSULA with the Global Waste Management System Concept. If the concept is supported by political and government support, especially by the Semarang City government, then the proposed model will run well because it is supported by large waste capacity, infrastructure and community support. Moreover, this concept will be able to ensure the creation of green, economic, and clean environment. This becomes important because with no cost to be issued by the local government of Semarang City, the garbage in the neighborhood becomes the public struggle to be a smart card voucher. In addition to realize the clean and green environment the key required vision and mission that clearly dr the government that has welfare society, educating people to improve the concept of life through community habits. Nevertheless, the concept of collaboration between UNISSULA and the Municipal Government of Semarang need to be further investigated.

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