Article

Empowerment of Semi Formal and Informal Sector in Realizing A Cheap and Environmentally Friendly Alternative Energy of PLTSa Sumur Batu Business Process

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Abstract: The development of PLTSa has become a government priority program to overcome electricity needs and reduce the amount of waste in Indonesia. However, the program also harms informal groups who earn a living and survive through collecting plastic waste. The objective of this paper is to design a PLTSa business process that not only aims to generate electrical energy and overcome the problem of landfills but also accommodate the needs of informal groups. The situational analysis is conducted using PESTLE and SWOT to enhance a business process canvas that is beneficial to all stakeholders by recommending business innovation for PLTSa. Society as a source of waste is entitled to sort out the waste according to the specified category. The Semi- formal group of workers assist the government in the process of collecting, recycling the waste, and finally selling it to third parties. In addition to building PLTSa, government should provide waste management facilities and infrastructure and simultaneously developing an application for elaborating B2B and B2C business processes including collecting waste and selling recycled products. PLN is appointed to be in charge of buying electricity generated by PLTSa and selling it to the community at a reasonable price. The semi-formal groups of workers are expected can improve their business performance and willing to realize environment waste free. The community will be supported with the cheaper electricity bill, while the government will not be burdened with the operational costs of PLTSa.

Keywords: PLTSa, waste sorting, waste collection application and sales of recycled products, semi-formal sector, landfill, community, cheap electricity

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1. Introduction

Indonesia's waste production has reached millions of tons annually. The Ministry of Environment and Forestry (KLKH) revealed that Indonesia's total waste in 2018 had reached 64 million tons and kept on growing to reach 68 million tons in 2020 (Indonesia.go.id, 2020). The volume of garbage dumped into the Sumur Batu landfill itself reaches 1000 tons daily after the enforcement of Work from Home (WFH) issued by the government due to the COVID-19 outbreak [1].

The volume of waste will keep rising on an annual basis due to lack of society's perception into waste as a valuable resource. It is evidence that the distributed questionnaires aimed at the wider community (130 respondents), there is only about 4.6% who have turned waste into useful handicrafts such as ornamental flowers. This can be rated as proof of small role of society in making use of the waste.

The growing volume of waste is on the opposite side of the increasingly shorter age of Sumur Batu landfill. According to [2], the Sumur Batu landfill was to be full in capacity in 2019, two years back. Despite the fact that the UPTD Sumur Batu at the Bekasi City Environment Agency has opened two new zones to expand waste disposal area in July 2019, the Bekasi City Government is still being called to change the paradigm of waste management disposal instead of piling it up in the Sumur Batu landfill [3].

Based on these problems aroused on the field, the construction of PLTSa is undoubtedly a solution which should be implemented immediately to put it into practice, the central government has made a plan to accelerate the development of PLTSa delegated to local governments in various regions, such as DKI Jakarta Province, Tanggerang City, Bekasi City, and many more [4]. The design of PLTSa development aims to immediately solve the problem of waste that occurs in various regions in Indonesia, especially in the Sumur Batu landfill. Nonetheless, the development of PLTSa has the potential to have an impact on the social and economic side.

The construction of PLTSa will result in the landfills being fully organized by the government. What is worse, the Outside parties may find it difficult to get access to the landfill areas to scavenge garbage that still has a selling value. Furthermore, From the social point of view, those who are accustomed to work in dealing with the garbage are required to have a vicissitude in their work system as the raw materials (garbage) is only obtainable prior to the garbage being delivered to the landfill area. Looking closely in this case, the garbage businesspeople will sense the limitations of collecting raw material sources (garbage). Whereas in terms of the economy perspective, there is a possibility of a loss of sources of income for the marginalized. Quoted from the official page of [5], Wiyati as one of the garbage collectors at Piyungan landfill, Bantul, Yogyakarta stated that she was worried about losing her job if rumors of the construction of PLTSa became real. Marginalized people, who usually earn a living and survive their lives by sorting waste (plastic, cans, cardboard, paper, cables, battery stones, etc.), are apprehensive to lose their income due to the PLTSa program that will dump the waste in landfills. For that reason, these garbage collectors will feel aggrieved by the PLTSa construction planning.

To give the general perspective of the above-mentioned problems, this paper tries to design the waste management process conducted in PLTSa, as well as analyze the possible problems along with its implications aroused from PLTSa activities using SWOT and PESTLE analysis. Hence the paper also designs business innovation and concrete actions to be taken to provide solutions to the problem analysis along with the implications.

Basically, the business innovation was formed to protect the interest of stakeholders, especially in the informal sector in sustaining their lives upon the completion of the PLTSa's construction. The configuration of the waste management and processing procedure in PLTSa as well as its business innovation will be summarized in the business canvas model and action plan. The action plan is expected to contribute in minimizing the state of poverty and supporting the empowerment of the potential act of the Clean and Affordable Energy ecosystem, especially in dealing with the post-Covid-19 era

2. Literature

2.1. Waste Management

According to [6], waste management is the comprehensive act in handling waste so that it does not affect health, aesthetics, and the environment. The treatment includes the process of relocating the source, and recycling. In Indonesia, waste management methods that are commonly implemented by the community or even the government, are in the form of desertification, composting, open burning, small-scale incinerators, and dumped into rivers.

2.2. Semi-Formal Sector

What is more, results show that activities which are applied with community-based waste management concepts are actually merging the term of formal sector and the informal sector known as the semi-formal sector. In clarity, the semi-formal sector mentioned above is a community activity in waste management based on TPS 3R and Waste Bank [7].

a. Garbage Bank

The waste bank program is a garbage disposal management system using the principle of recycling [8]. In its mechanism, The Garbage Bank also empowers informal sectors (scavengers and fleas) to set the business processes in motion creatively that will enhance the selling value of its members.

b. Waste Treatment Site 3R (Reduce, Reuse, Recycle)

Referring to the Regulation issued by Minister of Public Works (PU) No. 3 of 2013, the landfill of 3R is the collection point prior to the process of, sorting, reusing, and regional scale processing [9].

2.3. PLTSa

PLTSa is the management of waste which is converted into electrical energy based on environmentally friendly technology in which the quality standards are fulfilled by the provisions required by the legislation to reduce the volume of waste significantly upon its trial. Needless to say, the development of PLTSa is a waste management system and electricity provider which has a joint venture with the regional government in supplying the waste as a raw material to be converted to electricity. An electricity sales memorandum of understanding with PT PLN as a granter of electricity supply from PLTSa [4] will also be signed.

2.4. B to B (Business to Business)

B2B states that the sale of products or services involving several companies is conducted using automatic systems. Generally, the company's counterparts are suppliers, distributors, factories, shops, and others [10]. In a B2B working mechanism, the sale of products or services provided by a business core in developing other business cores is not meant for consumers, such as distributors who sell their goods to other stores deliberately.

2.4. B to C (Business to Customer)

B2C, on the other hand, involves interaction and transactions between a selling company and the consumers [10]. In B2C, the outcome of the product will be sold directly to consumers for personal consumption, not for resale.

3. Methods

Various analytical processes are carried out to raise the awareness of the research objectives that have been formulated. By means of validity, this paper uses qualitative and quantitative approaches in search for various information that can be used as a reference in finding information and solution to the problems occurred on the ongoing process. The qualitative approach is using a literature study on how to manage and process waste in Indonesia, which is carried out by applying the analysis methods of SWOT and PESTLE. Meanwhile, the quantitative approach is out to process data on the dissemination of questionnaires for the community, in order to get an overview of waste management behavior that has been implemented by the community. The final output will be then listed and elucidated in the Business Canvas design model and the business process blueprint.

4. Results and Discussion

4.1. External Conditions of Waste Management Process

The external environment of the business is an aspect that cannot be controlled by the company; however, it gives a tremendous impact on the sustainability of the establishment and development of the business. In this case, PESTLE is used to analyze external circumstances that are likely to influence the waste management of business activities.

Referring to Table 1, it is obvious the external environment brings a big impact, both directly and indirectly, on several aspects that contribute to the business activities of the waste management process. Whereas the indirect impact cause indirectly occurs on the implementation stage of political aspects (government regulations), as these aspects contribute to the implementation of waste sorting activities into several categories before being disposed of by the community In detail the direct impact actually comes from the legal aspect that has cognition for the training implementation of Human Resources aiming for enhancing productivity of high waste management process activities, in PLTSa and semi-formal sector business. The volume of garbage itself should be in the main concern of the government, as it has be-come the business resources to some of the businesspeople in, both semi-formal sectors and PLTSa. However, waste is an internal burden for the government if the process of destroying is only carried out in PLTSa.

Table 1. Pestle analysis of waste management process business activities

	Issues	Implications
Politics	Law 18 of 2008 on Waste Management aims to improve public health and environmental quality and make waste a resource [11]	1. The government is directly in charge of waste management service 2. The community is expected to be able to sort out the waste according to its category
	Regulation issued by the Republic of Indonesia, Number: P.63/Menlhk/Setjen/KUM.1/7/2016 On the requirements and procedures for the collection of hazardous and toxic waste in the final hoarding facility article 1 to 32 [12]	The government and PLTSa entrepreneurs must ensure the procedures for the use of residues as products which have economic value to the surrounding community such as the business of making block paving, briquettes, asphalt raw materials, and cement mixed raw materials

Table 1. Pestle analysis of waste management process business activities (Cont.)

	Issues	Implications
Economy	The Country's Economic Growth Rate, in terms of expenditure and income [13]	1. Rising GDP resulted in a raise in labor wages that led to an upsurge in people's consumption patterns. 2. An increasement in public consumption contributed to the growing volume of the waste. 3. A hike in a country's acquisition that can be used as PLTSa funding
	An escalation in marginalized people due to layoffs	1. Marginalized people earn a by scavenging garbage in the residential area and landfills. 2. If PLTSa is built, the landfill organization will be entirely under the government control and the access of entering the landfill will be prohibited for marginalized people 3. Many marginalized people will lose their source of income from landfill waste
Social	An upsurge of garbage entrepreneurs	1. Businesspeople get garbage from garbage collectors. 2. PLTSa development is probably will close landfill access (garbage source) 3. Parties who are accustomed to doing junk business need to be reorganized
	Population growth [14]	1. Raising the volume of waste as the raw materials of PLTSa and its business counterparts which are located around the PLTSa environment 2. The productive age population increases so they are allowed to participate in the waste management system
	Labor Wage or Regional Minimum Wage (UMR) and Per Capita Income	1. From the internal aspect PLTSa opens up employment opportunities for the surrounding community which has the potential to increase their regional minimum income (UMR.) 2. From the external aspect, this regional minimum income (UMR) triggers public consumption on the products and has the potential to increase the amount of waste.
	Community waste disposal patterns [15]	Unsorted household waste is difficult to be utilized by semi-formal sectors to be-come a source of income
Technology	Procurement of PLTSa Technology of Bekasi City	The allocation of funds from local governments for the development of PLTSa technology will result in swelling of APBD, and will likely lead economic deficits
Legal	Bekasi City Regional Regulation No. 18 of 2011 concerning Employment Services [16]	The training implementation to enhance human resources competency and labor protection strategies are given with the elements ranging from the outermost unit of PLTSa to residual processing which will support the achievement of good business procedures
Environment	LD Regulation 15 of 2011 in relation with Waste Management system in Bekasi are classified into processed waste, policies and strategies of waste management in Bekasi [17]	Proper waste management processing will result in a clean healthy business environment

4.2. Waste Management and Processing Strategies Based on Internal and External Conditions

Upon getting the analysis outputs of both internal and external factors involved in waste management systems in Indonesia, the writing team then came up with several strategies depicted in Table 2. It is shown that the government can continue to make various breakthroughs to solve the waste problem, and one of which is by building a PLTSa. There is a possibility for PLTSa to become one of the main energy suppliers in Indonesia if it has been properly administered.

Table 2. SWOT Analysis and SWOT Matrix in waste management in Indonesia

	STRENGTHS (S)	**WEAKNESSES (W)**
	1. There is a plan for the conation of PLTSa 2. If managed properly, PLTSa is able to become one source of energy 3. There is a semi-formal sector (garbage bank, TPS become one of the main sources of energy 3R) that has been running quite well [18] 4. There is a semi-formal sector for the collection, management, and waste processing	1. Requires large amount of funds 2. Many landfills have run out of land space 3. Less means of transporting waste 4. Officer commitment in waste management and processing is still low 5. Insufficient waste management experts
OPPORTUNITES (O) 1. Most of the public elements agrees to enact government regulations on waste sorting 2. Most people agree that semi-formal sectors play an important role in waste management 3. Some people agree if the increase in waste dues is enforced 4. 80% of the public elements agreesthat the community should participate in the process of disposal and waste disposal 5. Technological innovation is beneficial to the society	**SO-STRATEGIES** 1. Support and develop semi-formal sectors 2. Develop an application that serves as one of the means 3. Escalating waste dues paid by the community gradually	**WO-STRATEGIES** 1. Provide adequate wages to semi-formal sector in charge 2. Issuing strict regulations along with its sanctions regarding the obligation of the community to sort out the waste 3. Increase the numbers of garbage transportation carriers, completed with regular destination schedule
THREATS (T) 1. Abundant volume of garbage 2. Allocation of waste management and processing funds from APBD and APBN is still low 3. There have been no fixed rules and sanctions applied for garbage sorting 4. Workers in the informal sector can lose their jobs due to the procurement of PLTSa 5. Low waste-dues paid by the community 6. The community must be compensated for participating 7. The level of community education affects the understanding of the waste sorting process 8. Some people refuse to pay the waste dues if the increasement is applied	**ST-STRATEGIES** 1. Building and developing PLTSa 2. Enactment of regulations on waste sorting and strict sanctions for the violators 3. Employing labor from sectors who are likely losing their jobs due to PLTSa building construction 4. Gaining a full support from the government, especially in increasing the allocation of the funds 5. Funds will be allocated for labor wages, land, technology, education, and many more 6. Impose a savings system for the communities that sort out and distribute their non-organic waste into semi-formal sectors	**WT-STRATEGIES** Establish waste management regulations which will be implemented in landfills or regional PLTSa, with semi-formal sectors in the household environment (garbage banks, TPS 3R, etc.). Both management methods, is expected to produce products worth using or suitable for resale.

Judging from the analysis output, it's evidence that the construction of PLTSa does have advantages. One obvious advantage is the raw materials (waste) are abundant, which means solving one of the existing threats of insufficient energy suppliers. Another advantage is the products produced are certainly needed by the community. However, one of the most threatening risks among other threats is that when PLTSa is built, there is a possibility that the informal sector (scavengers and fleas) will be put out of jobs. This is because workers from the informal sector are unskilful and incompetent to operate PLTSa, so the benefits of increasing employment vacancy will likely not meaningful. To prevent the growing number of unemployment and poverty rates from such problems, the government can employ those in the semi-formal sector (waste bank, TPS 3R) to execute waste management with adequate wages offered.

Activating and developing semi-formal sectors simultaneously are definitely arduous. More than that Attaining human resources or manpower who are committed to managing the semi-formal sector is not an easy task as mainly most of the workers have their own standard of wages expectations. Another difficulty aspect taken into account is there is still insufficient knowledge regarding the function of the semi-formal sector in society the results of a survey to 130 respondents, proved that there are 19.2% of whom feel unsure about the existence of this sector of waste management in their living environment. The outcome of the sample showed that the public was still indifferent toward the semi-formal sector. Therefore, the government began to include the role of the semi-formal sector worker in waste management to ensure the public involvement on the above-mentioned subject. This is necessary in order to gain the community trust that the government was doing in its role to well manage waste disposal through the semi-formal sector.

If the government plans to start actively involving the semi-formal sector, then the government should come up with innovative programs to gain public interest. Looking closely over. The results of the opportunities analysis, it is a fact that if there is technological innovation, it will certainly add value to the community. Therefore, the government should be able to design applications which are capable of making multiple connections to society, semi-formal sectors, and governments easily. For that reason, our team proposed an app called "Nirmala Bekasi". Most likely, the community will participate in the waste management process because the process is easy (will be explained in the business process). The expectation of building the application "Nirmala Bekasi", is to gain the approval of the people who once disagreed with the increment of waste management dues upon getting the satisfaction.

Some strategy points recommended by the author team were based on the results of swot analysis above which showed a fairly important role, somehow the main important thing that must be implemented by the government is to impose policies on sorting household waste based on its type, along with sanctions for violators. Pre-regulations and sanctions for violators aim to create an orderly society in waste sorting [19]. In addition to forming policies, the government is also expected to increase the state budget or APBD for waste management. Budgeted costs can be used for the purchase of additional waste dump truck units as one of the important components in waste management. A statement taken from an inter-view with the Head of Environmental Agency of Bekasi City, indicated that the number of garbage transport trucks in Bekasi is insufficient which led to the failure in transferring about 900 tons of garbage to its landfill on a daily basis [20]. Apart from adding the number of garbage truck units, the government budget should certainly serve to cope with other strategies aiming to eliminate the waste problem by involving all levels of society elements.

On the final stage, the author will authorize he cost structure. The authors have designed the cost structure based on the key activities carried out by each businessperson. In details the Budget will cover the cost of maintaining the TPA along with its facilities and infrastructure (including garbage trucks and land), also the cost of building and managing PLTSa, the costs for the development of the semi-formal sector (rental fee and the maintenance of the buildings or land, salaries of human resources, transportation, etc.), the expenses for the de-signing and developing the "Nirmala Bekasi" application, and finally the marketing costs to market the process of innovations and product results for solid waste management (costs for promotion in various media, and brand ambassadors)

Table 3. Business Model Canvas in solid waste management and processing

<table>
<tr><th>Key Partners</th><th colspan="2">Key Activities</th><th>Value Propositions</th><th>Customer Relationships</th><th>Customer Segments</th></tr>
<tr><td rowspan="4">SIPSN Courier
E-money</td><td>Society</td><td>● Classifying the solid waste
● The labor of formal sector
● The labor of informal sector
● Selling the solid waste to semi-formal sector</td><td>1. The house will be clean, neat, and no smell from mixed solid waste
2. Get the job and income</td><td rowspan="4">1. Public Seminar
2. Customer satisfaction survey</td><td rowspan="4">Household consumers

Business consumers</td></tr>
<tr><td>Semi-formal</td><td>● Managing and processing the solid waste
● Producing the processed waste product
● Cooperating and collaborating with semi-formal sector</td><td>1. Profit gaining</td></tr>
<tr><td>Government</td><td>● Estimate the budget for solid waste management
● Include the role of semi-formal sector
● Operate the landfills
● Build-up the waste-to-energy power plant
● Maximize the facilities and infrastructure
● Designing and developing the "Nirmala Bekasi" application</td><td>1. Reduce the solid waste problem
2. The better waste management
3. Income makings
4. Gradually increase the waste management fees
5. Fast and structured business process</td></tr>
<tr><td>PLN</td><td>● Buy the electricity from waste-to-energy power plant (PLTSa)
● Sell the electricity to public</td><td>1. New power supply
2. Profit gaining</td></tr>
<tr><td rowspan="2"></td><td colspan="2">Key Resources</td><td rowspan="2"></td><td>Channels</td><td rowspan="2"></td></tr>
<tr><td colspan="2">Human resources
Building or/and land
Technology
Transportation</td><td>All media and platforms
Brand ambassador</td></tr>
<tr><td colspan="3">Cost Structure</td><td colspan="2">Revenue Streams</td></tr>
<tr><td>Salary
Marketing
Transportation</td><td colspan="2">Rental and maintenance
PLTSa
TPA
Designing and develop the "Nirmala Bekasi" application</td><td>Product sale
Waste management fees</td><td colspan="2">Savings
Tax</td></tr>
</table>

Based on the business canvas model, the writing team prepared a blueprint to present the flow of solid waste management and processing business activities involving stakeholders in the environmental Business proposal which can later be referred upon making policies. It can be seen in Figure 1-3 that the author added and changed several flows and aspects of the waste management business activities that had been carried out so far. One of them is by designing and using the Nirmala Bekasi application to make it easier for stakeholders to con-tribute directly and actively to solid waste processing and management system.

The Nirmala Bekasi application is a typical software that combines the features of sending products from processed waste, taken care by the semi-formal sector (Bank Sampah and TPS 3R). There is a feature In the Nirmala Bekasi application which can be used for ordering solid waste transportation services from households to the semi-formal sector and saving the money from conducting solid waste transactions with the semi-formal sector for every community. This application is also designed to allow its users to see the availability of products being produced from processed waste (Figure 1).

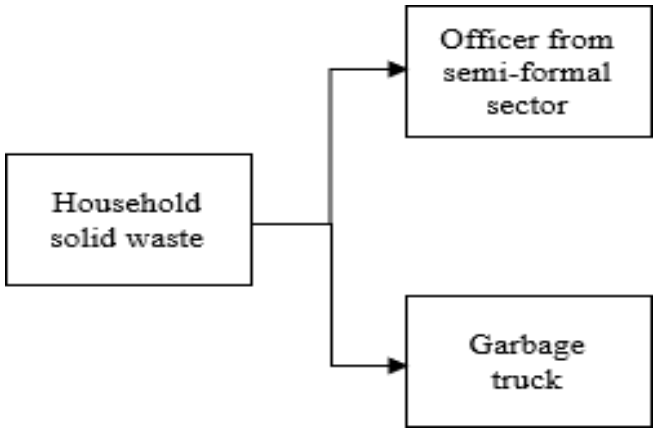

Figure 1. Blueprint Step 1

The initial stage in the business process designed was the sorting of solid waste carried out by the household (Figure 2). Solid waste that has been sorted will be distributed in two directions, namely the TPA and the semi-formal sector. Solid waste that is distributed to the TPA will then be transported by garbage trucks on a regular schedule. Meanwhile, solid waste that is distributed to the semi-formal sector is going to be transported by the officers using a call system through the Nirwana Bekasi application.

Upon the officer's arrival at the pick-up location, there will be a calculation of the weight of the solid waste to be given a price according to the weight. Then the officer will include a record into the savings account of the owner's the Nirwana Bekasi application system. Solid waste that has been transferred to the semi-formal sector will be re-separated to be managed directly and sold to formal businesses counterparts (Figure 3). Then, the waste is processed by the semi-formal sector and will be sold to consumers (B2B or B2C) through the Nirwana Bekasi application.

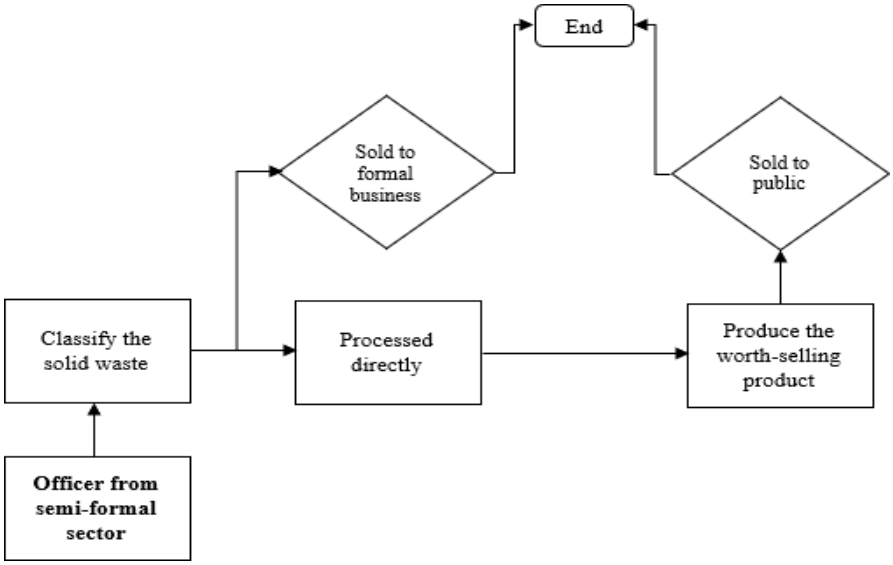

Figure 2. Blueprints Step 2

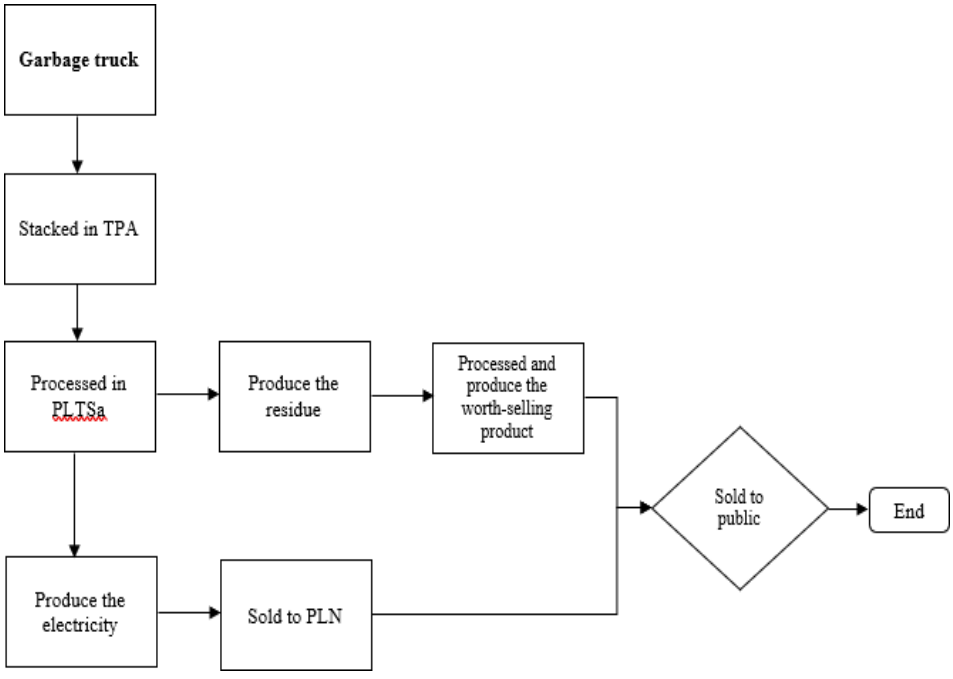

Figure 3 Blueprint step 3

On the other hand, solid waste that is transported from households by garbage trucks will be collected at the TPA. Later on, the waste will be processed in the PLTSa to generate electricity. The electricity being produced will be sold to PLN prior to being purchased by the public.

5. Discussion

Consequently, solid waste that is being transported from households by garbage trucks will be collected at the TPA. It will be processed in the PLTSa to generate electricity. The electricity produced will then be sold to PLN before being purchased by the public.

The mechanism for managing the Bank Sampah (the garbage bank) and TPS 3R that has been implemented is by collecting waste from scavengers and nearby households, it will surely be beneficial for the money-making profits to its solid waste collector. At a later stage, the solid waste will be distributed to formal industrial sector players or private industries to be used as raw material for reuse, recycling, and reduction. If the households usually hand over waste by taking it directly to the waste disposal Bank an TPS 3R, in this case the researcher uses the application technology equipped with a system for ordering solid waste transportation services from households to the garbage Bank and TPS 3R, as well as a transaction proof in selling solid waste collected from waste disposal Bank and TPS 3R to be resold to the public and businesspeople through the application provided.

6. Conclusion and Recommendation

The PLTSa development, which will be implemented in several regions in Indonesia, offers great hope for solving the problems regarding solid waste in Indonesia. The role of the central government in the construction of PLTSa to overcome the waste problem in Indonesia has come to final steps in its implementation. However negative impact on the environment, social being, to the economy as well as to informal groups who depend on collecting plastic waste for their life's survival. Not only that, the construction of this PLTSa also raises concerns about the increase of unemployment and poverty in Indonesia.

Taking everything into account, the author wishes to design business innovations plans outlined in business processes that can be used as an alternative to prevent the unemployment number from rising and reduce poverty rate. The business process designed involves the community in the household as waste producers, and the community who will be in-volved in the process of managing and processing waste in the semi-formal sector, also include the involvement of the government. In the business process, the writer's exam also designed the "Nirmala Bekasi" application as a manifestation of innovation. This application is expected to facilitate the business processes and enhance public interest in participating in waste management and processing programs.

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