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A PLAN FOR THE DISPOSAL OF MUNICIPAL SOLID WASTE

(FOR A PARTICULAR AREA)

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Introduction

Solid waste, especially municipal solid waste is a huge problem in the world. This problem has become more dangerous due to increase of the population. In this proposal we are mainly discussing how to reduce the generation of solid waste and how to achieve economical and environmental benefits. First, we want to identify the current situation of municipal solid waste management in Sri Lanka and I broad down it to a particular area to analyze. In that area we looked at the current procedure. Then get the waste generation data and divided into several types of waste as well as compare the waste generation with the population on different years. After that we looked into problems that people are currently facing because of the improper MSW management process. After identified the problems, I came up with different kind of solutions that affordable, effective, easy implementable and maintainable.

CONTENT

- ✓ 1.0 Current situation of waste management in Sri Lanka
- ✓ 2.0 Analyze a chosen area
 - ❖ 2.1 Map of the chosen area
 - ❖ 2.2 Current process of collecting, segregating and disposal garbage in this area
 - 2.2.1 Waste collection
 - 2.2.2 Transfer and transferring locations
 - 2.2.3 Separating, materials recovery and send for suitable places
- ✓ 3.0 Identify stakeholders of particular area
- ✓ 4.0 Identify the amount of waste generated
- ✓ 5.0 Identify existing issues of the current procedure
 - ❖ 5.1 Issues of collecting waste
 - ❖ 5.2 Issues of segregating waste
 - ❖ 5.3 Other common issues of the process
- ✓ 6.0 Better plan for waste management in selected area
 - ❖ 6.1 Objectives of the plan
 - ❖ 6.2 Procedure of the plan
- ✓ 7.0 References

1. Current situation of waste management in Sri Lanka.

Nowadays in Sri Lanka government is using waste management methods. But time to think, is that enough or is that efficient or is it suitable for our country? I would say that is a main section that need attention. Disposal of solid waste in Sri Lanka is not a thing that most of people care very much. The main reason for this is most of them don't see the wide area, they only think 'How to dispose our home garbage?' in easy manner. On that case people used to throw their garbage on to road sides, marshy lands, low lying areas, forests, public places, water courses and wild life areas etc. Causing various problems such as land and water pollution.

When we are talking about waste management we have to focus on mainly about municipal solid waste disposing. Because solid waste is the especially growing problem in urban areas.

What are the municipal solid waste?

- Domestic waste (exclusive of sewage and hazardous waste)
- Institutional waste (schools, hospitals, offices, universities, etc.)
- Garden waste (Tree cutting and grass cutting waste)
- Commercial waste (Market waste)
- Street sweeping and beach cleansing waste
- Wastes collected from rivers, lakes

Now we can look, what are the projects that currently processing in Sri Lanka?

1. Green Star Homes project
2. Weligodawata Community Development project
3. Home composting bin project
4. Sewerage treatment plant at Skanda Devala place.
5. Biogas unit- Vajira Sri Children's Home
6. Management and improvement of the city air

These are some of projects from many others.

Normally, what is the procedure of collecting garbage in Sri Lanka? When consider the metropolitan area, government is using different kind of methods. Main popular method of collecting garbage is to use vehicles.

Some photos of garbage collection places of chosen area.



2. Analyze a chosen area

2.1 Map of the chosen area

PLACE =Part of Kesbewa Local area

Pannipitiya

Western Province

Sri Lanka

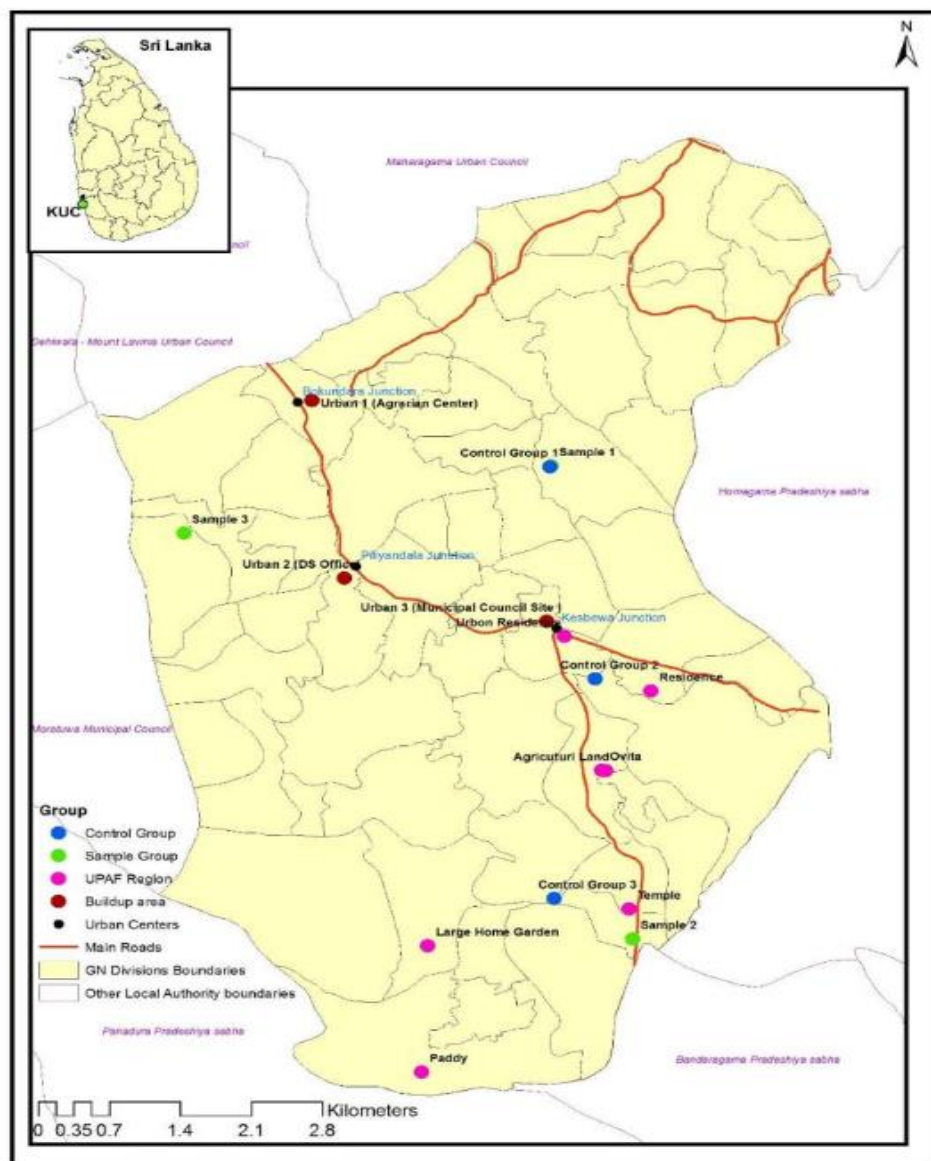
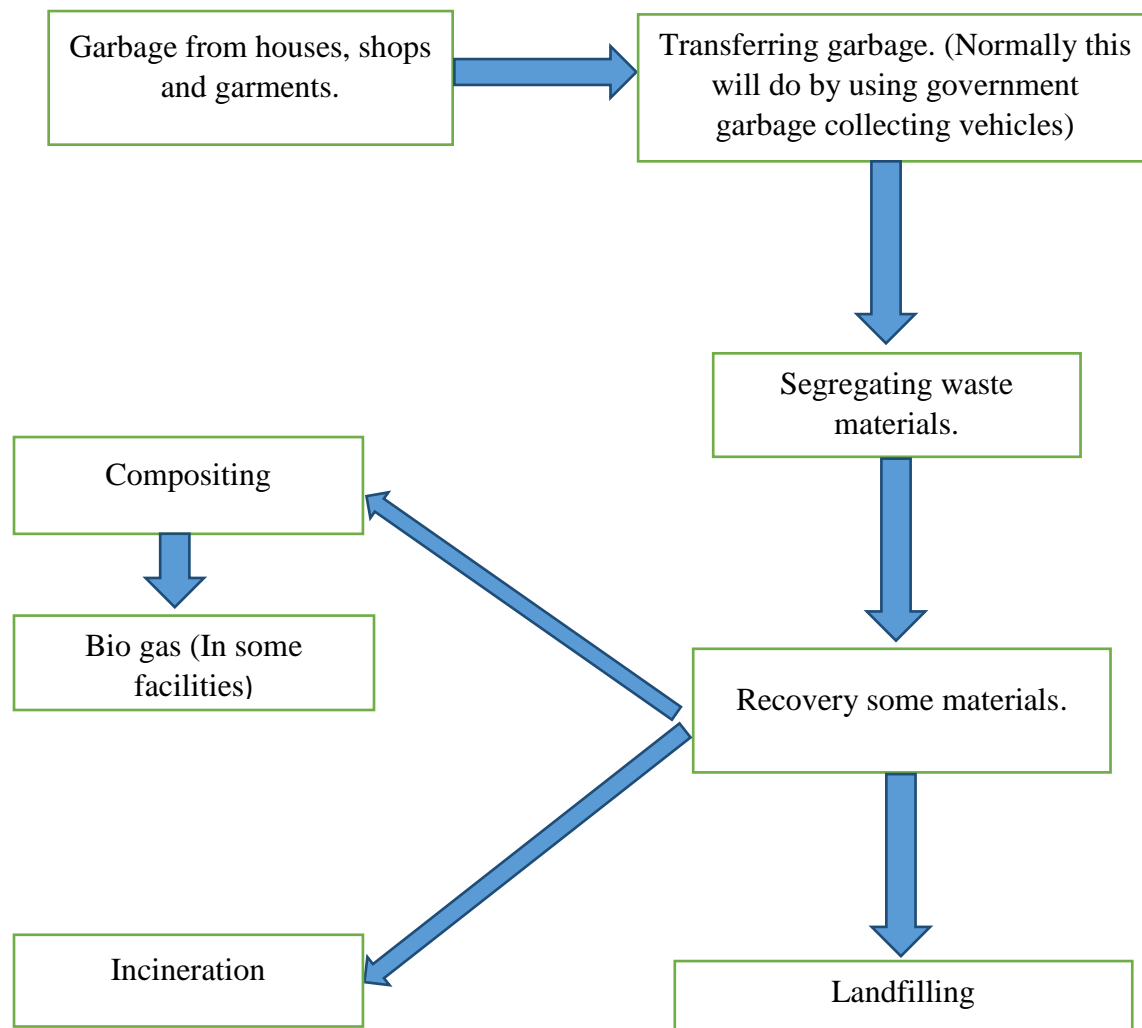


Figure 03: Kesbewa Urban Council (light yellow) area

Source: Urban Development Authority, Sri Lanka

2.2 Current process of collecting, segregating and disposal garbage in this area



2.2.1 Waste collection

This is mainly focused on how and from where to collect the waste, in other words picking up waste from shops, schools, commercial, institutions, parks and other domestic locations. In this area main method of collecting garbage is using vehicles and laborers that provided by the government. Normally garbage collects on one day per week, it is on Wednesday. They has specific transport routes, specific number of vehicles and a schedule for collection.

People in this area are used to collect their domestic waste on Wednesdays and throw it off to road sides. Sometimes this procedure doesn't work properly because of that animals spread the waste everywhere in that case environment damages. That is a big threat for homes at near the road.

Other major problem is not separated garbage. People doesn't care to separate domestic waste because there is no any programs to encourage such kind of good habits on peoples' minds. Therefore government bodies usually doesn't care to spend additional money to separate and recycle those waste.

Here are some data of waste generating-

- Total collection of MSW by local authorities in Sri Lanka is around 2900tones/day.
- Around 25% (700 tones) collected within Colombo Municipal areas, the most urbanized areas.
- The average composition of the household waste is roughly as follows: 0%-40% organic waste, 30%-40% paper, 15%-30% plastics, 10%-30% rest-fraction. Usually main waste in this area is organic waste.
- Waste production of the household in this area measured normally 100-300g per day.



2.2.2 Transfer and transferring locations

After collecting waste, it has to be transported into a material recovery or recycling or landfilling. A transfer location is a building or processing plant for the deposition of waste. Transfer stations sometimes have material recovery facilities with biological treatment plants.

Usually waste transported to smaller collections first and after that it moves to a processing facilities, disposal areas and to fill the lands. In some transfer operations separation of materials may be done at the transfer stations.

When transferring the waste, cost management is very important. Therefore determine the suitable transfer vehicle's type, capacities and number of vehicles and laborers is a major thing.

Transfer route should be efficient and easy. Also it should cover the particular area completely.

2.2.3 Separating, materials recovery and send for suitable places

After transferring to transfer locations separating, material recovery and processing is the fundamental point of this waste management cycle. After separating into main sections in transfer stations, further separating and processing done by material recovery facilities.

After segregation is done, particular waste components send to several processing systems based on the types of wastes. We can categorize these processing systems into some,

➤ For landfilling

This is done by a particular method. Usually, non-biodegradable waste is used for landfilling because we can use biodegradable solid waste to generate bio gas and compost. This is done while concerning about animals, environment and human health.

➤ Bio-Gas production

When generating bio gas from bioorganic solid waste, first it goes to proper mechanical separation by density and size. After that it is sealed on specific conditions for a while. It generates bio gas and the separation of gases is also done by the bio gas plant.

➤ Incineration

Incineration is a controlled process by which solid waste is burned and changed into gases. If it doesn't do in controlled conditions combustion will emit gases which causes air pollution. So the conditions of incineration are very important.

➤ Composting

Composting is the biological decomposition of biodegradable solid wastes under specific conditions. Chemical reactions are the main thing when composting materials. In this area domestic composting is popular among the people. They use concrete cans to decompose organic wastes.

➤ Recycling

In recycling process, solid wastes convert into some valuable reusable materials.

Composting is the controlled biological decomposition of organic solid waste materials under some specific conditions. In general, chemicals are used to decompose this organic solid waste. Segregation of waste affects the quality of the compost. After composting procedure,

Government sell it. It will generate money. This is a useful method when comparing to other processing systems.



Incineration process



Landfilling



Composting



Recycling

3. Identify stakeholders of particular area

(In selected area)

In the procedure of identifying the problems in current situation we have to identify who are the people involved in this waste management (i.e. Stakeholders).

What is mean by stakeholders?

Stakeholders are the persons that interested about any specific organization or any procedure that currently going on. In other words they can affect or be affected by the organization's actions, objectives and policies.

Stakeholders-

- Government
- Local authority
- Ministry of Environment
- Waste generators(Peoples in the area)
- Waste collectors
- Compost producers
- The recycling industry
- Landfill operators
- Donors

What is the important of stakeholders?

When the stakeholders of this MSW generated and collection problem increases, it gives more attraction and they are trying to get actions to solve this issue. It will become a benefit for the people who are living in this area. That is the main importance of having powerful stakeholders.

4. Identify the amount of waste generated

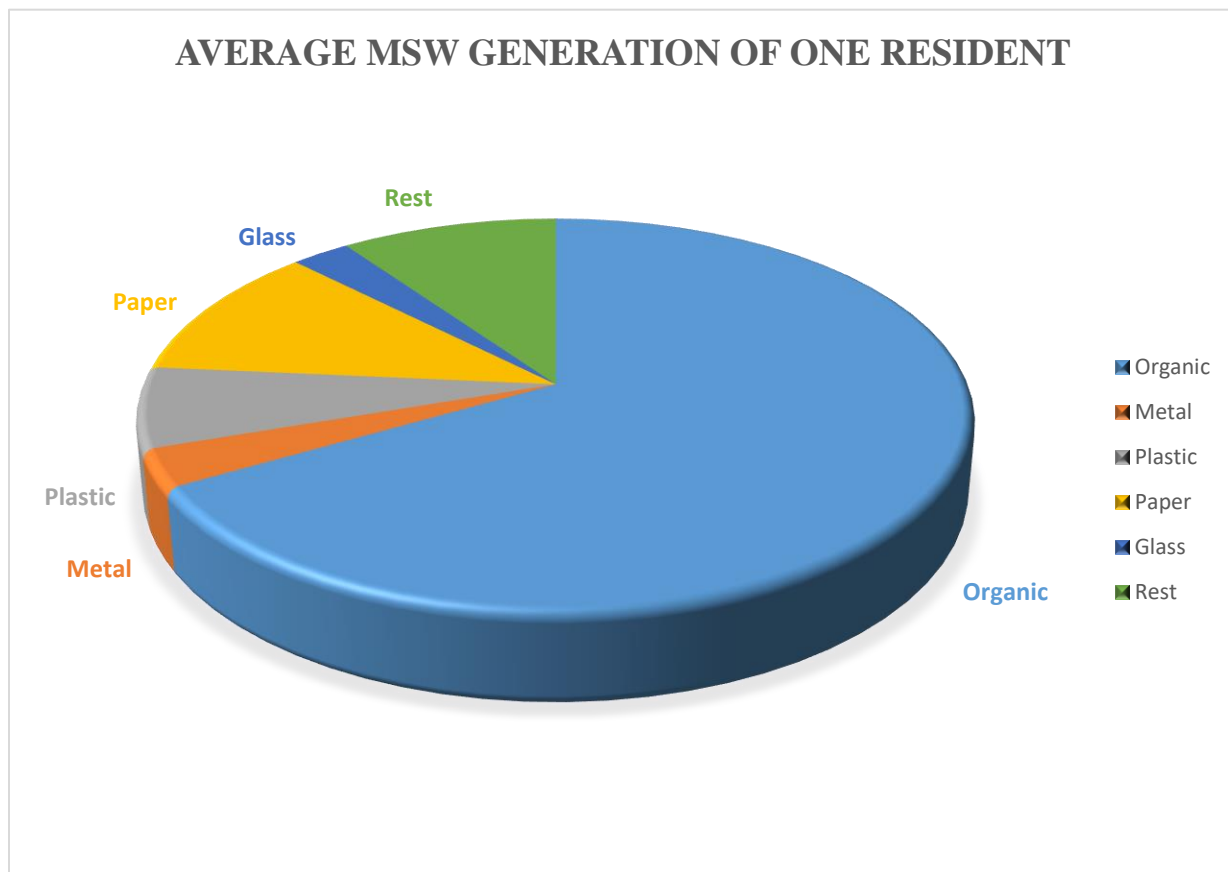
When identifying the amount of waste generated in this area we have to consider the economic levels of individual residential. When the economic level is high waste generating amount is high likewise it is low when the income is low.

According to the estimated data in this area, residential waste generation was normally 15-20 tons per day. This is from the collection solid waste but there are also non-collected solid waste also.

According to the rates of waste generation in more than 70% of the households exceeds 2kg per day.

First, we will look at the average types of MSW generation in one resident per day. It is shown below in pie-chart.

Figure 3.2.1



Residential Waste Composition-

Figure 3.2.2

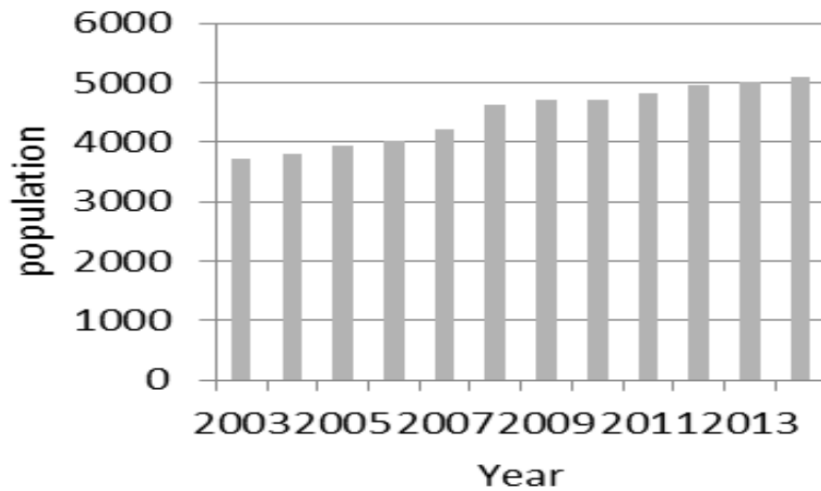
| Waste Type | Average percentage |
|---------------------|--------------------|
| From Kitchen | 80.3 |
| Garden | 8.9 |
| Paper and cardboard | 3.0 |
| Plastic | 3.3 |
| Metal | 0.6 |
| Rubber and leather | 0.3 |
| Glass | 1.0 |
| E Wastes | 1.3 |
| Textiles | 0.7 |

The significant of waste generated by the factories in this area such as Daya Groups. Most of it is non-bio degradable wastes. If we analyze this waste types and amounts we can see there are many bio degradable wastes. Bio degradable content of waste is 89.2% (i.e80.3+8.9) that is the sum of both kitchen and garden waste. Because of these lots of bio degradable solid wastes composting is good recovery for waste generation. As a recyclable point of view, food and garden (89.2%), paper and cardboard (3.0%) and plastics (3.2%) can be recycle. It shows that over 95% of wastes are recyclable.

Another major criteria that effects for Municipal Solid waste Management is the population. Normally population increases through the time. Because of that MSW generation is also increases.

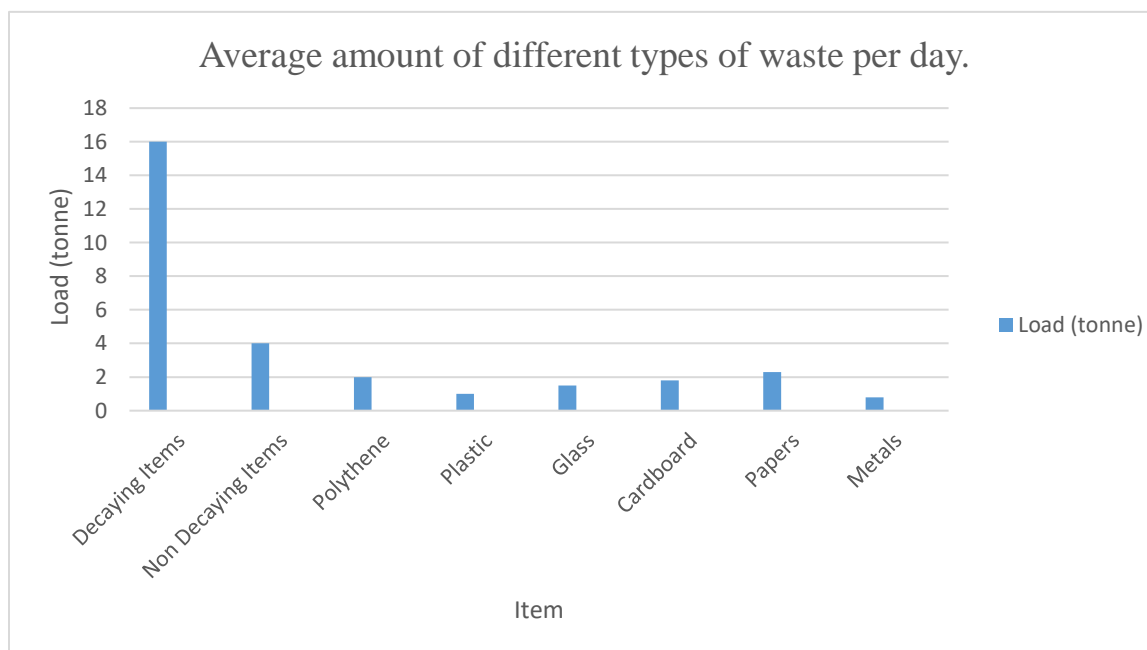
Following graph explains the general population variation by time. (These are not exact population values in this area)

Figure 3.2.3



Increasing population, urbanization and increasing the standards of the livings have enhanced the solid waste generation in developing countries such as Sri Lanka. This is causes for this area also. Not only the solid waste generation but also the health problems and environmental pollution. It means we want to activate upgradable solid waste management, if not it will beneficial for certain time not for a long time.

Figure 3.2.4



As shown in the Figure 3.2.4,

- According to the results of this graph, there are more decaying items than other all kind of waste types. And the second major item is papers and cardboards. Many people didn't concern about segregating their waste. But some of them separate their wastes as into main degradable and non-degradable types.

According to the data of Municipal Council, about 91% of the people concern on environment and 8% has no opinion also 1% didn't concern about the environment in this area. When it comes to concerning about waste disposal there is a slight increase of concerning people and not concerning people remains the same.

5 Identify existing issues of the current process

5.1 Issues of collecting waste

This is one of the main part of waste management. Local Authorities are obliged by law to collect and dispose of solid wastes put out by residents in areas in their jurisdiction. Collection of municipal solid waste are maintained by the Local Authorities with different levels of service.

- Litter often accumulates in roadside daily. As a result of that drainage channels filled with wastes. When there is a rain, drain water could not go through this tunnels as a result of that water will collect on roads with waste. This is mainly happens because of improper waste collection methods. Additionally in some places part of the tunnels completely filled with the soil. There is not a proper method for remove that soil and clean the tunnels. Drain` water has spilled onto the road due to heavy rain occurs because of that issues of collecting garbage.

Figure 4.1.1



- Because of the late collection of garbage, animals such as dogs and cats pull over the waste materials from the bags. It causes so much of environmental pollution and health issues.

5.2 Issues of segregating waste

After collecting the waste from household, it will go through main segregating process.

The main issue of segregating waste, it will become a procedure that occurs some cost and time. If we can minimize or stop the segregating process that will benefit the waste management cycle widely. To do that individual resident should separate their waste into at least two (i.e. bio degradable and non-biodegradable). By using trash bags the problem of cleanliness and health problems can be solved.

Advantages of segregating garbage in households-

- The transportation of solid waste become healthier and cleanliness.
- Organic wastes can be directly dumped / composted / landfill /used for power generation etc.
- Various alternatives can be designed for disposal.
- Better health and hygiene conditions of the people.
- Collecting garbage becomes more accuracy than before.

5.3 Other common issues of the process

- Lack of financial issues to promote new procedure of waste management.
- Landfill is the only option of dispose the garbage, and do not go for other methods.
- People need affordable solutions. Most of the solutions are not affordable and don't suitable with economy stage of the people.
- Stakeholder partnership is poor.
- Free services are less sustainable.

- Even if we have a currently processing plan, authorities don't try to monitor and check the effectiveness of the plan.
- Because of the busy life style people would not able to separate waste at source of generation.
- Health problems because of dengue and other diseases.
- Waste collection vehicles' storage doesn't enough. (Because of the increasing population)
- To get an approval for a new project is bit difficult.
- Waste collection points have not properly built in and maintained thus appears like mini dumping sites along the street.
- Most of the times, MSW collection and transportation vehicles are opened. Because of that it spreads the garbage all over the road and cause health problems.
- Garbage collection is done by only one day per week.
- There are troubles among the people because of not having a proper waste collection points.
- People are not familiar with new technologies.

6. Better plan for waste management in selected area.

6.1 Objectives of the plan.

The main objective of this plan is maximum waste recovery through composting, recycling, reuse and producing bio-gas. The long term objective is thus to reduce environmental pollution caused by solid waste.

By using composting methods to manage bio-degradable waste, this plan will be able to-

- Benefit the soil by using organic compost.
- People also can do this as an external income.
- Minimize the waste that needs to be disposed in centralized landfills.
- Reduce the environment impact and health issues.
- Easy to encourage people to start their own garden crops.

Furthermore, we can expect a properly run waste management system and effective one.

Why is that effective?

Promoting reuse and recycling we can get more from the waste that we are disposing. It will generate some income to people also and it minimize the problem of wastes. By reusing something for a different purpose reduces the cost that spent for that purpose as well as it ensures the quality of the life. On the other hand recycling helps to convert waste into a reusable materials which again gives external income. When considering all of the objectives of this plan it will become an effective plan for MSW management. In order to achieve this objectives we want some source of financial support. It will discuss below on this proposal.

6.2 Procedure of the plan

In this procedure we are mainly look at 4R strategy- Reduce, Recycle, Reuse and Refuse as well as composting and bio-gas producing. First of all we have to introduce our new plan to the people of this area.

➤ Public awareness about the process

If we can give more information that will be good for the project also it will help encourage people on MSW management. In order to do that we can go door to door and distribute some leaflets. While doing that we can briefly explain about the procedure and encourage to separate their own solid wastes. Introducing new benefits for those who separate their own waste will encourage other people also. These public awareness programs conducted to minimize per person cost of municipal solid waste management.

➤ Financial aspects

MSW management services account for a high percentage of municipal budgets. It is necessary to recover costs for collection, transportation, treatment and disposal. We can satisfy those who give separated garbage by selling compost fertilizer. But it will not enough to carry up this plan in long term aspects. So as my opinion we can go for stakeholders and shop owners in this area that willing to sponsor this project. We can make a project proposal to build separate bio-gas unit as well as composting unit. Stakeholders can invest their money on those projects. By selling bio-gas and compost fertilizer benefits the stakeholders as well as project owners. If we have excess money, it helps to satisfy who helped for this MSW management process by separating their solid waste. So it will become wider and wider. Also by establishing separated garbage barrels on waste collection points will boost the waste collection procedure as well as segregating process of municipal solid waste.

➤ Get helps from non-profit organizations

Sponsorships and investments will not be enough to success this project. We can get help from non-profit organizations and NGOs on this area such as Lions Club. While maintaining relationship with those organizations we can perform more public awareness programs inside the clubs and societies. It is easy to spread ideas of the value of solid waste management.

➤ Municipal solid waste reduction

As source reduction actually prevents generation of waste in the first place, it is the most suitable method of waste management and goes a long way towards protecting environment and minimizing cost. Many local authorities tried to reduce the solid waste generation. In order to reduce that we can use methods such as home bio-gas plants, home composting plants and establishing recyclable items collecting centers. But introducing home bio-gas units is little bit difficult when consider the peoples' living condition in this area. So as a solution I introduced to make one bio-gas unit for this area by getting help of stakeholders, organizations and NGOs. As I mentioned above it will benefits all parties which involved on this process. Also the household compost production has been identified as an option to enhance economic condition of urban poor people through selling compost and home gardening.

➤ Municipal solid waste collection and transport

Most of the Local authorities are very concerned about collecting solid waste management because if there is any failure in collections and transportation there will be more complaints against them. Waste collection was done by once per week in this area. It is actually not enough and waste generation increases every day. So as my project proposal if we can use labors to collect waste on another day per week and transport into a bio-gas unit and recyclable unit, it will become more effective than collecting waste

once per week. Also the faith of the people about the project will increase. It is also effective and affordable.

➤ **Municipal solid waste treatment and disposal**

According to my project proposal I identified main waste treatment methods as producing bio-gas, recycling and composting. Due to high demand of fertilizer composting will become more important from others. After producing bio-gas we can transport it by using cylinders to households in this area at lower cost. It will persuade them to use more bio-gas other than using LP gas. But for these processes want only bio-degradable waste. Actually it is not a problem because on the above content we saw that most of the waste generated in this area was bio-degradable waste. Also recycled solid waste can sell for parties that is willing to pay. It will generate money to enhance this process.

7.0 References

- United Nations Environment Program *International Source Book on Environmentally Sound Technologies (ESTs) for Municipal Solid Waste Management (MSWM)*
- http://www.env.go.jp/recycle/3r/en/asia/02_03-3/08.pdf
- <https://www.wikipedia.org/>