MANAGING MUNICIPAL SOLID WASTE IN KATHMANDU: OBSERVATION AND POLICY RECOMMENDATION

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EXECUTIVE SUMMARY

The observation, analysis and policy recommendation in this document are derived from data and information obtained from Kathmandu Metropolitan City Office, past research on solid waste management and field study. Policy recommendations in this document are expected to help policymakers (officials in KMC and Government of Nepal) to analyze gap between current practice and policy. It is expected that it will help them to come up with more practical policies to solve waste management issue.

Kathmandu Metropolitan City (KMC), the capital of Nepal, is the most urbanized city in Nepal. It is home to more than one million people. Increased population due to unplanned urbanization has intensified environmental pressures including Municipal Solid Waste (MSW) management. KMC is responsible for collection, transfer and disposal of MSW. KMC uses hundreds of employees and spends tens of Millions of Rupees every year to manage solid waste. For KMC, it has become a one way investment with no returns.

Government of Nepal came up with many waste management policies since 1987. Objective of solid waste management policies introduced time and again was to mobilize waste as resources and make solid waste management simple and effective. But KMC is still treating waste as problem and spending tens of millions to solve this problem. Limited success on door to door collection is attributed to private sector which doesn't have proper legal authority (and protection) to do it. All collection is done without any segregation and proper planning. Waste is being dumped without any treatment process which has led to environmental degradation and public health issues.

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1. WASTE MANAGEMENT SYSTEM IN KATHMANDU

Within the municipality of Kathmandu, Kathmandu Metropolitan City, four sections are working parallel with environmental tasks; Environmental Department, Solid Waste Management Section, Maintenance Section and Urban Environment Section (KMC, 2003). The Solid Waste Management Section of KMC has the responsibility for the entire solid waste management in Kathmandu city i.e. organization, street Sweeping, collection, transports, transfer station and final disposal.

Generally, MSW management consists of three stages waste collection, transfer and disposal. Although KMC waste composition varies depending on the source, few composition analysis of waste from restaurants, hotels, schools and streets have showed a high percentage of organic wastes and significant percentage of other recyclable materials. These numbers suggest a greater potential for recovery of organic wastes via composting and an opportunity for recycling. It also suggests possibility of using solid waste for power generation via biogas conversion or other waste to energy technologies. However, none of the reduction and reuse attempts has been done in organized way and municipal level.

Private and municipal sectors collect waste from the streets, from door-to-door or by a container system. Domestic waste is either collected from streets, or in waste containers or by door to door collection. The municipal sweepers clean the streets and collect the waste, usually by handcarts, after which it is loaded on either tractors or trucks. In the streets scavengers collect useful plastic, paper and metals. When the waste reach the transfer station the dumping site scavengers again sort out another percentage of the paper, plastic and metals.

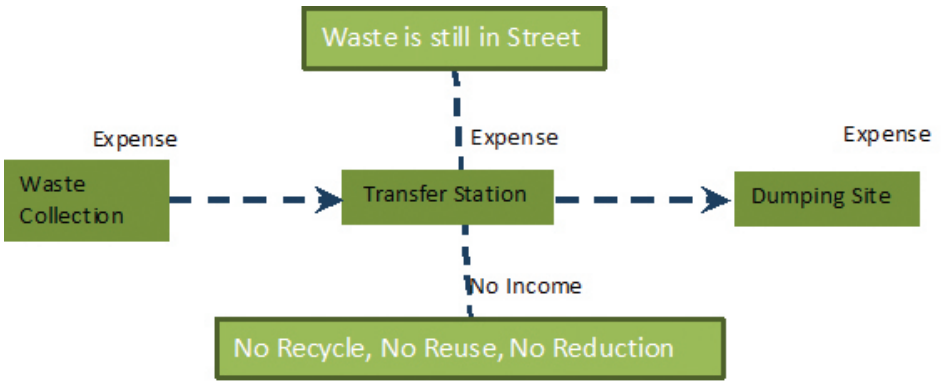

Figure 1: Current Status of Waste Management in Kathmandu

In Kathmandu the waste collected is first taken to either Teku Transfer Station, where it is unloaded on to a concrete platform, or directly to the landfill at Sisdole. At the transfer station the waste is loaded on to bigger vehicles before it is taken to the dumping site.

2. CAN THE SITUATION BE IMPROVED

Several environmental friendly and efficient methods for waste collection has been suggested. The potential integrated solid waste manage system will involve waste minimization and reduction, re-use, recycling, composting, energy recovery and landfill which are outlined below:

1. **Waste Minimization and Reduction**: can play an important role by limiting the growth in waste production. Local authorities can play a vital coordinating, facilitating and leadership role for the various waste producing sectors in their area. This is likely to include long-term education programs and publicity campaigns.

2. **Re-use**: involves putting an item to another use after its original function has been fulfilled. Examples include reusing milk bottles and taking clothes to charity shops for resale.

3. **Recycling**: is the processing of recyclables into a raw material in order to allow the material to be remade into the same or another product. Councils can collect these materials in civic amenity sites, bottle banks and through provision of second wheeled bins for recyclables to households. Materials such as glass, paper, card, plastic and textiles are often collected for recycling.

4. **Composting**: this involves converting organic (garden/kitchen) wastes into reusable compost by an aerobic degradation process. Composting can be undertaken in the home by using home compost units, or garden and kitchen wastes could be collected from sites or in second wheeled bins from households. Should these wastes be collected then the Councils are required to centrally compost these materials.

5. **Energy Recovery**: Energy recovery techniques include thermal treatments such as waste to energy and gasification and other techniques such as anaerobic digestion. Thermal treatments require the burning of wastes with recovery of energy in the form of heat or gas, with the energy being subsequently converted to electricity. The scale of these facilities have until recently been substantial, however smaller scale facilities are being brought on line to deal with municipal wastes. Anaerobic Digestion is the degradation of organic wastes in the absence of oxygen and has been used for many years for the treatment of agricultural and sewage sludges. Although generally more expensive than composting, the process does have the advantage of producing gas for energy recovery in addition to a usable end product.

6. **Landfill Disposal**: Whatever combinations of integrated waste management options are developed, Landfilling will continue to be required. Modern landfills accepting municipal solid waste will be designed to meet the requirements of the Landfill Directive. However, costs are increasing rapidly due to the reduction in the number of landfill sites and hence availability of space, the escalation of the Landfill Tax and demands for higher standards of operation

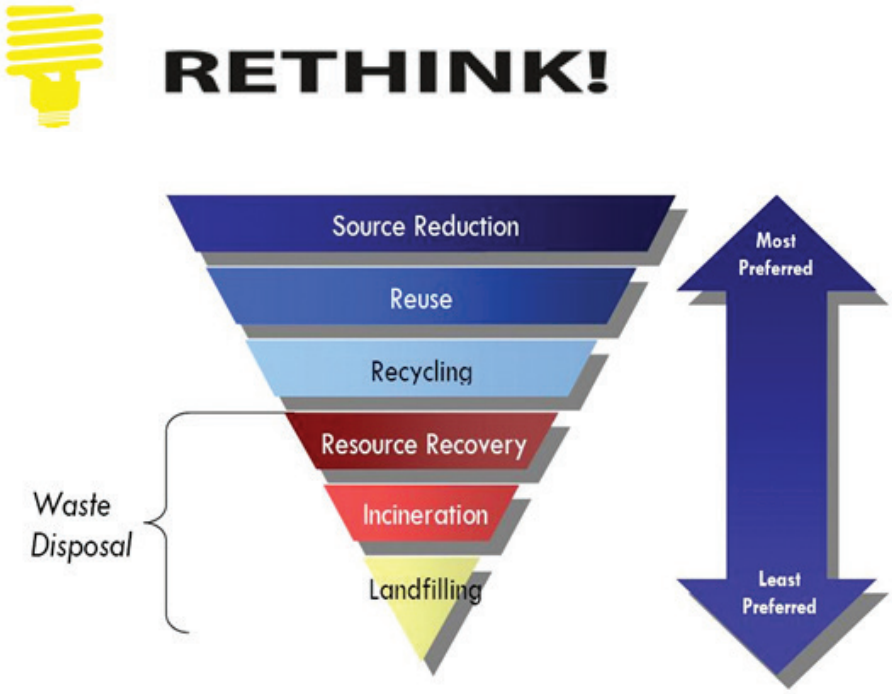

Figure 2: Ideal way to handle Municipal Solid Waste.

Figure 2 shows ideal way to handle municipal solid waste. Even though solid waste can be reduced, reused and recycled there will be always need of dumping site as all materials cannot be used. This is the reason why we should start rethinking about what we do and what we consume. This is the best way to deal with this issue.

3. PROBLEM IN WASTE MANAGEMENT SECTOR IN KATHMANDU

Kathmandu's waste management system has its own unique characteristics and its unique problems which will require innovative and noble approach to solve. Biggest obstacle on solving the problem is understanding of problem as there is limited research on the issue. Many solution prescribed in past were not successful because of many reasons like lack of resource, public unwillingness to contribute, public opposition in dumping site area and so on. This studies analyzes current practice, attempted improvement attempts, their failures and suggest alternative method to improve waste management.

3.1. LIMITED INFORMATION AND RESEARCH

There is limited information regarding the quantity and generation rates of total municipal solid waste (MSW). Waste that the municipality collects for disposal and household waste collected is often misinterpreted as the total MSW generated. But, the stockpiles of waste seen in courtyards, sidewalks and inner streets; along the edges of riverbanks; around demolished structures; on abandoned land and filling rear-facing areas of old structures, government complexes, schools and temples go unrecorded as does the waste from renovated facilities such as concrete, bricks, cement mix and debris from fallen structures and waste from agricultural work and temporary settlements.

KMC's reports on waste is limited to quantity of waste, number of vehicle used, number of employees employed and capital spend on MSW management. There is very limited information about quality and characteristics of solid waste. There has been no extensive study done to analyze content and characteristics of MSW throughout the year. Few study about content and characteristics of MSW done by third parties are academic in Nature. These few studies have been carried out mostly in dumping site area; hence information about waste composition is not available for different sectors and localities. For example, we might think restaurants and hotel industry might produce more organic waste, but we don't have any research data to support the claim.

3.2. PROBLEMS IN COLLECTION, TRASFER AND LANDFILL, AND ALTERNATIVE SOLUTIONS

Waste collection in KMC region is not well organized. It has lot of informal groups and companies involved. As door to door collection and waste disposal is completely voluntary, large portion of solid waste generated in city ends up in streets and public places. There is no reliable and extensive data of waste generation and its characteristics. Only transfer station, Teku is too small for waste sorting and reuse as it has to handle all waste from Kathmandu Valley alone. KMC spends lot of money and manpower to transfer waste to Teku and then to Landfill site. Some of the money could have been saved by simply having more transfer station and reducing the transport volume by stripping recyclable materials from waste.

Landfill sites have their own set of problems. They are not well managed and all Landfill sites KMC manages are already filled up. There is also social opposition to landfill operation because of environmental and social concern at local level. As landfill is filling up at faster pace, KMC is struggling to find another site suitable for sanitary landfill.

3.2.1. Waste segregation

Waste segregation is the most widely suggested solution to manage MSW. Waste segregation typically means dividing waste into biodegradable and non-biodegradable.

Normally, separate bins are provided to segregate different type of waste products and people are expected to throw their waste based on its type. This method has helped many cities around the world to reuse and recycle waste materials in unprecedented level.

Segregation has not been practiced in Nepal in large scale. Most of successful MSW segregation are done in developed countries. Many cities in developing countries including cities in India and China have failed to make their people comply their waste segregation directives. So it will be a big challenge to KMC to make its habitat comply and cooperate on segregation based waste management practice. There are many reasons why people might not comply with segregation practice. People are reluctant to adapt to need of change. There is also public awareness and educational issues cities have to deal with to make waste segregation possible. So it might take many years to practice waste segregation to satisfactory level. More importantly, it is not possible without increasing the efficiency of KMC waste collection team (or alternatives).

Alternative suggestion
Without proper segregation lot of goodness of solid waste reuse and recycle will go away. For example, composting is impossible without segregation because non-segregated waste might contain lot of harmful materials. Sorting useful materials for recycling and reuse (for example iron, copper) will be very expensive if recyclers and re-users have to get them from unsorted mass of waste. So, instead of gunning for all out segregation, focus should be given to limited segregation and batch segregation.

1. **Limited Segregation**: It might be very difficult to make individual household to follow directives but Hotels, restaurant, fruit shop, vegetable shop, slaughterhouse, cold storage, food processing companies, poultry houses and many other businesses can start segregating waste products easily because they produce lot of particular type of waste and they have resources to do it. The volume of waste in these sectors is so huge that business of recycling, reusing and reducing can be established successfully. Risk of failing business for this business will be quite high if they pitch their business idea on all-out waste segregation. Limited segregation will also help these businesses, local people and KMC to understand how this system works.

2. **Batch Segregation**: If segregation in collection fails, batch processing might be best alternatives we can have. It can be done in transfer station or dumping site. In this process waste will be separated mechanically or by hand picking in batches. Each batch will be stripped off of its valuables and tested for contamination. If organic matters have contamination it should not be used for composting.

3.2.2. Door to Door Collection

Currently, most of door to door collection is done by informal private sector. People pay change to these private groups and companies to collect their household waste from their premises. But this has been done in very informal and disorganized manner. Frequency of collection and amount of change to household is not standardized. It is voluntary for people to buy this service. They can choose not to participate in this program and continue to throw their waste in public places and riverside.

There had been many attempts to privatize this sector formally. Idea was to authorize private sector to collect household and business sectors garbage. It was expected that business will make lot of money from monthly charge to households and KMC will earn revenue instead of having to pay millions on waste collection. But these attempts failed because of various reasons including bureaucratic delay, lack of policy support and even legal intervention. Most important reason for all these maneuvers was fear of monopolizing waste collection to one particular company.

Alternative Suggestion

1. Permit multiple private companies to compete in waste collection. Previous attempt to privatize waste collection sector failed because it would have given right to collect waste and earn from it to only one company. There are already many companies and groups working in waste collection, informally. Such businesses would have been wiped out if privatization attempt was successful. Instead of allowing only one company, KMC should promote multiple companies (like 20 or more) in the sector so that all will be benefited. People will have chance to buy best service from competitors and KMC will still be earning revenue. If privatized to many companies social opposition to privatization will also be reduced.

2. Make it compulsory for household and businesses to buy their own bins. KMC distributed lot of waste bins and dumpsters in public places. Many of these dumpsters have been damaged and many lost because people care less for things they don't have to pay. Moreover, why should KMC put dumpsters in street for people and business that make waste?

   Alternatives: Businesses and households should be asked to put their own binsfor waste collection. It should be legally enforced. The size of bins should be based on amount of waste they produce. This system is already enforced in many cities around the world including the cities in the United States. To implement this policy KMC should come up with legal provision with inspection, enforcement and punishment right.

3. Make it compulsory for household and businesses to buy waste collection service from one of authorized waste collection service. Currently, the practice is voluntary in nature. People have option of not paying for waste collection and they can throw waste in streets and riverside which is not acceptable. If made compulsory, people will not throw waste. People can be charged based on amount of their waste. To encourage waste reduction and reuse at the source, this provision can be relaxed to those who choose to compost or dispose their waste themselves (if they can show capability to do that). For example, people who chose to compost their waste should have land/farm to use them.

3.2.3. More Transfer Station or Collection Station

Currently, there is only one transfer station. All waste collected in Kathmandu is taken to Teku transfer station which is then again taken to dumping site. If more collection/ transfer stations with waste sorting facility (and possibly composting) are built at different location of KMC, waste can be sorted out locally. It will help recycle businesses to thrive at local level. It will also help KMC to save money in transportation cost and will save space in landfill site. For example, composting facility tried out in Kalimati don't only generate income but also save money KMC would have to spend, if it has to collect and transfer and dispose this waste itself. More research and planning needs to be done to study possibility of additional collection station as supposed benefit can be offset by high real-estate cost and higher social cost.

4.2.4. Privatization of Landfill Management business

Currently, landfill management is most costly and mismanaged sector in waste management. As KMC landfill sites are not well managed, there is huge opposition to existing and proposed landfill sites due to possible environmental and social impact on surrounding people.

Privatization of Landfill will help KMC to benefit in many ways

a. Private sector will handle most precarious task of convincing local people on viability of establishing new landfill site and acquiring land for it.

b. KMC and other waste collectors can pay Landfill Company to dump their waste based on volume and mass. It will encourage polluters to pollute less and reduce waste materials volume and mass by reusing or recycling waste materials.

c. KMC has weak adherence to environmental and sanitary standards in existing landfill sites, and the regulatory body to enforce those standards. But by privatizing landfill operation KMC can dictate terms and condition to its favor.

d. Private sector can operate more efficiently since they can do the same job with much less expense. Unlike KMC, they can become more flexible on hiring and retaining employees and keeping their fixed expense lower.

3.2.5. Post-processing of Municipal Solid Waste

Currently waste is treated as a burden. It is one-way expenditure of KMC. It doesn't earn anything from waste. But careful handling and processing solid waste can bring a lot of benefit to KMC. KMC can initiate post-processing of waste materials in every step of waste management. Waste reduction can be done by waste sorting and composting. Waste can also be used to generate energy. For instance, biogas generation has a big potential because MSW consists more than 65% of organic materials. Other alternative waste reuse and reduction technologies are Refuge Derived Fuel (RDF) production, Syngas generation, Waste Incineration to generate electricity and so on. But to do anything mentioned above there should be clarity in government and KMC policies regarding waste management and attracting Investment. Counting out government solo investment in this sector, following policy considerations is critical to attract private sector.

1. Clarify ownership and usage right on waste materials. For example if private company wants to build Biogas plant, it should be guaranteed right to use waste materials for certain years.

2. Grant authority to KMC to work with private sector directly. Clarify responsibility and accountability of all stakeholders

3. Guarantee the duration of operation of business venture.

4. Provide incentives in form of tax credit or tax holiday and subsidy.

5. Guarantee feed-in connection and minimum electricity rate for electricity generated using waste.

6. Specify quality parameters and standards for use of MSW as compost fertilizers.

4. CONCLUSION

The study concludes that existing waste management system practiced by KMC is not satisfactory. KMC is spending lot of money to manage solid waste but its effort has not been successful so far. By practicing reduce, reuse and recycle approach, KMC can turn it into lucrative resource to produce fertilizer, recyclable materials and energy. To achieve goal of making solid waste management sustainable and less costly to KMC, it need to involve private organization and techniques in waste collection, transfer, recycling, managing dumping system and waste recycle, composting and energy generation. It can be done only with policy support on part of KMC and Government of Nepal.

KMC needs to completely improve its waste management approach and change its policies and regulation to make Kathmandu free from municipal solid waste pollution.