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Promote Sustainable and Healthy Environment of Rajshahi City Corporation through Effective Management of Solid Waste

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Abstract

The urban population of Rajshahi City Corporation is increasing very rapidly. The increase in populations is solely responsible for high increasing rate of solid waste thus its proper management is prerequisite. Management of waste is a costly and troublesome problem for most of the local authorities of developing countries. Rajshahi City Corporation also lacks proper management facilities therefore dumping of solid waste in water bodies, drains and vacant lands are very common. The unplanned and poor management of waste pollutes water, air and land that consequently creates a number of health related problems. Therefore, the study was conducted to explore the existing waste management system and the deficiencies in the sustainable waste management within the study area. This paper will examine various techniques and technologies on solid waste management in light of structural, management and behavioral aspect with the aim to ensure healthy environment of Rajshahi City Corporation.

Keywords: Solid waste, Management, Environment, Sustainable development, Rajshahi City

1. Introduction

Waste is an unavoidable by product of human activities, economic development, urbanization and improving living standards in cities, have led to an increase in the quantity and complexity of generated waste [1]. Rajshahi is the 4th largest Metropolitan Cities of Bangladesh and one of the prominent cities in the northern region of Bangladesh. The city was declared as City Corporation in 1991 with 284056 urban populations that have reached to 449757 urban populations by the year 2011 [2 & 3]. The increase in populations is solely responsible for high increasing rate of solid waste. The waste generation rate in the RCC area is highly increased from 100 tons to 350M.tons by the year 2014 compared to 1994 [4] however the waste collection and management system is not improved significantly thus its proper management is prerequisite. In RCC still a large proportion (54%) of urban populations disposes their household wastes alongside the road (Field survey, 2014). Up to 2003 in RCC area the solid waste disposal bins covered only 19.52% of the area [5]. Due to shortage of dustbins and inadequate collection facilities dumping of solid waste in water bodies, drains and vacant lands was very common [4]. The unplanned and poor management of the waste pollutes water, air and land that consequently creates a number of health related problems [9]. Thus its proper management is prerequisite to enhance environmental sustainability. Management of waste is a costly and troublesome problem for most of the local authorities of developing countries [6]. Inefficient management and disposal of solid waste is an obvious cause of degradation of the environment in most cities of the developing countries. In particular, the City Corporations of the developing countries are not able to handle increasing quantities of waste, which results in uncollected waste on roads and in other public places [10]. There is a need to work towards a sustainable waste management system that requires environmental, institutional, financial, economical and social sustainability [11]. This paper looks in brief the current waste- generation, collection and management scenario in RCC area, along with the associated environmental impacts.

Finally a number of strategic options are proposed to improve the overall waste management system that may lead to healthy environment in the Rajshahi City Corporation area.

2. Materials and Method

Waste management is a costly and troublesome problem in most of the cities of Bangladesh and considered as burden to the environments and daily lives [6]. In the developing countries a very little considerations are given to manage the waste properly therefore, the environments are degrading day by day. Proper management of waste not only brings environmental benefits but also economic benefits to the society and ensures long term sustainability of any city. In the Rajshahi City Corporation area the solid wastes are not managed properly therefore the city is facing a lot of environmental problems. Thus the study has been carried out with the aim to achieve the following objectives:

- To investigate the solid waste management system within the study area (RCC).
- To identify problems and prospects in practicing the hygienic method of waste management.
- To formulate guidelines to improve the overall waste management of the City.

To achieve the objectives of the study an extensive literature review was conducted for background study and better understanding of the topic. The study was conducted based on the secondary data collection and official opinion survey of RCC. The secondary data have been collected from the conservancy department of RCC, Bangladesh Bureau of Statistics, journals, books and reports. Official opinion survey was conducted to know the existing waste management system of the city and the problems faced to ensure hygienic waste management system. Simple statistical technique is used to analyze the data and the final outcomes are presented in the form of tables, figures and photographs etc.

3. Results and Discussions

3.1 Existing Waste Generation, Collection and Management System in RCC Area

Rajshahi City Corporation (RCC) is the designated authority to manage solid waste and to keep the city clean. The cleaning systems can be classified as household level, solid waste disposal from house, collection and transportation by CBO, dumping to the nearest bin/point and collection by RCC to main landfill site/final disposal sites (Fig. 1).

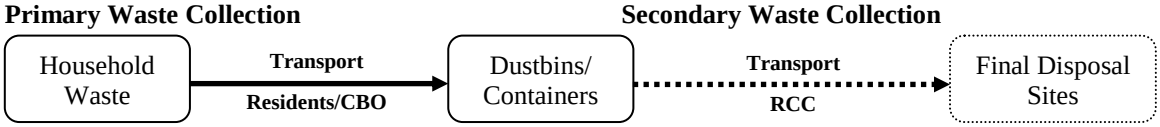

Fig. 1. Waste Collection System in RCC area

With increase in population the waste generation rate has increased in RCC area. The table 1 shows that in 1994 the waste generation rate was only 100 tons that has reached to 350 M. tons by the year 2014. It is also apparent that RCC is unable to collect of all the generated waste and it collects only 210 M. tons (Table 1).

Table 1. Waste Generation and Collection Rate in RCC area

Type \ Year	**1994**	**2014**
Waste Generation/Day	100 tons	350 M. tons
Waste Collection/Day	40-50 tones	210 M. tons

Source: RCC, 1994 & Official Opinion, 2014

A questionnaire survey was conducted in 2014 among all the 300 citizens of RCC and the result depicts that still the waste dumping system is not satisfactory in RCC area. No hygienic method is followed to dump the household waste therefore; the majority of the citizens 54% dump their household waste alongside the road without any segregation (Fig. 2). This open air dumping system creates an unpleasant and unhygienic environment with odor, air and land pollution.

In terms of waste collection, RCC is not in a satisfactory condition though a dramatic improvement is occurred in the provision of waste collection accessories. The table 2 represents that the waste collection facilities including rubbish bins and landfill sites are increased over the last 20 years in RCC area. But these are a crude dumping sites and not engineered or sanitary. No soil cover is provided at the landfill

sites hence the environmental pollution is increasing day by day that pose to health related hazards. There is no enforcement rule for the effective management of solid waste in Rajshahi City Corporation that leads to dumping wastes here and there. In addition, RCC does not follow any recycling and waste segregation practice. Therefore, the unhygienic waste collection and dumping facilities is deteriorating the environment significantly.

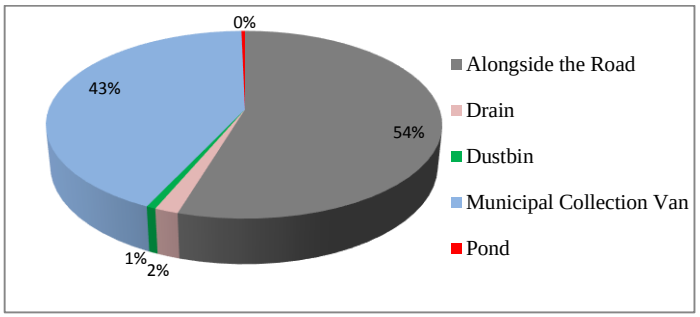

Fig. 2. Waste dumping points used by the citizens of RCC

Table 2. Solid Waste Collection facilities in RCC area

Facilities	**Quantities in Different Years**	
	1994	**2014**
Rubbish bins	325	1050
Push carts	30	150
Rickshaw van	20	228
Trailer	1	3
Garbage Truck	7	12
Sweepers	372	1200
Landfill sites	1acres	12 acres

3.2 Impacts of Open Air Solid Waste Disposal on the Environment

Improper management of solid waste is one of the main causes of environmental pollution and degradation in many cities. Deteriorating soil quality and decrease in vegetation abundance are grave consequences of open waste dumping which have resulted in growing public concern. The menace of environmental pollution has been haunting the human world since early times and is still growing due to excessive growth in developing countries. Solid waste disposal possesses a greater problem as it leads to land pollution because of open dumping, water pollution because of dumping in low lands and air pollution because of burning. The decomposition of waste into constituent chemicals is a common source of local environmental pollution. This problem is especially acute in developing nations. Very few existing landfills in the world's poorest countries meet environmental standards. The problem is again compounded by the issues associated with rapid urbanization. A major environmental concern is gas release by decomposing of garbage. Methane is a by-product of the anaerobic respiration of bacteria, and these bacteria thrive in landfills with high amounts of moisture. Methane concentrations can reach up to 50% of the composition of landfill gas at maximum anaerobic decomposition [8]. A second problem with these gasses is their contribution to the enhanced greenhouse gas effect and climate change. Liquid leachate management varies throughout the landfills of the developing world. Leachate poses a threat to local land surface and ground water systems.

3.3 Problems of Waste Management within the Study Area

Bangladesh is a developing country with a large number of populations. The major cities of Bangladesh are becoming over populated due to rapid urbanization. The city corporations and the city development authorities are unable to provide the basic municipal services and a very little consideration is given to waste management. Wastes are always considered as unwanted and burden to human life and never considered its prospects and economic benefits. Beyond this, the city corporations lack adequate resources and finance to facilitate its functions and activities smoothly. Unlike other City Corporations, the RCC also faces a lot of problems regarding the effective waste management.

3.3.1 Financial

Though Rajshahi is one of the prominent cities in the northern region of Bangladesh still it is an agrarian city and lacks of adequate industrial and commercial activities. Industrialization and commercialization accelerates to generate revenue of the local authorities that in turns help to develop the municipal services. As the rate of industrialization is very sluggish in RCC area therefore it leads to low revenue generation. Lack of finance and dependency on the central government for fund are the major impediments in the proper management of solid wastes.

3.3.2 Institutional

The RCC lacks skilled and adequate manpower to handle the increasing volume of wastes. The authority has no monitoring cell at the field level therefore the workers are indifferent to carry out their responsibilities. In addition, lack of training, modern office and equipments are also the impediments in the effective management of wastes. There is also no installed weighbridge to automatically calculate the amount of daily wastes.

3.3.3 Management

In RCC area it is a common scenario to dump and throw waste here and there openly. In these consequences RCC fails to impose fine as there are no strict rules and regulations. There is no regular record keeping format for generated wastes and no policy to encourage recycling practice. It lacks synchronization and segregation between primary and secondary collection system and lacking of proper handling rules and standard.

3.3.4 Others

RCC is one of the key local government institutions in Rajshahi that works independently without cooperation and coordination with other organizations, NGO's and the local peoples. There is insufficient public education and community participation about waste management. In many cases dustbins are provided but not in appropriate locations and these are not attractive that's why people dump waste outside the dustbins that in turns pollutes the environment and creates a number of health problems.

3.4 Recommendations for Effective Management of Waste

Proper solid waste management have to be undertaken to ensure that it does not affect the environment and does not cause health hazards to the people living there. At the household-level proper segregation of waste has to be done and it should be ensured that all organic matter is kept aside for composting, which is undoubtedly the best method for the correct disposal of this segment of the waste. Including the above all the effective management of waste is only possible if the structural, management and behavioral issues are considered and promoted collectively.

3.4.1 Provision of Structural Facilities

To ensure effective management of solid wastes first of all the structural facilities should be extended in terms of dustbin coverage, collection points and collection vehicles. Attractive and innovative dustbins should be provided to motivate the peoples for using these. Ensure scientific collection practices by providing sufficient equipment, manpower and other resources. To minimize recycling cost separate dustbins should be provided at the dumping sites and transfer stations need to be provided to transfer waste from the smaller collection vehicle to larger transport.

3.4.2 Adopt Appropriate Management Policy and Proposals

RCC is weak in terms of management and imposition of strict rules and regulations. Therefore it should adopt appropriate management policy and proposals to enrich the conservancy department of RCC. Strengthen the managerial efforts by providing modern equipments; forming special monitoring cell; appointing skilled and sufficient man powers; and organizing training programs at regular basis. In addition to these the billboards can be set to encourage people for using dustbins.

The strict rules and regulations should be formed at the national and local level. Peoples violating the rules will be fined and the fine will be multiplied by 2 times if a person is captured for free dumping wastes for 3 times or more. A citizen who is given penalty his name should be announced publicly, so that he may feel shy to violate the waste management rules in the next time.

3.4.3 Change the Behavioral Aspects of the Citizens

To motivate the local peoples for using dustbins and fixed disposal sites the RCC should ensure public participation. The RCC should organize community based meeting to increase public awareness regarding proper management of waste. The community meeting will also help to understand the negative impact of unauthorized dumping. To change the behavioral aspects of the citizens - attractive dustbins should be provided to encourage people using these; a best community can be declared yearly on the basis of proper waste management; in the provision of utility facilities the declared best clean community will be given priority from RCC so that other communities are motivated by it; the civic taxes and other charges might be reduced for the citizens who keep clean the surroundings of their home.

3.4.4 Adopt Appropriate Techniques of Waste Management

In today's world due to rapid industrialization, population is on the rise therefore the creation of large volume of waste material is a common phenomenon. Wastes are not always harmful to the environment. Its harmfulness depends on how these are disposed off. Proper disposal of waste material helps to keep the environment free from disease causing pathogens and keeps it green. The methods described below should be followed for a sustainable and clean environment (Fig. 3).

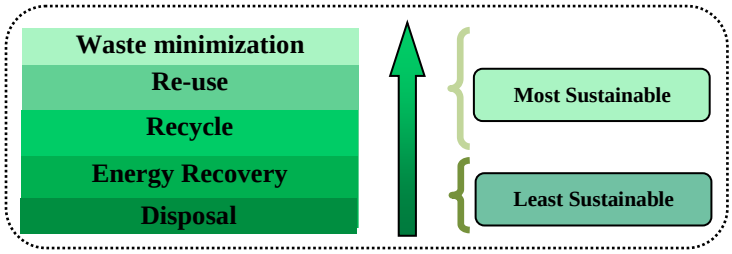

Fig. 3. Sustainable Waste Management Practices

Recycle

Recycling is one of the most well know method of waste management. It is not expensive and can be easily done by anyone. Practice of recycling will save lot of energy and resources that in turn reduces pollution. The recycling techniques should be adopted to minimize the negative environmental impacts. Solid waste recycle can eliminate air, water and land pollution. Ammonia, carbon dioxide, carbon monoxide, methane are produced from solid wastes and creates huge pollution. In Bangladesh maximum rivers and water bodies are polluted by industrial wastes. In same way land and air also become polluted. Therefore practice of recycling should be encouraged that not only will improve the environment but also the recycling practice will generate income for the poor.

Composting

This is a natural process that is completely free of any hazardous by-products. This process involves breaking down the materials into organic compounds that can be used as manure. Using leaves, grass, twigs and add vegetable and fruit peels and skins anyone can practice composting in their backyard. People should encourage composting as a rich nutrients to improve the soil of their garden.

Reduce

It reduces or prevents green house gas emissions, reduce the release of pollutants, conserve resources, save energy and reduce the demand for waste treatment technology and landfill space.

Landfill

Amongst the many waste management methods, using a landfill is probably the most practiced in more cities of the world than any other method. Landfills are often old and abandoned quarries and mining areas, considered as the most cost-effective way of waste disposal. The waste is layered in thin spreads and then compacted, with a layer of clean earth covering the waste material before more layers are added over time.

Reuse

The most important strategy is to reuse, that is when an item is cleaned and the materials are used again. There are two main ways that the concept of reusing can be applied to reduce waste. First, when purchasing a new item, people can look for a product that can be used repeatedly instead of a version that is only used once and thrown away. The second way to reuse is to buy an item secondhand, borrow, or rent an item, instead of buying the product new. There are many ways that an individual can reuse items.

Some common examples include shopping at thrift stores or yard sales for second hand items. People can also donate items that are no longer need to thrift stores so that someone else can use them. Another common method of reuse is to bring own reusable shopping bags instead of using plastic or paper bags provided at the store.

3.4.5 Other Recommendations

Publicity of waste management practices through distributing leaflets, posters and mass media support. Spontaneous participation and involvement of government, households, service holders, students, day labor, businessperson, etc should be ensured to manage and dispose solid wastes properly in order to maintain clean and healthy environment.

4. Conclusion

The solid waste management in Rajshahi City Corporation area appeared to be inadequate and it should be improved. The solid waste should be disposed off scientifically through sanitary landfill and recycle. Segregation of recyclable material would also leads to reduce the quantity for final disposal. Higher priority needs to be assigned to manage municipal solid waste by the local authority. A systematic approach needs to be adopted for optimizing the entire operation of solid waste management encompassing segregation at source, timely and proper collection, transportation and proper operation of sanitary landfill site.

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