

WM05

Solid Waste Management through Bartering- A case study in sylhet

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Abstract— This survey is conducted to assess the effective implication of bartering as a sustainable way of solid waste management in Sylhet, Bangladesh where about 800 barterers are involved in waste collection. From the ancient bartering this bartering is different, performed to make profit rather than meet the needs. The collected amount of waste is about 25000 kg/day which is 63.27% of these specific wastes (Plastic and rubber, paper, glass, and metal) and it is 7.99% of the total solid waste generated in this area. Through this activity they earn 200-400 tk/day. It is found that 30% barterers have high job satisfaction and 10% have very low. In their activities some health risks are involved such as chance of injury, chemical and germs from the waste. These activities can be encouraged by providing free (or at low price) vehicles and the process can be facilitated by providing loans at low interest.

INTRODUCTION

Solid waste is a very important and emphasized concern of waste management in the present world, especially for the country like Bangladesh, where a huge number of population are present and growth rate is very high. Solid waste is generated from human consumption and through construction, operation, maintenance and renewal of towns and cities [4]. The life cycle of waste is often referred to as a journey from cradle to grave (i.e., from when an item is put on the curb or placed in a dumpster to when value is restored by creating usable material or energy, or the waste is transformed into emissions to water or air or into inert material placed in a landfill) [6]. The seventh highest populated country, Bangladesh, has a population of about 150 million generating solid waste in their household, institutions and in other fields. Reference [8] stated that solid waste generation from the big 8 cities of Bangladesh was 10,000 tons/day in 2000-2001. Sylhet is the foremost tea producing city in north eastern part of Bangladesh [1], a good place of development. The waste generation rate of sylhet is 0.48 kg/cap/day [3] and on this basis about 87,600 tons solid waste is generated a year in this city. Only a very few of inorganic wastes are recycled leaving behind the organic part. Rest of the inorganic wastes are burnt or thrown away in open place which is responsible for blockage of drains, air pollution, and decrease of soil fertility. Due to lack of motivation, awareness, commitment, expertise and money a big amount of wastes (40-60%) is not properly collected and treated [2]. When the environmental specialists are seriously concerned about the inorganic solid waste to save the environment from pollution and soil from losing its fertility, the low income barterers in Sylhet city are collecting these inorganic wastes like plastic, rubber, metal, glass and the organic waste paper. In ancient world bartering was the mode of exchange

when money was not introduced to the human being. Bartering is the mode of exchange in which goods or services are directly exchanged for other goods and/or services without any medium of exchange, for instance money. In modern world bartering is also exists. Many business and countries do it considering mutual benefits in exchanging goods and services rather than cash, and it enables those who are lacking hard currency to obtain goods and services. In ancient bartering generally the main purpose was to fulfill the needs, not making profit. In Bangladesh some hawkers have established a simple but profitable business strategy based on bartering. They buy goods which has good demand (generally basic needs of the customer like vegetable) . They do not sell it rather than exchange it with other unused goods made of plastic, glass, metals etc. Generally these are wastage of our daily life. The objective of the study is to assess the solid waste management system through bartering business and to analyze the health risks and other difficulties of the barterers of Sylhet city.



Fig. 1: A barterer exchanging products and wastes.

The process of bartering business

The fig. 2 is a model of the activities that is followed by the barterers in their business. First they analyze the demand of the goods to the customer and search a product to offer considering the difference between the market price of their offered products and the waste received in exchange for profit. If they are satisfied they buy it and start to visit customer houses, institutions. After exchanging at the end of the day they sell the waste received in exchange to the store. Receiving the profit they again by the products, they continue selling the same products until they do not get any alternative which has good demand and lower price. Some times the price of their selected products goes up or demand falls then they shift to another product. This business has no marketing activities but it is contributing in

social welfare. It contributes in the solid waste management.

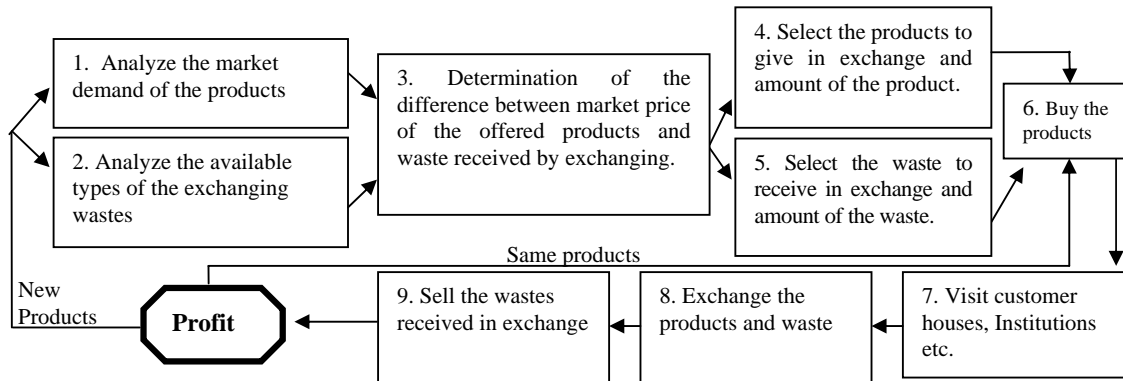


Fig. 2: Steps followed by barterers to run their business

Usually customers throw those wastes away or burn it which directly pollutes our environment. In case of service their activities are simpler than the goods.

METHODOLOGY

Data has been collected through questionnaire survey and face to face conversation with the barterers and store keepers from different area of Sylhet where the waste collecting stores are available and barterers are also gathered every day. Collected data was cross checked by the information provided by barterers and stores. After data is collected it is organized and analyzed for interpretation. Data and information collected and compiled from various primary and secondary sources on waste management in Bangladesh. A rating table is used to determine the job satisfaction of the barterers. Other factors involved in the operation also observed and considered. In different area of Sylhet a questionnaire survey is conducted among the people to calculate the acceptance rate of bartering and other waste collection process.

RESULT AND DISCUSSION

This study focused on the most of the inorganic solid waste paper, plastic and rubber, metal and glass and organic paper. Fig.-3 shows the waste generated in Bangladesh and Sylhet. For this study considered waste was paper, plastic and rubber, metal and glass depending on the involvement in bartering process. Table I shows the amount of waste collected by the barterers in Sylhet. The amount of solid waste collected by the barterers is not a small one it is about 25000kg/day in Sylhet city. In a year the collected amount of waste is about 7000 tons, which is 63.27% of the total amount of considered solid waste generated and it is 7.99% of the total solid waste generated. The value of the collected waste in terms of barterer's selling price is 448000 Tk a day and yearly it is 125.44 million tk. The incentive of the barterer is the difference between the buying price of the offered products and selling price of the wastes. The high rate of acceptance by the people helps them to run their activities. Barterers sell the waste to the store plastic & rubber at 24 tk/kg, paper at 11 tk/kg, metal at 26 tk/kg, glass at 5 tk/kg. Stores sell it adding 2 tk profit per Kg which is shown in fig. 4.

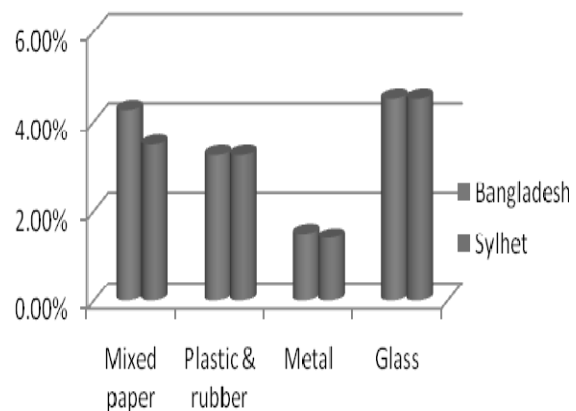


Fig. 3: Waste generate in Bangladesh & Sylhet

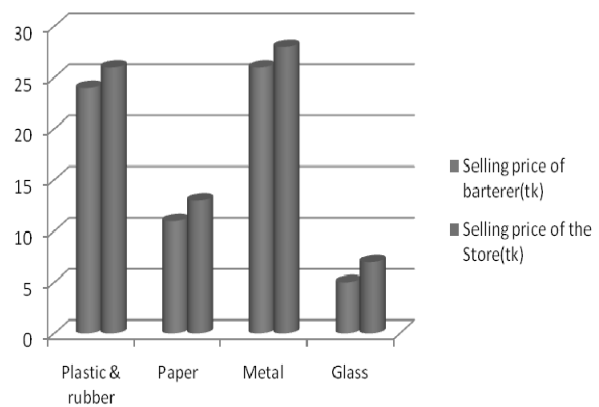


Fig. 4: The selling price of waste by barterer and store.

Bartering is accepted by 80% people where the other waste collection activities tukai (scavengers) and direct waste trading have 3% and 17% acceptance rate respectively. Fig.-5 shows the acceptance rate of waste collection activities among the people. Mentionable that, selling price of the barterer is the buying price of the store. Barterer can make a profit of 5-10 tk/kg and store can make average profit of 2 tk/kg. The volume of waste increases the total earnings of the store. Barterers can earn 200-400 tk/day and stores can earn 1000-2000 tk/day.

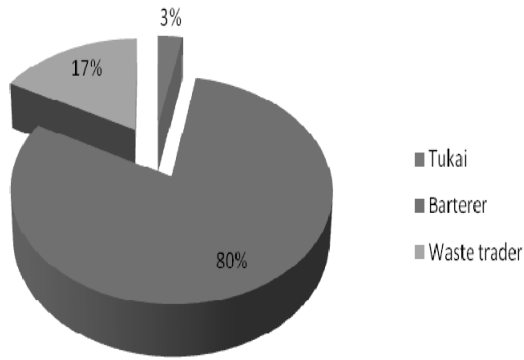


Fig. 5: Peoples acceptance rate of waste collection process

The exchanging products among the barterers vary, can be goods or services. Generally they select the spices, vegetables, children's foods/toys and repairing services. Services need fixed investment in it like instruments for repairing. Table II shows the buying price of the exchanging products of the barterers.

Table I: Amount of waste collected by barterers and its value.

Items	Plastic	Paper	Metal	Glass	Total
Average Collected Waste(kg/day)	11000	5000	4000	5000	25000
Value(tk)	264000	55000	104000	25000	125440000

Table II: Exchanging products of bartering with waste

Products(goods or services)	Price
Spices or vegetables	5-20 tk/kg/pieces
Children's foods/toys	Packets (12-50) tk/pieces 2-10tk
Repairing	Fixed cost (1000-3000)

The amount of products to be exchanged with the amount of waste depends on the buying price of the products. In case of services it depends on the fixed investment and their labor paid for the service. There have some additional cost involved in the process as shown in table III, it includes transportation cost, they need to spend to reach the customers and the cost of materials needed for maintenance of the products or equipment like pots and lubricates. The maintenance cost of goods or services may be fixed or variable.

Table III: Other costs involved in bartering process

Cost item	Amount
Transport	20-30 tk/day
Maintenance	3-5tk/day
Balance and weight	100-150tk(fixed)
Carrier	60/day or fixed

This survey also measured the job satisfaction of the barterers and this is done through rating scale method. 20 barterers were asked to rate their job satisfaction. Table-IV shows the scoring of the barterers on their job under rating scale method. 10% barterers rated their job as very poor and 10% as very high. 35% barterers rated showed moderate satisfaction level and 30% high, 15% barterers have low satisfaction in their job.

Table IV: Job satisfaction of the barterer

Barterer	Very low	Low	Medium	High	Very high
1	*				
2			*		
3				*	
4	*				
5			*		
6				*	
7					*
8			*		
9				*	
10			*		
11			*		
12		*			
13				*	
14					*
15		*			
16			*		
17				*	
18			*		
19		*			
20				*	

A. Health Risk

In the operation of bartering some health risk is involved, such as.

- The chemical from the medical and other waste.
- Chance of injury.
- Germs from the waste.

The survival rate of viruses has revealed that most material that is present in hospital wastes is able to carry viruses keeping them alive for several days (5 - 8 days) [7]. Harmful Chemicals present in biomedical waste such as heavy metals can also cause water pollution [7]. The chemical poisons in hospital waste can affect different parts of the body: for instance, hepatotoxic agents (e.g. carbon tetrachloride, tetra chloroethane) affect the liver; nephrotoxic agents (e.g. halogenated hydrocarbons) affect the kidneys; haematopoietic toxins (benzene, phenols)

affect blood; and neurotoxic agents (e.g. methanol, metals, organometallics) and anaesthetic agents (e.g. ethyl ether, esters, acetylene hydrocarbons) affect nerve systems and consciousness, respectively [5].

B. Educational status and awareness level

Though many types of health risks are involved in the bartering process of waste collection, barterers do not have minimum level of awareness about the health risks let alone preventive mentality. A strong responsible factor of the low level awareness of barterers is their poor educational status. It is found that 88% barterers are fully illiterate and only 9% have participated in primary education and 3% in secondary. Another responsible reason is lack of government and NGOs activities to develop their awareness. Fig. 6 shows the educational status of the barterers.

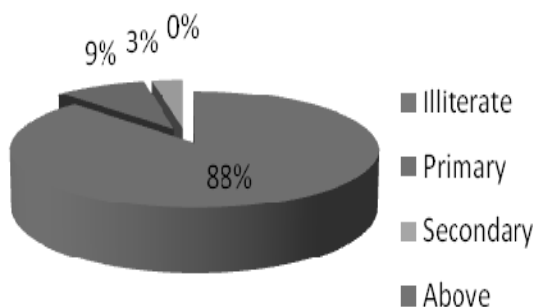


Fig. 6: Educational Level of the Barterer

CONCLUSION AND RECOMMENDATION

From the study it was revealed that barterers play a vital role to minimize the solid waste through a sustainable way. Though it is not a scientific way of waste minimization but it is a way of minimizing the waste through business where a city like Sylhet could not effort to introduce technologically improved equipment. From the study it is clear that by bartering 63.27% inorganic waste is removed which 7.99% of total solid waste generated. By selling the waste a barterer can earn Tk. 150-200 per day whereas a store keeper can earn TK. 1000-2000 per day, though there are some additional costs included in the process. From the study 80% barterers found illiterate and under rating scale method 35%, 30% and 10% barterers showed moderate, high and very high satisfaction in their job. Bartering is accepted by 88% people for its attractive strategy. Like Sylhet city waste collection by bartering exists in the other cities of Bangladesh. Barterers are contributing in the solid waste management establishing such a good business strategy. This activity should be emphasized by the government and steps should be taken to improve the living standard of the barterers. Some awareness programs can be organized to increase the awareness of the barterers about the risk of injury and health risk of chemicals and germs. Free (or at low price) carries/vehicles of the waste can be provided to them or to facilitate the process loan can be distributed at low interest. The child labor in bartering

process should be removed by providing them educational facilities. Government assistance is needed to spread bartering to waste collection across the country. Today, solid waste management involves technologies that are more energy efficient and protective of human health and the environment [9] and in Bangladesh we can use those technologies as our ability. With waste minimization bartering helps to reuse, recycle the waste and ultimately utilization of waste. In other words this idea also helps to reduce the unemployment problem which is a buzzing word in this country.

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