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RESEARCH ARTICLE

An Analysis of the Plastic Waste Collection and Wealth Linkages in Ghana

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ABSTRACT

Since the turn of the new millennium, there has been a steady increase in the use of plastic products resulting in a proportionate rise in plastic waste in the municipal solid waste streams in Ghanaian cities, including the Kumasi metropolitan area. The adoption of a more hygienic mode of packaging food, beverages, "iced water" and other products brought plastic packaging to replace the existing cultural packaging methods. However, the packaging revolution has not been correspondingly backed by appropriate plastic waste management policy, which has left many cities in Ghana littered with plastic wastes; thus, creating disgusting visual nuisances and other public health problems. Despite the environmental and health implications of plastic waste, plastic recovery and recycling has become a very lucrative activity that have the potential to lift Ghana from its current economic quagmire. Using both quantitative and qualitative methods, the paper reveals that plastic waste collection and recycling has generated employment and revenue. The research further revealed that plastic waste is used as raw materials by the construction and oil industries. The paper concludes that plastic waste recovery and recycling should be institutionalized and regulated so that the wealth linkage can be mainstreamed with national policies.

INTRODUCTION

Economic growth and changing consumption and production patterns are resulting into rapid increase in generation of plastic waste in the world, (Fobil, 2000). The world's annual consumption of plastic materials has increased from around 5 million tons in the 1950s to nearly 100 million tons; thus, 20 times more plastic is produced today than 50 years ago, (UNEP 2009). This implies that on one hand, more resources are being used to meet the increased demand for plastic, and on the other hand, more plastic waste is being generated. The rapid growth of plastic waste in cities of developing countries, including Ghana presents a dilemma. Cities historically have been centers of industry and commerce and magnets for millions of people, however, the sheer size of cities and the rapid, continuing influx of rural migrants cast doubt on their ability to continue providing improved standards of living including plastic waste management for their inhabitants, (Brokherhoff, 2000). Over the last few decades, there has been a steady increase in the use of plastic products resulting in a proportionate rise in plastic waste in the municipal solid waste streams in large cities in sub- Sahara Africa (World Bank, 1996; Yankson, 1998).

Most products are now packaged in polyethylene films, which form about 70% of the plastic waste in the municipal waste stream. According to (Fobil, 2000), the plastic materials in commerce across the sub-region include low-density polyethylene (LDPE) commonly called polyethylene films, high-density polyethylene (HDPE) and other plastics such as polypropylene, polystyrene, polyvinyl chloride (PVC) and polyethylene terephthalate (PET). The analysis of the historical trend of plastic waste composition in the waste stream in Ghana shows that in 1979 the percentage by component was 1.4% and by 1993 it had risen to 4% (Schweizer and Annoh, 1996). In 1996/97, the proportion of plastic waste in the waste stream was 5% (Schweizer & Annoh, 1996; Archer *et al*., 1997) and by 1999/2000 its proportion increased to 8% (Fobil, 2000). This was a consequence of huge profits from the sale of plastics and the existing large domestic market, propelling private enterprises to begin to commit huge capital into plastic industry, and, by 1996, there were about 20 plastic producing establishments in Ghana. This included those of plastic films, with notable ones such as Poly Products, Poly Tank and Sintex (Agyenim-Boateng *et al*., 1998). By the turn of this century, it was reported that there were about 40 plastic manufacturing companies producing about 26,000 metric tons of assorted plastic products annually in Ghana, with 90% of the companies in the Kumasi and Accra-Tema Metropolitan Areas. Additionally, over 10,000 metric tons of finished plastic products are imported annually into Ghana (Fobil, 2001).

Statistics released by the KMA Waste Management Department and other waste management bodies indicate that about 16.5% of waste which is generated daily, are plastic related (KMA, 2010). In Ghana, drinking water comes in plastic bags and bottles. The public have developed a strong taste for such sachet water since it is portable and can easily be carried from one place to another. There is also a perception that such water is cleaner and more mineralized than tap water. After gulping down the liquid content, these bags are discarded indiscriminately thereby littering the whole environment. Owing to its excellent properties of low cost, light weight and high durability, plastic has gradually become prevalent in its use for product packaging, replacing other materials such as leaves, glass and metals as a cheaper and more efficient means of packaging (IRIN, 2006). The relatively low energy consumption level per unit weight of plastic in the production process is another attraction. As it greatly enhances the transportation of products by providing good protection and insulation while ensuring sanitary conditions, it is highly accepted by producers and consumers. These bags now constitute a major proportion of the plastic waste generated throughout the country, see Table 1.

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Table 1: Composition and Volume of Solid Waste Generation in the KMA

Composition	Volume (KG)	Percentage (%)
Organic	1235	19.0%
Paper	967	17.5%
Plastic	1225	16.5%
Glass	562	8..2%
Metal	481	8.5%
Textiles	403	6.7%
Wood	499	10.9%
Miscellaneous	799	12.7%
Total	6,171	100%

The Plastic Waste component of the Municipal Solid Waste has been described as quite problematic because it is non-biodegradable and can stay in the environment for a considerable length of time causing all sorts of environmental problems, (Oteng-Ababio, 2011). The management of Plastic Waste through combustion (incineration) is not environmentally friendly since this may release carbon dioxide, a major contributor to global warming (greenhouse effect). Despite the health and environmental effects associated with plastic waste, it is a great resource that can have a very positive economic and social implications for the general citizenry, but this has not been adequately exploited (GTZ, 2000). The researcher believes that if the limitless potentials of plastic waste are fully exploited they could be a panacea for economic development. The aim of this paper is therefore, to bring to the fore, some of the hidden economic potentials associated with plastic waste collection and recycling and to establish the wealth linkages, drawing on the experiences in the Kumasi Metropolitan Area of the Ashanti Region.

METHODOLOGY

Study area

The study was carried out in the Kumasi Metropolitan area which is the second largest metropolitan area in Ghana after Accra. Kumasi is located in the forest zone, between latitude 6.35^{o} – 6.40^{o} and longitude 1.30^{o} – 1.35^{o}. The unique central location of the city as a traversing point from all parts of the country makes it a special place for many to migrate to. With over 2,022,919 million people and an estimated growth rate of 5.4 per cent annually Kumasi generates about 450,167 tons of waste annually of which 16.5% are plastic waste (KMA, 2010) (Fig. 1).

Data collection

Considering the self evident nature of the plastic waste situation in the Kumasi metropolis, visits to suburbs and public places were undertaken to have an in-depth knowledge and understanding of the situation. The research reviewed extensive literature on plastic waste collection and recycling. Apart from the use of documented sources, the study also generated first hand information from the field. Purposive and simple random sampling techniques were also utilized in the study to select interviewees. The study relied on qualitative and quantitative approach, taken in to consideration, sources of data, sampling techniques, data collection techniques, as well as data analysis and presentation techniques. Using purposive sampling technique, in-depth interviews was organized with waste pickers, officials of plastic waste recycling companies, and to managers of solid waste dumps. Officials from the Ministries of Local Government and Rural Development (MLGRD) and Environment; the Environmental Protection Agency (EPA) and Regional Coordinating Council (RCC), Kumasi Metropolitan Assembly (KMA) were also interviewed. The interviews covered themes on the quantity of plastic waste they are able to pick, the price value and their role in solid waste management as well as their detailed knowledge about the enterprise. Additionally, the study used focus group discussions (FGDs) as its primary data collection technique among the scavengers/waste pickers, recycling plant workers and other interested identifiable parties.

This approach is deemed appropriate when the object of the research is to explore altitudes or reactions of a group or community in response to some commonly experienced aspects of their environment (Ulin *et al*., 2005). Through such interactive discourse, participants are able to offer insights on the perspective of the enterprise, revealing clues to the social contexts that shape their opinions (Scammell *et al*., 2009). In all, five workshops (FGDs) were conducted. Thus, two FGDs each (one for men and the other for women) were conducted for the two groups, culminating in joint final and broader FGDs for all the groups. In both workshops, there were also representatives of RCC, WMD of KMA and recycling plant workers. With the exception of the last FGDs which had expanded participants of 11, the rest had gender-balanced eight participants each. Issues discussed during the FGDs included the question of income, their knowledge and the extent of their involvement in the waste recycling as well as the general public perception about their

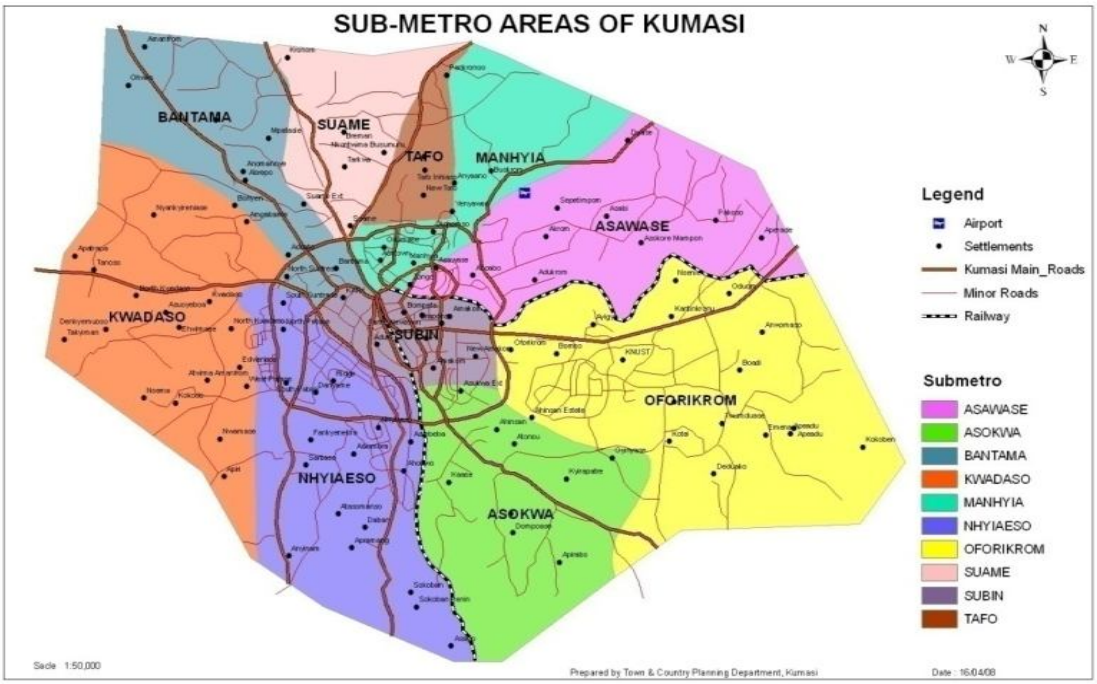

Figure 1. A Map of the Kumasi Metropolitan Area

trade, with the sole aim to explore the advantages and disadvantages of the enterprise. All the proceedings, which were mainly in the local 'TWI' language, were recorded and later transcribed and translated into English, and subsequently analyzed and organized around the key themes that emerged from the FDGs.

RESULTS AND DISCUSSIONS

Plastic Production Regulation

The results revealed that, as yet, there are no legal and policy framework regulating the production and use of plastic bags in Ghana despite the fact that it continues to cause environmental degradation. While plastic waste recycling is generally acknowledge as the way to go in reducing this menace, the involvement of state institutions in this endeavour is lacking. The general guidelines concerning the management of plastic waste in Ghana are embodied in the Local Government Act of 1994 (Act 462) and the Environmental Sanitation Policy (ESP) of 1999, revised in 2008. While regulatory authority is vested in the Environmental Protection Agency (EPA), general solid waste management in Ghana is the responsibility of the Ministry of Local Government and Rural Development, which supervises the decentralized Metropolitan, Municipal and District Assemblies (MMDAs). The MMDAs are responsible for the collection and final disposal of plastic waste through their Waste Management Departments (WMDs) and their Environmental Health and Sanitation Units. The EPA Act 490 was the enabling legislation and, with regard to plastic waste management, it enables the Minister in charge of Environment to make regulations concerning the type, quality or conditions or concentration of substances that may be released into the environment; and the collection, storage, recovery, recycling or disposal of substances which may be hazardous to the environment.

The Kumasi Metropolitan Assembly for instance does not play a direct role in plastic waste recycling and that they mainly focus on collection, storage, transportation, and disposal of plastic waste. As a consequence, most of the collection of plastic for reuse and recovery in the city is performed by the informal sector in the absence of the government provision. The organization of the recovery system has a complex structure including different waste generators such as households, institutions and industries, and continuing with systems for reuse, separation, collection, buying and selling of recyclables, transformation, use of recyclables and final disposal. Again, the research revealed that in Ghana, per capita generation of plastic wastes stands at 0.016–0.035 kg/person/day, and plastics make up between 18–20% of the component materials in the waste stream. A 2012 statistics from the Association of Sachet water Producers revealed that there are 895 plastic manufacturing companies and sachet water manufacturers in the country, producing about 26,000 metric tonnes of assorted plastic products annually, with 90 per cent of the companies in the Accra, Tema and the Kumasi metropolises. This by implication means that more plastic waste is produced in the three metropolitan areas. This is because of their population sizes, incomes and standard of living. It is therefore not surprising that statistics from the KMA reveals that the number of waste collectors in the three cities is substantially high as compared to the other cities.

Economic Benefits of Plastic waste

Source of Employment

The research further found that the sorting of waste for recyclables takes place at various levels in the waste management process. The first level of plastic waste collection and sorting is done at the households. At this level, plastic materials are considered valuable and are therefore usually sorted out for reuse. Thus, the materials are used several times before they lose their utility value and are considered as waste. This practice is not on a large scale as many households have still not cultivated the habit of recycling. At this level too, plastic materials are thrown into the waste cycle, given away to old or poor people, and either sold or thrown away. The collectors can be divided into three groups in the KMA: street boys, private sector enterprises, and scavengers' operations at the municipal landfill.

Street Boys

These are a group of collectors in the informal sector consisting of young men and women who move from house to house or street to street to buy or pick any plastic waste that they may come across. They sometimes also sit near the municipal containers and wait for some valuable materials to arrive which they can collect and sell. At several places in the city, one can observed these young men and women sitting nearby containers every day, all day long.

Private Sector

Some of the collection crew in the private sector collects plastic waste at the same time as they are collecting solid waste from households and institutions. Open and push collection vehicles give them easy access to sort out and collect plastic materials from the mixed waste. The majority of the waste enterprises in the city only engage in the collection and disposal of solid waste, but in certain cases the employees are seen collecting plastics for themselves and are selling them to wholesalers. Because this is not an institutionalize activity, some waste enterprises have inspectors to check that the employees do not sort out plastic materials for their own purposes. These activities are very common in the KMA.

Scavengers at the Municipal Landfill

The last group of collectors is those who collect different kind of materials at the municipal landfill and open dump site in the metropolis. The quality of the plastic materials collected at this stage in the system is generally of a much lower quality compared to those collected by the street boys and the waste enterprises. The main reason for this is that the separation of plastic materials has already taken place earlier in the system, such as at the household level. Therefore, the plastic materials that reach the landfill site are of a much lower quality. Plastic waste picking from municipal sources (i.e. refuse containers and waste dumps), have become lucrative business for many residents in the KMA, this is because of the monetary incentive that comes along with it. The income generation in the plastic recovery system differs sharply between the various groups at different levels within the system. The survey showed that the street boys collect more and quality plastic and therefore makes more money than their counterparts. The survey showed that GHC5000 is paid for 10 tons and 25p for 1kg of plastic waste collected. Eighty percent (80%) of the street collectors said it took them between 2 to 3 weeks to do such a collection whereas scavengers who scout at landfills and open dumps spend between 4-6 weeks to do similar collection.

Three types of plastic are normally sought after by the waste pickers and these are sachet, damaged plastic containers such as cups, buckets among others, and plastic liquid bottles. In a focus group discussion, it came out that the pickers prefer the plastic sachet and plastic bottles to the damaged plastic containers because of the weight and comparatively ready market. A forty-four year old waste picker had this to say *"as for the sachet, immediately you call the company officials, they come and weigh and give you your money but with the damaged plastic containers, you may have to wait for a while and gather more before they buy, but how do you keep such filthy and smelly items"*. This view was corroborated by other members in the group. Another 34 year old man explained how the market has been good for him with the plastic liquid bottles, *"the plastic liquid bottles are patronized by the herbal medicine practitioners who prepare traditional herbs, as we sit here I have a contract with Angel Herbal company to provide as many bottles as possible because my money is waiting for me"*. Several companies have been established in the KMA, AMA and the TMA to recycle plastic waste. One of such companies is Clamonia Limited located at

Amanfrom, a suburb of the KMA. According to the marketing manager, the company employs 70 personnel and goes round to buy the plastic waste from their locations. According him their plant can recycle 18000tons of waste a day and therefore look beyond the metropolis for the supplies. *"We go even beyond Sunyani and Techiman in the Brong Ahafo Region to get the products because the Ashanti Region alone is unable to supply our demand"*. Blowplast Limited, another company that recycles plastic waste has an organized network of about 100 people engaged in collecting plastic waste sachets. They supply the company's 14 trucks that regularly pick up the waste in the various areas of Accra. The plastic wastes are transported to Tema where they are stored in a depot or warehouse that belongs to the company. The company collects between 7-8 tons of waste plastics sachet per day, but the capacity of the recycling plant is 24 tons. The company pays 20p per kilograms of plastic waste. One kilogram contains about 200 plastic waste sachets. Some individual collectors are able to collect up to 200 kg per day. This means that on the average, some individual collectors are able to make over GHC40.00 a day and if one thinks of the fact the daily minimum wage in Ghana is not up to GHC 4.00 then plastic waste is a real Gold. Hence some collectors have become so rich that they have also organized people below them to collect the plastic sachets.

Revenue

Again, the research further revealed that plastic waste contributes significantly towards the tax revenue and foreign exchange generation for the state. In the words of the marketing manager of Clamonia Limited, *"Ghana gains substantial amount of dollars from the export of recycled plastic to neibouring countries such as the Ivory Coast, Togo and Nigeria"*. Again, the country saves a substantial amount of foreign exchange that could have been used to import raw materials for the plastic industry. The recycled plastic serves as a resource for the production of Sign and information boards, Garden furniture, Litter bins, Garden Fence, Toys among others; hitherto, these items had to be imported. In an interview with the registrar general of companies in the Ashanti Region, he mentioned that many companies have applied to recycled plastic waste in the Region and that when they start their operations, the employment base of the country will increase significantly. By implication, plastic waste picking and recycling constitute a single largest source of informal employment and revenue in the country despite the negative environmental impact.

Industrial and Constructional Purposes

The research further revealed that plastic waste is now being used to produce plastic oil which could be used to lubricate industrial machines. In an interview with officials from the Ministry of Environment, they confirmed that Ghana has set a taskforce to learn from the experiences of China, Kenya and Mauritania and also collaborate with a multi-national recycling company to covert plastic waste into machine oil. The chief Director at the Ministry of Environment revealed that if Ghana is able to recycle plastic waste into machine oil, it will rake in a lot of foreign exchange that may even surpass that of cocoa. Apart from exporting the oil for foreign exchange, Ghana could also save millions of foreign currency that could have been used to import the machine oil. Available literature indicates that China, Kenya and Mauritania are leading the way in this endevour with China leading the rest. In an interview with an oil engineer, who is also a member of the ministerial task force, he explained *"Plastics are man-made organic materials that are produced from oil and natural gas as its raw materials. Plastics consist of large molecules (macromolecules), the building blocks of all materials and therefore it is only natural that when it is recycled, the oil is gotten back"*. Energy recovered from plastic waste can make a major contribution to energy production. Plastics can be co-incinerated with other wastes or used as alternative fuel (e.g. coal) in several industry processes (cement kilns). The energy content of plastic waste can be recovered in other thermal and chemical processes such as pyrolisis, he added. The contribution of energy obtained can also be used to augment the current shortfalls in the energy supply of the country. Available literature from India indicates that plastic waste collected from 1381 quintals was used for the production of plastic-bitumen mix that would be sufficient to tar a stretch of 138 km of road. The Himachal Pradesh State Pollution Control Board in collaboration with the Public Works Department (PWD) has built three road stretches on a pilot basis by using shredded plastic waste on the outskirts of Shimla. The project used waste plastic such as carry bags, disposable cups and laminated plastics like pouches of chips, pan masala, aluminum foil and packaging material used for biscuits, chocolates, and milk and grocery items was used in surfacing roads, (Vishal Gulati, 2010). Learning from the India experience, officials from the Building and Road Research Institute of Ghana (BRRI) has started an experiment to see how the India experience can be replicated in Ghana. *"The results have been good in the past four months as there has been no stripping or any other major damage to the roads lay by using plastic-asphalt mix. Of course, the plastic blend not only helps lowering the cost of tarring but also enhances the durability of roads because of higher binding strength of plastic"*, PWD superintending engineer. Explaining the rationale for using the waste plastic in road construction, he said if plastic waste could be mixed up to 15%, this would lead to saving of equivalent quantity of asphalt, reducing the overall construction cost. According to one researcher with the institution, plans are far advance in this direction and that within a very short time, pavements of some government institutions will be constructed with plastic chips.

Conclusion

The research has shown that plastic recycling activities have become economically profitable venture and thus play an important role as livelihood support system for many residents in the metropolis. Thousands of individuals in the KMA are depending on the recycling of plastic materials in order to make a living. The high degree of labour intensity of the waste picking and sorting processes enables numerous people to earn some kind of income and thus reaping the economic benefit of the system. The results of the study has also shown that apart from individual incomes that could accrued from the collection and sale of plastics, the nation stand to benefit through waste minimization and reduced expenditure on solid waste management. The study concludes that owing to the immense benefit plastic recycling can bring, formal rules and policy should be put in place to integrate it into the formal solid waste management options.

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