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**ENSURING AVAILABILITY AND SUSTAINABLE MANAGEMENT
OF WATER AND SANITATION FOR ALL**

**Solid waste management in developing countries:
a case of Dar es Salaam City, Tanzania**

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BRIEFING PAPER 2543

Solid Waste Management (SWM) is still a global challenge to the 21st Century, and now is on the Universal Agenda. Low income cities in Africa and Asia alone will double their waste generation within 15-20 years (ISWA, 2015). This needs proper handling so as to reduce the impact to the human health and the Environment. This paper presents the review of solid waste management in developing countries and using the city of Dar es Salaam DSM) Tanzania as a case study. There is a huge problem of poor handling of wastes, especial the solid waste collection and disposal in Dar Es Salaam City and other developing countries cities. Indeed it is a high time for DSM and other developing countries to find a way of improving the solid waste collection and disposal by giving priority to the solid waste management sector.

Introduction

The speed with which urban populations grow in developing countries (DCs) has far out-paced the government institutional capacity and this is a big challenge to solid waste management (Sujauddin *et al*, 2008, Parrot *et al*, 2009, Otteng-Ababio *et al*, 2013). It is estimated that, from 1990 to 2030, global population will grow by 3.7 billion people. Ninety percent (90%) of this increase will take place in developing countries, of which ninety percent will be urban (UNCHS, 1994). Due to this mismatch between the speed with which population has concentrated in particular urban areas and the very slow pace at which societies have developed, the institutional capacity has failed to cope with the responsibilities. Because of such enormous increases in population, resource consumption and waste generation will also increase. Cointreau-Levine (2000) mentioned that in the poorest countries the solid waste service coverage reach only 10% - 40%, and in the better organized middle-income countries the service coverage reach 50% - 80% of the urban population. It is estimated that about 50 per cent of the solid waste generated within urban centres is left uncollected in developing countries with around 2 billion people without access to solid waste collection and about 3 billion people lacking proper waste disposal (ISWA, 2015). This paper presents a general overview of solid waste management in developing countries, using the city of Dar es Salaam (Tanzania) as an example.

Literature review of solid waste management in developing countries

The consequences of uncollected waste impact particularly on health; piles of solid waste serve as food and breeding grounds for disease vectors, rubbish blocks water courses and open drains. At times of heavy rain, the blocked drains may result in serious flooding, with loss of life and property. Environmental health issues arise from the higher content of organic waste in the municipal waste stream of many DCs. Thus climate and composition of waste make a frequent and regular service in waste collection a high priority. Much literature on SWM addresses environmental health issues, along with the technical, financial, and managerial problems of waste collection, transport and disposal in many developing countries. (Alkhatib *et al* 2007; Kassim & Ali, 2006; Parrot *et al*, 2009; Oyoo *et al*, 2014)

Industrial and hospital waste often enters the municipal waste stream, presenting a threat to health. It has been argued that human exposure to these wastes whether inhaled, ingested or absorbed through the skin may result in acute effects and chronic diseases (Pfeffer, 1992). The municipal waste stream in some cases includes human excreta, which is likely to contain pathogens. This solid waste also serves as a medium for the transmission of pathogens (Coffey and Coad, 2010, Otteng – Ababio *et al*, 2013). In addition to its composition, there are other environmental problems associated with solid waste. When people have no other way of getting rid of waste, as is often the case in many DC cities, they burn, bury, or leave waste to accumulate on vacant space (Cointreau-Levine, 2000, Kassim, 2006, Oyoo *et al*, 2014). This contributes to air pollution, particularly if there is high content of plastic which is a growing component of waste in many DC cities. An air pollution study in Manila indicated that refuse burning was the second major cause of health damage through air pollution (Beall, 1997).

Waste that accumulates on vacant land pollutes the surface and may directly enter into the drains or streams. In other cases people throw waste directly into the drains and streams which not only pollutes the water but also clogs drainage and increases the risk of flooding. The case of serious flood occurred in Maharashtra India in August 2005 caused by poor solid waste management; gutters choked with plastic bags led to the enormous losses for the state, death of at least 1,100 people and more than 300 others died due to waterborne diseases that broke out after the disaster (BBC News, 2005)

Solid waste buried in land pollutes the ground water. Even wastes that are officially collected can end up in an uncontrolled open dump. In this case waste pollutes the ground and surface water, while leachates permeate the soil and enter surface and underground water systems which become contaminated with hazardous and toxic substances (Oyoo *et al*, 2014). It is argued that there are 1.2 billion people suffering from diseases caused by drinking polluted water or transmitted by inadequate waste treatment, and cleaning up contaminated water resources is a costly and sometimes impossible task (Horchani, 1992). While improved SWM will not provide the solution to all urban environmental and public health problems it can contribute to minimising them. Therefore it is extremely necessary to improve the SWM in developing countries. The following sections present the case of Dar es Salaam, which briefly focuses on solid waste collection and disposal.

Methods of data collection

The Data were collected through interviews with key informants; at Dar es Salaam City Council (DCC) and municipalities' official, private sector and workshop facilitated by first author in October 2015. Questionnaires were distributed to the municipalities' official, private sector and DCC officials. Another method was the desktop survey done by the first author at Dar es Salaam City Council (DCC) office from September - October 2015.

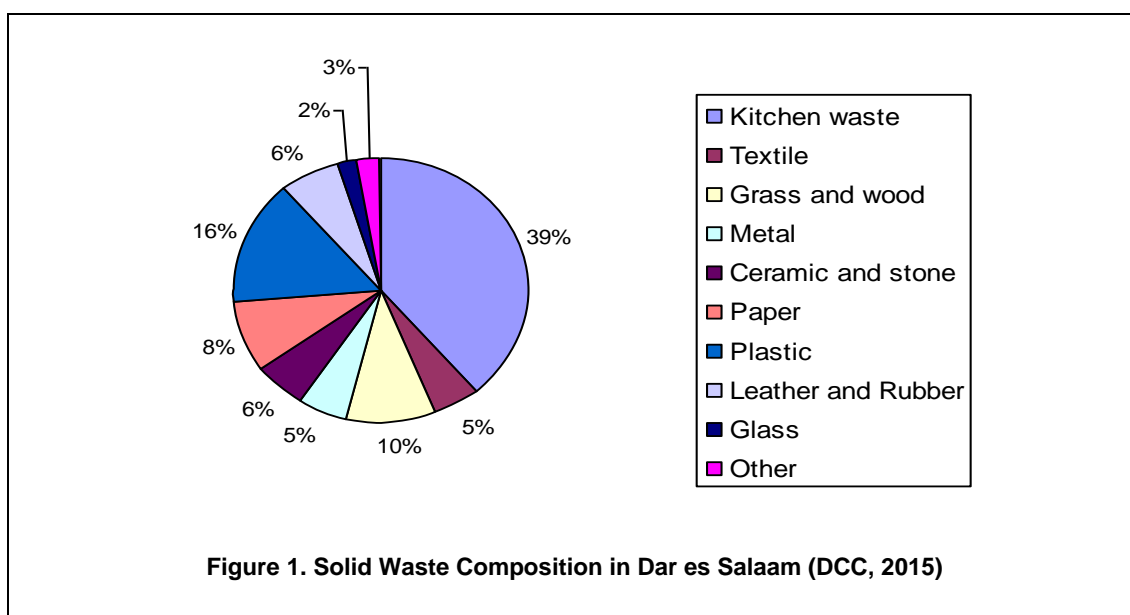
Findings and discussions

Background

Dar es Salaam has an area of 1,800sq. Kilometer and grows very fast, mainly due to rural urban migration. The city has the population of 4,364,541 million people (2012 Census). The City has four Local Government Authorities namely Dar es Salaam City Council, Ilala, Kinondoni and Temeke Municipal Councils with 91 wards. The City is Tanzania's largest and most important industrial and commercial centre. It is also a centre for government activities though it is not the capital City of Tanzania. 70% of the population lives in unplanned settlements. It is estimated about 4,252 tones of solid waste is generated per day and only 42% collected and transported to the dump site (DCC, 2015).

Solid waste composition

The composition of solid waste has implications for its storage, collection and disposal. Solid waste in Dar es Salaam comprises a large amount of kitchen waste/ organic waste. In hot climate areas the collection of solid waste has to be done frequently due to the natural decomposition process taking place in solid waste. Fig 1 below shows the composition of waste in Dar es Salaam.



Solid waste collection in Dar es Salaam

Solid waste collection is the most important aspect in the system of solid waste management. In Dar es Salaam the solid waste collection service is carried out by the municipalities with private sector. Only 42% of solid waste is collected and transferred into dump site (DCC, 2015) and the remaining waste is left uncollected. **The main reason for this anomaly is the inadequate facilities for solid waste collection vehicles.** Both private and public sector admitted that there is insufficient number of collection vehicles for the service as reported by the DSM municipalities in the fig 2 & 3 below. If the waste remains uncollected it has a major impact to the environment and public. ISWA (2015) reported the major public health impacts of uncollected waste as; Gastrointestinal and respiratory infections particularly in children and the blocking of drains, floods and spread infections disease especially during the rain seasons.

There are also reported logistical difficulties in the collection of waste in Dar es Salaam, particularly in unplanned area, where streets are narrow, irregular or unpaved. A number of different collection vehicles are needed for the service; pushcarts, and trucks are very common in DSM. Push carts are used mainly in an unplanned area where the streets are narrow and trucks are used mostly in planned areas. When solid wastes are higher in organic waste content, this makes call for the urgent removal by using the appropriate collection vehicles. The organic waste with higher density is very common in developing countries which have a typical density of 300 - 500kg/m³ which is quite different from developed country waste (Ydego, 1994; Mbuligwe, 2004; Coffey and Coad 2010). Another issue reported by the private sector they do not receive enough support from the public sector and service recipients. This makes them running the service in difficult way. In deed the support from the public sector is very important for the sustainability of the private sector.

It is argued that different kinds of solid waste collection are needed for different settlements, and it is necessary to solve local problems which match local needs.. High temperatures accelerate the microbiological process, and the breeding houseflies are much faster and so the waste should be collected more frequently to control the number of insects and the spread of diseases (Coffey and Coad 2010). Other reasons for the inadequate service coverage include operational insufficiency and the use of inappropriate technologies which lead to an inefficient use of time and resources (Coffey and Coad, 2010). More effort is needed to make sure all waste is removed from DSM city and other developing countries cities, so as to minimize the health risk and degradation of the environment.

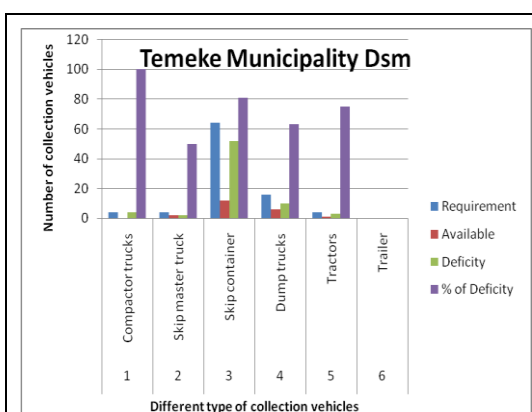


Figure 2. Collection vehicles for Temeke Municipality Requirements and available

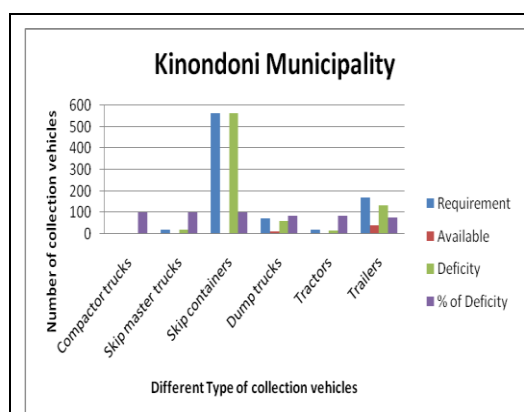


Figure 3. Collection vehicles for Kinondoni Municipality Requirements and available

Disposal site

The solid waste in Dar es Salaam is disposed into dump site. Although solid waste in DSM like many other developing countries is suited for landfill. It is found that DCC who is responsible for dump site has insufficient vehicles for disposing waste. It is also very common to see fire outbreak at the site. This leads to problems with the environment and public health. In DCC, like in most cities of developing countries, the disposal sites are open dumps; without leachate treatment, protection at the bottom by liners, nor is there any treatment of gases - this results into direct pollution of the environment, which in turn increases health risks to the public. Besides the official dump sites the cities in many developing countries suffer from the illegal dumping of wastes in the rivers, oceans and drainages empty lots and along the roads sides (Guerrero *et al*, 2015). Photograph 1 shows a fire outbreak at the dumpsite and Figure 4 the status of vehicle owned by DSM city Council.



Photograph 1. Fire at the dump site

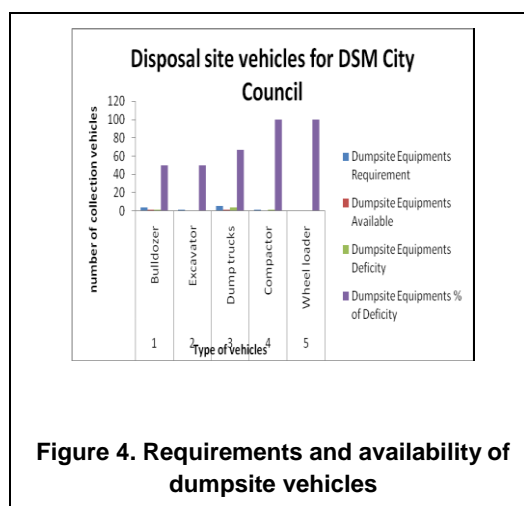


Figure 4. Requirements and availability of dumpsite vehicles

The impact of disposal site to the environment are severe land pollution and freshwater and groundwater pollution and sea pollution. In addition it causes local air pollution, and compounds effects of climatic change (ISWA 2015). Indeed it is a high time for DSM and other developing countries to find the way of improving the solid waste disposal sites.

Problems of public sector management of solid waste

Inadequate management of solid waste is not only due to the pressure of population growth and increasing city size, but to financial constraints, and poor planning (Bolaane, 2004). Although most governments in DCs increasingly acknowledge that solid waste is an immediate and serious problems, political priorities

related to waste and the social status of people dealing with SWM are still low and limit rapid and sustainable improvements in this sector (Kassim 2006). It is estimated that only around 50 per cent of solid wastes are being transported to final disposal sites daily (ISWA, 2015), and most of the low-income areas are not served. Solid waste management is essential utility and critical service to the society, but is often not recognized and given priority to the most developing countries (ISWA 2015).

Way forward

Proper solid waste management should be given a priority though has a financial cost, which is a major challenge in developing countries. It is a high time now for the Developing countries to ensure provision of solid waste services for all members of community starting with basic solid waste collection service by doing the following:

- Strength the public private partnership in solid waste collection by supporting the private sector legally and financially so as solid waste will be collected mainly by private sector.
- Extend affordable solid waste collection services to all people irrespective of income level by using affordable mechanism; such as appropriate vehicle to reach the unplanned areas.
- The public sector should ensure the controlled disposal sites of the solid waste as the important step towards the environmental protection, so as to reduce the health impact to the community. In this case the appropriate technology and enough vehicles should be in place
- To use the opportunity of 3Rs (Reduce, Reuse, Recycle) to reduce waste going to the disposal site and increase the life span of the disposal site, at the same time generate income from the waste, and the use organic manure for land fertilizer from compostable materials.
- To ensure waste generators know what is required from them concerned the solid waste management so as to facilitate the required changes in attitude and behaviour among the society continuous education is needed to the service recipients.

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