Global Scientific JOURNALS
GSJ: Volume 7, Issue 11, November 2019, Online: ISSN 2320-9186

www.globalscientificjournal.com

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ABSTRACT

Sandali Ward in Temeke Municipality lacks effective formal waste management services. Consequently, informal solid waste collectors emerged in providing waste collection services in several sub-wards including; Mwembe-Mnofu, Mwembe-Ladu, and Sandali. However, little is known about potential of their service and the challenges they face.

The methodology involved a randomly sampled population of 210 households and 9 ISWCs. Questionnaires, non-participant observations, interviews and documentary review used for data collection. Data were analysed using descriptive statistical analysis. The findings show that 210 (100%) of the respondents considered the service offered by ISWCs reliable, 2493 (90%) of the households were effectively paying for the waste collection services, 189 (90%) of the respondents preferred 'pay as you pollute' mode, 210 (100%) of respondents satisfied by the service on demand mode, and the head carrying, pushcarts and trucks as applied technology observed to be effective. Also, there were positive market response as three truck operators found to work with ISWCs at a cost ranged from Tshs15000 per pushcart to Tshs180,000 per trip. In addition to that, the waste management costs by ISWCs were found to be less by 80% compared to the formal services. Despite that, the existing legal framework restrict the service offered by ISWCs.

THE POTTENTIAL AND CHALLENGES OF INFORMAL SOLID WASTE COLLECTION SERVICES: THE CASE OF SANDALI WARD, IN TEMEKE MUNICIPALITY, DAR ES SALAAM-TANZANIA

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1. Introduction

Solid waste management (SWM) is one of the important services supporting society in urban areas especially in developing countries (Kabera, *et. al*., 2019). However, the way it is managed poses enormous economic and environmental challenges (UN-Habitat, 2010). According to UN-Habitat (2010), nearly 1% of the gross national product (GNP) and 20 to 40 percent of municipal revenues in developing countries are consumed in managing the generated solid waste. Despite that 40 to 60 percent of the generated solid waste in many urban areas of developing countries remain uncollected leaving majority of the population without services (Hussein, 2019)

Several scholars including Hussein, (2017) have indicated that population increase contributed to the increase in solid waste generation. Dar es Salaam has been reported as one of the fastest growing Cities in Sub-Saharan Africa and projected to become the fourth largest City in Africa with about 10 million population by 2030(URT, 2019). The City population growth also witnessed the solid waste generation growth from 2000 tonnes per day in 1998 to more than 5300 tonnes per day in 2016 (URT, 2019)

While responding to waste management challenges, in 1992 Dar es Salaam Sustainable Cities Programme has introduced Environmental Planning and Management (EPM) approach. This approach advocated on promoting participatory and partnership arrangements whereby working groups formulate strategies and prepare action plans to deal with identified most pressing environmental issues. As an output of the working groups, innovative ways of improving solid waste management in the Dar es Salaam have included emergency clean-up campaigns, privatization, community involvement, and disposal site management (URT, 2019)

However, since the adoption of EPM over 25 years ago, waste management continued to be a challenge in Dar es Salaam. This has prompted the mushrooming of informal solid waste collectors (ISWCs) who engaging in providing house to house waste collection services parallel with formal waste collection service providers.

1.1 Description of the case study

Geographically, Sandali Ward informal settlement (Figure 1) is within Temeke Municipality in Dar es Salaam City. The settlement is about 13.4kilometres from the Dar es Salaam City Centre. Being close to the Central Business District (CBD), makes the area attractive for different activities including trading, settlement development, and investments. According to the 2012 Population Census, Sandali Ward had a population of 52,660.

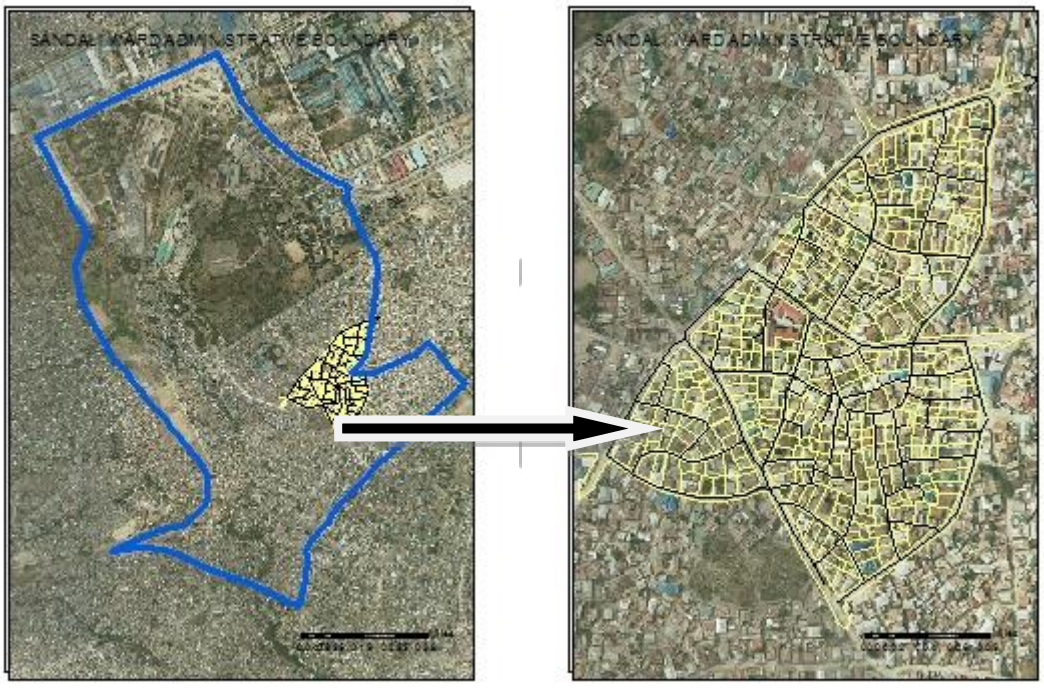

Figure 1: Sandali Ward Map

Source: SATELLITE IMAGE, 2017

1.2 Problem Statement

Just as other informal settlements in Dar es Salaam City, Sandali Ward lacks effective waste management serviceswhereby the existing formal systemsobserved to be ineffective. As a result,Informal solid waste collectors have been providing services in some *Mitaas* such as Mwembe-Ladu, Mwembe-Mnofu and Sandali. However, if informal solid waste collectors were not involved in service provision the result would have been significant negative

environmental impacts in the study area. In that regard, this paper attempted to examine the potential of informal solid waste collection services and its respective challenges in Mwembe-Mnofu, Mwembe-Ladu and Sandali *Mitaas* in Temeke Municipality.

1.3 Main Objectives

The main Objective of this study is to investigate on untapped potential of informal solid waste collectionservices and the challenges facing informal solid waste collectors (ISWCs)in Sandali Ward.

1.3.1 The study specific objectives include;

i. To examinesthe reliability of waste collection services offered by ISWCs.
ii. To assesses the willingness of residents to pay for informal solid waste collection services.
iii. To analyses the perception of residents towards informal solid waste collection service.
iv. To assess the market response towards informal solid waste collection service providers.

2.0 Theories and Concepts

2.1 Social network theory

According to Hussein (2019), social network theory has a key importance in informal solid waste collection livelihood. This is because the theory looks how actors, individuals, government, property-owners or occupants, agencies in the public and other stakeholders in solid waste management working together (Kyessi, 2002). The theory also highlights that in a well working environment, partners tend to reduce their dependency on each other, while increasing the dependency of others on them, thus creating the source of power differentials between partners. This applied in analysing how the power influence affecting solid waste collection service provision in the study area.

Also, Hussein (2019) indicated that through social network theory the landscape of relationships as well as the degree to which different actors in informal solid waste collection value each other can be well understood. Based on that, network theory applied in this study

to analyse the extent in which partnership and networking between various actorsin solid waste collection affect waste collection service performance in the study area.

2.2 Organization theory

According to Kalwani (2009) in Hussein (2019), network theory considers not only stated set of rules and hierarchy of officers placed within the organization based on their talent and expertise in performing particular roles, but also other obstacles in the environment such as technology, service, income, preference, etc. The interaction of these constraints figures the potential wealth maximizing social, economic or political opportunities of the entrepreneurs including solid waste collectors (ibid). On this basis, there has been increased interest in seeking ways of organizing and empowering communities. The theory applied in this study to assess how ISWCs organized with respect to their performance in the provision of waste collection services

2.3 Conceptualising solid waste collection performance

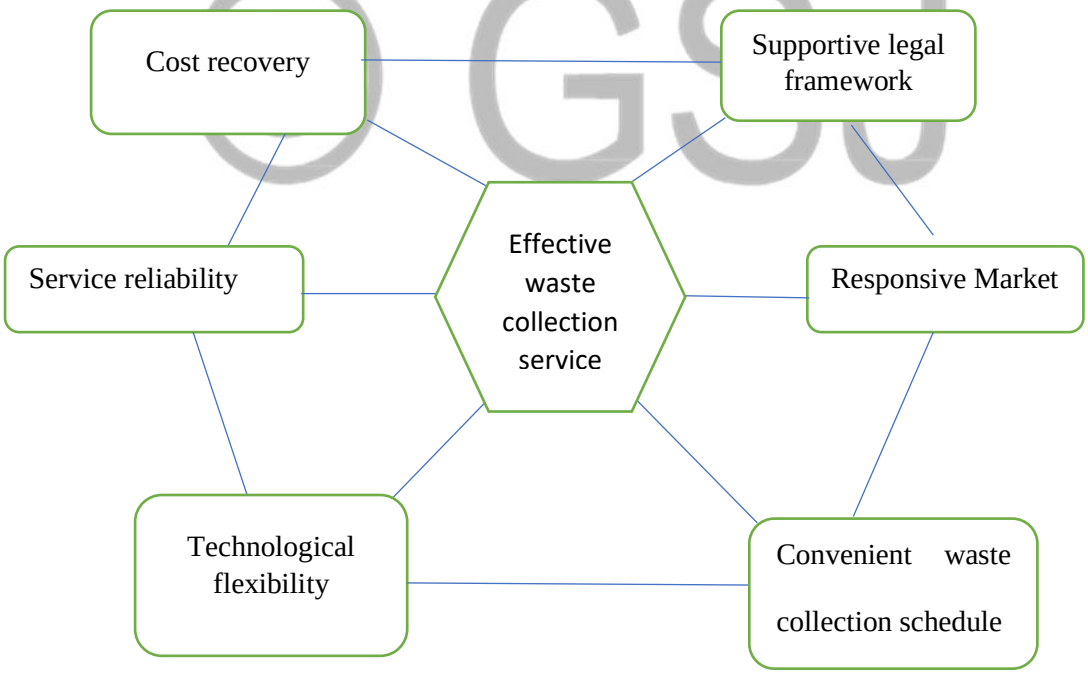

Figure 2: Conceptualising solid waste collection performance

Source: Own construct, 2019

2.3.1 Description of variables

i. Cost recovery

Performance of the waste collection service is very much affected by the ability of the service providers to cover for the cost associated with the rendered services. The willingness of the service recipients to pay for the service is very significant in the quality of the service and performance of the service provider.

ii. Service reliability

The reliability of waste collection service has an implication to the waste collection performance. The unreliable services could directly be linked with poor performance of the service provider. The effective waste collection service expected to be reliable. The service recipients should be sure on how, when and where the service is going to be provided.

iii. Technological flexibility

The applied technology in waste collection services has a consequence to the performance of waste collection service provider. Different context requires different technological application for effective waste collection services. For example, narrow streets settlements especially in unplanned areas may require a different approach from the commonly waste collection trucks.

iv. Convenient waste collection schedules

The waste collection schedule has an implication to the effectiveness of the waste collection service provided. The collection schedule which does not respond to the demand of the service recipients may lead to ineffective waste collection. For example, a schedule which does not consider the convenience of the service recipients may led to illegal damps. This is because missing schedule will leave no choice other than illegal waste disposal.

v. Responsive Market

Solid waste collection service provision involves several stakeholders. Some of the stakeholders include suppliers of various gears necessary for waste collection service provision. For example, there are stakeholders for manufacturing waste collection trucks, supplying waste collection trucks, providing rental services for

waste collection trucks, supplying waste collection trucks spare parts etc. It is necessary for the market to respond to the demands of waste collection service providers to ensure effective waste collection services.

vi. Supportive legal framework

Effectiveness of solid waste collection service provision is very much influenced by legal backing. The provided services should be termed legal with in the operating legal framework in order to grow and expand. Failure to be recognized by the existing policies, laws and regulations will lead to unstable services as the operations might be disrupted by the law enforcers.

3.0 Methodology

The study was conducted using primary and secondary information. Primary information was collected through household interviews, focus group discussions, physical observations and official interviews. Focus group discussions were held with all9 informal solid waste collectors operating in the study area. Official interviews were held with 4 Temeke municipal environmental officers, Sandali ward health officer, Ward executive officer, 3 Mtaa executive officers for MwembeMnofu, Sandali and Mwembeladu sub-wards and Mtaa chairperson for MwembeLadu, Mwembemnofu and Sandali sub-ward. Secondary information for the purpose of knowing what others have done in the subject of solid waste management was collected through documentary review.

This study employed qualitative procedures for creating the appropriate number of households to be interviewed. The researcher determined that an appropriate sample size of 70 households in each sub wardto be enough for achieving the goals of the study. This has made a total of 210 households identified for the study. This was also supported by nearly similar study conducted by Kasala (2014).

4.0 Results and Discussion

4.1 Service reliability

Solid waste collection services provided by informal solid waste collectors were found to be more reliable than services offered by contracted waste collection companies. While responding on reliability of waste collection services offered by ISWCs, 70 (100%) household respondents have indicated that the service offered by informal solid waste collectors is more reliable compared to the service offered by formal waste collection service providers."Service offered by formal contracted companies is highly unpredictable". One of the respondents has indicated. He further added that, "It is very common to take your waste outside the house in a day scheduled for waste collection only to find out no waste collection truck appeared". This claimed was also supported by Ward, and Mtaa Executive officers as well as Mtaa chairperson for Sandali, MwembeLadu and MwembeMnofu.

4.2 Pay as you pollute as convenient payment mode

The willingness to pay for waste collection services by residents in Sandali, Mwembe Mnofu and Mwembe Ladu found to be very high. For example, while responding on the number of residents who pays for waste collection services, 100 percent of ISWCs have indicated that more than 90 percent of the 2770 households in Sandali, Mwembe Ladu and Mwembe Mnofu are paying for waste collection services.

However, the applied mode for the service offered is different from the one prescribed in municipal by law where, payment for the service offered is done monthly. which is also applied by formal service provider. of pay as you pollute working like LUKU for electricity or meter reading for water supply. The mode found to be favourable in Sandali, Mwembe Mnofu, and Mwembe Ladu sub-wards (Mitaa). Residents were found to pay according the amount of waste generated. The payment range between Tshs500 to Tshs2000

Figure 3: Waste collection container that charged Tshs5000 per collection

While responding on their preference between pay as you pollute mode versus monthly payment as prescribed in municipal by-laws,189 (90%) of the respondents have indicated to prefer 'pay as you pollute' mode. This was attributed to the fact that majority of the houses have more than four households. That has made each household to share the identified cost per the volume generated in that house. The study found that a household pays an average of Tshs700 to Tshs2000 per week in a house with more than 4 households. This found to be less costly compared to Tshs3000 per household per month.

Again, 7 (10%)) of the respondents who have indicated to prefer monthly payment they have argued that they are paying more in the 'pay as you pollute' mode. They have indicated to pay a minimum of Tshs1000 per week which make a total of Tshs4000 per month compared to the prescribed Tshs3000 in the Municipal by-law.

4.3 Service on demand as an alternative service delivery mode

While responding on the frequency of services offered by informal solid waste collectors per week, 210 (100%) of the ISWCs respondents have indicated that the service offered by informal solid waste collectors is on demand-based mode. Each household has its own waste collection schedule depend on the quantity of waste generated. However, 210 (100%) of household respondents have indicated to be satisfied by this mode of service delivery. Informal solid waste collectors observed to be operational 6 days in a week. Informal solid waste collectors are not in operation Sundays and public religious holiday such as Eid, Christmas and Easter only.

Moreover, 210 (100%) of the household respondents have indicated that the formal waste collection services were scheduled to be provided once or twice a week. However, in some incidences the formal waste collection services were provided just once a month. During the study, it was found that prior to the full-scale engagement of ISWCs in Sandali and Mwembe Mnofu sub-wards it has passed 2 months without formal waste collection services. That has made the sub-wards very dirty. Also, during interviews with wards and sub-wards leaders it was commonly agreed that the service on demand mode by informal solid waste collectors has improved the cleanliness of their sub-wards compared to the schedule mode offered by formal service providers.

4.4 Flexibility in technological application

The study area is 100 percent unplanned. This has made accessibility to some areas by waste collection trucks impossible. However, informal solid waste collectors observed to apply three technologies for collection and transportation of the collected waste.

Figure 4: Pushcarts waiting to off-load to waste collection truck

However, there were also some areas observed not to be accessed by pushcarts. In those areas informal solid waste collectors parked pushcarts in a specified area and carry the waste on their shoulders and heads from households to where the pushcart parked. Figure 5 shows the areas commonly used to park pushcarts in the study area.

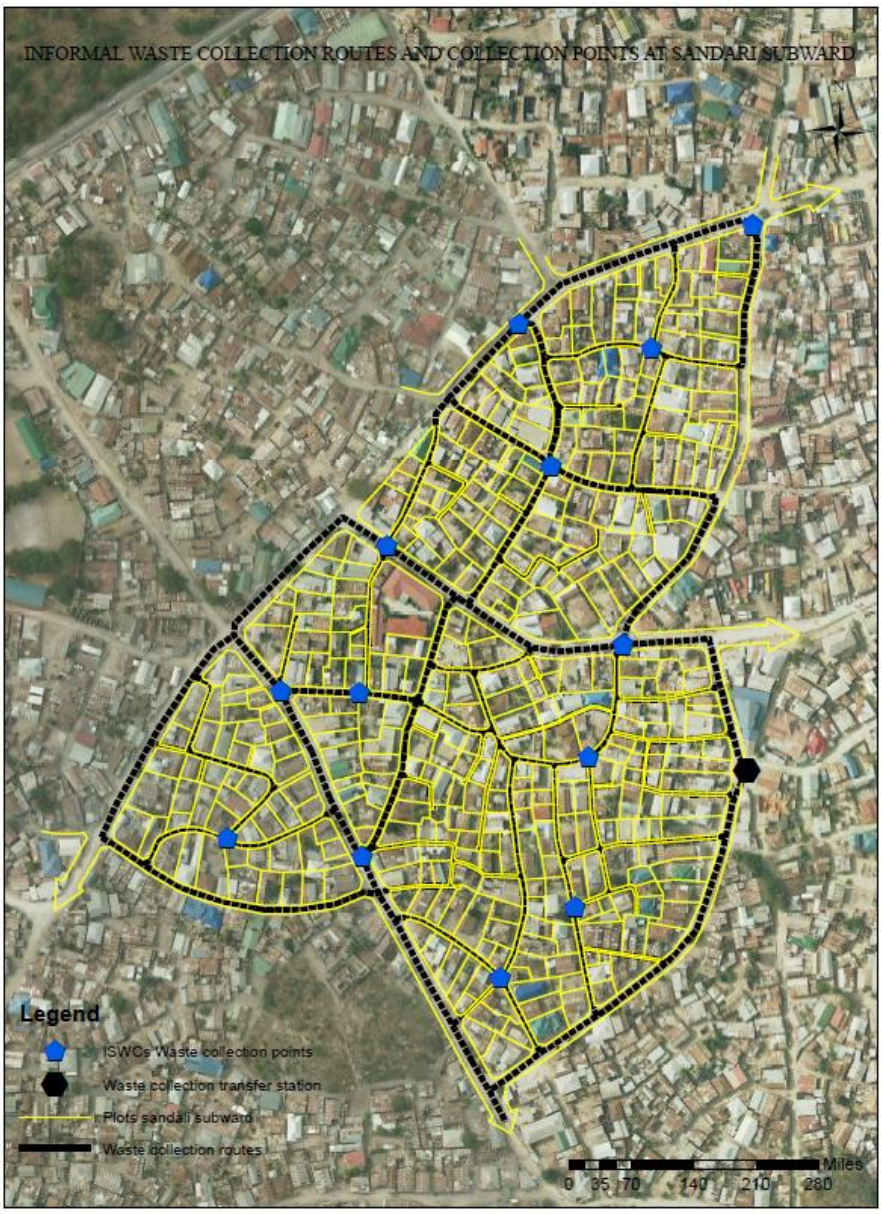

Figure 5: Informal solid waste collection routes and waste collection points

4.5 The positive market response to ISWCs needs

Through observation it was found that informal solid waste collectors are unable to transport the collected waste directly to the damp site which is over 25 km from Sandali Ward. This has made it imperative for informal solid waste collectors to hire trucks for waste transportation to the damp sites. However, during the study it was found that ISWCs can pay Tshs15,000 per pushcart to the waste collection trucks. The cost incurred by informal solid waste collectors for a period of one month presented in Table 1.

Table 1: Waste collection cost by Informal solid waste collectors (ISWCs)

S/No	Date	No. of ISWCs provide service	Cost incurred by ISWCs
1.	17 May 2019	6	46,000
2.	18 May 2019	6	51,000
3.	20 May, 2019	6	51,000
4.	21 May 2019	8	68,000
5.	22 May 2019	8	81,000
6.	23 May2019	8	68,000
7.	24 May 2019	4	64,000
8.	25 May 2019	8	68,000
10.	27 May 2019	8	85,000
11.	28 May 2019	8	85,000
12.	29 May 2019	8	111,500
13.	30 May 2019		
14.	31 May 2019	8	8000
15.	1 June 2019	8	122,500
16.	3 June 2019	8	10,000
17.	4 June 2019	8	90,000
18.	5 June 2019		
19.	6 June 2019	8	10,000
20.	7 June 2019	8	143,000
21.	8 June 2019	8	85,000
22.	10 June 2019	8	10,000
23.	11 June 2019	8	160,000
24.	Wednesday12		
25.	Thursday 13	8	85,000
26.	Friday 14	6	51,000
27.	Saturday 15	6	51,000
28.	Monday 17	8	85,000
	TOTAL		**1,689,000**

Source: Field survey, 2019

Although, from the interview with Temeke waste management officer it was highlighted that ISWCs are polluters and are not able to cover the cost of transporting waste to the damp site,

the study found it opposite. As shown in Table 1.0, for a period of one-month ISWCs operating in Sandali, Mwembemnofu, and MwembeLadu have spent Tshs1,689,000 in managing waste transportation to the damp site. They have managed to pay Tshs15,000 per pushcart to the waste truck operators while paying Tshs2000 per day for renting pushcart.

During the study it was observed that 3 different waste collection truck providers were ready to work with informal solid waste collectors. The first service provider was providing service to informal solid waste collectors as an additional income after providing waste collection services in a nearby Ward at the cost of Tshs15000 per pushcart. The second service provider enter into contract with ISWCs under the guarantee of Dar Urban Job programme. This service provider provides the service at the cost of Tshs180,000 per trip. However, the truck was found to be of low capacity to satisfy ISWCs demand and hence considered not feasible. Figure… shows the truck which was found below capacity to satisfy the requirement of carrying 12 pushcarts meet the cost of Tshs180,000. Dar Urban Job Programme guaranteed to supplement the any deficiency from Tshs180,000 agreed to be paid by ISWCs. This service provider has provided the service for 12 days.

Figure 6:ISWCs loading waste to the hired waste collection truck

The third waste collection truck provider agreed to provide the service to ISWCs based on number of pushcarts. Through this service provider ISWCs manage to pay between Tshs75,000to Tshs150,000 and making the sub-wards very clean. Figure 7 shows the waste collection truck by the third service provider

Figure 7: The third waste collection truck provider serving ISWCs

4.6 Supportive legal framework

In Tanzania there are different policies, laws and by laws governing waste management. These include; the National Environmental Policy of 1997, Environmental Management Act, of 2004, Local Government Act of 1982, and local Authorities by-laws.

Chapter three of National environmental policy of 1997, emphasizes on the involvement of NGOs and Private sector in environmental management. The NGOs and the private sector are believed to have the expertise and experience in environmental management through better technologies in some areas like waste re-using and recycling. However, the policy kept quieton the involvement of Informal solid waste collectors in the management of solid waste.

In addition to that, as mentioned in Hussein (2019), The Environmental Management Act, Part IX (a) Section 114,115,116,117,118, and 119, discuss the issues of solid waste management. For example, Section 114 prescribes the role of the local government authorities in waste minimization. The section also emphasizes on the involvement of Non-Governmental Organizations in planning and raising awareness on waste separation from the source. However, no section in this Act discusses the involvement of informal solid in managing solid waste as it happens in some other countries like Brazil as mention in Hussein (2019).

Again, Local Government Act 1982 section 55(g) stipulate clearly that, Solid waste management (collection, transportation and disposal) is one of the key duties of all urban authorities in Tanzania.

The Act, delegates to the local authorities, including Temeke municipality, the power to make waste management by-laws within their respective areas of administrative. However, the Temeke municipal waste management by-law does not have any provision that allow informal solid waste collectors to operate. The by- laws also forbid the deposition and throwing of all types of waste and the accumulation of dust of any kind. Based on that the operations of Informal solid waste collectors considered as committing an offence and liable for being prosecuted. However, due to ineffectiveness of formal service providers informal solid waste collection service providers observed to operate in MwembeMnofu, MwembeLadu and Sandali Ward.

During, the study it was observed that, there are informal agreement on the three sub-wards between informal solid waste collectors and sub-wards leaders through Diligent Consulting Ltd in their project called Dar Urban Job programme. DiligentConsulting Ltd assured Temeke Municipality, Ward officers and Sub-ward officers that they will be responsible for covering the waste transportation cost to the damp site for a period of one month if ISWCs failed to pay for the services. This made the authority to allow ISWCs to operate even though the law does not allow.

A license to operate has improved the performance of informal solid waste collectors. While responding on how they are comparing the performance of ISWCs and contracted formal service providers, 210 (100%) of the respondents have indicated that their sub-wards are much cleaner now than it ever was. They have indicated that, *"before ISWCs allowed to give services only few residents were ready to give their waste to them. However, after our leaders introduce them to us, we are now happy to work with them and their service is much better"* One of the respondents have indicated.

4.7 Relatively low waste management cost

The study found that waste management cost by ISWCs are relatively lower compared to formal service providers. The monthly cost by ISWCs on managing solid waste in 3 sub-wards found to be Tshs1,689,000. However, the cost of managing waste for the three sub-wards by formal waste collection service provider found to be Tshs8,310,000.

5.0 Conclusion and Recommendation

5.1 Conclusion

The study revealed that Informal solid waste collection service is an untapped potential in urban areas especially in informal settlements. The service offered by informal solid waste collectors found to be reliable, effective, and convenient to the service recipients. For example, the service on demand and price bargaining option preferred much by service recipients compared to the prescribed weekly or monthly schedule with attached fixed prices by formal service providers. The waste management cost by formal service providers are highly exaggerated which affect their waste management performance. The area exclusively served by informal solid waste collectors were cleaner even though the existing legal framework is yet to recognize their services.

5.2 Recommendation

5.2.1 A policy change to recognize informal solid waste collection services

Formalization of the informal solid waste collection livelihood can be done in gradual process. The formalization can start by registering all informal solid waste collectors through *Mtaas* and Ward offices. The registration should start by identifying informal solid waste collectors and coordinating their activities in providing waste collection services. At this stage informal solid waste collectors should be given identity cards like those given to petty traders commonly known as Machinga. This will also play a role of increasing government revenue for an approximately 1 billion in Dar es Salaam alone.

Moreover, as highlighted by Hussein (2019), the existing legal framework should be expanded, or new laws should be instituted to protect the rights of the informal solid waste collectors to provide solid waste collection services as well as to protect the right of access to waste.

5.2.2 Capacity building of the Informal solid waste collectors

Informal solid waste collectors should be supported by the Government, NGOs and/or donors to be able to grow and provide waste collection services effectively. As it was happened through *Dar Urban Job Programme* intervention ISWCs should be linked with other stakeholders in the sector who have resources and expertise. This can be done through capital assistance, skills development and mentoring programmes.

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