THE NATURE AND CHALLENGES OF STREET SWEEPING IN ADO-EKITI

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ABSTRACT

This study examined the nature of street sweeping, the composition of litters, the socio-economic and health status of street sweepers and the public perception of the benefits and challenges of street sweeping in Ado-Ekiti. Primary data were obtained through direct personal observation, questionnaire administration and in-depth interview while secondary data were sourced from published and unpublished documents. Purposive and random sampling methods were adopted in the selection of respondents for questionnaire administration. Four types of structured questionnaire were designed and administered separately to: 103 (20%) of the street sweepers along the 21 swept streets; 193 (5%) buildings along the 21 streets; 14 officials of the Ekiti State Waste Management Authority involved in the street sweeping programme, and 42 pedestrians (female and male) along the 21 swept streets. Descriptive statistics were used to analyse the data collected. Findings revealed that all the street sweepers were females and casual workers.

Sediments/broken blocks/sand/gravel (18.8%), plastics (16.6%), nylon/polythene (16.6%), leaves/wood/grass (15.0%), food wastes (12.6%), paper (9.9%), aluminum cans/metals/glass (5.3%), and miscellaneous (5.2%) constituted the street litters. The sweepers suffered from joint pain (96.1%), catarrh (91.3%), cough (83.5%) eye infection (70.8%) asthma (46.6%) and malaria (31.1%). Inadequate personnel, insufficient tools and equipment, poor remuneration, stigmatisation, exposure to accidents and harassment were the challenges faced by the sweepers. The benefits created by the street sweeping programme are: city beautification and aesthetics (74.6%); employment opportunity (16.6%); improved urban environmental health (6.2%), and attractiveness of the streets (2.6%).The study concluded that the street sweeping programme has made the streets sanitary and aesthetically pleasing, provided employment and raised public perception of Ado-Ekiti as a clean and healthy city. Employment of more sweepers, provision of adequate equipment, public sensitisation and attitudinal change, enforcement of environmental sanitation laws, and improved remuneration will make street sweeping a sustainable waste management strategy in Ado-Ekiti.

Keywords: *Street littering and sweeping, Environmental sanitation, Employment, Sustainable waste management, Ado-Ekiti.*

INTRODUCTION

Increasing urbanisation in nations of the world is creating environmental consequences in the form of flooding, greenhouse gases and poorly managed solid and liquid wastes. The process of rapid urbanisation in Africa has resulted in severe pressure on urban land, urban utilities and services. The increasing population of Nigerian cities is also accompanied by the worsening issue of poor urban environmental sanitation in the form of inadequate solid waste management which is making it difficult to maintain desirable environmental health conditions in the cities (Egunjobi and Agbola, 1993). The menace of solid waste is the most enduring of all the urbanisation-induced problems in the country (Agbola and Jinadu 2006) in terms of the environmental nuisance and accompanying health hazards. There are problems of excessive waste generation; inadequate collection, transportation and disposal; indiscriminate dumping of waste in open spaces, streets, drainage channels and flood plains of rivers (Sridhar *et al.*, 1985; Egunjobi 1986; Ogu, 2000; Izugbara and Umoh, 2004; Afon, 2006; Nabegu, 2010; Ayorinde *et*

al., 2010; Wahab, 2013). Unhealthy waste management practices in Nigeria, especially waste diversion into drains and streams, and uncontrollable open dumping, are causing a lot of harm to the environment (Izugba and Umoh, 2004). Refuse is thrown onto streets, pedestrian walkways, and dumped into drainage channels thereby blocking the free-flow of storm water and resulting in devastating floods of 1982 (Filani and Abumere, 1992) and 2011 and 2012 (Wahab, 2013) in virtually all cities in Nigeria such as Lagos, Ibadan, Port-Harcourt, Aba, Enugu, Calabar, Kano, Kaduna and Sokoto.

The beauty of any city environment is closely tied to its good sanitary condition and as reflected by the appearance of the streets. The daily increase in both human and vehicular traffic arising from uncontrolled rural-urban migration into cities has overwhelmed city streets with dirt, pollution and accidents (Wahab and Kehinde, 2014). Mabogunje (2001) notes that Nigerian cities are reputed to be some of the dirtiest in the world. One factor that contributed to the dirty state of the cities is the unwholesome conditions of major streets. The solid waste being deposited on the streets by commuters and street users creates a negative visual impression on visitors and indirectly affects the economy of city government and city residents. Dirty streets are great hindrances towards attracting businesses to towns and cities. The significance of clean cities in the socio-economic well-being of any nation prompted the Nigerian Institute of Town Planners (NITP) and the Town Planners Registration Council (TOPREC) to devote their 2014 Mandatory Continuous Professional Development Programme (MCPDP) towards educating planners and members of the general public on the need for and how to build clean cities in Nigeria (Wahab *et al.,* 2014). Attempts by governments in both developed and developing countries to efficiently manage the litters and refuse on their city streets has led to the adoption of street sweeping as a sustainable solid waste management strategy in major cities and towns. Street sweepers play an important role in maintaining the health and hygiene in the communities (Ewis *et al.,* 2013). In Nigeria presently, most state governments are investing in street sweeping in order to improve the quality of their city streets, enhance the physical appearance of the properties abutting such streets, and create a good impression of a healthy city for the visitors. Manual street sweepers are a common sight in Abuja (the Federal Capital Territory), Lagos, Ibadan, Warri, Calabar, Uyo, Enugu, Kano, Kaduna, Osogbo, Ikirun, Ile-Ife, Iwo, Ilesa, Ede, Ado-Ekiti and Ikere-Ekiti.

Street sweeping has now become a popular solid waste management strategy in Nigerian state capitals and major towns. In Abuja and Ibadan, street sweepers and cleaners are employed to rid the cities of all forms of dirt either in the drainages or on the roads. Concessions are granted to independent contractors to reduce the work of the Abuja Environmental Protection Board and the Oyo Waste Management Authority respectively. Street sweeping is a set of activities concerning the cleanliness of the street (pavements and adjoining edges of roads and grassed and planted areas). It involves litter-picking, the removal of graffiti and fly-posting (Lewis *et al.*, 2009). This is done with the aim of creating healthy and aesthetically pleasing urban environments.

Although, a traditional environmental sanitation practice among Yoruba (Wahab and Kehinde, 2014) and other tribes in Africa, its immediate benefits to the urban community, such as improvement in urban environmental health (Terrene Institute, 1998) have made street sweeping a sustainable and irresistible urban waste management strategy in recent times. Indeed, the significant impact which street sweeping has on quality of life and the attractiveness of neighbourhoods, towns and cities has been increasingly recognised. First, there is a growing evidence of the impact which local environmental quality has on quality of life and satisfaction with neighbourhoods (Oberts, 1994; Parkes *et al*., 2002). There is also the concern that attempts to build more socially mixed neighbourhoods as well as social cohesion at the town or city level can be compromised where there is a gap in environmental quality between neighbourhoods (Silverman *et al.*, 2006). The links between environmental problems and other

forms of disorder and crime have been prominent in policy debates (Home Office, 2006). The contribution which good environmental quality can make to urban development in helping to make places attractive to tourists, investors and mobile workers has been increasingly recognised (Waschbusch, 2003; Hastings *et al*., 2005). Human health, environmental quality and pollution control are all closely linked to street sweeping with cities becoming a better and healthier place because of street sweepers (Brinkman and Tobin, 2001).

The Ekiti State Government in year 2000 initiated the street sweeping programme as an integral part of the solid waste management scheme for the cities of Ikere and Ado-Ekiti. It was undertaken as a means of improving the aesthetics of the streets and public safety. The programme took off with 128 female sweepers and 12 staff members. Records obtained from the EKSWMA in 2014 revealed that the street sweepers had increased to 614 (519 in Ado-Ekiti and 95 in Ikere-Ekiti) and 43 staff employed by the authority to clean the streets in the two cities. The sweepers are all females which is a reflection of the traditional practice among the Yoruba people of Nigeria where sweeping of the houses and their surroundings are solely the responsibility of the girls and women. Fourteen years into the programme, it is necessary for both the government and the public to know whether or not the objective of reducing the accumulation of litters on city streets has been achieved. A critical study of relevant literature revealed a gap in scholarship on this topic. It is on this premise that this paper examined the nature, benefits and challenges of street sweeping in Ado-Ekiti and whether or not the objective of reducing litters on city streets has been achieved. The paper is structured into five sections. The introduction is followed by conceptual clarifications and literature review. Section three presents the study area and methodology while section four presents findings and discussion. Conclusion and recommendations are contained in section five.

Conceptual Clarification

Street and Street Littering

A ‘street’ is a paved or unpaved public road with walkways which facilitates the movement of people and goods across the different areas of a village, town and city. The Ekiti State Government of Nigeria (2004:7) defines “street” to mean “any streets specified by the Local government council including all highways, expressways and bridges in/and around the State”. The unrestricted movement of people and goods within a city is essential to its commerce and vitality, and streets provide the physical space for this activity (Kirkpatrick and Carter, 2007).

Street activities increase in types and volume as urbanisation rate gets higher resulting in the indiscriminate littering and throwing of thrash on the streets which make them very dirty, and unwholesome (Wahab and Kehinde, 2014). Street littering is a careless disposal of minor amounts of waste (Geller et al., 1982; Stokols and Altman, 1987).

Waste Picking

A relevant concept in street sweeping is waste picking. Waste picking involves sorting and collection of reusable materials from the waste stream. The collected waste is either sold to the waste recyclers or retained by the waste pickers. The waste pickers usually operate informally within the solid waste management sector (Medina, 2008). The patterns of waste picking as identified by Gerold (2009) are itinerant waste buying, door-to-door collection, street picking, truck picking, dump picking, and transfer station picking.

Itinerant Waste Buyers (IWBs) move from street to street and collect recyclables from households or businesses. They get the items “as a donation” from the public, but they also buy the items from households or exchange them for households goods. Itinerant waste buyers

often specialise in one or two kinds of materials (Gerold, 2009). A few days of training are sufficient for getting the required technical skills (IJgosse, 2012). The IWBs generally sell the collected materials to a dealer who may be the owner of the cart which is used for waste collection. The owner may also give a cash advance to the IWB for buying the items from the households (Rouse, 2006). Door-to-door collectors collect, to a limited extent, mixed waste from households against payment and in parallel to private and public collection services (Rouse, 2006).

Street picking is often a casual activity of teenagers, elderly and unemployed persons who move in and out depending on their financial requirements (Nas and Jaffe 2004). Street pickers collect materials which have already been discarded by households or shops and pick up selected items of waste such as empty plastic water bottles and beverage containers which can be reused. They also extract materials from bags or containers which have been put in front of houses for emptying by the formal sector waste collection service, or remove materials from litter bins, trash bags, community containers in the streets, unauthorised dumping areas or secondary collection sites (Medina, 2007). Street pickers pick for private and commercial uses. Truck pickers ransack waste that is loaded onto waste trucks (by workers of the formal sector) and bring out what can be sold (Thomas-Hope, 1998). They are generally not a part of the formal sector waste collection crew but outsiders who have gained the right to work alongside the crew among whom they have relatives (Thomas-Hope, 1998).

Dump pickers and transfer station pickers climb in and around heaps of waste that are discharged from collection vehicles for extracting materials and they tend to be highly specific about the material they extract (Scheinberg *et al.*, 2006). However, IJgosse (2012) has suggested that the pickers only need some days of training to acquire the required technical skills for selecting appropriate material. Dump picking is usually competitive and socially stratified, with “dump-bosses” and “coordinators” that control particular materials (Masocha, 2006). Many dump pickers live near or on the dump site. In some countries, dump picking is a family based and/or a seasonal activity (Chapin, 1995).

A number of benefits of waste picking in municipal waste management have been identified in the literature. McLean (2000) observes that the official waste management system in many cities could not be managed without their myriad waste pickers, scrap collectors, traders and recyclers. Although not officially recognised, they often form the very basis of waste collection services and in many cases at no cost to the local authorities, central governments or residents (Wilson *et al.*, 2006). Naturally, waste picking activities are highly adaptable, flexible and able to respond quickly to demand-driven forces. Waste pickers and recyclers unrelentingly come up with adaptive strategies to access waste and circumvent barriers while at the same time integrating new systems as they emerge (PCI, 2008). Also, by contributing significantly to the recovery of organic waste and non-organic materials that can be used as secondary raw materials or alternative fuel resources, the informal sector also contributes to the reduction of greenhouse gases and thus to the mitigation of climate change (Guerrero, 2013). Waste picking assists street sweeping in no small measure by reducing the amount of litters on the streets, thereby easing the work of the street sweepers (Kayser, 2015).

One major challenge of waste picking, however, is social exclusion (Gowan, 1997; Binion and Gutberlet, 2012). Also, waste pickers usually face harassment by authorities simply because waste picking activity is considered illegal or unpermitted in many cities of the world (Dias, 2011; Chikarmane, 2012). There is also the problem of exploitation and intimidation by middlemen and touts, which usually affect their earnings (Scheinberg, 2007). Exposure to contaminants and hazardous materials from fecal matter and medical waste to toxic fumes and chemicals create serious health hazards in waste picking (Gutberlet, 1997). There are also the risks of fires and surface slides associated with waste picking in open dumps (Binion and Gutberlet, 2012).

LITERATURE REVIEW

Street sweeping and drainage cleaning practice rank among the oldest practices used by communities to ensure a clean environment (Law *et al.,* 2008). In Yoruba land, street sweeping is an extension of the routine house-keeping involving the daily sweeping of the inside and surrounding of residential compounds and their linkages (Wahab and Kehinde, 2014). Tobin (2001) cited by Wahab and Kehinde (2014) observed that human health, environmental quality and pollution control are all inextricably linked to street sweeping and that the city is a better and healthier place because of the street sweepers. Schilling (2005) in his analysis of the effects of street sweeping in controlling water pollution in North St. Paul city, the State of Minnesota (USA), maintains that high-efficiency street sweeping and associated operations may lead to a 70% removal of water pollutants. Minton *et al.* (1998) had earlier observed that motorised sweeping removes an average of 220,000 lbs. of debris from the street before it goes into the storm drains. Street sweeping is perceived to lead to improvements in the environmental conditions of urban waterways by preventing pollutants deposited on streets from entering the storm water systems (Walker and Wong, 1999).

Street sweeping is also cost-effective when compared to structural best management practices such as detention ponds and settling or filtering devices. It prolongs their operational efficiency and required maintenance (Walker and Wong, 1999; USEPA, 2000; Storm Water Center, 2005). As a pollution prevention or source control measure when integrated with other structural and non-structural best management practices (BMPs), high-efficiency street sweeping improves water quality and reduces habitat deterioration (Newman *et al.*, 1996; Minton *et al.*, 1998; Martinelli *et al.,* 2002). Similarly, street sweeping frequencies (approximately monthly to biweekly and varied depending upon land use and transportation features) have been shown as being most effective for pollutant removal leading to improved air, water and environmental quality (Keating, 2002; Lake Barcroft WID, 2005). A mathematical optimisation study for best management practices in street sweeping in Los Angeles (USA) showed that street sweeping is likely to be cost-effective in reducing non-point pollution. The optimisation model shows insensitivity to a reasonable range of street sweeping costs, but sensitivity to sediment removal effectiveness (Volkening, 2004). This suggests that it is more important to address sediment removal effectiveness for street sweeping rather than cost. Curtis (2002) had earlier observed that regardless of absolute cost-effectiveness, street sweeping is one of the few easily implemented practices for use in highly developed urban areas that will clearly reduce sediment and any associated pollutants, and provide for improved air and water quality to often severely degraded urban environments.

Walch (2006) notes that street sweeping is typically done in the early morning hours when traffic is light. In order to ensure effective sweeping of the streets, he recommends control parking by placing signs which limit the hours and/or the side of the street in which parking is allowed. However, the frequency in which street sweeping should be done is very controversial, and the schools of thought range from "not at all" (Parkes *et al.*, 2002; Omran and Read, 2008) to "every other day" (Bartone, 1990; Lewis *et al.*, 2009). Some studies (Leavin, 1994; Curtis, 2002; and Walch, 2006) have shown that street sweeping may have a negative effect by breaking down aggregated particles (clumps of particles) into fine particles which can be carried more easily by runoff. Other studies such as Laughin (1980), Ward and Kamsteeg (2006) insist that the goal of street sweeping should be to keep the larger-sized pollutants from entering

storm sewers. The effectiveness of street sweeping appears to be primarily dependent upon the frequency of sweeping and the pavement conditions. Additional considerations are operator skill, total mass of the area to be swept and its relation to loadings on other areas not accessible to sweepers, and local storm characteristics *(*Kidwell-Ross, 2013*)*. Wahab and Kehinde (2014) in their study of street sweeping in Ibadan reported the benefits of street sweeping indicated by respondents as employment opportunities (10.0%), aesthetics and safety (4.0%) and city beautification (80.0%). Bulle (1999) has argued that women traditionally have been at the vanguard of maintenance of domestic space and the general environment because they are endowed with a sense of civic responsibility and a desire to improve their living and environmental conditions. Therefore, they tend to participate more in street sweeping. UNEP (2015), however, asserts that women participation in street sweeping occurs more often in developing than in industrialised countries.

A number of factors have been observed to influence street sweeping in third world cities. One of these is the inappropriate behaviour on the part of the public, such as discarding litter in the street (Ali, 2006). Ojedokun and Balogun (2011) noted that littering in Ibadan is a bad habit which is mostly indulged in by the men. Additionally, in many medium and high density residential neighbourhoods, a high proportion of street waste is generated from deficiencies in the refuse collection system. Owing to the poor coverage of the collection system, a number of people in high density areas of Ibadan opt for discarding their waste in the street or in vacant lots. In essence, this situation merely transfers the responsibility for removing the waste from the refuse collection crew to the sweeping crew (Coad, 2003).

Other causes of the large quantities of litter that may be observed in some cities in developing countries are: improper or no clean-up activities after completion of public works projects as well as accumulation of construction materials and construction debris on the streets (Brinkmann *et al.*, 1999); inadequate or inappropriate species of plants and trees selected for urban landscaping (Liebens, 2001); erosion of soil from vacant lots and unpaved streets (Liebens, 2001); inefficient or non-existent storm drainage systems, and spillage of wastes set out for collection by either scavengers or animals (FDEP, 2004).

There is a dearth of scholarly works on waste management in Ado-Ekiti. Agbayekhai and Odeyemi (2008) dealt with the application of Geographic Information Systems to manage waste collection points in Ado-Ekiti. Awosusi (2010) assesses the environmental problems and methods of waste management in Ado-Ekiti while Awosusi *et al.*, (2012) explore the development of waste management enterprise in slum communities of Ado-Ekiti. Other scholars such as Adebayo *et al.*, (2006); Olufayo and Omotosho (2007); Adefemi, and Awokunmi (2009); Akintudire and Alebiosu (2013) have all examined the strategies, techniques and effects of solid waste management in Ado-Ekiti. However, none of the reported studies has so far examined the street sweeping programme in Ado-Ekiti. There is a need for empirical investigation into the relevance of street sweeping to the conventional waste management activities of the EKSWMA which is basically in the form of spot collection and disposal at dump sites, as well as how they complement each other. The fourteen-year old street sweeping programme of the Ekiti State Government deserves an appraisal to assist the government to take informed decisions on whether or not the programme objectives are being met, its benefits, challenges and continued relevance. This is a grey area in knowledge that the study being reported in this paper is filling by examining the operation of street sweeping, the composition of litters, the socio-economic and health status of the street sweepers, and the public perception of the benefits and challenges of street sweeping as a sustainable solid waste management programme in Ado-Ekiti.

3.0 The Study Setting and Methodology

Ado-Ekiti, the capital of Ekiti State, lies between latitude 7 $^{o}31^{1}$ and 7 $^{o}49^{1}$ north of the Equator and longitudes $5^{o}7^{1}$ and $5^{o}27^{1}$ east of the Greenwich Meridian. The city lies within the pre-cambrian basement complex rock group which underlies most south western part of Nigeria. In general, Ado-Ekiti region exhibits striking landforms of various geological and geomorphologic origins. The city falls within the climatic belt of tropical wet and dry climates. The average annual temperature is about 24^{o}C while the mean annual rainfall is between 1,000 to 1,400mm. Thus, Ado-Ekiti lies within the tropical rain forest region (Ebisemiju, 1993). Ado-Ekiti had a population of 156,122 in 1996 when the state was created. The population increased to 176,090 in year 2000 (Awosusi *et al.*, 2012) and to 313,690 in year 2006 (NPC, 2007). In recent times, economic, social and political transformation is taking place in Ado-Ekiti. As a result, the city has begun to witness physical expansion in terms of new buildings, construction of new and expansion of old roads, establishment of new markets and creation of social, economic and religious facilities (Awosusi, 2010) by public and private sectors. The influx of people into the city has increased the volume of waste generated from durable goods, construction materials, organic matter, and from street vendors from about 95 tons per day in 1996 to 120 tons per day in 2011 (Awosusi *et al.,* 2012).

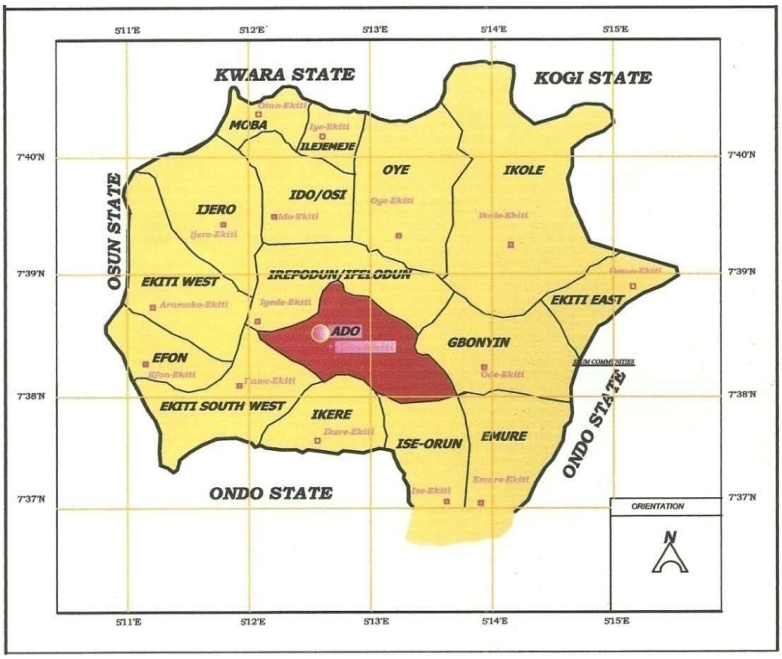

Figure 1: Ado-Ekiti in the State Setting

Source: Ekiti State Ministry of Lands and Physical Planning, 2014.

Sanitation is generally poor in Ado-Ekiti as majority of the residents dispose their waste unlawfully inside bushes (25.0%) and gutters/streams (17.5%). This is a habit that results in health hazards in the city (Awosusi, 2010). There are unsightly heaps of over-flowing rubbish in containers (Plate 1). Livestock are often found feeding on some of the rubbish on the streets and other open places. The area has a very poor drainage system and the few well-constructed ones along major roads are in a deplorable state with most of them caving in. These drains are

largely dirty and filled with rubbish. Basically, there is a minimal provision of amenities such as adequate refuse dumps, public toilet facilities, playing fields and recreational centres. There is evidence of uncontrolled development and inadequate basic infrastructure which have resulted in environmental problems especially poor solid waste management. Awosusi (2010) identified the problems facing the Ekiti State Waste Management Authority in the performance of its functions as shortages of vehicles (20.0%), waste containers (10.0%) and personnel (30.0%), poor funding (25.0%) and lack of dedication to duty (15.0%). The indiscriminate dumping of waste into drains and roadsides have made the city environment, especially the city streets, to look unpleasant, littered and dirty (Awosusi *et al.,* 2012).

Street littering is a major waste management problem in Ado-Ekiti. Illegal/roadside dumping has assumed a pattern of waste disposal in the city resulting in damage to scenic resources, soil pollution and health hazard to plants, animals and humans (Awosusi et al., 2012). Most streets are often littered with food waste, metals and animal carcasses, nylons, plastic bottles, used tyres, batteries and broken furniture. Road side economic activities (trading, eating, drinking, vulcanizing, hawking etc.) generate wastes which are deposited on the streets. Those wastes thrown inside drains are either washed back to the streets by storm water or evacuated and thrown onto the streets by some occupiers of buildings along the streets thereby making the affected streets ugly.

The Ekiti State Environmental Health and Sanitation Law No. 4 of 2004 enacted by the administration of Governor Ayodele Fayose made adequate provision to protect streets and drainages from littering and unhealthy use as waste receptacles by pedestrians, occupiers of houses or operators of businesses in buildings abutting all categories of streets in Ekiti state. Section 8(2)(a) provides that “every occupier of any building shall keep clean the drains, sidewalks and gutter area from the sidewalk into the street” while Section 8(2)(h) states that every occupier of any building shall “not litter, sweep out or throw ashes, refuse, paper, nylon and rubbish into any street, public place or vacant plot”. Section 9 (1) also states that “no pedestrian shall dispose of any scrap paper, newspaper, candy wrapper, fruit skin and similar refuse anywhere except in litter bins” while Section 10(2) states that “no passenger shall throw litter, fruit skins, scrap paper or other item onto the road from any vehicle”. Section 11(2) provides that “All streets shall be free from obstruction and from construction or demolition materials” while Section 11(4) states that “No person shall dump indiscriminately any domestic, industrial or commercial waste, sand or gravel or discarded vehicle spare parts or tyres along highways, roads, channels…” Similarly, Section 19(1) provides that “All vehicles or containers used in transporting or conveying refuse shall be securely covered in such a way that the contents do not litter the road”.

Any violation of any of the cited provisions is liable to a fine ranging from N500 to N3,500 as spelt out in Schedule One of the law (Ekiti State of Nigeria, 2004:13-17). However, in Ado-Ekiti, the various provisions have been defied and are continuously violated by residents, road users and visitors to the city. In order to improve the city aesthetics and public health, and also make the streets attractive to residents and visitors as public spaces to behold and enjoy, street litters must be addressed in the most efficient and sustainable manner. This scenario has made it imperative to engage street sweepers to remove the dirt and keep the streets clean.

Plate 1: Refuse dumped at the base of a waste container and along the street at Ijigbo Junction, Ado Ekiti.
Source: Authors' Field Survey, 2014

METHODOLOGY

Data for this study were obtained from primary and secondary sources. Primary data were collected through direct personal observation, questionnaire administration and in-depth interviews while secondary data were sourced from published and unpublished documents. A preliminary survey was conducted to identify the streets where sweeping took place within the city and ascertain their lengths with the use of a car odometer while driving through each street. The number and length of the streets were confirmed by the officials of the Ekiti State Waste Management Authority (EKSWMA) to be 21 major roads (10 dual carriage-ways and 11 single lanes). The length of the roads varied from 1km to 5.7km giving a total length of 64.5km. Purposive and random sampling methods were adopted in the selection of respondents for questionnaire administration. All the 21 streets were covered and a total of 103 (20%) of street sweepers from all the 21 swept streets (Table 1) were randomly sampled and administered structured questionnaire designed to collect information on the socio-economic attributes of the street sweepers, years spent on the job, pattern of street sweeping, equipment being used, level of satisfaction with the job, benefits and challenges of the job among others. Fourteen officials of the EKSWMA involved in the street sweeping programme were purposively sampled and administered with a structured questionnaire. Questions asked included the objectives and management of street sweeping programme, number of sweepers, the characteristics of street litters, adequacy of sweepers and equipment, disposal of swept litters, sweepers' complaints and challenges of street sweeping in the city.

A total of 193 (5%) of the counted buildings on both sides of the swept streets were sampled using systematic random technique. The head of one household in a residential building, shop owners, office managers or their senior staff in the case of commercial, institutional and religious buildings were administered with copies of a structured questionnaire. The questionnaire was designed to obtain the perceptions of the residents and operators of businesses along the swept streets on the significance and challenges of street sweeping in their respective areas. Two pedestrians (one male and one female) in each of the twenty-one streets, making forty-two (42) pedestrians, were also interviewed using a structured questionnaire. The questionnaire sought to obtain information on how and where they dispose

their litters while on the streets, their perceptions on the effectiveness, benefits and constraints of street sweeping in the city. All categories of persons interviewed were assured of the confidentiality of the data and their informed consent was obtained.

Table 1: Sample Distribution

S/No.	Street Name	Street Type	Length (km)	No. of Sweepers	Sample size 20%
1.	Fajuyi roundabout-Basiri-Police Headquarter	Double Carriage	4.5	49	10
2.	Commissioner of Police-Secretariat-CBN-House of Assembly	Double Carriage	1	15	3
3.	Fajuyi-State Secretariat-Basiri Junction	Double Carriage	2.8	28	6
4.	Mathew Junction-Irona-Ile Abiye-Isato-Post Office- Igbehin-Atikankan	Double Carriage	3.4	35	7
5.	Ile Abiye-Falegan-Ilawe Road	Double Carriage	2.1	21	4
6.	Commissioner of Police-NTA-Baptist Junction	Double Carriage	3.0	29	6
7.	Fajuyi-Okesa-Ereguru-Okeyinmi-Oke-Ila to Housing Road	Double Carriage	2.8	34	7
8.	Old Garage to Agric. Junction	Double Carriage	2.9	29	6
9.	Agric. Junction-Mobil-Ajebandele	Double Carriage	4.0	40	8
10.	Pathfinder-Christ school-Fajuyi Park	Double Carriage	5.7	54	11
11.	GRA-Onigari-Bisi Elegberun-Ile Abiye-Ajibade-Ilawe Road	Single	3.5	16	3
12.	Old Garage-New garage-Ajebade lane to Immaculate Mugbagba-Idemo-St. Paul	Single	2.8	22	4
13.	Ijigbo-Odo Ado-Igirigiri-Local Government to Mathew Junction-St. Paul	Single	3.8	23	5
14.	Deputy Governor's Office-Government House-Barracks road to Oke-Oriomu	Single	5.0	29	6
15.	Nova road-Opopogbooro Junction-Basiri	Single	3.7	18	4
16.	Dallimore-Stadium-Kajola-Oduduwa-Oke-Ese-Okutagbokuta	Single	2.6	16	3
17.	Ereguru-Oja-Oba-Palace-Old Garage	Single	2.0	21	4
18.	Old Garage-Agere-Idolofin-Idemo junction to Immaculate to Oke-Ila junction	Single	2.0	10	2
19.	Coca-cola Junction via Moferere-Agric.	Single	2.3	9	2
20.	Mobil Junction-Orire-Housing-Oke-Ila	Single	1.6	6	1
21.	Adebayo-Orire Junction-Housing-Oke Ila	Single	1.6	6	1
	Total		**64.5**	**519**	**103**

Source: Ekiti State Waste Management Authority, 2014

RESULTS AND DISCUSSION

Socio-economic Attributes of Street Sweepers

The street sweepers were all (100%) females. Table 2 indicates that 37.9% of the sweepers (which forms the largest group in this study) were between 31 and 40 years old. About 36.9% were between 41 and 50 years, 14.5% were above 50 years while only 10.7% were between 20 and 30 years old. . Thus, the sweepers largely fell within the economically active segment of the population. Also, about 71.8%) of the sweepers were married, 15.5% were widows and only 4.0% were singles. Although street sweeping does not require any formal education, the educational status of the sweepers showed that majority (45.6%) had primary education, 27.2% attained secondary education while only 27.2% never had any formal education. This implies that 72.8% of the sweepers are likely to understand the basic rules guiding the activity. The sweepers earned between N5000 and N10,000 monthly. This is because they were all casual workers and were paid without consideration for their length of stay on the job. It is pertinent to note that the street sweepers fell within the low income class of the society considering the fact that the current national minimum wage in Nigeria is N18,000 ($90 at N200/$).

Table 2: Socio-economic Attributes of the Street Sweepers

Age Distribution of the Sweepers		
Age	**Frequency**	**Percentage**
20 – 30 yrs.	11	10.7
31 – 40 yrs.	39	37.9
41 – 50 yrs.	38	36.9
Above 50 yrs.	15	14.5
Total	**103**	**100.0**
Marital Status of the Sweepers		
Status	**Frequency**	**Percentage**
Single	4	4.0
Married	74	71.8
Divorced	9	8.7
Widow/widower	16	15.5
Total	**103**	**100.0**
Educational Status of the Sweepers		
Educational Status	**Frequency**	**Percentage**
No Formal Education	28	27.2
Primary school	47	45.6
Secondary school	28	27.2
Total	**103**	**100.0**
Monthly Income of the Sweepers		
Income	**Frequency**	**Percentage**
N5,000 – N10,000	103	100.0
Total	**103**	**100**

Source: Authors' field Survey, 2014

Characteristics of Litters and Waste Disposal practices of Pedestrians and Residents

The street sweepers indicated the common littering materials found on the streets of Ado-Ekiti and their estimated proportions as: sediments, broken blocks, sand and gravel (20%);

nylon/polythene, pure water sachets (18%); plastic straws and bottles (15%); leaves, chopped wood, grass (15.0%); food wastes, fruit skins, food wrappers and packaging (12%); paper, cartons and cardboards (10%); aluminum cans, metals/iron cuttings, nails, glass pieces (5%), and miscellaneous- animal droppings and carcasses, batteries, textiles, medical/pharmaceutical waste (5%). Personal observations and results of interviews conducted indicated that these litters came through the indiscriminate disposal of the materials by the pedestrians, residents/business operators located along the streets, passengers inside moving vehicles, occasional falls from overloaded waste vehicles or activities of the wind. This is in defiance of the provisions of the Ekiti State Health and Sanitation Law No. 4 of 2004 cited in previous section.

In a study of street littering in Nigerian towns, Nkwocha (2009) found that subjects littered the streets for reasons such as absence of bins, inefficiencies of local authorities, ignorance, weak legislation, anger, and stress. Littering in Ado-Ekiti is attitudinal and a reflection of individual's unhygienic behaviour, lack of patriotism, and lack of concern for fellow citizens. This is similar to the littering habit among residents of Ibadan city which Ojedokun and Balogun (2011) describe as an attitudinal and behavioral problem which requires a psychological explanation as 62.65% of respondents exhibited a low tendency to engage in responsible environmental behaviour.

Some of the sweepers interviewed complained about how some shop operators threw empty cartons, wrappers and packaging materials on portions of the streets few minutes after they had swept past the shops. This is a confirmation of the assertion of Da *et al.* (2008) that citizens are found to continuously throw waste on the streets throughout the day, even after cleaning of streets. When challenged by the sweepers in Ado-Ekiti, the responses from the shop operators included: "common pack the rubbish, after all that is what you are paid to do"; "if you are tired of or not happy with the job leave it for those who need the job"; "*Se o ko mo wipe agbale oja ni o sa*?" meaning "don't you realise that you are a market sweeper?"

About 69.2% of the sampled pedestrians threw their litters on the roadside, inside drains/bush (11.6%), waste basket (11.6), and any available open space (7.6%). None of these pedestrians disposed their wastes in the waste bins placed by the road side by the EKSWMA. This unhygienic and harmful waste disposal practice of the people undoubtedly necessitates the need to employ the street sweepers to ensure better urban sanitation and safeguard public and environmental health.

Two-thirds (66.3%) of the occupants of buildings along the swept streets interviewed were males. About 38.9% were above 50 years of age, 94.3% had formal education and 56.5% were civil servants. The bulk of the buildings (59.6%) were residential, 25.9% were commercial/office, 10.9% were religious and 3.6% institutional buildings. Table 3 indicates the waste disposal practices by the building occupants which are similar to those of the pedestrians. Over a half (52.9%) of them dumped their litters on the roadside, 19.7% disposed into nearby drains or gutter/bush, 9.3% in stationary skip bins placed by the road side by the EKSWMA while 1.0% disposed in mobile waste trucks. A majority (95.9%) of the building occupants were aware of the presence of the street sweepers by their reflective jackets (73.6%), their sweeping activity (22.3%) and the notices placed on the road (4.1%).

Table 4 indicates the causes of street litters identified by the building occupants with droppings by passers-by as the major cause (73.6%) followed by street trading/hawking (17.6%) and wind/erosion as the least (2.6%).

Table 3: Waste Disposal Practices of Occupants of Buildings along Swept Streets

Disposal Practice	Frequency	Percentage
Roadside	102	52.9
Nearby Gutter/bush	38	19.7
Waste basket	23	11.9
Open space	10	5.2
Stationary skip bins	18	9.3
Mobile refuse truck	2	1.0
Total	**193**	**100.0**

Source: Authors' Field Survey, 2014

Table 4: Causes of Litters on the Streets

Causes	Frequency	Percentage
Dropping of waste by passers-by	142	73.6
Street trading and hawking	34	17.6
Fall from overloaded trucks	12	6.2
Wind/erosion	5	2.6
Total	**193**	**100.0**

Source: Authors' Field Survey, 2014

Nature of Street Sweeping

The discussion of the nature of street sweeping covers the number of years sweepers had spent on the job, length of streets swept daily, how swept litters are disposed of, the tools and equipment being used and sweepers' level of satisfaction (Table 5). The sweepers' duration on the job varied from less than a year (12.6%), one to three years (34.9%), four to five years (19.4%) to above five years (13.2%) (which forms the largest group). The sweepers worked every day of the week except Sunday.

The length of street swept daily by the sweepers varied with the volume of litters on the streets, locations such as in markets, government house/office areas, and waste bin placement points. While majority (68.0%) of the sweepers swept between 100m and 200m daily in areas like Fajuyi, Ajilosun, and Mathew Streets, 12.6% swept over 200m, and 9.7% swept less than 100m daily in areas like Atikankan old garage and Oja Bisi. However, 9.7% of the sweepers did not have specific length of street to be swept daily as the quantum of their work depended on the decision of their supervisors.

Meanwhile, 87.4% of the sweepers disposed the swept litter into waste bins located on their streets of operation. This practice was predominant among the sweepers in areas such as Old garage, Saint Paul, Odo-Ado, and Mathew who had easy access to public waste containers. About 8.7% of the sweepers who had no waste containers on their streets left the litters packed in nylon bags by the street kerb for waste collection trucks to pick. This practice was visible in places like Ojumose, Okesa roundabout and Adebayo streets. However, 3.9% of the sweepers disposed their litters (especially organic matter) into nearby bushes along the streets like Bank road and NYSC secretariat road. Swept sediments, sand, small pebbles, leaves and grasses were simply packed and thrown into the bushy road set-backs. A sweeper claimed that the organic matter thrown into the weedy set-back would decompose and replenish the soil nutrient. The inadequate provision of waste bins in many streets was corroborated by 64.3% of the officials interviewed as being responsible for some sweepers' indiscriminate disposal of litters.

Short brooms and packers were the major tools used by the street sweepers (Plates 2 & 3). The tools were considered adequate (9.7%), fairly adequate (74.2%) and inadequate (16.1%). All the street sweepers claimed that they wore reflective jackets for easy identification

and protection from vehicular accident (Plates 2 & 3). This was also corroborated by 73.6% of the residents who claimed that they normally spotted the sweepers through their uniforms (reflective jackets). Other personal protective materials used by the street sweepers were nose masks and hand gloves. However, they did not use these materials regularly because, according to them, the items which were given to them by their employer only once when they were starting the job, had worn out and they could not afford a replacement.

Plates 2 & 3: Street sweepers without hand gloves at work on Old Garage and Fajuyi Streets of Ado-Ekiti Source: Authors' Field Survey, 2014.

Considering the sweepers' level of satisfaction with the job, 22.3% were well satisfied, 58.3% were fairly satisfied, while 19.4% were unsatisfied because of poor remuneration and the rigour of the job. However, despite the inadequate remuneration, it can be safely said that over three-quarters (80.6%) of the sweepers were largely satisfied with the job. This appears to be the driving force for their continued stay on the job and relative satisfactory performance despite the challenges facing them.

Table 5: Nature of Street Sweeping and Level of Job Satisfaction

Characteristics	Frequency	Percentage
Job Experience		
Less than 1 year	13	12.6
1-3 years	36	34.9
4-5 years	15	14.6
Above 5 years	39	37.9
Total	103	100.0
Distance swept daily		
Less than 100m	10	9.7
100 – 200m	70	68.0
Over 200m	13	12.6
As decided by supervisor	10	9.7
Total	103	100.0
Disposal of swept litters		
Sweep/pack into nearby bush	4	3.9
Pack into waste bin/truck	90	87.4
Leave litters in a nylon by roadside	9	8.7
Total	103	100.0

Adequacy of tools		
Adequate	9	8.7
Fairly adequate	36	35.0
Inadequate	58	56.3
Total	103	100.0
Level of job satisfaction		
Well satisfied	23	22.3
Fairly satisfied	60	58.3
Not satisfied	20	19.4
Total	103	100.0

Source: Authors' Field Survey, 2014

Benefits Derived from Street Sweeping Practice

Occupants of buildings along the swept streets indicated that the street sweeping programme has made the streets of Ado-Ekiti clean (62.2%) and very clean (20.7%) while less than one-third felt that the streets were still dirty. A majority (93.8%) of them indicated that street sweepers were very necessary to ensure good quality and beautiful streets and control of diseases. The benefits derived from street sweeping activity in Ado-Ekiti as indicated by the sampled building occupants are: beautification of the city (74.6%); employment opportunity for at least a fraction of the city's population (16.6%); improved urban environmental health (6.2%), and attractiveness of the streets (2.6%) (Table 6).

Table 6: Benefits of street sweeping

Benefits	Frequency	Percentage
Beautification of the environment	144	74.6
Employment opportunity	32	16.6
Improved urban environmental health	12	6.2
Attract people to enjoy street life	5	2.6
Total	**193**	**100**

Source: Authors' Field Survey, 2014.

Challenges of Street Sweeping

The street sweepers identified a number of economic, institutional, social, security and health challenges facing them as shown in Table 7. Economic challenges included poor remuneration as indicated by a majority (83.9%) of the sampled sweepers. Their maximum monthly income was N10,000 (Table 2) which is just 55.5% of the N18,000 government-approved national minimum wage. Institutional challenges result from inadequacy of staff leading to the sweepers being overworked as indicated by almost all (96.8%) the sweepers (Table 7). Inadequate provision of personal protective materials and unavailability of waste containers in some streets which eventually result in already packed wastes spilling back onto the street and "forcing" the sweepers to re-sweep was considered a challenge by over 87.1% of the sweepers. Careless and indiscriminate throwing of litters on the streets by the pedestrians, residents and commuters was considered a challenge by 71.0% of the sweepers. Security challenges include susceptibility of the sweepers to road accidents (87.1%). A majority (96.8%) of the sweepers experienced regular physical assaults by pedestrians, harassment and abusive words by drivers while 66.0% experienced stigmatisation by members of the community (Table 7). Health challenges resulted from susceptibility of the sweepers to various disease infections (Table 8).

As noted by the European Agency for Safety and Health at Work (EU-OSHA) (2009), cleaning jobs are physically demanding and strenuous for the musculoskeletal and cardio-

respiratory systems. As presented in Table 8, joint pain (in the form of twisted backs, sprained wrists, pains in arms, necks, hips, and knees) was the commonest health challenge by almost all (96.1%) of the sweepers. The sweepers explained that the pains were caused by the awkward postures they assume when sweeping, bending down for long and very low because of the short brooms they used. A married sweeper between 41 and 50 years had this to say: "I am physically exhausted after the work that I am unable to cook when I get home". Cleaners can be exposed to micro-organisms such as bacteria and moulds and their products such as fungal secretions present in dust (EU-OSHA, 2009). Catarrh (91.3%), cough (83.5%) and respiratory disorder or asthma (46.6%) are the second, third and fifth common health challenges of the sweepers resulting from inhalation of dust and dirt, and sometimes unexhausted chemicals inside cans of pesticides and insecticides that are mixed with ordinary wastes dumped on the streets. Eye irritation and infection (70.8%) was the fourth and malaria the least (31.1%) of the sweepers' health problems. Noise from moving vehicles, motorcycles, record stores and at market areas distracted and frightened them while a few complained about the working hours of 6am-8am as a disruption of family responsibility and an exposure to the risk of violence and hit-and-run accident. A widow said: "this early morning work is preventing me from preparing my children for school and giving them breakfast".

The roadside building occupants also identified similar challenges of street sweeping as insufficient personnel (89.1%), insufficient tools (85.0), exposure to environmental hazard and accident (71.0%) and stigmatisation (11.45).The waste management officials interviewed confirmed most of the challenges indicated by the sweepers. For instance, 85.7% of the officials identified the challenges as; insufficient personnel for street sweeping; inadequacy of street sweeping equipment (85.7%); careless disposal of waste by the pedestrians and the residents (71.4%) and insufficient funds (92.9%) to address the problems.

Suggested solutions

The pedestrians interviewed suggested the following solutions to the challenges: increased remuneration for the street sweepers (96.8%); employment of more sweepers to ease the work load of the sweepers currently engaged (90.3%); provision of modern equipment for the sweepers (71.0%); adequate welfare package (87.1%); wearing of reflective jacket to prevent being knocked down by vehicles (54.8%); and engaging traffic wardens to control traffic and protect the sweepers when on duty (74.2%).

Table 7: Challenges of Street Sweeping

Challenges	Yes		No		Total	
	Freq.	%	Freq.	%	Freq.	%
Poor remuneration	86	*83.9*	17	*16.1*	103	100.0
Insufficient staff	100	*96.8*	3	*3.2*	103	100.0
Insufficient equipment	90	*87.1*	13	*12.9*	103	100.0
Indiscriminate street littering	73	*71.0*	30	*29.0*	103	100.0
Susceptibility to road accident	90	87.1	13	12.9	103	100.0
Assault and harassment by pedestrians	100	96.8	3	3.2	103	100.0
Stigmatization in the community	68	66.0	35	34.0	103	100.0

Source: Authors' Field survey, 2014

Table 8: Diseases experienced by the sweepers

Diseases Experienced	Yes		No		Total	
	Freq.	%	Freq.	%	Frequency	%
Joint pains	99	96.1	4	3.9	103	100
Catarrh	94	91.3	9	8.7	103	100
Cough	86	83.5	17	16.5	103	100
Eye infection	73	70.8	30	29.2	103	100
Asthma	48	46.6	55	53.4	103	100
Malaria	32	31.1	71	68.9	103	100

Source: Authors' Field Survey, 2014

Conclusion and Recommendations

This paper has elucidated the nature, mode of operation and challenges of street sweeping practice in Ado-Ekiti. It concluded that street sweeping is a significant and sustainable urban solid waste management strategy in Ado-Ekiti which the state government should strive to develop and replicate in other streets not yet covered. Though street sweeping is a traditional environmental sanitation practice among the Yoruba of south-western Nigeria, it is currently one of the global best practices in solid waste management, with many developed and developing countries of the world adopting the practice in most of their cities and towns. Street sweeping in Ado-Ekiti has been proved to be a poverty reduction strategy and a means of improving environmental quality. The state and local governments are, therefore, called upon to pay more attention to the practice and ensure that the entire streets in the city are covered by street sweepers. However, to achieve efficient street sweeping in the city, the challenges identified must be adequately addressed as a matter of policy based on the following recommendations.

The current N10,000 ($50 at $1 to N200) monthly remuneration of the street sweepers is below the poverty line of $2 per day and should be reviewed. This step will motivate and bring out the best in them. More sweepers should be employed to ease the work pressure on the available sweepers. Adequate protective equipment such as hand gloves, nose mask, boots, helmets and others that are appropriate to their needs should be provided to the sweepers regularly so that their exposure to health hazards will be reduced. Long brooms that will prevent bending and packers of appropriate size should be provided as needed. Sweepers should be given regular health talks which should include hazard prevention and use of disinfectants and be provided with healthcare insurance owing to their high susceptibility to disease infections and accidents.

In order to protect the sweepers from being knocked down while sweeping by vehicles and motorcycles, adequate road signs and markings to alert drivers and pedestrians of the existence of street sweeping at certain hours of the day should be employed in their streets of operation. The government may also partner with the Nigerian Security and Civil Defense Corps (NSCDC) to provide security for the sweepers during the hours of operation and also organise sensitization programmes for cyclists, motorists and roadside business operators on their responsibilities for the safety, well-being and non-harassment of the sweepers. Government should seek to minimise the rate of street littering by ensuring adequate supply of litter bins to be placed on streets at 200m interval to enable sweepers perform their duties more efficiently. Residents, commuters and operators of roadside businesses need to be regularly sensitised on the need to avoid street littering by inculcating responsible environmental behaviour and making the maximum use of the litter bins. There is the need for sustained political will to adequately enforce the Ekiti State environmental health and sanitation law.

Ekiti State Government should encourage the use of sorted litters from the swept streets as raw materials by its waste recycling plant as a means of generating revenue for government which can then be used to improve and sustain the street sweeping programme.

Finally, in order to make street sweeping much more efficient and effective, the state government should work towards adopting mechanical sweeping techniques and acquire equipment suitable for the climate and soil of Ado-Ekiti. There are various types of mechanical sweepers suitable for different climatic and vegetation zones (Claytor, 1999). The machines eliminate most of the shortcomings of manual sweeping identified in this paper and ensure quicker, cleaner and wider sweeping at less cost and physical strain. However, mechanical sweeping should be structured in such a way that it does not eliminate the job creation and poverty alleviation benefits of manual sweeping. The state government should create the enabling environment for and encourage the private sector and community-based organizations to engage in street sweeping enterprises (Wahab and Odetokun, 2014). Finally, stakeholders in urban planning, environmental health, urban transportation, cleaning contractors and business enterprises in Ado-Ekiti should emphasise what Ojedokun and Balogun (2013) called attitudinal change among the city residents through cognitive intervention to discourage littering and encourage responsible environmental behaviour.

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