

## **Assessment of Public Participation in Household Waste Management in Awka Metropolis, Anambra State, Nigeria**

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**Abstract:** Poor household waste management practices have been found to contribute immensely to rapid environmental degradation. This study assessed the level of public participation in household waste management in Awka metropolis of Anambra state, Nigeria with a view to develop a sustainable framework for public participation in waste management. It assessed the compliance levels of different sizes of households and some distinct groups of the population in waste management. Factors inhibiting the performance of the identified roles of the public were determined, while mitigation strategies were proposed in the framework for sustainable household waste management in Awka metropolis. A survey approach was employed in the study. Using a cluster and simple random sampling technique 400 questionnaires were administered to the public while 170 questionnaires were administered to operators of Anambra State Waste Management Authority (ASWAMA). The data was analysed and presented using frequency tables, percentages and mean percentages. Results obtained revealed poor waste management practices and low compliance with waste management regulations. The study proposed a framework for sustainable public participation in waste management, and recommended that government should support research in aspects of waste management such as waste prevention, reduce, reuse, recycle and recovery.

**Keywords:** Household, Waste Management, Public Participation, Environmental Degradation, Sustainable Framework

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### **I. Introduction**

Achieving a sustainable environmental strategy that harmonizes existing policies, regional realities, economies and all other human activities is a peculiar challenge faced by Environmental Managers globally. The threat of environmental pollution, especially solid waste has been a setback to development. This is particularly alarming due to the exigencies related with the rapid growth of the world's population, economic and technological advancement especially with developing countries, urbanization and the consequences of poor city planning.

Nigeria is perhaps the fastest urbanizing country in the African continent (Ezeigwe, 2015). One of the most important challenges facing the country is associated with the strategies used in waste management. As more and more Nigerians make towns and cities their homes, the resulting social, economic, cultural, environmental and political challenges need to be urgently addressed (Raji, 2008). Most of the problems of waste management started with the rate of urbanization of the cities where the increase in population cannot be met by the services provided by the city, which is regarded as the most efficient agent of production (Uchegbu, 2002). Waste is generated by, and from different sectors that include domestic, commercial, industry and others. In many instances, the financial burden of waste management has been left to the state government or administrative authorities of whom it is over bearing (Pongrácz, 2009).

With the directive from the Federal Government to every state government to set up its own environmental protection agency, Anambra State Waste Management Authority (ASWAMA) was established in 2011 to take over the task of waste management in the state. Awka the capital city is expected to attest to the effectiveness or otherwise of this Authority. However, Awka is presently experiencing various forms of waste management problems. Several authors have conducted extensive research on the various problems associated with solid waste management in Nigeria which are not far from what is faced in Awka. These include the works of Okpala (1986), Ademoroti and Akpovi (1987); Adedibu and Okekunle (1989), Umeakuka and Mba (1999), Uchegbu (2002), Onwurah, Ogugua and Otitoju (2006), Ogwuleka (2009), Kadafa, Latifah, Abdullah and Sulaima (2013) and Okonkwo (2010,2012). Among the identified problems of solid waste management are;

singular source of revenue from the state government to manage waste, ignorance of the volume and classes of generated waste and negligence of the public in waste management.

Many of the studies done on solid waste management relating to public participation such as Klundert, 1999, Eugene, Günter and Lilian, (2013), Mustapha, (n.d), Michael *et al.*, (2014), Wahab and Kehinde, (2014), Ali, 2006, Medina, (2008), Gerold (2009), focused mainly on individual informal groups like the women, youths, scavengers, street sweepers and have also been directed towards analyzing their individual participative role in waste management. However, levels of public participation in specific roles in the different aspect of waste management have not been assessed. Also, levels of participation of different specific actors of the public in solid waste management were not addressed by the previous researchers.

This study explores the compliance levels of different sizes of households, some distinct groups of the population in waste management, the roles of the government and the public, factors inhibiting the performance of the identified roles were determined, while strategies to mitigate or avert these challenges were proposed in the framework for sustainable waste management in the metropolis. The study further assessed the level of public participation in waste management in Awka metropolis of Anambra state, Nigeria and developed a sustainable framework for public participation in waste management.

## **II. Research Methods**

### **2.1 Research Design**

This study adopted a survey design method using both primary and secondary data. The primary data for the research was collected from the sample population (Awka metropolis) who are involved in the generation, collection, transportation and disposal of refuse and ASWAMA who are in charge by law to manage waste in the state. The research tools like the structured questionnaire, observation, public survey, interviews were used to obtain the information (Mugagga, 2006). Secondary source is an important source of data when there is limitation of resource, time and money and which limits data collection for extensive areas (Clifford and Valentine, 2010). Here, the secondary information was collected through library sources, articles, published and unpublished research reports, databases, internet etc.

After obtaining the sample size, cluster sampling and simple random sampling technique was used to collect data from the sample area. A total of five hundred and seventy (570) questionnaires were distributed to a hundred households, a hundred youths, a hundred street vendors, hundred business owners and a hundred and seventy (170) workers at Anambra state waste management authority (ASWAMA) ASWAMA records, 2017.

In-depth interviews with the Authority staff mandate review and a structured questionnaire containing quantitative aspects were means used in data collection.

The quantitative data from questionnaires were well sorted and coded for purposes of entry into the Statistical Package for Social Sciences (SPSS 20.0) and MS Excel 2007 and analyzed by comparing frequencies and percentages. Frequencies, percentages and mean percentages ( $\bar{X}$ ) were the statistics used to take decisions on various research questions.

### **2.2 Population of the study area**

The population of the study is made up of youths, households, businessmen/women and vendors of Awka metropolis. Awka, the study area is the capital of Anambra State Nigeria, with the area coverage of about 120km<sup>2</sup> (NBS, 2010). The study population of the area is estimated at 301,657 (NPC, 2006). The second population of the study is made up of all staff within the Anambra State Waste Management Authority (ASWAMA). The population of ASWAMA is estimated at 170 (ASWAMA records, 2017).

## **III. Study Area**

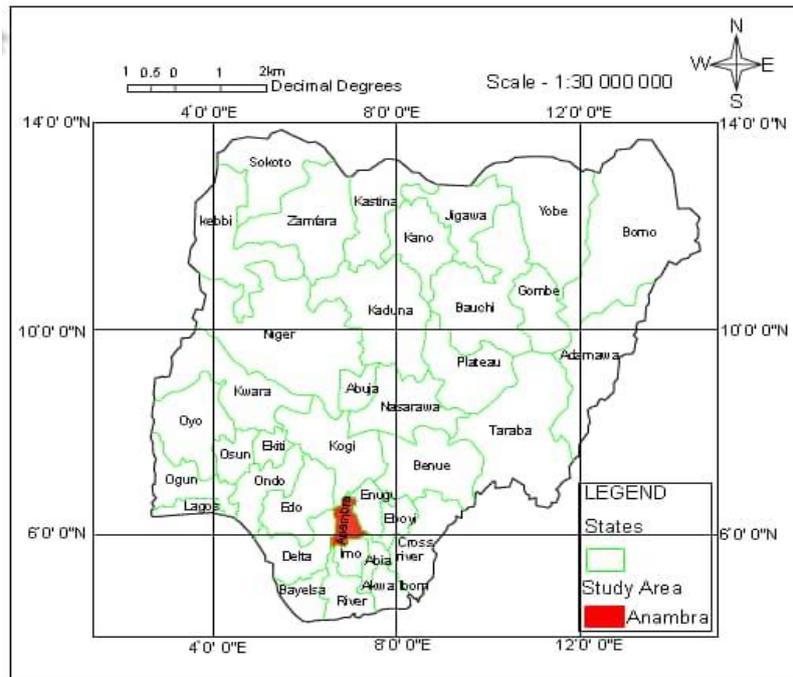
Awka is situated in the South Eastern Region of Nigeria. It is specifically located in Awka South Local Government Area of Anambra State. It is located at Latitude 6°12'15.00" N and longitude 7°04'2.40" E. Awka is at about 600km east Lagos and the centre of the densely populated Igbo heartland in south-eastern Nigeria (Muoghalu, 1996). The West-East Federal Highway links Lagos, Benin City, Asaba, Onitsha and Enugu to Awka, and several location roads link it to smaller towns such as Agulu, Nibo, Amawbia, Enugwu-ukwu and Abagana.

Awka is in the tropical zone of Nigeria and experiences two distinct seasons brought about by the predominant winds that rule the area: the Southwest monsoon winds from the Atlantic Ocean and the Northeastern dry winds from across the Sahara Desert. Seven months of heavy tropical rains starting from April to October are followed by five months of dryness from November to March. The harmattan, a particularly dry and dusty period usually occurs during this period. The temperature is generally hot and humid in the range of 27-28°C during July through December, but rising to 35°C between February and April. As a result of

the long period of rains in the study area there is tendency of flooding if the drainage systems are block and if there is lack of drainage system and maintenance of the already existing ones Sunmap.eu (2014).

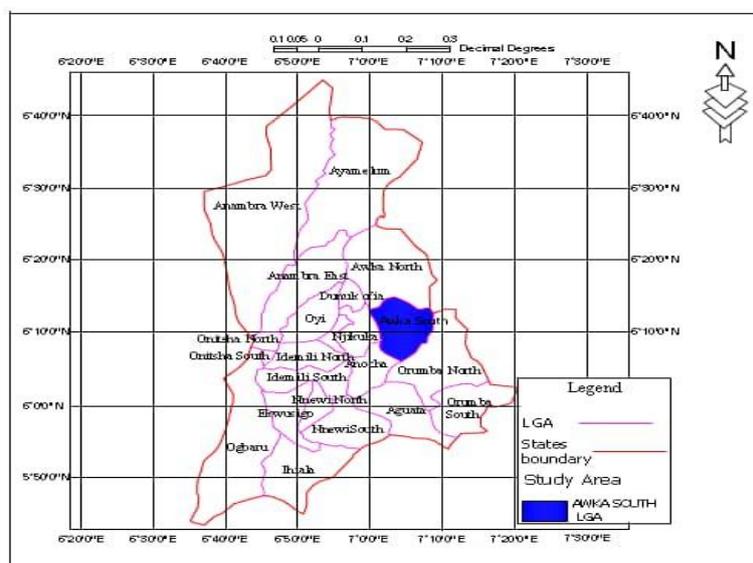
The socioeconomic activities embarked upon in Awka recently includes: Agriculture, Craftsmanship, Construction activities, Educational activities, State and Federal establishments, Hotels of all classes, Petroleum and Allied companies, pharmaceuticals and other manufacturing industries as well as major financial institution such as Banks with branches within and around Awka. Also Awka is equally endowed with large rudimentary open-air markets where everything from basic food produces to clothes, cosmetic, electronics, household items are sold. These various economic activities in the area bring about the heterogeneous composition of waste generated and disposed off on a daily basis (Ezeigwe, 2015).

Fig 1.2: shows the location of Anambra state in the Map of Nigeria. Awka is the Capital of Anambra State which is under Awka South Local Government Area of the state. This can be seen in Fig 1.3 and Fig 1.4.



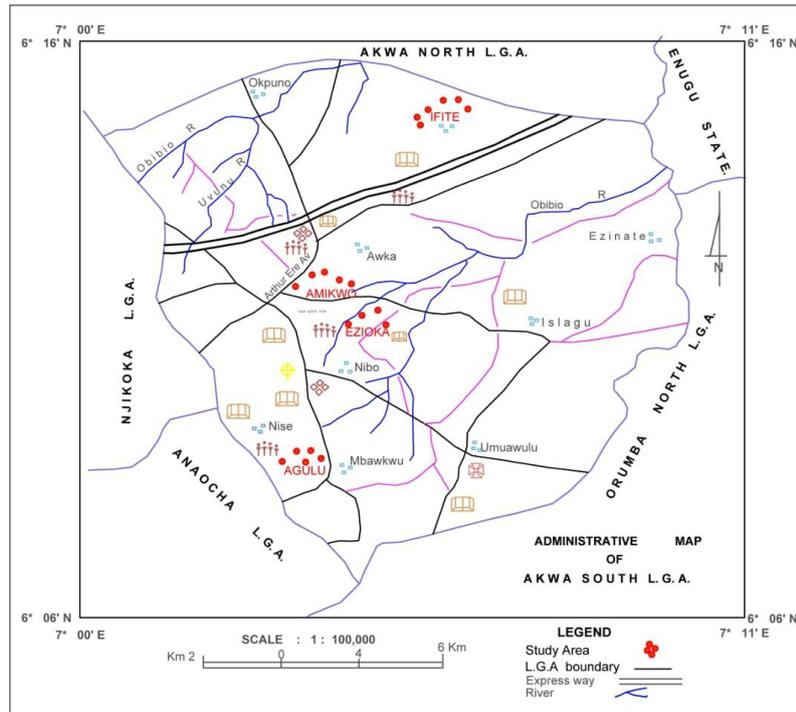
**Fig 1:** Map of Nigeria Showing Anambra State

Source: Surv. Ibrahim (Created from Google Earth, 2016)



**Fig 2:** Map of Anambra State Showing Awka South LGA

Source: Alemika Segun (Created from Google Earth, 2017)



**Fig 3:** Map of Awka South LGA Showing Awka metropolis

Source: Google Earth, 2017

**3.1 Sampling Technique, Sample Size and Data Collection Method**

The multi-stage sampling technique was used to determine the first study population sample size, which consists majorly of the generators of waste in the area (Households, street vendors and businesses) and simple random sampling technique was used for second sample size (ASWAMA staff). First, the neighborhoods were stratified into four (4), according to their known quarters (Ifite, Amikwo, Ezioka and Agulu Quarter) and further divided into clusters.

*Sample size determination*

The Taro Yammane statistical formula was used. This is given as

$$n = \frac{N}{1+N(e)^2}$$

Where ‘n’= is desired sample population size

N= is study population

e<sup>2</sup> = is 0.05 (level of significance)

Since, the total study population for the three selected area is 301,657, the desired sample size, n, was calculated as follows:

$$n = \frac{301,657}{1 + 301,657 (0.05)^2} = \frac{122,830}{755.1425} = 399$$

Therefore = 400.

The number was further shared equally among the 4 Quarters in Awka metropolis, as follows: Ifite Quarter (100), Amikwo Quarter (100), Ezioka Quarter (100) and Agulu Quarter (100).

**3.2 Data Collection Method**

The research adopted a combination of both qualitative and quantitative methodology. The research used document review, interview and structured questionnaire administration. Documents reviewed include: Anambra State Waste Management Authority Law, internet sources of both published and unpublished journals, articles and books and local sources of both published and unpublished books, projects and journals. Interview included people who were involved in solid waste management and somehow concerned in making the people participate in the solid waste management. They include; Chief Operations officer of ASWAMA, Staff from Ministry of Environment Anambra State, Staff from ASWAMA in charge of ASWAMA compost plant, Nnodu, Okpuno, Chairman Awka Scavengers at Ring road dumpsite.

Structured questionnaires were designed and administered randomly to all the selected groups. Four hundred (400) copies of structured questionnaire were distributed to the selected neighborhoods which include Ifite Quarters (100), Amikwo Quarters (100), Ezioka Quarters (100) and Agulu Quarters (100) using both Cluster sampling technique and simple random sampling technique. The questionnaires were administered to volunteer or willing representatives of the selected households, government staff, students, market vendors and every other participant that fell under the designed cluster. Questions covered the four research question.

The researcher employed the aid of research representatives for each quarter. The research assistants are of Awka extraction and experts in environmental studies, health sciences and urban and regional planning. Apart from being experts in these areas, they were trained on how to administer the instrument. However, 396 questionnaires were retrieved and ten (10) were found to be useless. At the end, 386 questionnaires were found to be usable. This represents 96.5% of the total questionnaire distributed and this was found to be adequate for the analysis.

Answer options were arranged in a 4-point likert-scale of not at all (1), a little (2), moderately (3) and Very high (4) for the first research question and No extent (1), Low extent (2), moderate extent (3) and High extent (4) for the second research question.

The research was carried out between June and November spanning an entire six months which allowed the respondents enough time for measured distribution of questionnaire.

#### IV. Results

##### 4.1 Public compliance level to ASWAMA Law

###### 4.1.1 Youth

The analysis in Fig.4 shows that out of the 14 listed waste management strategies of ASWAMA, a greater percentage of the youths affirmed that they comply with thirteen of the strategies to a low level, they include: keeping clean and collecting refuse on undeveloped plot and plot in built up area, properly disposing Industrial, commercial, liquid waste, oil grease and spent oil, covering vehicle (s)/containers used for conveying refuse, not throwing or depositing in an open drain anything capable of obstructing a free and uninterrupted draining away of any liquid substance or rainwater, prohibiting open burning, Paying my Waste Management Fees. On the other hand, the youths however affirmed that they comply with the remaining strategy to a high level, which is observing Sanitation Day Activities.

The analysis of the individual sections shows that under collection/storage, the level of public compliance with the laid down waste management strategies is low as 57.84% of the youths affirmed they comply to the strategies to a low level. The level of compliance with the laid down waste management strategies under transportation, disposal and monitoring is also low as 57.2%, 70.1% and 66% of the youths affirmed they comply with the strategies to a low level.

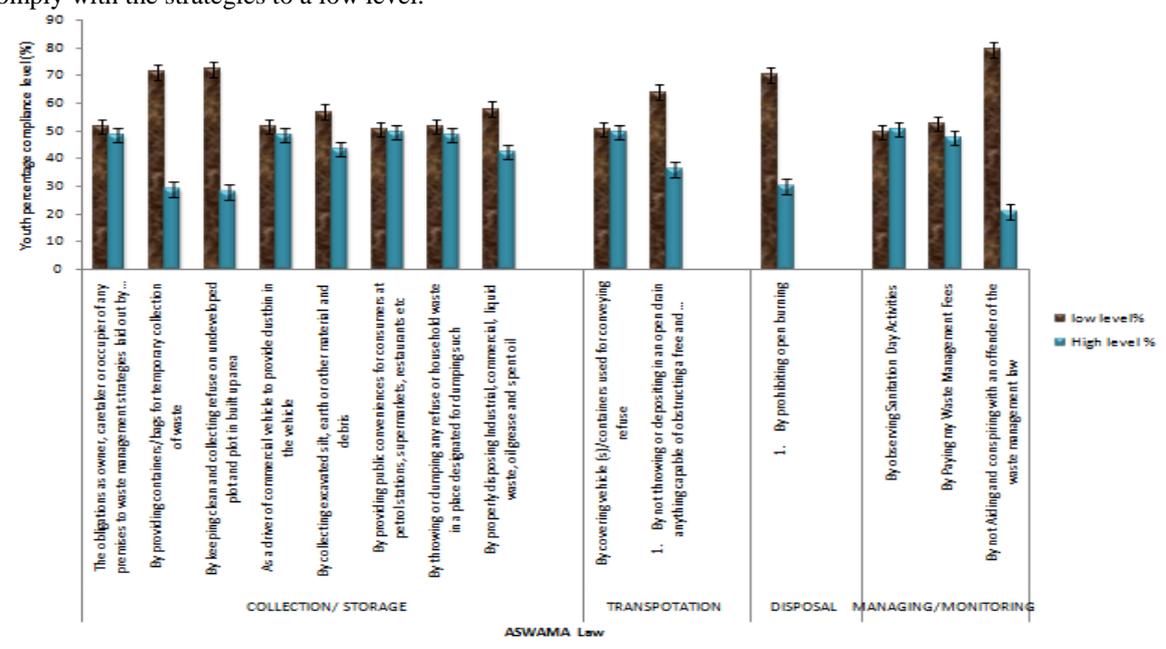


Fig 4: Showing the percentage compliance level of youths to the laid down waste management strategies of ASWAMA.

4.1.2 Household

As indicated by the frequencies and percentages in Fig 5, out of the 14 listed waste management strategies of ASWAMA, a greater percentage of the households affirmed that they comply with six of the strategies to a high level, they include: obligations as owner, caretaker or occupier of any premises to waste management strategies laid out by ASWAMA, providing containers/bags for temporary collection of waste, providing public conveniences for consumers at petrol stations, supermarkets, restaurants etc, throwing or dumping any refuse or household waste in a place designated for dumping such, properly disposing Industrial, commercial, liquid waste, oil grease and spent oil and observing Sanitation Day Activities.

On the other hand, the households affirmed that they comply with the remaining eight strategies to a low level. They include: keeping clean and collecting refuse on underdeveloped plot and plots in built up area, as a driver to provide dustbin in the vehicle, collecting excavated silt, earth or other debris, covering vehicles used for transporting refuse, by prohibiting open burning, by not throwing or depositing in an open drain anything capable of obstructing a free and uninterrupted draining away of any liquid substance or rainwater, paying waste management fees and not aiding and conspiring with an offender of the waste management law.

The analysis of the individual sections shows that under collection/storage, the level of public compliance with the laid down waste management strategies is high as 57.52% of the Households affirmed they comply to a high level. The level of compliance with the laid down waste management strategies under transportation and disposal is low as 60.4% and 67.7% of the households affirmed they comply with the strategies to a low level. Under monitoring, the households affirmed they comply with the strategies to a low level as 62.5%.

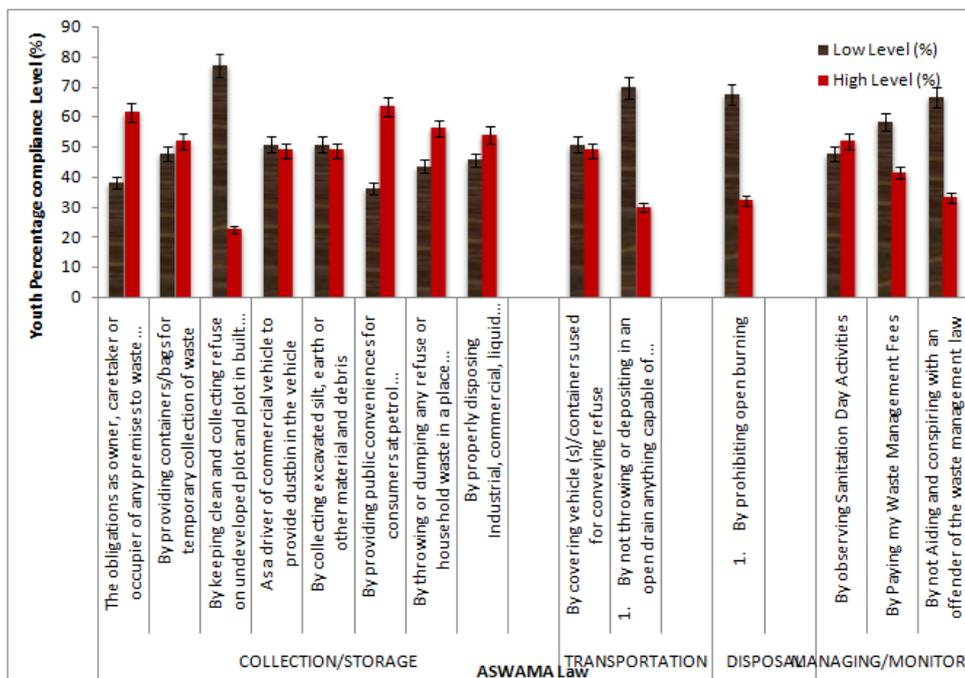


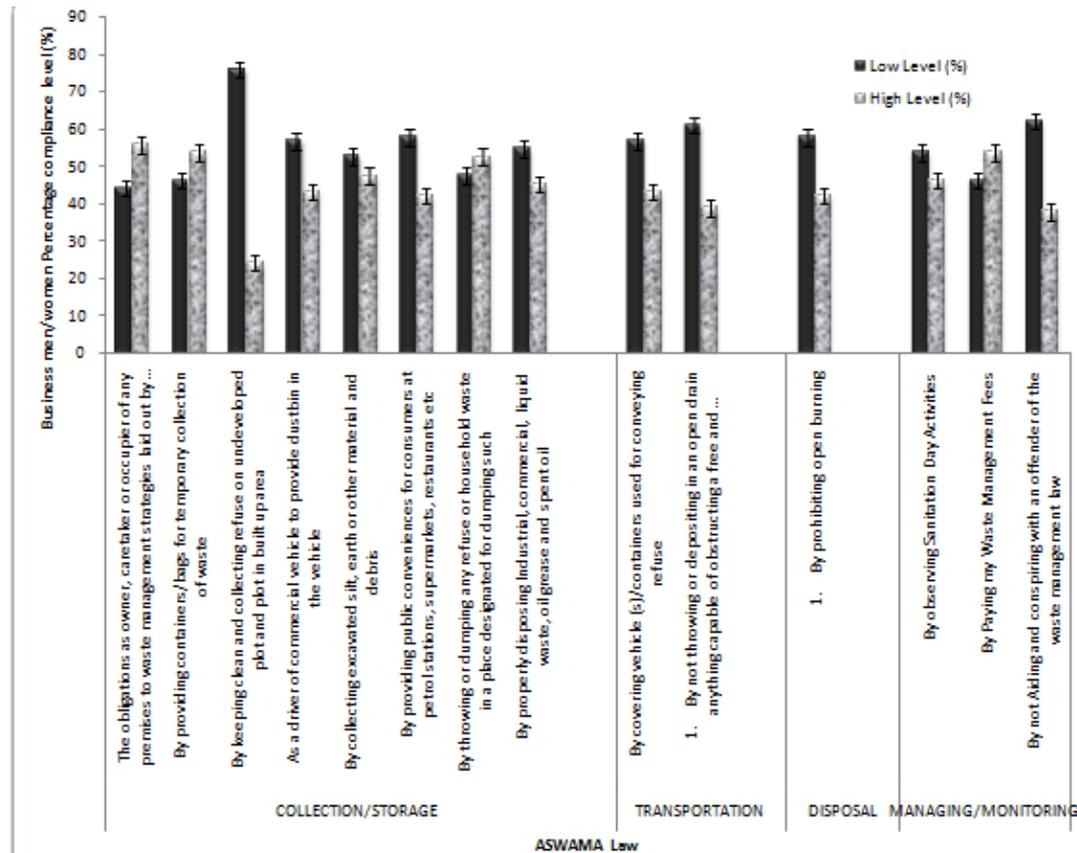
Fig 5: Showing the percentage compliance level of households to the laid down waste management strategies of ASWAMA.

4.1.3 Business men/women

As depicted in Fig 6, out of the 14 listed waste management strategies of ASWAMA, a greater percentage of businessmen/women affirmed that they comply with ten out of the strategies to a low level, the ten strategies include: keeping clean and collecting refuse on undeveloped plot and plot in built up area, As a driver of commercial vehicle to provide dustbin in the vehicle, providing public conveniences for consumers at petrol stations, supermarkets, restaurants etc, , not throwing or depositing in an open drain anything capable of obstructing a free and uninterrupted draining away of any liquid substance or rainwater, prohibiting open burning, observing Sanitation Day Activities collecting excavated silt, earth or other material and debris, properly disposing Industrial, commercial, liquid waste, oil grease and spent oil, covering vehicle (s)/containers used for conveying refuse, not Aiding and conspiring with an offender of the waste management law.

On the other hand, businessmen/women affirmed that they comply with the remaining four strategies to a high level. They include: obligations as owner, caretaker or occupier of any premises to waste management strategies laid out by ASWAMA, providing containers/bags for temporary collection of waste, throwing or dumping any refuse or household waste in a place designated for dumping such and Paying my Waste Management Fees.

The analysis of the individual sections shows that under collection/storage, the level of public compliance with the laid down waste management strategies is low as 59.56% of the businessmen/women affirmed they comply to the strategies to a low level. Also, the level of compliance with the laid down waste management strategies under transportation and monitoring is low as 58.95% and 57.9% of the businessmen/women affirmed they comply with the strategies to a low level. Under disposal the businessmen/women affirmed they comply with the strategies to a low level as 57.9%.



**Fig 6:** Showing the percentage compliance level of businessmen/women to the laid down waste management strategies of ASWAMA.

**4.1.4 Vendors**

Fig 7 shows the percentages of vendors on their compliance with the laid down waste management strategies of ASWAMA. Out of the 14 listed waste management strategies of ASWAMA, a greater percentage of the vendors affirmed that they comply with nine of the strategies at a low level, they include: keeping clean and collecting refuse on undeveloped plot and plot in built up area, provide dustbin, providing public conveniences for consumers, not throwing or depositing in an open drain anything capable of obstructing a free and uninterrupted draining away of any liquid substance or rainwater, prohibiting open burning, providing containers/bags for temporary collection of waste, throwing or dumping any refuse or household waste in a place designated for dumping such, covering vehicle (s)/containers used for conveying refuse, not Aiding and conspiring with an offender of the waste management law.

On the other hand, a greater percentage of the vendors however affirmed that they comply with the remaining five strategies to a high level. They include: obligations as owner, caretaker or occupier of any premises to waste management strategies laid out by ASWAMA, collecting excavated silt, earth or other material and debris, properly disposing Industrial, commercial, liquid waste, oil grease and spent oil, observing Sanitation Day Activities, Paying my Waste Management Fees

The analysis of the individual sections shows that under collection/storage, the level of public compliance with the laid down waste management strategies is low as 61.22% of the vendors affirmed they comply to the strategies to a low level. The level of compliance with the laid down waste management strategies under waste transportation and monitoring is also low as 61.2% and 53.05% of the vendors affirmed they comply with the strategies to a low level. Under disposal the vendors affirmed they comply with the strategies to a very low level as 75.5%.

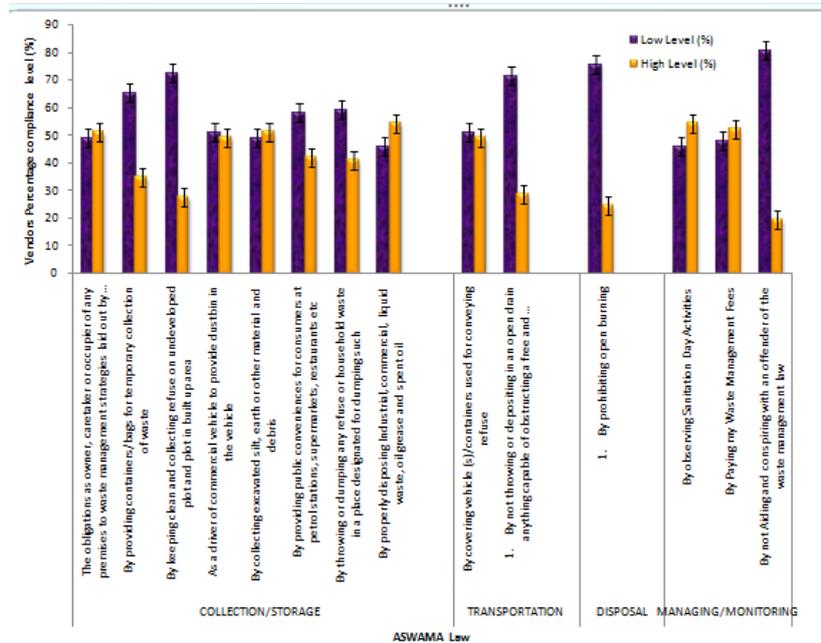


Fig 7: Showing the percentage compliance level of vendors to the laid down waste management strategies of ASWAMA.

## 4.2 Extent of Government involvement of the public in the management of waste in Awka

### 4.2.1 Youth

As indicated in Fig 8, a greater percentage of the youths (61.9% - 87.6%) affirmed that the government involves the public to a low extent in the 10 stages of public involvement listed.

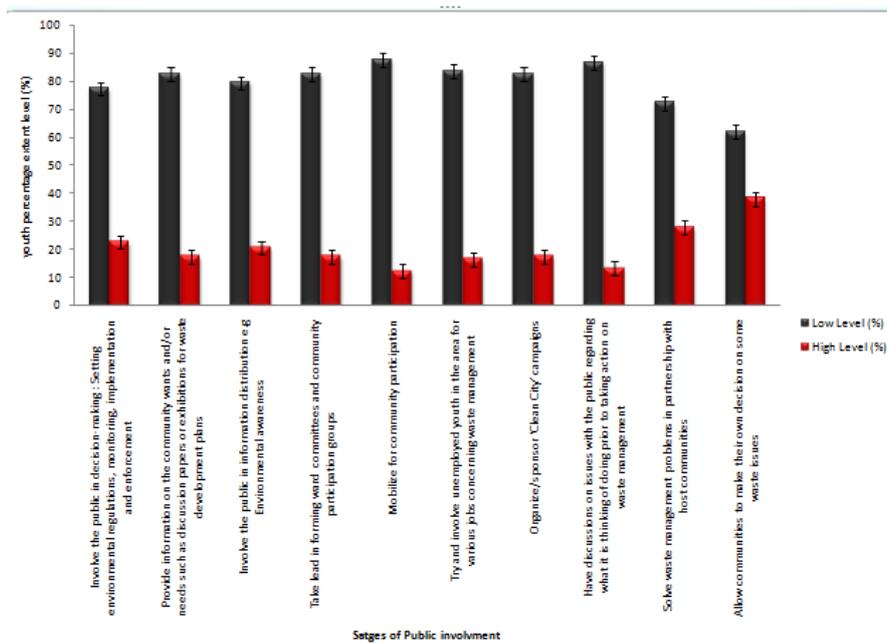


Fig 8: showing the stages of public involvement and the percentage extent levels of youth in waste management

4.2.2 Household

As shown in Fig 9, a greater percentage of the household (59.4% - 77.1%) affirmed that the government involves the public to a low extent in the 10 stages of public involvement listed.

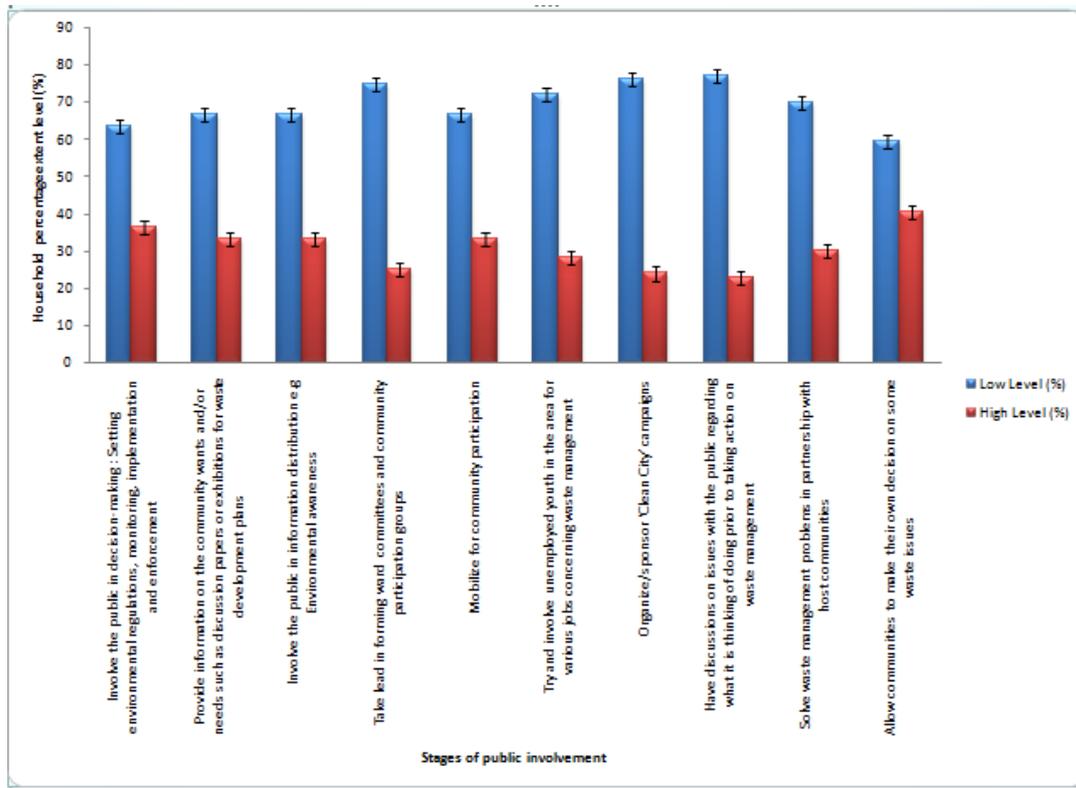


Fig 9: showing the stages of public involvement and the percentage extent levels of household in waste management

4.2.3 Business men/women

As depicted in Fig 10, a greater percentage of the businessmen/women (62.1% - 75.8%) affirmed that the government involves the public to a low extent in the 10 areas of stages of public involvement listed.

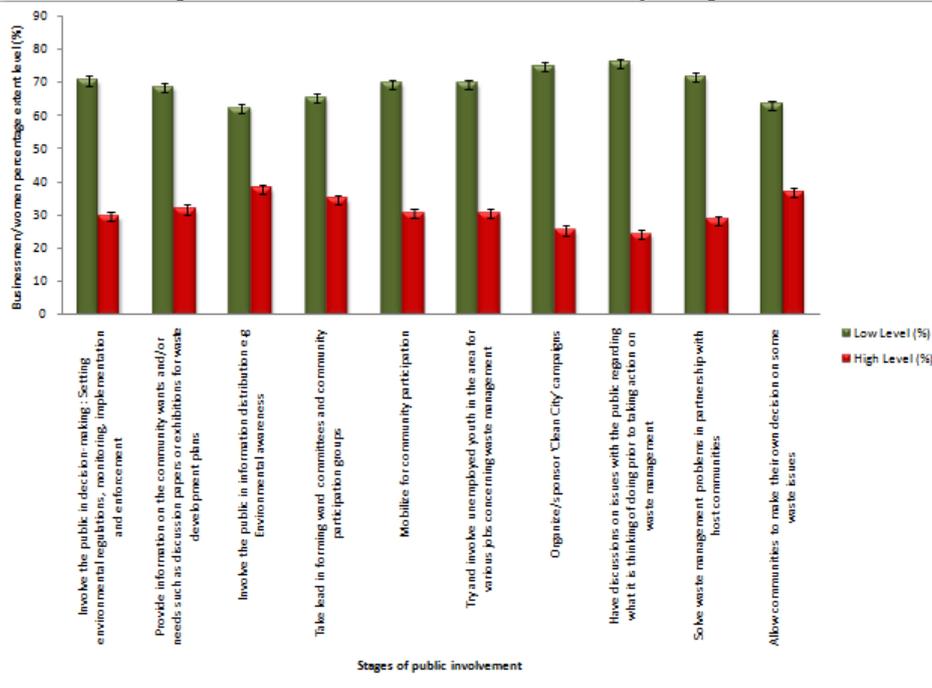


Fig 10: showing the stages of public involvement and the percentage extent levels of Businessmen/women in waste management

#### 4.2.4 Vendors

The percentages displayed in Fig 11 indicate that a greater percentage of the vendors (59.2% - 87.8%) affirmed that the government involves the public to a low extent in the 10 stages of public involvement listed.

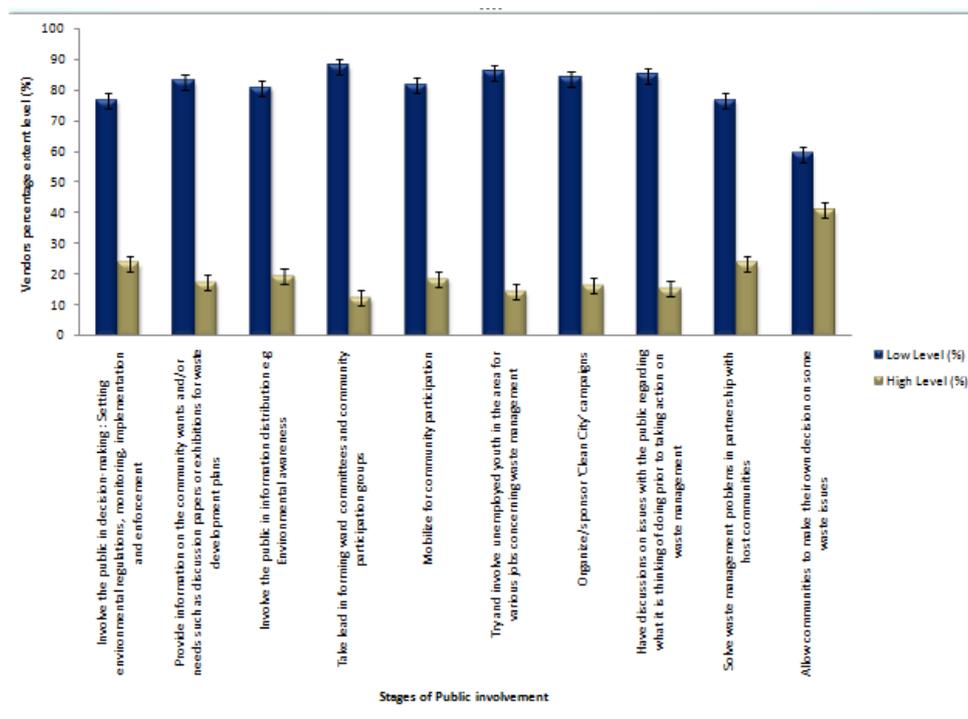


Fig 11: showing the stages of public involvement and the percentage extent levels of vendors in waste management

## V. Discussion

### 5.1 Level of compliance with the laid down waste management strategies of ASWAMA

Based on the laid down waste management strategies of ASWAMA, under Part 3 (Sanitation obligations, offences and penalties) of the Waste Management Authority Law, 2015 that outlined sanitation obligations for the public in the state, questions were coined out to check the level of compliance of the public. From the analysis above, the analysis of the individual sections of the public, shows that under collection/storage, waste transportation, waste disposal and waste monitoring/managing, the level of public compliance with the laid down waste management strategies is low as 57.84%, 57.2%, 70.1% and 66% of the youths respectively affirmed they comply to the strategies to a low level. Under households, the analysis shows that under collection/storage, the level of public compliance with the laid down waste management strategies is high as 57.52% of the Households affirmed they comply to the strategies to a high level. On the other hand, the level of compliance with the laid down waste management strategies under transportation, disposal and monitoring, is low as 60.4%, 67.7% and 62.5% of the households affirmed they comply with the strategies to a low level. Also results from vendors under collection/storage, waste transportation and waste monitoring/managing, showed that the level of public compliance with the laid down waste management strategies is low as 61.22%, 61.2% and 53.05% of the vendors respectively affirmed they comply to the strategies on a low level. While under waste disposal, they complied with a very low level as 75.5% affirmed it.

This finding supports that of Raid (2000) who stated that it is hard to have community willingness if communities do not feel a sense of ownership toward the waste collection. According to researchers in community involvement such as Reid (2000) and Minn, Srisontisuk and Laohasiriwong (2010), they are some of the opinion that by granting empowerment to the community is essential to build public participation. As can be observed from the above analysis, compliance to the laid down waste management law for the public is low because these communities do not feel any sense of ownership towards waste management.

Also, the researcher identified ten (10) challenges faced by the public which resulted to the low compliance levels. The analysis below gave a more factual indices as to what challenges posed a serious barrier.

**Table 1:** Percentages of the public on major challenges faced in waste management in Awka

		Disagree	Agree	Remark
		%	%	
1.	I lack the knowledge and skill of managing waste properly	37.1	<b>62.9</b>	Agree
2.	Lack of knowledge and skill of the waste Authority to build partnership with the public	20.6	<b>79.4</b>	Agree
3.	There is limited awareness towards our responsibility to the environment	17.5	<b>82.5</b>	Agree
4.	I am indifferent towardsmy responsibility in managing waste	33.0	<b>67.0</b>	Agree
5.	There is low self confidence among the women folk and the poor in managing waste.	32.0	<b>68.0</b>	Agree
6.	Lack of motivation from the Government	14.4	<b>85.6</b>	Agree
7.	Lack of information on the various roles of the public in waste management	15.5	<b>84.5</b>	Agree
8.	The hazardous nature of waste serves as a threat to my health and survival	9.3	<b>90.7</b>	Agree
9.	Limited resources in carrying out waste management e.g waste disposal fee	15.5	<b>84.5</b>	Agree
10.	Frequent illegal dumps	11.3	<b>88.7</b>	Agree

Source: Researcher’s Field Survey, (2017)

This findings support Minn *et al* (2010) who identified four similar challenges facing the people. They include: lack of knowledge and skills of the municipal personnel to conceptualize and build partnerships with the people; limited awareness and indifferent attitudes of the people towards their responsibility; low self confidence among the women and the poor, which makes them hesitant to take part in waste management activities because they feel inferior and lack of motivation and information. Elizabeth (2011) also identified major emotional challenges facing individuals towards waste management.

### **5.2 Extent of Government involvement of the public in the management of waste in Awka**

Everyone has a part to play to guarantee a sheltered and clean environment. Makwara (2011) recommended that the viability of waste management strategies rely on upon important cooperation of different partners, for example, governments, NGOs, private division, industrialist, people and the communities among others. Also, most researchers agree that collaboration or partnership between community and government authority is essential to participation success (Reid, 2000). Having this in perspective, this study found out that the extent to which the government involves the public in the management of waste in Awka is low especially in the areas of involving the public in decision-making: Setting environmental regulations, monitoring, implementation and enforcement, in providing information on the community wants and/or needs such as discussion papers or exhibitions for waste development plans so also with the remaining roles expected of the government to carry the public along in waste management. The findings of this study does not support Kinyashi, (2006) who in his study, stated that the authorities play a vital role since in most developing countries the local government is responsible for the delivery of basic services, like waste collection and disposal and for the implementation and enforcement of environmental legislation. Also, Mansoor & Saywell (1995) in their study supported community participation as it influences sanitation conduct and brings administration of waste management into realization.

The Wheel of Participation by Davidson (Mohammed, M, Sani, S & Awang, M. (2019), recommends four key areas the government can involve the public in any societal decision. These key areas include; Information, Consultation, Participation and Empowerment. Information sharing includes minimal communication sharing, limited information sharing and high quality information sharing. Consultation includes limited consultation, customer care and genuine consultation. Participation includes effective advisory body, partnership and limited/decentralized decision making. Empowerment includes entrusted control, independent control and delegated control.

## **VI. Proposed Sustainable Framework for Public Participation**

Using the research findings, the researcher developed the framework which can be replicated in other areas and states which embrace public participation in waste management as a tool to foster a sustainable environment.

6.1 Proposed framework for Public participation



Fig 12: Proposed framework for public participation in waste management in Awka metropolis, Anambra state.

The above proposed sustainable framework is a prototype design. It includes the actors in the public domain and the actors in the government domain together with their individual roles. For an effective and sustainable public participation in waste management, it shows a mutual involvement and cooperation of the government domain and the public domain. This can be achieved through information sharing, consultation, participation and empowerment of both parties. With this, both parties can effectively participate in the various sustainable waste management strategies: collection, storage, transportation, waste disposal and managing/monitoring.

Set Interpretation

1. Public Actors: this set consists of the different groups of communities and individuals both private and public that constitute Awka metropolis. They include: the family unit, children/students, senior citizens, unemployed and employed youths, vendors/shop owners, teachers/academia, hospitals, Petrol stations, supermarkets, commercial vehicle drivers, co operations, social workers, industries and other public areas. But for the purpose of this research, they include; the households, the youth, businessmen/women and the vendors/shop owners. In essence, a public actor includes every single human being living and working within Awka metropolis.

2. The public actors’ roles: this set consists of the various responsibilities and roles required to be acted upon by those within the public domain as it concerns waste management within Awka metropolis. The roles include: To own and/or provide and maintain a dustbin suitable to be used solely for depositing waste, do not deposit any obnoxious, toxic or poisonous waste in the dustbin, keep premises and surrounding clean from weeds and poisonous plants, keep grass, flowers and hedges low and trim, ensure that drains running through premises are kept free from blockage, bag all refuse, keep premises clean and free from odour, prohibit open burning of refuse, do not throw or dump any refuse or household waste in a place other than a designated place for dumping such, keep clean undeveloped plot or plot in built up area, make sure industrial, commercial, liquid waste, oil grease and spent oil are properly disposed of, deposit waste in the dustbins found in commercial vehicles, use public conveniences meant for consumers of services at petrol stations, supermarkets, restaurants etc, properly dispose excavated silt, earth or other material and debris, do not throw or deposit in an open drain anything capable of obstructing a free and uninterrupted draining away of any liquid substance or rainwater, observe Sanitation Day Activities, pay Waste Management dues, report defaulters of the waste management law to the appropriate authorities etc and are not limited to only these.

For an effective and active participation of the above roles and responsibilities, there must be a change in the way the individual perceive waste management. Therefore there is the need for behavioral change. Fog Behavior Model clearly outlined three (3) ways change in behavior can occur; through motivation, ability and triggers. Motivation could appear in the form of incentives and fines, environmental benefits and environmental

cost. Ability could appear in the form of time, money and physical strength while Triggers occur as enlightenment programs, awareness and involvement.

3. Government actors: this set consists of the different groups of people and individuals both private and public who have the power to make and enforce laws for the country and state. They include: the Ministry of Environment at the Federal and State levels and the Environmental Health Department at the Local government level, Anambra State Waste Management Authority (ASWAMA), Planning agencies, Politicians, Media, Financial institutions, NGOs, Private sectors etc.

4. The Government actors' roles: this set consists of the various responsibilities and roles required to be acted upon by those within the government domain as it concerns waste management within Awka metropolis. The roles include: setting environmental regulations and standards, monitoring and enforcement, integration of sustainable environment in developmental planning, policy guidance with long term view in allocating resources, supporting environmentally sound developments, environmental awareness, focus on real local priorities rather than sensationalisation, mobilize for community participation, solve waste management problems in partnership with host communities etc and are not limited to these.

For an effective and active participation of the above roles and responsibilities, the wheel of participation by Davidson (Mohammed, M et. al (2019) is recommended. In his wheel, Davidson identifies four key areas the government can participate in their roles as well as involve the public. These key areas include Information sharing, Consultation, Participation and Empowerment. Information sharing includes minimal communication sharing, limited information sharing and high quality information sharing. Consultation includes limited consultation, customer care and genuine consultation. Participation includes effective advisory body, partnership and limited/decentralized decision making. Empowerment includes entrusted control, independent control and delegated control.

5. Sustainable waste management strategies: this sub set includes sustainable acts in waste management. Waste management acts that can be easily maintained and exploits the natural resources without destroying the ecological balance of the area. Sustainable waste management includes the following practices: waste prevention, waste reduction, waste reuse, waste recycle, waste segregation, waste collection, waste storage, waste transportation, waste treatment and disposal.

## VII. Conclusion

This study is an attempt to assess the level of public participation in waste management in Awka metropolis, Anambra state with a view to develop a sustainable framework for public participation in waste management. The major objectives assessed include: level of compliance with the laid down waste management strategies of ASWAMA and the extent of government involvement of the public in management of waste in Awka. From the research findings, it can be deduced that the level to which the public (youths, households and vendors/shop owners) comply with ASWAMA laws is low and the extent to which the government on the other hand, involves the public in the management of waste in Awka is equally very low. The research recommended the need for the government to involve the public in waste management from the planning/decision making stage to final implementation and monitoring stage and also encouraged the need to increase the overall level of public participation in waste management. The research concludes with a proposed sustainable framework for public participation in waste management.

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### Author's Contributions

**Nwosu, Agnes Ogechukwu:** Prepared the manuscript

**Okoye, , Chinedu. Oguejiofo:** Revised the manuscript and together they approved the manuscript.

### Conflict of Interest

The authors declare that there is no conflict of interest.

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