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STEMMING PLASTIC BAG POLLUTION IN ANAMBRA STATE: WILLINGNESS OF THE PUBLIC TO ACCEPT ALTERNATIVE BAGS

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Abstract

With billions of plastic bags in circulation, their presence is seen everywhere and every day. Bags are a fundamental part of our everyday life especially when we go shopping. Plastic bags have dominated the bag market for years, beating others to become the most sought after by consumers. However, it is now clear that plastic bags play a role in polluting the environment and impacts on the environment negatively due to poor and prolonged degradation process. Following the negative impact of plastic bags several countries have placed a partial or total ban on plastic bags while some have used levies instead to curtail their use. It is also reported that other countries are considering or are at the verge of placing bans. Hinged on the concept of waste management hierarchy, this research appraises the willingness of plastic bag consumers in Anambra State, (Southeast) Nigeria to accept the usage of alternative bags. The result showed that 83% of respondents demand for plastic bag when they shop while 70% indicated they get upset when it's not provided. 60% preferred plastic bags to other alternatives, 65% had knowledge about the environmental impact of plastic bags, while 85% want a total ban on plastic bags. The study also showed that an average of 1 to 3 bags were used daily, giving a total of 90 bags in a month per person. An increase in production of alternatives, public enlightenment, and use of incentives are part of recommendations made towards reducing the impact of plastic bags on the environment.

Keywords: Environmental pollution, Plastic bags, Sustainability, Waste management

INTRODUCTION

In 2018 the World Environment day was tagged “Beat Plastic Pollution”. This was done in a bid to draw the world’s attention to the menace of plastic pollution. On daily basis millions of plastic bags are been produced world over. While annual production and usage statistics are not available from industrial sectors, environmentalists, researchers, and environmental groups estimate that between 500 billion and 1 trillion plastic bags are used globally each year (Rayne, 2008; UNEP, 2018) and that whereas these plastic bags are put to diverse uses, the most usages

were in packaging and shopping. According to statistic from UNEP (2018), in 2011, one million plastic bags were consumed every minute worldwide.

Plastic bags are synthetic, non-biodegradable thin and flexible film made from polyethylene, a product of petroleum, which is a non-renewable natural resource. UNEP (2018) states that polyethylene, the most commonly used plastic was created by accident in 1933 at a chemical plant in Northwich, England. Plastic bags which are made from polyethylene was introduced into public use in 1970's and gained an increasing popularity amongst consumers and retailers (Jalil & Mian, 2011; Moharam, & Maqtari, 2014). From inception, plastic bags which seemed the best option, at the time, have been causing environmental problems, starting from their production to their disposal. This appears not farfetched for the casual observer watching the ubiquitous windblown, ill-disposed plastic bags found all over the city of Awka, Anambra State. As reported by BBC News (2009, May 9); Germain (2005); Clapp (2008); Rayne (2008); Chitombe (2014) and UNEP (2018) a number of regulatory instruments have been used worldwide to reduce the plastic bag problem, ranging from traditional command and control approaches such as total and partial bans, imposition of taxes or levies and marketing of alternative bags. Despite the varying measures to encourage the use of alternatives, the preference for plastic bags has remained high. The question then arises that with the obvious effects of plastic bags on the environment, how willing are the residents of Awka, Anambra State to swiftly accept and utilize alternative bags? Based, therefore, on the premise that residents of a community have a role to play in stemming plastic bag pollution, this study sought to examine the willingness of residents in Awka to accept alternatives to plastic bags. This is with the view to proffering measures for their sustainable use.

LITERATURE REVIEW

Conceptual Framework: Waste Management Hierarchy

The waste management hierarchy is a concept that promotes waste reduction/prevention ahead of recycling and disposal. The concept advocates for minimisation, reuse, and energy recovery as well. The waste management hierarchy is used as an over-riding principle with respect to waste management strategy and policy development. This hierarchy is widely accepted and used at an international level. Plastic bags which are ever present in the environment due to their wholesome embrace and constant use by the public, has caused devastating effects. In order to stem plastic bag pollution and its accruing effects, the practical implementation of waste management hierarchy, therefore, becomes a necessity. This is illustrated in Figure 1.

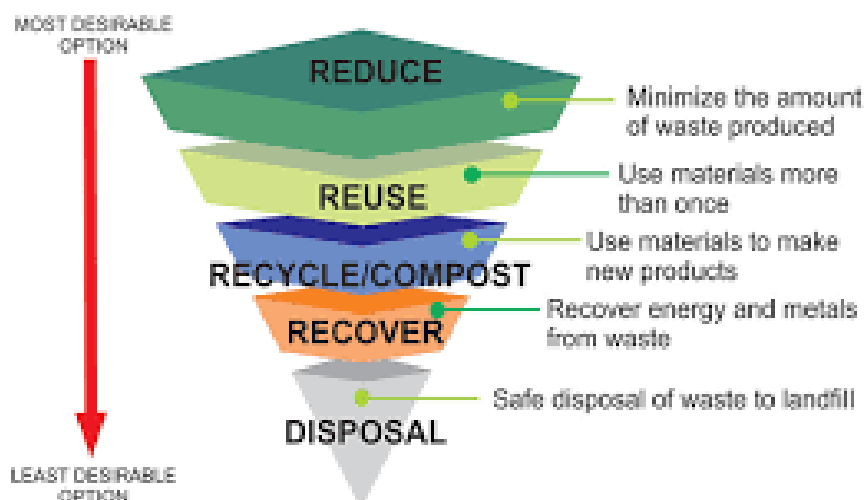


Figure 1: Waste Management Hierarchy

Source: (Sharif, Nagalakshmi, Reddy, Vasanth, & Uma, 2017)

Review of Related Literature

Duru, Ikpeama, and Ibekwe (2019) while reviewing consumption of plastics, its waste generation, collection, and treatment in Nigeria and a few selected countries stated that the combined properties of low cost, lightweight, and resistance to chemicals and corrosion has increased the use of plastic materials for packaging and storage purposes in preference to other materials. Consequently, there is a continued increase in their proportion in domestic solid wastes worldwide as well as the concern of their impacts on the environment. Bello (2017) examined the possible application of solutions applied in other countries to remediate the effects of plastic bag pollution in Lagos State, Nigeria. He revealed that the Use of plastic bags has increased massively over the past few decades; this can be attributed to preference of plastic bags over others. Widespread production and use of plastic bags cause environmental pollution, constitute danger to public health, and contribute to depletion of natural resources.

In a bid to tackle plastic problems 187 studies reviewed by Heidbreder, Bablok, Drews, and Menzel, (2019) showed that people much appreciated and routinely used plastics, despite a pronounced awareness of the associated problems. In January 2009, the Government of Delhi introduced a wide-ranging ban on the use of plastic bags in market places. Research results from Kanupriya and Rohini (2011) showed a dilution in the efficacy of the ban within a year. About 94% of the consumers continued to use plastic bags in blatant violation of rules.

Advantages and Convenience of Use

Plastic bags are convenient for carrying goods. These bags are very popular with both retailers and consumers, because they are very cheap, strong, lightweight, functional, and as a hygienic means of carrying food and other goods. Plastic bags are also waterproof. As such, contents are protected from damage by liquid substances such as water or rain.

Environmental Impacts of Plastic bags

In a number of countries (including African countries), plastic bag pollution is causing severe environmental and health damage that manifests itself in a number of ways (Rayne, 2008). These damages range from mild to severe such as distortion of environmental beauty, clogging of drainage which leads to flooding in several cases, extermination of different forms of terrestrial and aquatic life, etc. In 2019 a pregnant dead whale which washed up in a tourist spot in Italy had 22kg of Plastic in its stomach. In an earlier report in 2018 in Philippines a dead whale was discovered to have 80pounds (36kg) of plastic in its stomach. According to UNEP (2018) Charles Moore discovered the great pacific garbage patch, the largest of the several gyres in the world's oceans where immense amount of plastic waste have accumulated, threatening marine life. Plastic bags are notorious for killing sea turtles which mistakenly think they are Jellyfish and eat them. Plastic bags do not only impact negatively on the marine environment but on the terrestrial environment as well.

Figure 2 and Figure 3 show the presence of plastic bags in Ifite Awka, Anambra State, Nigeria. Open dumping of solid waste which consist largely of single use plastic bags, are easily blown by wind or scattered by scavenging animals, this process helps in distorting aesthetics and spreading the waste into areas where it is not wanted. Chitotombe (2014) citing Anthony (2003) states that light weight plastic bags can be carried off by wind even from rubbish bins and landfills leading to accumulation of plastic bag wastes causing environmental pollution. This is also supported by a similar assertion from Rayne (2008), which averred that since most landfills are not routinely covered with soil in Africa, the bags are easily transported around the countryside where wildlife and livestock consume the materials. Numerous cases of animal injury and death as a result of this practice have been reported. According to EMA Newsletter (2011) and CUA (2007) as cited by Chitotombe (2014), thin plastics can be ingested by domestic animals and wildlife becoming a choking hazard or even more a threat from mistaken ingestion right up to the food chain. To further exacerbate the problems associated with plastic bag usage, its synthetic nature ensures that takes centuries or millennia to biodegrade, irrespective of their end-use or disposal location.



Figure 2: A waste dump located in Ifite-Awka, Anambra State, Nigeria.

Source: (Nkwocha, Nwabudike, Iheukwumere, Oluyori, & Umeh, 2019)



Figure 3: Open waste dump consisting of mostly plastic bags located in Ifite-Awka, Anambra State.

Source: (Nkwocha, et al, 2019)

The impact of plastic bags on the environment can be depicted using a theorized IPPAT formula put forward by the authors as: $I = f(P : P : A : T)$

Where I = Impact; P = Production rate of plastic bags and production of alternatives; P = Population of consumers and rate of consumption; A = Attitude (in terms of reuse, recycling and disposal); T = Technology (in terms of adequate structures for efficient waste collection, safe disposal and recycling technology)

The extent of impact (I) is determined by the combined function of production rate of plastic bags and alternatives (P); Population of consumers which also includes the rate at which it is consumed (P) (Madu (2001) agrees that population is a key element in environmental damage. Madu explained the population factor using formula from Paul and Ann Ehrlich (1986), and Southwick (1996)); Attitude of consumers and waste managers, and importantly technological structures. This is to say that environmental impact of plastic bag waste could exacerbate with increased production of plastic bags and less production of alternatives. Population of consumers of the product (P) will also play a key role in determining the impact of plastic bag waste on the environment especially in countries and cities where poor attitude to plastic bag reuse and disposal exist as well as inadequate technological structures for collection, recycling, and other forms of managing plastic waste (See Figure 4).

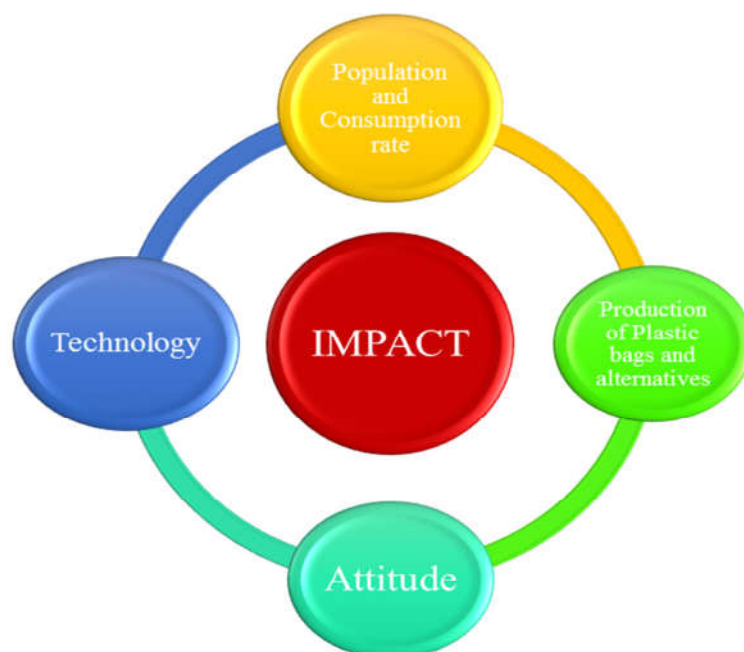


Figure 4: The IPPAT Concept

Ban on Plastic Bags in Some Countries and Cities

The African countries of Eritrea, Zanzibar, and Somaliland have banned plastic bags, as have China, Bangladesh (the first country in the World to implement a ban on thin plastic bags), Taiwan, Thailand, Papua New Guinea, Nepal, Philippines, and several states in India (BBC News, 2003, May 9; Germain, 2005; UNEP, 2005; CBC News, 2007, March 28; Clapp, 2008; Rayne, 2008; UNEP 2018). Minimum thickness rules (*i.e.* a partial ban) exist in South Africa (which also applied a tax to the thicker non-banned bags), Rwanda, Uganda, Kenya, and Zimbabwe. Bans are being considered in Ethiopia, Ghana, Lesotho, and Tanzania in an attempt to reduce the use of the most-disposable thin bags (UNEP, 2005; Cawthorne, 2007; Rayne, 2008; Chitotombe, 2014).

In Nigeria, various State Environmental Protection Authorities (EPAs)/Waste Management Agencies have been faced with the daunting task of managing plastic waste and their efforts have resulted in abysmal failure. The Taraba State Government has placed a ban on plastic bags usage, making it the first State in Nigeria to do so. Though this move is yet to receive legal backing from the State Assembly, the ban ushered in the introduction of paper bags (Odunsi, 2019; Piak, 2019).

Alternatives to Plastic Bags

Though not widely known, there are many environment-friendly alternatives to plastic bags which are easily biodegraded. Examples of such alternatives are: Jute bags, Paper bags, Biodegradable plastic bags, and Reusable bags.

Jute Bags

Jute bags are recommended as an environment friendly alternative to plastic bags because the bags are made from biodegradable material which comes from a plant fibre called jute, mostly consisting of cellulose, which is also eco-friendly and has no harmful effects on the environment (Jalil & Mian, 2011).

Paper Bags

Paper bags have been in existence for a long time, even before the emergence of plastic bags. In fact, plastic bags came to rapidly replace paper bags. The weaknesses of paper bags easily paved way for the dominance of plastic bags. Paper bags are not as strong as plastic bags; they perform poorly in wet seasons and wet environments; they are expensive, and weigh more. According to Wong (2011), a report from the Government of Australia concluded that if a person used an average of ten bags per week, 22.5 kg of paper would be used and in contrast only 3.12 kg of polyethylene would be used. This same study also stated that the manufacture of paper bags consumes more water and generates more water borne wastes. However, paper bags are an alternative because it can be fully recycled and composted. The paper from paper bags can be recycled up to six times and the recycled paper can be used to make a whole host of paper products (Wong, 2011). The environment friendly nature of paper bags and the fact that recycling it consumes less energy is making paper bag a viable option. Other alternatives to plastic bags are included in Table 1.

Table 1: Alternatives to Plastic bags

Alternatives	Source	Durability	Length of Biodegradation	Recyclability
Paper bags	Tree plants		2 months	Recyclable
Jute bags	Jute plant			
Ecosilk	Parachute Silk	4-5 years		Recyclable
Bio-Bag	Starch-based polymer and polyesters from vegetable oil, organic waste		45 days without enhancing chemicals	
Thermoplastic Starch	Corn starch			
Aliphatic polyester	Starch		8weeks	
Organic bags (Tote bags)	Cotton, Hemp		5-6 months	Recyclable
Woollen bags	Wool		6-14 months	

There are many environment friendly alternatives to plastic bags. However, there are many types of degradable and biodegradable plastic bag alternatives, but not all are without environmental impact, in which case the same can be said about reusable alternatives to plastic bags. As a result of these perceptions, many alternatives to plastic bags suggested have equal if not more damaging environmental impacts than plastic bags. Therefore, the alternatives to plastic bags have to be assessed for environmental and social impacts across their potential life cycles, or a life cycle analysis before they can be recommended (Jalil & Mian, 2011).

MATERIALS AND METHOD

Study Area

Anambra State is located in the South-East geo-political zone of Nigeria. Awka being one of the urban centres in the State also serves as the administrative hub and seat of power in the State. Awka is geographically located between latitudes $6^{\circ}06' N$ and $6^{\circ}15' N$ and longitudes $7^{\circ}05' E$ and $7^{\circ}15' E$. The population of Awka was stated as 189, 654 thousand (96, 902 males and 92, 752 females) in the National Population Census of 2006.

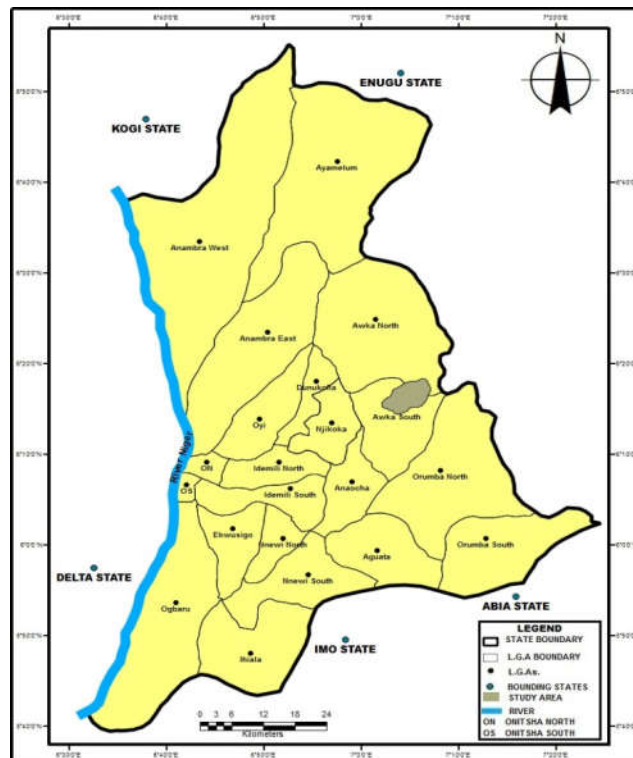


Figure 5: Map of Anambra State showing the study area
Source: (Awka Town Planning Authority, 2017)

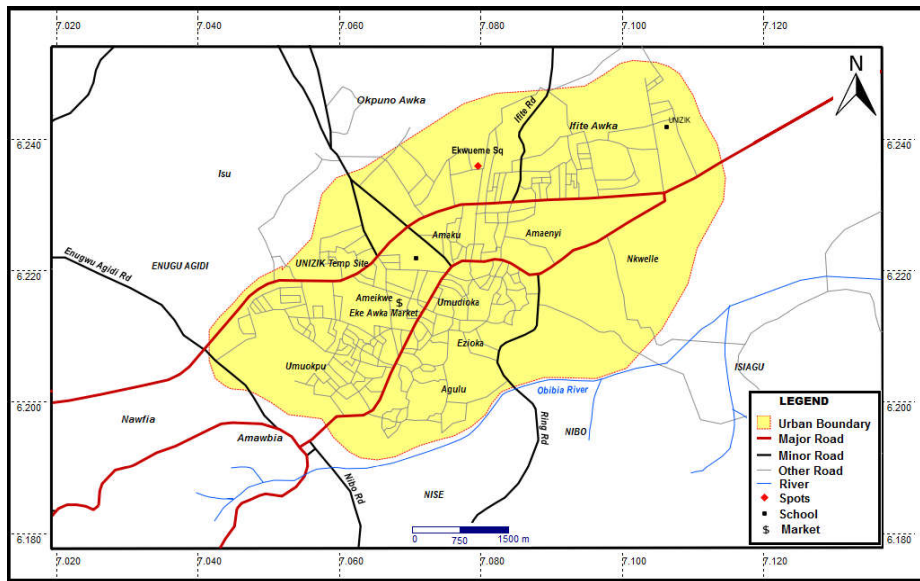


Figure 6: Awka Metropolis

Source: (Awka Town Planning Authority, 2017)

Data Collection and Analysis

A survey method of research design was adopted for the study. Primary data was collected through the administration of questionnaires to 200 respondents within the city of Awka. These were chosen purposively to obtain data from persons most acquainted with the phenomenon they were being asked to evaluate. The quantitative analysis involved descriptive analysis such as mean and percentage. The results are graphically presented in charts and graphs.

RESULTS AND DISCUSSION

i. Demand for Plastic Bag and Reaction when not provided

The result from the analysis of data on these items showed that 82.5 percent of the respondents always demanded for plastic bags when patronising a grocery store. 70 percent indicated that they get upset when plastic bags are not available or provided (Figure 7).

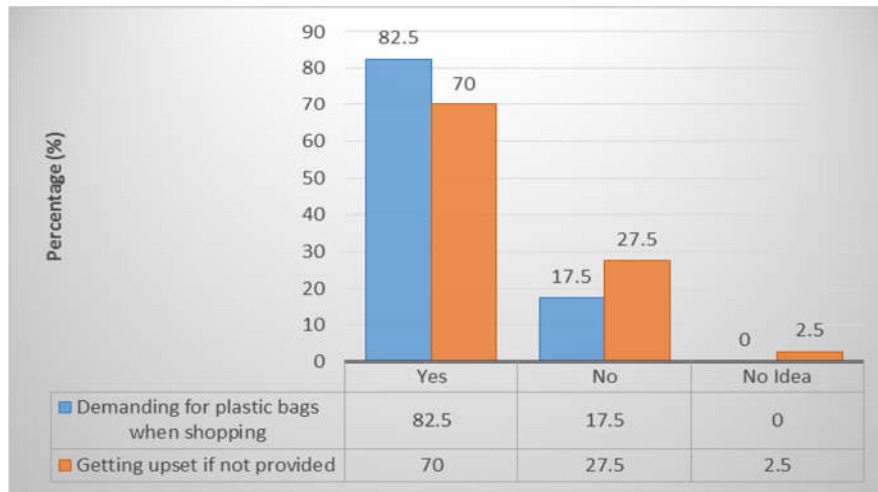


Figure 7: Response for demand for plastic bag and reaction when not provided

ii. Preference and Reuse of Plastic Bags

Individual preference and reuse of plastic bags was assessed. The results showed that 60 percent preferred plastic bags to alternatives such as paper and woollen bags; 62.5 percent constantly reuse their plastic bags while 35 percent throw their plastic bags after one time use; 4.1 percent indicated that they reuse large plastic bags as refuse bins. The study also discovered that 55 percent of the respondents do not subscribe to reduction in the usage of plastic bags as against 45 percent of respondents who would want a reduction in the use of plastic bags (see figure 8). This result is contrary to Camann, Kirk Dragsbaek, Krol, Sandgren, and Song (2010) who reported that 91% of the Worcester public believed that there are environmental problems associated with polyethylene bags and were willing to use alternatives. The much depicted preference for plastic bags is not unconnected with its ease of use, cheapness, and moisture proof nature as averred by Camann, et al (2010); Wong, (2011); Saidan, Ansour, and Saidan (2017).

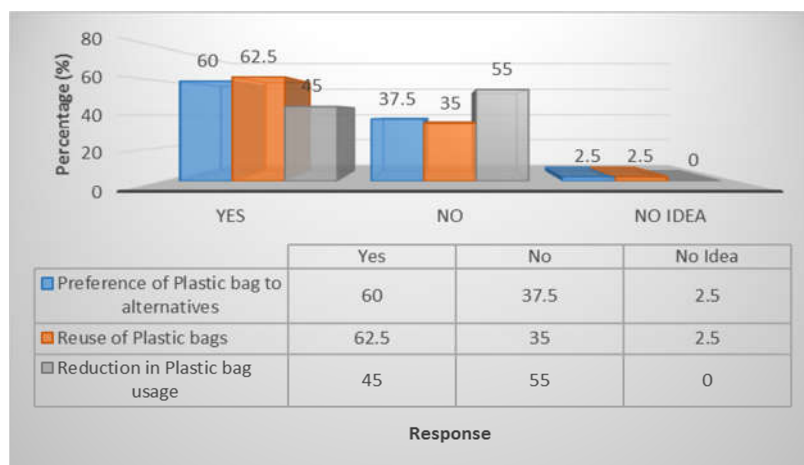


Figure 8: Response on preference for plastic bags and reuse

iii. Knowledge of Environmental Impact of Plastic Bags

The results of analysis revealed that 65 percent of the respondents are aware of effects of plastic bags on the environment, following which 85 percent recommended innovative research for production of high quality degradable plastic bags. 85 percent indicated that they feel bothered when they see plastic bags litter the environment. This is shown in figure 9.

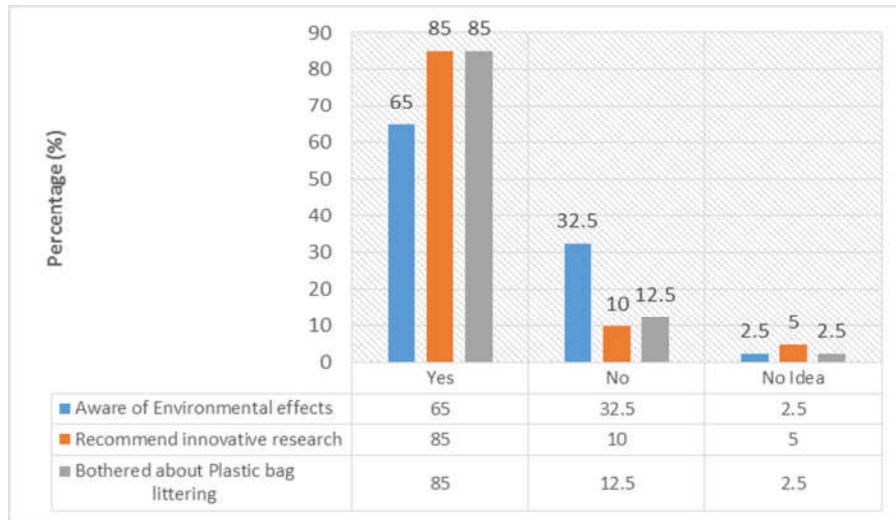


Figure 9: Knowledge of environmental impact of plastic bags

iv. Ban on use of Plastic Bags

Respondents’ responses on banning plastic bags showed that 85 percent want plastic bags to be totally banned, while 62.5percent want levy imposed on plastic bag use instead of a total ban. 15 and 32.5 percent respectively opted that plastic bags should not be banned and no levy imposed on plastic bag use (figure 10). Due to acute negative effects of plastic bags on the ground and on agriculture, Jalil and Mian, (2011) stated that plastic bags should be banned worldwide and their alternatives which are biodegradable should be introduced in order to resolve these obnoxious and toxic problems. The use of plastic bag levy is important as it is a mechanism for changing the consumer behaviour. This is why it has to be coupled with educational and awareness campaigns (Safitri, Ahamad, and Omar 2013; Saidan, et al 2017).

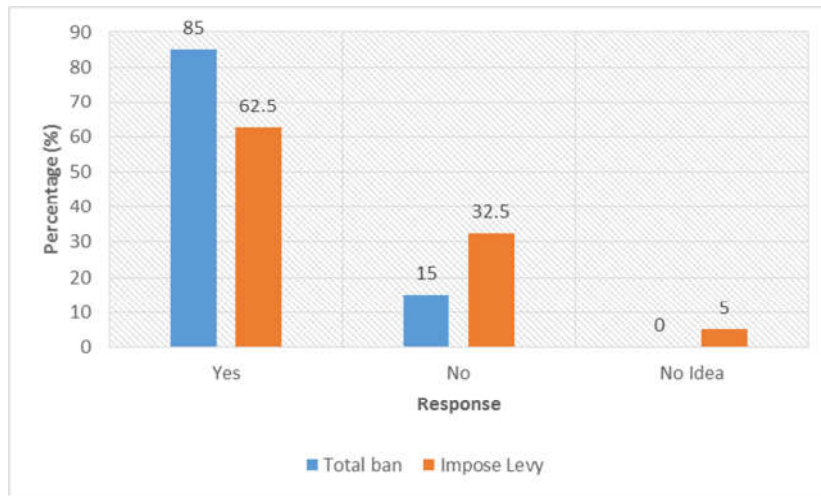


Figure 10: Response for ban on use of plastic bags

v. Knowledge of Recycling

The research revealed that 85 percent of the respondents know about recycling and 90 percent of these encouraged recycling of plastic bags (Figure 11).

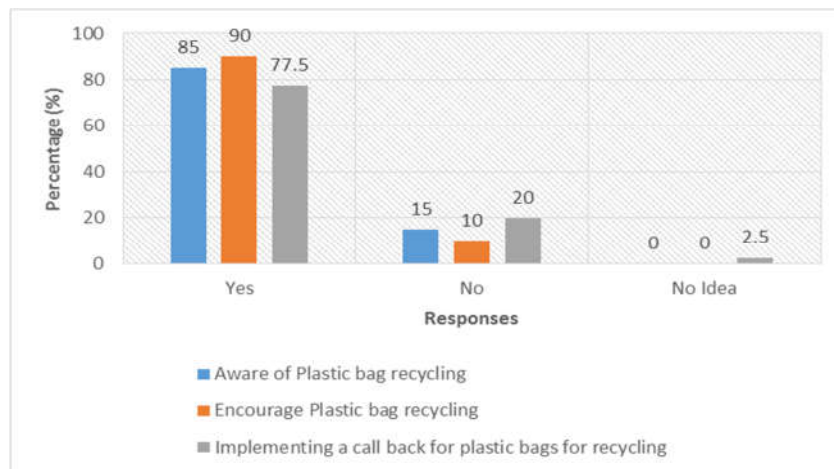


Figure 11: Response on knowledge of Recycling

vi. Existence of Recycling Plants

From the research results, 72.5 percent of the respondents stated that no plastic recycling industry existed in the study area. However, 15 percent stated that there was informal collection of plastics (excluding plastic bags) which were sent to recycling industries in Onitsha, a commercial town of about 40 minutes' drive from Awka. 60 percent of these stated that the recycling companies did not belong to the government.

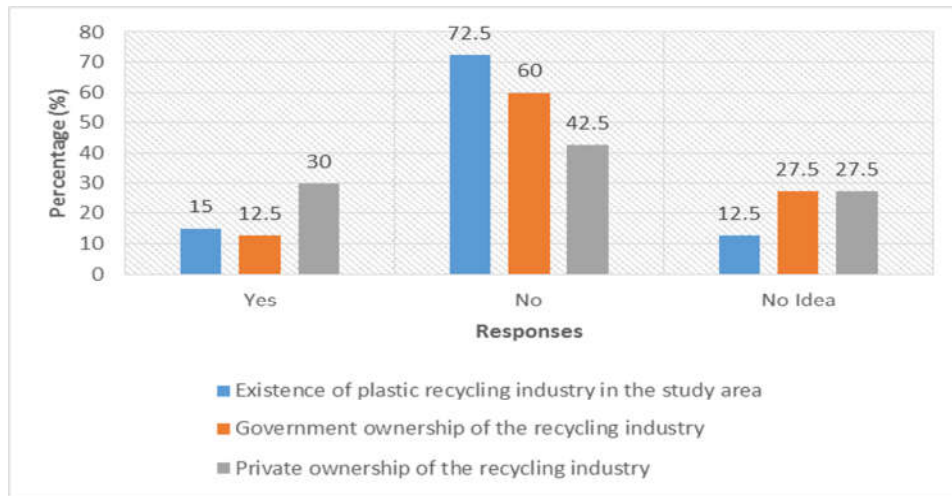


Figure 12: Response on awareness of an existing recycling industry in the study area

vii. Usage of Plastic Bags

The study showed that 60 percent of the respondents made use of between one and three plastic bags on a daily basis. 25 percent indicated that they don't know their average number of plastic bags used per day. 7 percent and 8 percent make use of an average of four to six bags and above six bags respectively. An average number of 3 bags per day gives a total of 21bags in 7days and about 90 bags in one month. This result corroborates the position of Wong (2011) who estimated 1095 plastic bags each year person. A breakdown of 1095 by the 12 months of the year gives an average of 91plastic bags per month.

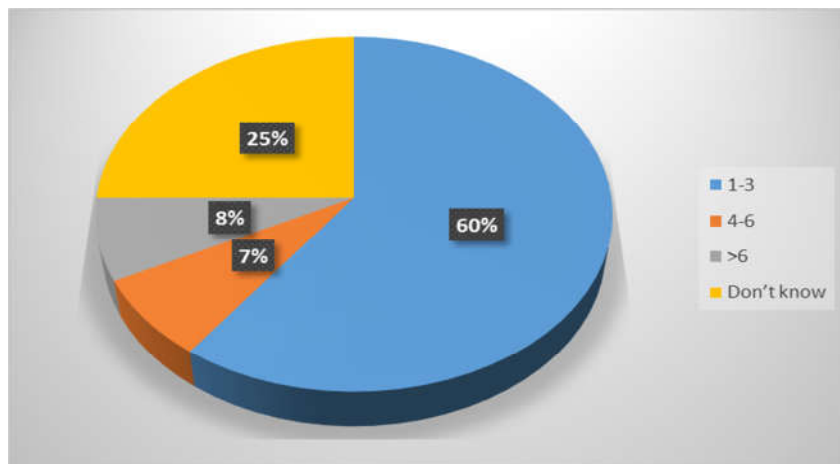


Figure 13: Response for average daily usage of plastic bag per individual

viii. Suggestions on Plastic Bag Use

The respondents gave their suggestions on plastic bag usage. Majority (40%) of the respondents suggested that plastic bags should be recycled/ reused in order to reduce pollution and heaps of plastic bag waste. 20 percent opted for use of alternative bags; 11 percent recommended that plastic bags should be properly disposed of, after use. While another 11 percent voted that plastic

bags should not be banned, 9 percent of the respondents want innovative research to develop high quality biodegradable plastic bags. Another 9 percent suggested minimisation/reduction. Contrary to the low recommendation for reduction and high recommendation for recycling and reuse, Plastic Waste Solutions (2012) labelled reduction as the most important of the three R's in waste management. Reduction is the first step in solid waste management, followed by reuse and recycling. Because Reduction happens prior to the initial point of consumption, reduction is the most effective waste management technique.

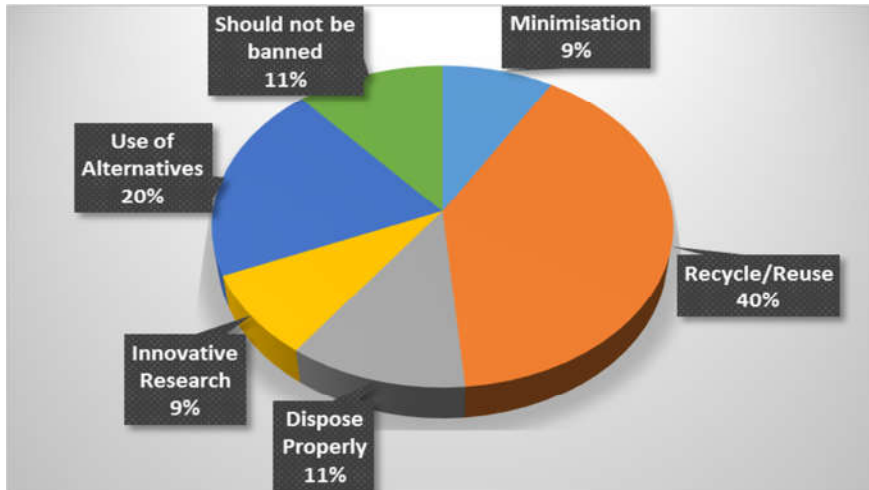


Figure 14: Response for suggestions on Plastic bag use

CONCLUSION AND RECOMMENDATIONS

Notwithstanding its environmental impact, the widespread presence of plastic bags coupled with its cheapness, ease of use, wide acceptance, will likely attract a wide outcry and protest in the event of the placing of a ban. However, public enlightenment, campaigns and use of incentives will raise consciousness on use of alternative bags. Reduction on plastic bags usage and inventing alternatives are the most welcome move than imposing an immediate outright ban on plastic bags which enjoys much preference by consumers. Imposing levy will encourage reuse/long-term use of plastic bags before disposal as against the initial practice of one-time use and dispose system.

Following the waste management hierarchy and the earlier stated IPPAT formula, to reduce impact (I) of plastic bags on the environment, there should be reduced (P) production of plastic bags and increased production of alternative bags. Enlightenment campaigns and incentives should be applied as they will aid in changing the attitude (A) of consumers by encouraging the use of alternatives and reuse of plastic bags. The outcome of a changed attitude will be visible in the reduced (P) population of consumers and rate of consumption. It is also necessary that adequate technology (T) is put in place for proper collection, recycling, waste to energy program or disposal of spent bags.

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