

## SOCIO-ECONOMIC IMPACTS OF PLASTIC WASTE RECYCLING IN KATSINA STATE

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### ABSTRACT

This paper investigates the socio-economic impact of plastic waste recycling in Katsina State. Primary data have been collected using validated structured questionnaires and interview techniques. The seventy two respondents have been selected using random sampling method. Descriptive analysis, Percentages and Chi-Square tests have been applied. The paper found that plastic waste scavengers make a meager income from collection and sale of plastic, largely from event centers, streets, dustbins and drainages, which hardly cater for their daily needs, considering the unprecedented inflation rate and upward review of VAT in Nigeria, but to some extent, plastic waste business helped the poorest people in getting petite food on their table. The paper also found that plastic waste dealers benefit more from plastic recycling than the scavengers, while the plastic manufacturing companies are the best beneficiaries, even though they face lingering challenges ranging from poor electricity supply and high taxes. The Chi-Square result also revealed that plastic waste recycling helps in job creation and poverty reduction in Katsina State. The paper recommends supply of constant electricity, reduction of tax on plastic businesses and manufacturing, provision of financial support to both dealers and manufacturers to ensure smooth operation of plastic business in the State.

**Keywords:** Socio-Economic, Impact, Plastic Waste, Recycling

### 1. INTRODUCTION

Rapid population growth and the identified effects of climate change on human survival triggered aggregate demand for virtually all categories of goods and services in Nigeria and beyond, which in turn escalates excessive pressure on the raw materials use in most production activities. This development necessitates business managers and entrepreneurs to raise concern and think out of the box for a viable and certainly sustainable option. Capacity building and idea cross fertilization has been a dominant alternative embraced, which brought the world researchers together and yielded a universal solution. Recycling is the idea that gained momentum and received attention as the best and sustainable universal solution to lingering challenges of raw material shortage and environmental degradation. Virtually all categories of inorganic waste products are now recycled, yielding unprecedented benefits to the economy and the environment. The idea creates job opportunities, wealth and reduced environmental pollution.

Plastic wastes are now being turned to wealth through recycling and the activity is part of our daily life as a result of which the polymer is produced at a massive scale worldwide. On an average, production of plastic globally crosses 150 Million tons per year. All kinds of disposed plastic waste such as wrapping materials, shopping and garbage bags, fluid containers, clothing, toys, household and industrial products, and building materials are now being scavenged and recycling through a chain of indispensable stages. Recycling is a viable alternative in getting back the lost value of some polymers. As petroleum prices increase, it is becoming more financially viable to recycle polymers rather than produce them from raw materials. The recyclables plastic waste can be collected from individual homes or from collection points such as tips, schools and supermarkets. After transport to the recycling plant, plastics are sorted and arranged for processing. The bags of recycled plastic are taken to factories where they are crushed and melted and made into new products. With more refined processes and technology available now, plastic waste recycling industry has changed holistically. Those who scavenge the waste for recycling are not the people processing it. They only scavenge, sell to dealers who in most cases crush, wash and dry them before selling to plastic manufacturing companies. These processes add more value to plastic waste.

Nigeria being a highly populated country produced approximately 32,000,000 tons of municipal solid waste annually. About 13% of the produced waste is plastic. The scavenging and recycling of plastic waste is taking place in all states of the federation. With high rate of unemployment in the country, youth and in some cases women are passionately embracing plastic scavenging and sale to earn income and cater for their daily needs. Unfortunately, the activity is not being regulated, even though it is not as threatening as scrap metal scavenging. People are not complaining of missing their useable plastic items. Demand for disposed plastic waste in Nigeria is persistently increasing nowadays perhaps due to rapid increase in the country's population. Though, Nigeria experiences eye-popping population growth, with no

end in sight. In 1963, its population reached 56 million. By 2011 it had grown to 167 million, and in 2013 the population exceeds 171 million and 216 million in 2023. Most projections indicate Nigeria will surpass the USA in population by mid-century 2050, at 440 vs 400 million. And, by 2100 its population is predicted to have reached a staggering 914 million, overtaking a shrinking Chinese population (This Day Live 2011).

However, the traditional theory of demand postulates that Population is a major factor affecting demand for goods and services (Abdullahi, 2012). This justifies the high rate of demand for plastic waste in Nigeria. Plastic waste are demanded in production of plastic bottles, takeaways, plates, spoons, containers, overhead tanks and electronics. To ensure sanity in the activity, there need to establish a plastic waste collection agency to promote the idea of recycling and enforce laws that will ensure sanity, fairness, growth and development of plastic industries in Nigeria.

In Katsina State however, more people are embracing plastic scavenging due to increasing unemployment arising from the frequent banditry while rendered hundreds of thousands of people homeless. Plastic scavenging in many parts of the state is an alternative to begging by many displaced families. These category of people trooped to places where events and commercial activities take place, with the hope of packing all the thrown plastic bottles used. After huge collection, the bottles are taken and sold out to major dealers who wash, sort and crush them for onward sale to the recycling companies. Scavenging and recycling of plastic surge due to unimaginable benefits to the economy and the society at large. Young men and growing children of school age are passionately attracted in the activity because of the income being earned due to increasing demand of the plastic waste by companies within and outside the state. Many people in the state are happy with the development because of the economic gains they derive. On the other hand some people underline the negative side of the scavenging and the recycling of the waste having observed a number of economic disadvantages and social decadence it caused. This paper however, investigated the impact of plastic waste scavenging in Katsina State. To achieve this objective, Descriptive analysis, percentages and Chi-Square test were applied.

### Plastic Waste

Plastic waste is define as ant discarded plastic after its utility is over. It is a fact that plastic waste never degrades, and remain on landscape for several years. Mostly, plastic waste is recyclable but recycled products are sometimes harmful to health and environment as they contains additives and colors (SAMADHAN 2024).

### Types of Plastic Waste

The common types of plastic waste are PET bottles, beverage bottles, bottled water, and soft drink bottles. Pure water sachets are another kind of plastic. The packaging wraps used in packaging bottled water plastics called 'Shrink Wrap' are another Low-Density Polyethylene (LDP), High-Density Polyethylene (HDP), plastic bowls, paint bowls, broken plastic chairs and crates are another category of plastic waste. In the plastic spectrum, many people concentrate just on PET. There is polypropylene. There is polyethylene. There is polystyrene. People focus on their area of interest (SAMADHAN 2024).

### Recycling

Recycling is the process of converting waste materials into new materials and objects. It is an alternative to "conventional" waste disposal that saves material and help lower greenhouse gas emissions. Recycling prevents the waste of potentially useful materials and reduce the consumption of fresh raw materials, thereby reducing energy usage, air pollution and water pollution. Recycling is a key component of modern waste reduction and is the third component of the "Reduce, Reuse, and Recycle" hierarchy. Recyclable materials include many kinds of glass, paper, cardboard, metal, plastic, tires, textiles, batteries, and electronics. In the strictest sense, recycling of a material would produce a fresh supply of the same material - for example, used office paper would be converted into new office paper or used polystyrene foam into new polystyrene. However, this is often difficult or too expensive (compared with producing the same product from raw materials or other sources), so "recycling" of many products or materials involve their re-use in producing different instead. It helps significantly in reducing the use of virgin materials and energy, thus also reduces of carbon dioxide emissions.

### Study Area

Katsina State occupies 24,192 square kilometres. Katsina State is bounded in the East by Kano and Jigawa States, in the West by Zamfara State, in the South by Kaduna State and in the North by the Niger Republic. The indigenes are Hausa and Fulani.

It is one of the few states in the country where crops are grown all the year round. Apart from farming during the rainy season, dry season farming is done along river banks and along the numerous dams built by the State and Federal Governments.

Due to its vast arable land, it is currently playing a leading role in commodity/food production namely: cotton, groundnut, millet, guinea corn, maize, rice, wheat and vegetables. Government's encouragement and general incentives

to both large and small scale as well as peasant farming over the year, has been quite commendable. Katsina State was carved out of Kaduna State on September 23, 1987. (Wikipedia, 2018).

### Hypothesis:

**H<sub>1</sub>:** To investigate the impact of plastic waste recycling on job creation in Katsina State.

**H<sub>2</sub>:** To investigate the impact of plastic waste recycling on poverty reduction in Katsina State.

### Diffusion of Innovations theory

The theory was adopted for the study. The theory was first introduced by Everett Rogers in his book, "Diffusion of Innovations" in 1962. The theory defines the process by which new ideas, products, and technology spreads through a social system, leading to behavioral change. According to Roger's theory, the diffusion process involves five stages: knowledge, persuasion, decision, implementation, and confirmation. The first stage involves individuals being exposed to innovation, leading to awareness and acquisition of knowledge of the product or idea. In the second stage, individuals develop a positive or negative attitude towards innovation, based on its perceived benefits and disadvantages. The third stage involves individuals making a decision to adopt or reject innovation. The fourth stage is when individuals put the innovation into practice, and the fifth stage involves individuals assessing the benefits and disadvantages of innovation after implementation (Rogers, 1962).

## 2. LITERATURE REVIEW

Plastic waste management remains a major phenomenon and one of the most intractable problems facing developing nations in Africa, Asia and Latin America. Recycling and scavenging therefore is a ubiquitous occurrence throughout the developing world. As a result of the above, plastic wastes and scavenging have generated considerable research interests Adeyemi, et al, (2001). Many researchers have worked on various aspects of wastes scavenging Fulani and Abumare, (1986) waste characteristics Adedibu, (1983), (1985) and (1986); disposal problems Odutola, (1986), Adedibu, (1986); factors affecting waste generation Onidundu-Amao, (1989), Ibitoye, (1995), recently waste scavenging for poverty alleviation Magaji and Dakye, (2011), and quality of work life of waste scavengers Engler, et al., (2009).

Literatures are replete with the picture of recycling and scavenging are occupations that provides livelihood for the poor in many societies in the world. Recycling therefore, is an important survival strategy in which the lower class individuals cope with scarcity. Adegoke (1991) defines wastes as substances and materials which are disposed or are required to be disposed of according to the provision of national law. While Ajibade (2004) considers wastes as man's unwanted materials that need to be discarded, Magaji (2005) opines that wastes are materials that no longer have value to the person who is responsible for it, and is not intended to be discarded through a pipe. It does not normally include human excreta. He further says that they are generated by domestic, commercial, industrial, healthcare, agricultural and mineral extraction activities and accumulates in streets and public places.

Plastic waste is an important component of municipal solid waste (MSW). In Nigeria, Ohimain, (2013); says it accounts for 18% Olanrewaju and Ilemobade, (2009); 10.8% Ayotamuno and Gabo, (2000) and 3-20% Nabegu, (2010) of the municipal solid waste generated in the South-western Nigeria, Southeast and North-western parts of Nigeria respectively. Through the activities of scavengers, useful materials are often recovered from MSW including plastic waste, wood, metals, etc. Nabegu, (2010). Adebola, (2006), Nzeadibe, (2009), Scheinberg, (2012), Manhart, et al. (2011), Medina, (2010) and Umaru, (2010).

However, many countries have seen the negative effects of plastic and cardboard waste in landfills and incinerators, so governments are taking actions to promote recycling. They are providing incentives to businesses to reuse materials instead of manufacturing new ones. Governments are using tax exemptions, sanctions, and "community awareness campaigns" to entice businesses and consumers to recycle more (Murakimi et al 99). Countries in Europe have seen success with their focus on environmentalism, as "27 EU member states reported the recycling of 48 million tons of packaging waste" in 2009 (Pericot et al. 1932).

### Plastic Waste Recycling

Over the past 60 years, plastic production has continuously increased. This is not surprisingly due to inexpensive price of plastic materials, easy manufacturing, and adjustable properties as lightweight, flexibility, durability. The presence of polymers in plastic products varies from less than 20 percent to 100 percent, where the remainder is defined by additives are added to the polymers in order to provoke chemical reactions that would impact the properties of these polymers. Properties such as, stiffness, strength, general durability, thermal resistance, impact resistance, resistance to flexure and wear, acoustic isolation, can be obtained by adding any of these three types of additives: Inorganic, organic or organometallic. The most adequate recycling technique depends on several factors related to the plastic waste. Purity

of the polymer, its chemical composition and what additives had previously been added to the polymeric material are all important influential factors (Francis, 2016).

### Process of Plastic Waste Recycling

Before any plastic waste is recycled, it needs to go through five different stages so that it can be further used for making various types of products (SAMADHAN, 2024).

**Sorting:** It is necessary that every item is separated according to its make and type so that it can be processed accordingly in the machine.

**Shredding:** After sorting, the plastic waste is loaded into different conveyer belts that run the waste through the different shredders. These shredders tear up the plastic into small pellets, preparing them for recycling into other products.

**Grinding:** Next step in the waste recycling process is grinding. Grinder is used to remove waste material from the small pellets plastic.

**Dust Cleaning:** After grinding, the plastic waste is cleaned to remove the dust from the poly bags. This process is not required for hard plastic.

**Conveyer Washing:** In this process, the material is washed in clean water for few minutes. • **Drum Washing:** Now the material is washed after conveyer washing. For this a round shape drum is used for washing the material in the plant.

**Dryer:** In this process dryer/ Hydro is used to dry the material came from the washing drum.

**Melting:** This involves melting the washed plastic so that it can be extruded into small pellets, which can be used as a raw material for different types of plastic products.

### Benefits of Plastic Waste Recycling

It paves the way for the establishment of a robust recycling industry, generating a plethora of green jobs. It proves to be a cost-effective alternative to traditional waste management practices. A shift towards a recycling-centric approach not only enhances resource efficiency but also bolsters economic growth (Hopewell and et'al 2009). The recycling of plastic helps save a lot of energy and natural resources. It reduces Environmental Pollution

### Challenges Plastic Waste Recycling

Plastic waste recycling involves a number of difficulties such as, availability of Materials, sourcing clean waste, availability of Space to Scale the Business, inconsistent government Policies, power supply and raising capital to Purchase Assets.

## 3. METHODOLOGY

Primary data was collected from plastic waste scavengers, dealers and the CEOs of plastic manufacturing companies using questionnaire and interview techniques, owing to the nature of the research question. This is because some respondents were found literally sound while others were illiterate. Descriptive analysis in the form of mean, mode, minimum, maximum and percentages were applied. Chi-Square tests was also used to test the hypothesis of the study.

**Table 1:** Economic Impacts of Plastic Waste Recycling to Scavengers in Katsina State

S/N	Variables	Minimum	Maximum	Difference	Average
1	Daily plastic waste collected	2kg	6kg	4kg	3.5kg
2	Daily plastic waste sold	2kg	6kg	4kg	3.5kg
3	Daily Income earned	N600	N1,200	N800	N700
4	Daily Profit	N600	N1,200	N800	N700
Sample Size			50		

**Source:** Author's Computation

From table 1 above, the economic impacts of plastic waste recycling to plastic waste scavengers was analysed using descriptive statistics. The results showed that plastic waste scavengers use to collect and sale a minimum of 2kg of wasted plastic and maximum of 6kg per day. They make a minimum of 600 Naira and Maximum of 1200 Naira daily from the plastic sold out to dealers.

**Table 2:** Economic Impacts of Plastic Waste Recycling to Dealers in Katsina State

S/N	Variables	Minimum	Maximum	Difference	Average
1	Daily plastic waste collected	40kg	120kg	3kg	3.5kg
2	Monthly Plastic waste sold	1200kg	3600kg	2400kg	2400kg



3	Monthly Income earned	N540,000	N1,620,000	N1,080,000	N1,080,000
4	Monthly Profit	N300,000	N900,000	N600,000	N600,000
Sample Size			20		

Source: Author's Computation

From table 2 above, the economic impacts of plastic waste recycling to Plastic waste dealers was analysed using descriptive statistics. The results showed that plastic waste dealers use to buy a minimum of 40kg of wasted plastic and maximum of 120kg per day. They make a minimum of 300, 000 Naira and Maximum of 900, 000 Naira profit on monthly basis from the plastic bough from the scavengers and average profit of 600,000 Naira monthly.

**Table 3:** Economic Impacts of Plastic Waste Recycling to Manufacturing Companies in Katsina State

S/N	Variables	Minimum	Maximum	Difference	Average
1	Monthly plastic waste bought	60,000kg	180, 000kg	120, 000	120, 000kg
2	Monthly plastic waste used	52, 000kg	156, 000kg	104, 000kg	104, 000kg
3	Monthly Income earned	N23,400,000	70,512,000	N47,112,000	N46,956,000
4	Monthly Profit	7,400,000	21,200,000	13,800,000	14,300,000
Sample Size			2		

Source: Author's Computation

From table 3 above, the economic impacts of plastic waste recycling to Plastic waste plastic manufacturing companies was analysed using descriptive statistics. The results showed that plastic waste manufacturing companies use to buy a minimum of 60,000kg of wasted plastic and maximum of 180,000kg per month. They make a minimum of 7. 400, 000 Naira and Maximum of 21, 200, 000 Naira profit on monthly basis from the plastic bough and recycled from dealers and average profit of 14, 300, 000aira monthly.

**Table 4:** Percentage Analysis of the Socio-Economic impact Plastic Waste Recycling in Katsina State

S/N	Description Question	Strongly Agreed (%)	Agreed (%)	Undecided (%)	Disagree (%)	Strongly Disagree (%)	Total (%)
1	impact of plastic waste recycling on job creation Katsina State	25 (34.72%)	34 (47.22%)	02 (2.78%)	09 (12.50%)	02 (2.78%)	72 100%
2	impact of plastic waste recycling on Poverty Reduction Katsina State	29 (40.28%)	33 (45.83%)	02 (2.78%)	06 (8.33%)	02 (2.78%)	72 100%

Source: Author's Computation

Table 4 presents the Percentage Analysis of the economic impact Plastic Waste Recycling in Katsina State. From the result 34.72% of the respondents strongly agreed that plastic waste recycling has positive impact on job creation, while 47.78% agree on the same question. On the other hand, 40.28% and 45.83% strongly agreed and agree respectively that plastic waste recycling helps on poverty reduction in Katsina State.

### Test of Hypothesis

**Table 5:** H<sub>01</sub>: Plastic Waste Recycling does not Create Job Opportunities in Katsina State

	O	E	O – E	(O-E) 2	<u>(O-E)2 E</u>
	54	72	-18	324	4.5
	32	72	-40	1600	<b>22.22</b>
	69	72	3	9	<b>2.04</b>
Total	155				<b>28.76</b>

X<sup>2</sup> calculated = 28.76

X<sup>2</sup> Tabulated at 5% level of significance = 0.05

d.f = ( r – 1 ) ( c – 1 )

Where r = row total, while c = column total

$$r = 3, c = 2$$

$$df = (3 - 1)(2 - 1)$$

$$df = 2 \times 1 = 2$$

$X^2$  Tabulated at 5% level of significance  $df = 9.49$

The  $X^2$  result in table 5 shows that calculated value 28.76 is greater than the tabulated value 9.49

Therefore, the null hypothesis is rejected that Plastic waste recycling does not create job. The alternative hypothesis is however, accepted that Plastic waste recycling creates job opportunities in Katsina State.

**Table 6:**  $H_{02}$ : Plastic Waste Recycling does not Reduce Poverty in Katsina State

	O	E	O – E	(O-E)	$\frac{(O-E)^2}{E}$
	43	72	29	841	11.68
	38	72	34	1156	16.06
	56	72	16	256	3.56
Total	120				

$$X^2 \text{ calculated} = 31.30$$

$X^2$  Tabulated at 5% level of significance = 0.05

$$d.f = (r - 1)(c - 1)$$

Where r = row total, while c = column total

$$r = 3, c = 2$$

$$df = (3 - 1)(2 - 1)$$

$$df = 2 \times 1 = 2$$

$X^2$  Tabulated at 5% level of significance  $df = 9.49$

The  $X^2$  result in table 6 shows that calculated value 31.30 is greater than the tabulated value 9.49

Therefore, the null hypothesis is rejected that Plastic waste recycling does not reduce poverty. The alternative hypothesis is however, accepted that Plastic waste recycling reduces poverty in Katsina State.

#### 4. DISCUSSION OF THE RESULTS

This paper investigated the socio-economic impact of plastic waste recycling in Katsina State, Nigeria. The results showed that plastic waste scavengers use to collect and sale a minimum of 2kg of wasted plastic and maximum of 6kg per day. They make a minimum of 600 Naira and Maximum of 1200 Naira daily from the plastic sold out to dealers. This amount is too meager to cater for the need of household in the state considering the high inflation rate in Nigeria arising from petroleum subsidy removal upward review of taxes in Nigeria. But to some extent it may help the poorest people to get food that is not nutritionally balanced.

On the other hand, the plastic waste dealers make a minimum of 300, 000 Naira and Maximum of 900, 000 Naira profit on monthly basis from the plastic bough from the scavengers and average profit of 600,000 Naira monthly. This shows that the dealers benefit more from the plastic recycling than the scavengers. The average monthly income they make of 600,000 naira is manageable for a relatively decent life in Katsina State.

The Plastic waste plastic manufacturing companies do make a minimum of 7, 400, 000 Naira and Maximum of 21, 200, 000 Naira profit on monthly basis from the plastic bough and recycled from dealers and average profit of 14, 300, 000 naira monthly. This is very much okay to live decently and comfortably in Nigeria. If more people can key into plastic production from the plastic waste, it will help in reducing poverty in the state and improve the living standard of many poor people as well.

The Percentage Analysis and the Chi-Square results on the economic impact Plastic Waste Recycling in Katsina State indicates that greater percentage of the respondents believes that plastic waste recycling has positive impact on job creation and helps on poverty reduction in Katsina State. This requires stakeholder's intervention to encourage more unemployed youths graduating from tertiary institutions to key into plastic business to earn living

#### 5. CONCLUSION

This paper concludes that plastic waste scavengers make a meager income from the plastic collected from event centers, streets, dustbins and drainages. The income earn is too meager to cater for the need of household in the state considering the high inflation rate in Nigeria, but to some extent it helped the poorest people to get little food on their table. The

paper also concludes that plastic waste dealers benefit more from the plastic recycling than the scavengers considering the higher profit they make from plastic waste business. While the plastic manufacturing companies benefits better than other stakeholders in the business, even though they face a lot of challenges ranging from poor electricity supply and high taxes and charges from regulatory bodies. The paper finally concludes that plastic waste recycling helps in job creation and poverty reduction in Katsina State.

## 6. RECOMMENDATIONS

Since plastic waste recycling has positive impact on job creation and poverty reduction, there is need for government intervention to support the scavengers, dealers and plastic manufacturing companies with financial support to encourage more entrepreneurs to invest in plastic business with a view to creating more job opportunities thereby reducing poverty in Katsina State.

There is a need for creating awareness among citizens in the state to not to throw plastic materials in areas where it may not be easily traced, to simplify collection and reduce environmental pollution and soil degradation in the state.

Provision of technical support and capacity building workshops to all stake holders will help in adding value to plastic production and eventually propel profit maximization, national income and reduce importation of plastic and enhance economic independence.

Effective monitoring and evaluation will help in sanitizing the general operations, detecting and responding to challenges, track growth and development of plastic industry with a view to ensuring socio-economic sustainability and healthy environment.

Provision of electricity is key to propelling growth and wooing more investment to plastic industry. A special consideration to the sector will facilitate achieving this goal. With electricity, more people will be encourage to join the industry, more output can be produced at least cost and more profit can be made from the business.

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