

Theoretical Approaches to Plastic Waste Regulation in Nigeria

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Abstract

This paper aims to provide a broad perspective on the plastic waste management problem globally and examine different theories and approaches to plastic waste management. The objective is to ascertain best practices for sustainable plastic waste management. Recently, managing plastic pollution has become a major international environmental priority due to observed and estimated damage that plastics can cause to the environment, aquatic wildlife and ecosystems (both freshwater and marine). It was found that the world collectively produces more than 400 million tons of plastics every year, of which thirty-six percent is single-use plastic packaging. Their increased use in modern society has increased environmental impacts associated with their production and disposal. It is feared that the growing demand for these resources will facilitate an increase in resource consumption and waste generation, contribute to the deterioration of the natural environment and climate change, and impact future generations. Equally, the environmental cost and incredibly low recycling rates have prompted the argument that plastics should be replaced with alternative materials, which may present fewer environmental challenges or adopt a sustainable means of usage. Large populations, rapid urbanisation, robust consumption, and low waste collection rates, in addition to other challenges, have been identified as reasons for inadequate plastic waste management. An examination of theoretical and practical approaches such as Human Behavioural Change, Extended Producers' Responsibility and Sustainable Development has shown that no single approach can or has sufficiently solved plastic waste problem due to a myriad of reasons. However, the paper concludes that the adoption of mixed approaches will ensure socially, economically and environmentally sustainable plastic waste management.

Keywords

Extended Producer Responsibility, Sustainable Development, Human Behavioural Change, Single-Use Plastics

1. Introduction

In recent years, the management of plastic pollution has become a major international environmental priority. This is due to the observed and estimated damage that plastics, in particular, can cause to the environment, aquatic wildlife and ecosystems (both freshwater and marine) (Beaumont et al., 2019: p. 189; Borrelle et al., 2017: p. 9994; Marazzi et al., 2020; p. 8). Recent research indicates that the world collectively produces more than 400 million tons of plastic every year, of which 36 percent is SUP (single-use plastic) packaging (UNEP, 2018). A 2018 study found that more plastics have been produced in the last 10 years than in the whole of the 20th century, and every piece of plastic ever produced still exists today (Hub, 2018: p. 2). Geyer et al. (2017) and Babayemi et al. (2019) put the figure to the weight of virgin plastic produced across the globe from 1950-2015 to be about 8300 Metric tonnes (Mt), generating approximately 6300 Mt of plastic wastes, of which around nine percent have been recycled, 12 percent have been incinerated, and 79 percent are accumulated in landfills, and a large amount transported by rivers into the oceans (Jambeck et al., 2015: p. 768; Schwarz et al., 2019: p. 92; UNEP, 2021, Plastic waste a ticking time bomb). Notably, the number is expected to quadruple by 2050 (Dowty et al., 1976: p. 696; Schmidt et al., 2017: p. 12246). It is estimated that by 2030, approximately 344 Mt of polymers and plastic will be used in Africa if there are no policy changes to reverse this trend (Babayemi et al., 2019: p. 60; UNEP, 2021, Plastic waste a ticking time bomb).

Undoubtedly, these plastics have deleterious effects on the environment, human health, oceans and the society (UNEP, 2018, Single Use Plastics Report 2018-Single Use Plastics: A Roadmap for Sustainability; Salami, 2018; Nyathi & Togo, 2020: p. 8). They have shown to be the prominent form of garbage, blocking drainage systems and causing floods, clogging water ways, littering streets and sewage banks (Salami, 2018). Animals and livestock often mistake plastic bags for food and often die after ingesting discarded plastic bags. For example, in Gondar city, Ethiopia, plastic bags were found in the stomachs of cows in abattoirs (Ramaswamy & Sharma, 2011: p. 1). It is feared that the growing demand for these resources will facilitate an increase in the resource consumption and waste generation, contribute to the deterioration of the natural environment and climate change, and impact future generations (Ogwo et al., 2013: p. 35). The environmental costs and incredibly low recycling rates have prompted some to argue that plastics should be replaced with alternative materials, such as paper and polypropylene bags which may present fewer environmental challenges, or adopt a sustainable means of usage (Elias & Omojola, 2015: p. 74).

It has also been established that African countries have a high proportion of mismanaged waste plastics and lack state-of-the-art recycling facilities (Jambeck et al., 2018: p. 256; Chitombe, 2014: p. 5; Dikgang et al., 2012: p. 59; Deonath, 2019: p. 210; McLellan, 2014). It is estimated that two billion people have no access to adequate waste collection systems, and in 2010, the total mismanaged

plastic waste globally was estimated at 32 Mt (Jambeck et al., 2015: p. 768). There is, therefore, a need to encourage reusable products in circulation and a sustainable approach to managing plastic waste.

The discussion on managing plastic pollution has heightened at the global level (Nordic Council of Ministers, 2019). Several approaches and theories have been adopted by different countries and at several international conventions aimed at mitigating plastic waste (UNEP, 2019a; Convention on Migratory Species, 2017) Such approaches include activities that reduce waste generation, improve waste management and litter capture, and encourage attitudinal and behavioural change to consumption and waste disposal (Jambeck, 2016; OECD, 2017 Tackling Environmental Problems with the Help of Behavioural Insights,). Recent meetings of the COP to the Basel and the Stockholm Conventions encouraged regional and coordinating centres to work under the Convention on the impact of plastic waste, marine plastic litter, microplastics and measures for prevention and environmentally sound management (UNEP, 2019c, Report on Activities of The Basel and Stockholm Conventions Regional Centres). The Basel Convention led to the development of a guideline for the environmentally sound management of all forms of plastic waste, as well as hazardous e-waste, much of which contains plastic (The Technical Working Group Secretariat of the Basel Convention, 2002; UNEP, 2019b; Stockholm Convention on Persistent Organic Pollutants, 2001).

The first part introduces the paper, while the second part gives a context to the subject matter. It also provides an overview of the sources and typologies of plastics to show why their production, usage and disposal are problematic. The third part critically explores available theories and approaches depicting the constituent dimensions of plastic waste management. Based on this exploration of dimensions, a sustainable approach is proposed. The proposed approach offers a framework which Nigeria and other nations can draw from to tailor their approach to pursuing a sustainable plastic waste management. It further serves as benchmarks for evaluating the extent to which waste management laws and policies promote sustainable waste management.

2. Contextualizing Plastic Waste: Sources and Typologies

Defining Plastic Waste

Plastic is a lightweight, hygienic and resistant material which can be moulded in a variety of ways and utilised in a wide range of applications either for single use or for long term use (Hopewell et al., 2009: p. 2115). Unlike metals, plastics do not rust or corrode. Most plastics do not bio-degrade, but instead photodegrade, meaning that they slowly break down into small fragments known as microplastics (Clapp & Swanston, 2009: p. 3). Often, most of the plastics found littered in the environment are SUPs, which are equally referred to as disposable plastics (Brink et al., 2016). They are affordable and commonly used for plastic packaging and include items intended to be used only once before they are thrown

away or recycled (Brink et al., 2016). These include, among other items, grocery bags, food packaging, bottles, straws, containers, cups and cutlery (UNEP, 2018 Report—Single-Use Plastics: A Roadmap for Sustainability). They are either thermoplastics or thermosets (UNEP, 2018 Report—Single-Use Plastics: A Roadmap for Sustainability). Thermoplastics are a family of plastics that can be melted when heated and hardened when cool; as such, they can be reshaped and frozen repeatedly, while thermosets are a family of plastics that undergo a change when heated (UNEP, 2018, Report—Single-Use Plastics: A Roadmap for Sustainability). This category of plastic cannot be re-melted and reformed (UNEP, 2018, Report—Single-Use Plastics: A Roadmap for Sustainability).

Plastic waste is, therefore, the accumulation of plastic objects (plastic bottles, plastic bags, etc.) in the earth's environment that adversely affects wildlife, wildlife habitat, and humans (Hopewell et al., 2009: p. 2115). It also includes a significant number of plastics that are not recycled and ends up in landfill or, in the developing world, thrown into unregulated dumpsites or littered on the streets (Hopewell et al., 2009: p. 2115). The actual measure of the degree of environmental pollution caused by plastic is not the volume of waste it generates but whether the waste can be disposed of satisfactorily. It is when these latter processes perpetually lag behind that plastic waste becomes an environmental nuisance (Bawa & Mohammed, 2012: p. 24).

The rapid increase in production and consumption leads to a considerable increase in the volume of plastic waste generated from several sources, such as domestic waste, commercial waste, institutional waste and industrial waste of the most diverse categories (Bawa & Mohammed, 2012: p. 24). The average consumer comes into daily contact with all kinds of plastic materials that have been developed specifically to defeat natural decay processes. These plastics tend to persist in the environment as they are improperly disposed of – that is dropped on the ground, thrown out of a car window, heaped onto an already full rubbish bin, or dispersed by the wind (Moore, 2009).

3. Approaches to Plastic Waste Management

The general method for dealing with plastics has, over time, been restricted to landfill disposal, incineration and littering (Adeniran & Shakantu, 2022: p. 779). These methods were not effective or sustainable in managing plastic waste. They often cause environmental damage, pollution and health risks (Adeniran & Shakantu, 2022: p. 779). In recent years, the growing recognition of the impact of plastic waste has heightened the need for more sustainable solutions to address the plastic waste problem, such as improved recycling technologies, waste reduction strategies, and the development of biodegradable or compostable alternatives to convertible plastics.

This research, therefore, investigates the application of plastic waste regulation, reframing the inquiry with insights from sustainable waste management theories. Waste Management Theory (WMT) is based on the hypothesis that the

way a target is described prescribes action upon it, which implies that sustainable waste management depends greatly upon how waste is defined. The understanding that waste causes harm to both humans and the environment is a major consideration for its sustainable management and handling. Also, the proper definition of waste is crucial to constructing a sustainable agenda for waste management (Pongracz, 2002).

According to Pongracz et al. (2004a) the foundation of any sustainable waste management depends on waste prevention or at best, waste minimisation. Waste minimisation is therefore achieved through resource use optimisation and Industrial Ecology (Pongracz et al., 2004b). The idea of Industrial Ecology is that former waste materials, rather than being automatically sent for disposal, should be regarded as raw materials, useful sources of materials and energy (Wang & Aulenbach, 2006). It also involves coordinating design over the life cycle of products and processes and enabling creation of short-term innovation with awareness of their long-term impacts (Pongracz et al., 2004b). Resource use optimisation on the other hand involves the recovery, recycling and re-use of waste materials to reduce the amount of waste directed to landfills (Chandrakanthi et al., 2002: p. 1771).

A good waste management approach requires a robust organisation and reliable financing source (Cyclos, 2019). This is because in many developing nations, large populations and rapid urbanisation overwhelm the local waste management infrastructure (Zurich, 2023). For smaller communities, solid waste management can be a more complex and multi-dimensional challenge, mainly because of their geographies, limited resources, and economic activities (UNEP, 2019d, Strategies to reduce Marine Plastic Pollution from Land-based Sources in Low and Middle-Income Countries). Some smaller countries and communities have employed or addressed these issues by a combination of practical interventions, community involvements, sustainable systems and relevant partnerships (Brooks et al., 2020). Some of these approaches are practically exhibited through plastic tax, strict plastic ban regulation, taxes and levies to persuade consumers to change their shopping and consumption behaviours and an increase in recycling and reduction in SUP packaging (Brooks et al., 2020). It has also been asserted that while the Global South countries use the strict ban approach, the global North countries utilizes the taxes or levies approach to persuade consumers to change their consumption behaviour (Royal Geographical Society, 2020: A 60-second guide to...; Alam et al., 2015: p. 21). Past studies have equally identified approaches such as population control, stakeholder engagement, and national and local (municipal) government pro-activeness in the enforcement of waste management laws, education and public awareness as suitable approaches for waste management. The approaches will be discussed and examined below.

3.1. Human Behavioural Change Approach

Scholars have pointed out that human behaviour plays a crucial role in preserving the environment, and as such, investment should be made in educating and

creating awareness of environmental variables (Hungerford & Volk, 1990: p. 8; Akintunde, 2017: p. 120). A few theories have emerged in this regard. These theories and concepts enhance further understanding as to why people participate in different environmentally influencing behaviour. The following human behavioural models and theories categorised under the primitive model will be discussed (Hungerford & Volk, 1990: p. 8; Akintunde, 2017: p. 120). These models were founded on the assumption that enlightening a community or the public on diverse ecological and environmental concerns could change human behaviour (Hines et al., 2010; Hungerford & Volk, 1990: p. 8; Akintunde, 2017: p. 120).

1) The Behavioural Change Model

This model specifically assumes that an increase in knowledge of environmental problems motivates environmentally favourable attitudes that lead to responsible environmental actions (Hungerford & Volk, 1990: p. 8; Akintunde, 2017: p. 120; Bamberg & Moser, 2007: p. 14). This behavioural model has been refuted and criticised for its simplistic nature and not being in tune with the real world (Hwang et al., 2000: p. 19; Siemer & Knuth, 2001: p. 23). Nevertheless, it provides a rather new perspective on the linkage or relationship between environmental knowledge, environmental awareness and attitude and how these can translate to action or inaction for plastic waste management. Hence, Rahmani et al. (2021: p. 1622) noted that a lack of public awareness causes many environmental problems. Likewise, Mohamed et al. (2006) believe that environmental protection education is one of the most important and fundamental goals of UNESCO (1978), which enables a person to be active in solving environmental problems through participation with acquired methods and skills.

2) Environmentally Responsible Behaviour (ERB)

This theory indicates that various variables such as intention to act, locus of control (an internalised sense of personal control over the events in one's own life), attitude, sense of personal responsibility (recycling; purchasing environmentally friendly and sustainable goods) and knowledge all suggest whether a person will adopt a behaviour or not (Hines et al., 2010: p. 8). This theory is founded on the belief that no single variable or knowledge is sufficient to ensure that a person acts responsibly towards the environment (Peggy & Korsching, 1996: p. 38). This implies that, in waste management, no single factor is responsible for people's behaviour because a good knowledge of environmental variables may not necessarily imply good and sustainable environmental behaviour as implied in the behavioural change theory. On the other hand, a lack of environmental knowledge or awareness may also not necessarily imply poor environmental practice; other variables or intervening factors may need to be considered (McKinney, 1986: p. 7; Baran, 1959: p. 52).

3) Reasoned/Responsible Action Theory

This theory specifies that good intentions towards the environment are not enough to propel action (Ajzen & Fishbein, 1980). It further explains that attitudes and subjective norms contribute to behavioural intentions, which can be

used to predict behaviour (Schifter & Ajzen, 1985: p. 843). This theory is founded on the belief that behavioural intention is the direct precursor to behaviour (Fishbein & Ajzen, 2001). According to Glenda Hanna (1995), Reasoned Action Theory accounts for times when people have good intentions, but translating intentions into behaviour is thwarted due to a lack of confidence or control over the behaviour. This theory tries to understand why people may not act in an environmentally favourable way despite having good intentions. And these reasons might either be lack of capability, capacity, confidence, lack of funds, lack of behaviour or past experience (Schifter & Ajzen, 1985: p. 843). Summarily, this theory argues that prevention of environmental pollution can neither be achieved by education, public awareness or legislation alone but by a mix of the three or more variables (Rahmani et al., 2021: p. 1622). That is, if the objective of a plastic pollution communication campaign is to induce the youth to avoid single-use plastics, the attitude will be the degree to which individuals feel positively or negatively towards avoiding single-use-type plastics (Oguge et al., 2021). A key finding in a study investigating knowledge and attitudes towards plastic pollution among youths in Nairobi, Kenya, was that knowledge of plastic impacts on the environment and humans among the youths was statistically significant in relation to attitude and practice variables (Oguge et al., 2021).

In support of the above theories, scholars such as Sujauddin et al. (2008: p. 61) further identify finance and education as other factors that influence waste generation and management. Their submission is reinforced by Salequzzaman & Laura (2018: p. 261), who argued that education is critical for promoting sustainable development and improving the capacity of people to address environmental and development issues. In addition, Hogan reports that environmentally engaging education activities provide a platform on which a community begins to exercise the knowledge needed to improve its environment. Jatau (2013: p. 119), explicitly argues that sufficient knowledge of the impact of waste management on health may help people to protect themselves from diarrhoea, typhoid fever, cholera, hepatitis, malaria, and other infections, alludes to the assertion by reiterating that education and change of attitude are interwoven (Fredrick et al., 2018: p. 261). Adequate education on the negative impact of poor refuse disposal may encourage people to adopt positive waste management practices, which in turn may promote personal hygiene and a healthy environment (Fredrick et al., 2018: p. 261).

A study carried out on the influence of education and sensitisation on solid waste management practices of communities in Kampala city revealed that education is improving waste management practices of the communities in Kampala city (Fredrick et al., 2018: p. 261). In Rwanda, one of the public awareness approaches adopted was the “beat plastic pollution” sensitisation campaign (Bresler, 2019; Nsabimana, 2018). National competitions were organised to pass environmental messages to the public through poems, songs and drawings (Republic of Rwanda, 2019 World Environment Day).

Contrary to the above arguments, Pfeffer & Sutton (2000); Morris & Miller

(1999) and Asmawati et al. (2012: p. 47) argue that education or information to groups or individuals will not necessarily lead to appropriate personal or organisational action and performance. They admit that knowledge is crucial, but it is not sufficient to cause action. According to Pfeffer & Sutton, 2000, “there is only a loose and imperfect relationship between knowing what to do and the ability to act on that knowledge.” Research illustrates that knowledge on a topic may increase; people may change attitudes (values), but the step to improved behaviour and practice depends on a complex set of social and psychological factors of which legislation forms a major part (Asmawati et al., 2012: p. 47). This was demonstrated by the Wangwa community in Thailand, where an integrated waste management system was developed by the community (Sea Circular, 2020). The system entailed segregation of waste into organic, recycled, hazardous and general waste (Sea Circular, 2020). Over time, the practice became a way of life for members of the community and their major source of income because the organic waste was used to make fertilisers and also served as animal feed. The recyclable waste was sold to factories for recycling and the other types of waste were sent to waste treatment centres (Sea Circular, 2020).

Another instance of the success of attitudinal change in waste management is the Chinese case, where the separation of waste by households recorded a high output of secondary raw materials (He et al., 2003: p. 62). The successful development in China is what Zhuang et al. (2008) and Scheinberg et al. (2011: p. 188) referred to as an attitudinal shift on the part of households. He, however, emphasises that attitudinal shifts must be backed up by rules and regulations in order for it to be sustained. For instance, communities or cities should have rules and regulations on waste disposal methods, impose fees for collection services based on waste volume and weight, public participation, continuous enlightenment and monitoring (Zhuang et al., 2008; Scheinberg et al., 2011: p. 188). Nigeria, for instance, has been caught up with a throwaway culture that treats plastic as a disposable material rather than a valuable resource to be harnessed. The level of indiscipline in Nigeria is such that plastic bottles are thrown on the streets by commuters with no consequence (Uwaegbulam et al., 2018). To make headway, in addition to an adequate legal framework that provides for sanctions, there is a need for an attitudinal shift through education and public awareness of the negative impacts of plastic litter.

The above models focus on the will of humans to act in an environmentally responsible behaviour. An intermingling of these models and theories can create relational paths to finding long-lasting solutions to various environmental problems created by different human behaviours. However, in the case of plastic waste management (specifically SUPs), it is evident that what differentiates plastic waste management in developed countries from developing nations is, perhaps, the general attitude of individuals to waste and the environment as well as the fact that developed countries have advanced policies to deal with each waste stream.

3.2. Extended Producer Responsibility Approach

An identified scheme which has proved to be a critical policy tool with a successful track record of holding manufacturers accountable for their plastic products and plastic packaging's end-of-life impact is the EPR principle (Dawson, 2019). The EPR, according to the Organisation for Economic Cooperation and Development (OECD, 2001), is defined as an environmental policy in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle.

The environmental impacts of plastic waste and the increasing cost of waste management due to increased waste are the reasons why developed countries have opted for EPR for containers (Mmereki et al., 2016: c.4; Johannes et al., 2021: p. 690). The largest category of plastic waste is caused by packaging, especially plastic packaging (Malhotra, 2020). These waste quantities have constantly risen in many low and middle-income countries, especially for recyclable waste fractions such as paper, plastics and metals (Cyclos, 2019). Jambeck et al. (2015) note that significant sources of marine plastic debris are rapidly growing in countries such as China, Indonesia, the Philippines and Vietnam, where plastic is increasing whilst waste collection and proper disposal is limited. Therefore, the need to curb the increasing volume of plastic waste without affecting the economy has meant that manufacturers of plastic can be held responsible for the end-point disposal of their products (Green Growth Knowledge, 2019).

The EPR, which acts as an extension of the polluter pays principle and the prevention principle has two main aims: one, to reduce the immediate environmental impact of the product via mitigating the product's harm at the end of its life and the other, to influence the long-term design of a product (European Union, Council Directive, 2008 Article 191 (2); Indian Council for Enviro-Legal... vs Union of India and Ors 1996; OECD, 2016). In addition to these benefits, EPR has proved to be an effective regulatory tool in transitioning economies from the traditional linear model of disposal that evolves from single-use to one which promotes circularity (Dawson et al., 2021).

Governments of developed countries have in addition to developing EPR policy that directly holds manufacturers responsible for the waste generated from their products also legislated on policies that encourage recycling (Horvath et al., 2018; Gupt & Sahay, 2015: p. 595). Impressively, countries that have legislated on the EPR, have equally devised different strategies that mandate individuals, households and businesses to dispose of their waste responsibly for recycling, landfilling and incineration depending on the nature of the waste materials. The EPR policy programme has both economic and environmental dimensions to it (Watkins et al., 2017). While the economic dimension which involves designing a product to have recycling and reuse value has worked in some countries, scholars have argued that it has hampered its success in some other countries (Akenji et al., 2011: p. 919; Hotta & Kojima, 2018: p. 45; Kojima et al., 2009: p. 263). The EPR, in holding producers accountable to the end-of-life stage of their

products, embodies an increase in plastic recycling and is a veritable tool for plastic waste management because most plastics do not biodegrade, instead, they slowly break down into smaller fragments known as micro plastics. Worryingly, little is known about the impacts of microplastics on human health. Studies revealed that plastic bags and containers made of polystyrene foam could take up to thousands of years to decompose, contaminating soil and water (Uwaegbulam et al., 2018).

EPR policies have been introduced and formulated in various forms, strategies, approaches and schemes (OECD, 2013; Kaffine & O'Reily, 2015). Some countries feature a mix of both collective Producer Responsibility (CPR) i.e., a model that encourages collective implementation of EPR policy and individual producer responsibility (IPR) i.e. a model where the responsibility is placed only on the producers, importers and brand owners. There is also the Producer Responsibility Organisation (PRO) created by producers and takes responsibility for the practical recovery and recycling responsibilities of its member producers (Bio Intelligence Service, 2015). Kenya's EPR regulation adopts both the IPR and the PRO model for all products and packaging in all phases of their life cycle, (Environmental Management and Co-Ordination Act (N0.8 of 1999) Extended Producer Responsibility (EPR) Regulations 2020). while the South African EPR regulation expanded the definition of producers from packaging manufacturing industries to include brand owners, licence agents, importers and retailers (National Environmental Management: Waste Act of 2008).

In countries such as the United States of America and Canada, EPR was introduced in the form of deposit and refund schemes on beverage containers (Hickle, 2003). In Germany, the German Packaging ordinance of 1991 required producers to establish separate management and recycling of all types of packaging outside the public waste disposal system, to satisfy mandatory quotas for recycling. Countries like India have applied the EPR to both e-waste and plastic waste with different implementation modality (Plastic Waste Management Rule of India, 2016). For wastes like lead-acid batteries, the manufacturer, importer, assembler, and re-conditioner are required to collect the batteries while in the case of plastic waste the municipal authorities are responsible for setting up, operationalising, and coordinating the waste management system. Amendment of the Indian Plastic Waste Management Rules, 2016, put the responsibility of collection of used multi-layered plastic (MLP) sachet or pouches or packaging on producers. The EPR policy has been applied to all types of solid waste. However, it's mode of application has differed from imposing recycling on producers for the recyclables to setting up a recovery percentage of wastes (Regulations for the Administration, 2009; Cecchin et al., 2019: p. 1292).

Technological, social and economic differences between developed and undeveloped countries have led to massive criticism against the EPR (Kojima et al., 2009: p. 265). Understanding, that developing countries lack the technological sophistication to effectively recycle wastes and identify the actual producers of a product due to unregistered, illegal producers (free riders), have meant that

there might be challenges with applying the EPR policy in developing countries (OECD, 2014). Also, collection, transfer, transport and recycling practices of waste are affected by improper bin collection systems, poor route planning, low population density, scattered housing, lack of information about collection schedules, insufficient infrastructure, poor roads, inadequate waste collection systems, vehicles and lack of recycling technology especially in rural areas are part of the challenges plaguing the EPR policy implementation (Kojima et al., 2009: p. 263; Mihai & Taherzadeh, 2017: p. 1; Hazra & Goel, 2009: p. 470; Moghadam et al., 2009: p. 485). Due to these identified challenges, an effective application of the EPR approach in developing countries will require a collaborative effort of stakeholders. Sharholy et al. (2007), reinforce this point when they noted that organising the informal sector and promoting micro-enterprises are more effective ways of extending waste collection services. Also, developing countries can collaborate with developed countries with regards to skill and technological transfer. In this context, it will involve infrastructure development, financial support, collaborative research and development projects, capacity building and technological adaptation. Equally, the government is expected to be involved in some EPR systems by providing waste collection services and appropriate structures (World Economic Forum Insight Report, 2020).

Generally, factories are located in industrial areas. Therefore, the cost of transporting recyclable waste from some rural or remote areas to factories is too expensive (Johannes et al., 2021). Besides that, the distance between one house to another in rural areas tends to be further than in urban areas, so the transportation cost becomes too expensive for the producers (Beitsch, 2019). Recent research carried out by the World Economic Forum found that the recycling rate in megacities went up to 20 percent, whilst in the rural and remote areas, there were only 5 percent and 0 percent, respectively (World Economic Forum Insight Report, 2020). Therefore, increasing the recycling rate of recyclables in rural and remote areas, which will be borne by producers, will be too expensive and thus become a discouraging factor for the manufacturers to comply with the EPR system.

Low recyclable quality plastics and multi-layer plastics are also major challenges facing plastic waste management. Multi-layered plastic/packaging (MLP) is any material used for packaging and having at least one layer of plastic as the main ingredient in combination with one or more layers of materials such as paper, paper board, polymeric materials, metallised layers, or aluminium foil, either in the form of a laminate or co-extruded structure (Plastic Waste Management Rule of India, 2016). They are predominantly used in food packaging because they protect sensitive food products and, hence, have a longer shelf life (Devi, 2020). Nonetheless, they are challenging to recycle and reuse effectively (Kojima, 2019; Hansen, 2020; Seetharaman, 2019). In developed countries, they are managed by either sending them to landfills or, more often, open dumps or incineration (Hansen, 2020; Seetharaman, 2019). For some context, up to 56 percent of plastic packaging in developing countries consists of multi-layered

materials (Malhotra, 2020). Therefore, strict EPR enforcement will drive manufacturers/producers to change their design of products, packaging and delivery models.

Having been associated with sustainable waste management approach of which recycling/reuse is considered a major aspect, EPR might also run into problems of uncontrolled pollution from substandard recycling plants (Mmereki et al., 2016; Kojima & Jain, 2008: p. 36). It is argued that government compliance policies on environmentally sound recycling mechanisms might be difficult to enforce on informal recyclers (Godfrey et al., 2019). Financial and technological constraints are the main barriers to installing a sufficient pollution control mechanism (Kojima & Jain, 2008: p. 36). Like every business opportunity, informal recyclers will dominate the recyclable market and will ordinarily recycle at a lower cost compared to formal recyclers (Wilson et al., 2006: p. 797).

According to OECD (2001), the workability of EPR in any developing country requires strong government policy and intervention. However, the government must take into consideration monopolistic practices and market distortion by applying market-driven programmes (OECD, 2001). EPR is also a funding mechanism that can deliver benefits such as increased transparency and efficiency (incentivising continuous research and innovation) and incentivising upstream solutions such as packaging reduction, a shift from single-use to reusable packaging and recyclable packaging material (Ellen MacArthur Foundation, 2021).

In many developing countries, there are market-based collection systems that involve informal waste pickers collecting saleable recyclable waste. They work by picking up recyclables from waste bins on the road and dumping sites, which they eventually sell to recyclers (Johannes et al., 2021: p. 690). However, this method is inadequate because only high-value wastes are picked. Johannes et al. (2021) are of the view that to get the cooperation of waste collection workers, a part of revenues generated from recyclable waste should be allocated to waste collection workers. This will solve two problems, namely: the waste management mechanism, which is greatly lacking in developing nations, will be created and operated with the assistance of informal waste collectors who will collect all recyclable wastes despite their value. Secondly, employment would be created for a large number of people within the sector (OECD, 2016).

Other EPR initiatives, such as buying off recyclable waste directly from consumers, can also be employed, even though it will require continuous public awareness either at the purchasing points or through the media to encourage households to bring their recyclables (Kojima, 2019). This initiative is currently being practised in some Asian and European countries like Indonesia, Thailand and Germany. Indonesia, for instance, adopted the waste bank market-based collection system, which supports livelihood and encourages self-reliance in environmental management (Wijayanti & Suryani, 2015; Regulation of State Minister of Environment No. 13/2012, 2012). In some cities, the waste bank system is practised by posting the buying prices of up to 70 types of recyclables (includ-

ing plastic, paper, metals and glasses) on their online platform to attract local households to sell their segregated recyclables (Bank Sampah Malang, 2018).

Thailand, for example, operates a similar market-based collection system called zero-baht shops which allows customers to exchange their recyclables for consumer goods (Kashyap & Visvanathan, 2014: p. 41). Irrespective of these market-based waste management systems, there is the need for a proper waste management scheme where all types of waste can be properly collected because these market-based collection systems cannot deal with wastes that have low economic value. They only collect re-saleable waste with high economic value, leaving waste with low economic value to be mismanaged and improperly disposed of (Akenji et al. (2011: p. 919). In summary, economic feasibility, such as incentive mechanisms for implementing EPR policies for both consumers and producers, including a refund programme at collection points and equally incentivising design for environmentally recyclable products, are major obstacles to introducing ERP policy, especially in developing countries (Wiesmeth & Häckl, 2011: p. 891; Akenji et al., 2011: p. 919; Hotta & Kojima, 2018; Walls, 2006: p. 1; Atasu et al., 2009: p. 243). The EPR policy might not be a sufficient approach to plastic waste management because it provides no sufficient mechanism for the limited use of plastic or alternatives to plastic. It is safe to say that the EPR mechanism encourages the production of plastics in its advocacy for recycling. However, it encourages resource use optimisation through its collection and recycling mechanism and industrial ecology through its design mechanism, which in turn leads to waste minimisation.

3.3. Sustainable Development Principle

Sustainable Development (SD) has become a fundamental strategy to guide the world's social and economic transformation (Shi et al., 2019: p. 7158). It is a principle that has evolved from tackling environmental issues to dealing with global strategic issues such as economic growth and social inclusion (Olawumi & Chan, 2018: p. 231). SD is seen as both a concept and an approach. As a concept, it calls for improving living standards without jeopardising the earth's ecosystems or causing environmental challenges that can result in climate change and the extinction of species (Benaïm & Raftis, 2008). As an approach, it is seen as an approach to development which uses resources in a way that allows them (the resources) to continue to exist for others (Benaïm & Raftis, 2008; Mohieldin, 2017). Considering this angle, SD aims to achieve social progress, environmental equilibrium and economic growth (Gosling-Goldsmith, 2018). This implies that SD demands a shift from harmful socio-economic activities to activities with positive environmental, economic and social impacts (Ukaga et al., 2010).

According to Lele (1991: p. 607), the major contribution of the SD debate on the environment is the realisation that in addition to or in conjunction with ecological conditions, there are social conditions that influence sustainability or the unsustainability of people's interaction with nature. Equally, the advent of sustainability in development science has led policy makers and planners to ap-

ply the evolving notions of ‘sustainability’ to the contemporary debate over how laws should be made and how cities and regions should be revitalised, redeveloped, and reformed. “Sustainability” is regarded alternatively as either the proper means or the proper end of urban development (Basiago, 1998: p. 145).

The evolution of sustainable development from the embryonic phase to the moulding phase and finally to the current developmental phase, as uniquely distinguished by Shi et al. (2019: p. 7158), has shown that economic development and environmental protection are co-joined twins who cannot successfully be separated. The embryonic phase of SD focused only on the protection of the ecosystem and conservation of natural resources to avoid depletion (Zhou, 2009: p. 39). At the time, the discussion focused solely on the causes of environmental degradation, including farming, logging, and mining and some measures were recommended (Du Pisani, 2006: p. 83). As SD continued to evolve, the twin needs to strengthen environmental management policies while developing the economy became apparent (United Nations Conference on the Human Environment, 1972). This approach was made clear at the 1972 United Nations Conference on Human Environment, also known as the Earth’s Summit. The conference led to the 1987 Brundtland report on human development drafted by the World Commission on Environment and Development (WCED) titled “Our Common Future”, which gave the first recognised definition of sustainable development. It defined SD as Development that meets the needs of the present without compromising the ability of future generations to meet their needs (World Commission on Environment and Development, 1987). This definition has been interpreted to mean economic development that does not affect in a significant and irreversible way humanity’s living environment, does not lead to the degradation of the biosphere and reconciles the laws of nature, economy, and culture (Stefan Konstanczak, 2014).

The Brundtland report, 1987 systematically discusses a series of major economic, social, and environmental issues facing humanity and proposes, in three viewpoints, an urgent recourse to sustainability in the present development models. The report acknowledges that environment and development should be placed side by side, not in isolation. The Agenda 21, signed at the United Nations Conference on Environment and Development (UNCED, 2022), is a blueprint on how to make development socially, economically and environmentally sustainable. Since then, SD has been treated as a core concept for resolving the apparent contradiction between economic development and environmental protection, pointing out that it involves development in a sustainable manner regarding resources and the environment. As the concept of SD developed, it began to take a holistic approach by shifting its focus more towards economic development, social development, environmental protection for future generations and governance (Muff et al., 2017; p. 363; Lu et al., 2015: p. 520). This was in a bid to introduce the concept of cooperative governance, which is seen as a tool to resolve conflict among economic, social and environmental issues and with the understanding that the green economy is the key to solving conflicts

between development and the environment (Barbier, 2012: p. 887).

Economic sustainability under SD involves a system constrained by the requirements of environmental and social sustainability, while social sustainability involves the preservation the environment through economic growth and poverty alleviation (Basiago, 1998: p. 145; Ruttan, 1991). Environmental sustainability, on the other hand, is the responsible interaction with the environment to avoid depletion or degradation of natural resources and allow for long-term environmental quality (Environmental Sustainability: Definition and Application, 2013). Environmental sustainability proponents are of the view that consumption of natural resources must be kept within regeneration rates and economic output must be controlled or well managed (Daly, 1973; Pearce et al., 2000). None of the sustainable development concepts seeks to achieve one at the expense of the other, implying that economic sustainability cannot be achieved at the cost of social or environmental sustainability. Resolving the conflict that exists between the three sustainability theories depends largely on the governance structures in place. Therefore, the absence of policies and effective laws for proper waste management impacts on sustainable development. For instance, in the City of Favelas, a shantytown in Brazil, a large population led to careless dumping of refuse (Baer & Meller, 1995: p. 83). The citizens were convinced that it would be more cost-effective to divert money from waste collection and use it to feed the poor of the Favelas. In exchange for six bags of trash, residents are given one bag of groceries consisting of dietary staples such as rice, beans, eggs, bananas, and onions. The approach adopted by Favela proved to be sustainable because environmental concerns were sought alongside economic and social concerns (Baer & Meller, 1995: p. 83).

The concept of governance encompasses the ability to plan and create the organisations that are needed for sustainable development (Güney, 2017: p. 316). According to Graham et al, governance is seen as an interaction among structures, processes and traditions that determine how power and responsibilities are exercised, how decisions are taken, and how citizens and other stakeholders have their say (Graham et al., 2003). Sustainable waste management also involves strategic planning and decision-making to determine the best action, prescribing options, assessing their effects and consequences, and choosing the best treatment option while taking into consideration legislation (Pongracz, 2006: p. 59). A study carried out to examine the relationship between governance and sustainable development revealed that when the governance level is high, the sustainable development level rises as well (Güney, 2017: p. 316).

The concept of sustainability goes beyond the protection and sustainable use of natural resources. It includes economic and social sustainability, which, in essence, means meeting people's current economic and social needs without compromising the environmental needs of the future generation (World Commission on Environment and Development, 1987). The potential economic value of sustainability is recognised to not merely decrease environmental risks but also to optimise the social and economic benefits of environmental protection. How

to achieve this with regard to SUPs becomes a significant question that countries, regions, and municipalities around the world are grappling with [Thompson \(2015: p. 185\)](#). [Thompson \(2015\)](#), noted that in comparison with many other current environmental challenges, the benefits resulting from the use of plastics are not directly linked to the emission of plastic debris to the environment or to the degradation of the environment. Hence, in theory at least, society can retain the benefits of plastic products by protecting businesses of plastic industries and, simultaneously, reducing the quantity of plastic litter entering the environment, thereby minimising waste creation ([Thompson, 2015: p. 185](#)). Thompson's approach is based on sustainability theory, where balance is required in protecting the environment and seeking economic and social goals. Still, then a good governance system will be required to achieve this.

Similarly, [Lebreton & Andrady \(2019: p. 11\)](#) also believes that the main solution to plastic waste is to reduce actual consumption, targeting first where all suitable substitutes are available or potentially available rather than an outright ban. In other words, sustainable means of protecting the environment from indiscriminate plastic waste litter should be sought. Correspondingly, a study conducted by the NCPA reveals that a ban on plastic bags used by grocers and retailers negatively impacted sales in the ban area ([Caliendo, 2013](#)). The survey was conducted on store managers in Los Angeles County, where a ban was placed on thin-film bags. The survey result showed that most of the stores in the area experienced a 6 percent drop in sales, while areas without the ban reported a 9 percent increase in overall sales. The survey reported a 10 percent reduction on employment and an un-quantified increase in the free ban areas ([Caliendo, 2013](#)). The outright ban policy of shopping bags in Los Angeles might have had a positive impact on the environment, but the loss of employment and businesses within the area affected economic and social sustainability.

4. Conclusion

This paper examined three plastic waste management approaches, initiatives and their applications. These include human behavioural change, EPR and sustainable development approaches. A common thread that runs through the three approaches is the concept of waste minimisation. This suggests that resource efficiency and waste minimisation efforts should be the target of any plastic waste regulation.

The human behavioural change approach shows the impact of public awareness and education on waste management and handling. This means that the success of any waste management strategy will depend on the people's willingness to adopt and change their lifestyles. In other words, a change in consumption or disposal patterns first requires attitudinal change on the part of the consumers. Studies have shown that the lack of public awareness about environmental protection has led to failure to prevent pollution. The public's refusal to cooperate with the government in controlling environmental pollution is because of the lack of awareness of its detrimental effect on their health and the

environment (Rahmani et al., 2021). Notwithstanding, scholars have argued that proper waste management attitude or behaviour is dependent on a lot of variables, but the central argument lies on the fact that it should be backed up by laws and policies (Adeyanju et al., 2021; Van Rensburg et al., 2020).

The EPR approach has proved to be a significant waste management approach for all waste streams and has recently been applied to plastic waste management in some countries. This approach may not work as a single approach for a developing country like Nigeria. In adopting this approach, its various forms (i.e. collective responsibility, Individual Responsibility and the Producer responsibility organisation (all discussed above) must be considered due to the technological and socio-economic realities mentioned above. Adopting this approach will require strong government policy and intervention with a robust law enforcement mechanism comprising taxes, levies or other sanctions for non-compliance. It will equally set targets to be met by stakeholders.

The principle of sustainable development, in turn, advocates for source reduction and minimisation of products that generate waste. It emphasises balance in economic, social, and environmental development. In relation to plastic, a strict ban on the use and production of plastic products will affect a country's economic and social development because plastic factories and retail stores will be shut down, leading to increased unemployment. It may or may not achieve environmental protection. It may also result in the black-market use of other products that could be more environmentally sustainable. Therefore, economic development should be constrained by social and environmental considerations. Resources must be harvested no faster than they can be regenerated.

Remarkably, behavioural change and the extended responsibility approach all reinforce and promote sustainable development. Countries legislating on the EPR have devised different strategies that mandate individuals, households, and businesses to dispose of their waste responsibly, thereby changing consumption patterns or attitudes, encouraging continuous awareness and applying balance in demand and production. This is because attempting to adopt one approach may increase the waste generated. These approaches expounded above will serve as the benchmark for evaluating and examining the existing Nigeria legal and policy framework to find out if any aspect of the law/s promotes sustainability efforts.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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