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Breaking Legal and Socio-economic Challenges to Plastic Waste Regulation in Nigeria: Lessons learned from Singapore

Paul Atagamen Aidonojie[1]; Majekodunmi Toyin Afolabi[2]; Eregbuonye Obieshi[3], Molola Janet Adeyemi-Balogun[4]; Saminu Abacha Wakili[5]
[1,3,5] Faculty of Law, Edo State University zairue
[2,4] Faculty of Law, Olabisi Onabanjo University, Ago-Iwoye
Corresponding author's email: aidonojie.paul@edouniversity.edu.ng

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Abstract

Plastic, a versatile material derived from synthetic compounds, is widely employed globally due to its durability, cost-effectiveness, and ease of production. However, its improper disposal poses significant environmental threats. Despite concerted efforts, the indiscriminate dumping of plastic waste persists in the country's land and water environments. This study aims to comprehensively explore the legal guidelines and socio-economic initiatives relevant to plastic waste regulation, drawing inspiration from Singapore's successful model. Three hundred and ten questionnaires were also distributed among residents of Nigeria to achieve this objective. The data collected underwent thorough analysis, employing both descriptive and analytical methods. In this context, Singapore stands out as an exemplary model for Nigeria to emulate in addressing the challenges posed by plastic waste. Drawing inspiration from Singapore's successful strategies, It is imperative to meticulously regulate every stage, from production to disposal, to ensure environmental sustainability and minimize the detrimental impact of plastic pollution. The study found the need for more legislative measures in Nigeria to combat the pervasive problem of indiscriminate plastic waste disposal effectively. Also, The government should establish irresponsible plastic waste disposal's environmental and health risks and dumping of plastic waste.

I. Introduction

The surge in plastic production over the past decades has reached alarming proportions, presently standing at an estimated 400 million tons annually and is

predicted to double by 2040 (Andrady, 2015). This troubling reality is compounded by the staggering use of approximately 160,000 plastic bags every second, a significant portion of which ends up in landfills and oceans, taking nearly 1,000 years to decompose. The escalating global rate of plastic waste has attracted international attention, with minimal consequences for the beneficiaries of this pollution, while a considerable portion of the global population grapples with its harmful effects (Auta et al., 2017; Barboza et al., 2019). It is paramount to underscore that in Nigeria, the government's constitutional responsibility for ensuring a safe and pollution-free environment lies with the government (Willner and Vilkesland, 2018; Ukhurebor et al., 2021). Despite this duty, individuals and corporate entities within the plastic industry have been engaging in indiscriminate dumping of plastic waste within local communities, causing significant damage to the Nigerian environment. This reckless disposal releases harmful chemicals that leach into soil and water, contaminating natural resources agricultural lands, and contributing to global warming.

Despite global efforts to combat unregulated plastic waste dumping, Nigeria continues to grapple with an influx of such waste due to inherent flaws and inefficiencies in the country's legal and socio-economic frameworks (Tores et al., 2013; Riget et al., 2016; Adedeji Eziyi, 2010). The existing environmental laws in Nigeria are deemed inadequate in addressing plastic waste-related issues (Aidonojie et al., 2023; Aidonojie, 2023). Furthermore, there is a glaring absence of specific legislation regulating plastic waste. Socio-economic challenges, including poverty, limited access to education, cultural practices, and insufficient recycling technology, further complicate the regulation of plastic waste in Nigeria (Willner and Vilkesland, 2018; Ukhurebor et al., 2021).

Jeremy Bentham's philosophy, emphasizing the law's purpose in promoting the greatest happiness for the largest number in society, prompts reflection on whether this objective is being met amidst the ongoing trend of plastic waste dumping in Nigeria. Roscoe Pound's concept of law as social engineering, aiming to build an efficient societal structure that satisfies maximum wants with minimal friction and waste, highlights the need for legal intervention to address the significant societal friction caused by plastic waste (Aidonojie et al., 2023; Aidonojie et al. 2022). Therefore, it is evident that addressing the issue of plastic waste pollution necessitates the application of law; without a robust legal framework, anarchy would prevail. Hence, the imperative for enacting laws to counter and mitigate the current state of plastic waste pollution in Nigeria cannot be overstated.

Singapore stands out as a notable exemplar in effectively regulating plastic waste, providing valuable insights for Nigeria to consider. The Lion City has successfully implemented stringent measures and innovative approaches to tackle plastic pollution, serving as a potential model for regulatory enhancements in Nigeria. Singapore's success in plastic waste management can be attributed to robust legal frameworks and socio-economic initiatives (Hsien, 2019). The city-state has enacted comprehensive legislation, including the Environmental Public Health (Toxic Industrial Waste) Regulations and

the Resource Sustainability Act, which mandate the proper disposal and recycling of plastic waste (Hsien et al. 2010). These legal instruments establish clear guidelines for waste management and impose penalties for non-compliance, creating a deterrent for indiscriminate disposal.

In addition to legal measures, Singapore has prioritized socio-economic initiatives to address the root causes of plastic pollution. The city-state has invested in public awareness campaigns to educate citizens about responsible waste disposal and the environmental impact of plastic consumption (Renbi and Mardina, 2002). Furthermore, Singapore has promoted research and development in recycling technologies, fostering a sustainable ecosystem for plastic waste management. Nigeria can draw inspiration from Singapore's success by considering the adoption of similar legal frameworks and socio-economic initiatives (Hsien, 2019). Implementing stringent regulations with penalties for non-compliance would serve as a deterrent, encouraging responsible waste management practices. Moreover, investing in public awareness campaigns and supporting research and development in recycling technologies could contribute to a more comprehensive and sustainable approach to tackling plastic waste in Nigeria. In leaping Singapore, Nigeria has the opportunity to address its legal and socio-economic challenges concerning plastic waste regulation, ultimately working towards a cleaner and more environmentally sustainable future.

In light of the pivotal role of law in addressing this imperative, this study aims to comprehensively explore the legal guidelines and socio-economic initiatives relevant to plastic waste regulation, drawing inspiration from the successful model of Singapore. The research will identify shortcomings and propose legislative measures to strengthen the regulatory landscape for effective plastic waste management in Nigeria, leaping from Singapore's experience.

To ensure the effective realization of this study, a hybrid research approach, encompassing both doctrinal and non-doctrinal methods, was adopted. Incorporating the doctrinal method facilitated the researcher's exploration into conceptual intricacies and perils associated with the indiscriminate dumping of plastic waste in Nigeria and the success rate in Singapore. Furthermore, it aimed to dissect the legal and socio-economic framework and intricacies concerning plastic waste within the Nigerian and Singapore contexts. The study relied on primary and secondary sources such as legal statutes, textbooks, journal articles, and online resources in this endeavour.

On the other hand, the non-doctrinal research method enabled the researchers to engage with individuals residing in Nigeria, delving into the legal and socio-economic dimensions of plastic waste. This method also sought to identify potential strategies for mitigating the rampant disposal of plastic waste in Nigeria. To achieve this, a questionnaire was formulated through the utilization of Google Forms and subsequently distributed to a diverse array of respondents. The amassed data underwent scrutiny employing both descriptive and analytical techniques.

II. Conceptual Issues of Indiscriminate Plastic Waste Disposal and its Dangers in Nigeria

Indiscriminate plastic waste disposal has evolved into a dire environmental crisis in Nigeria, characterized by the widespread, thoughtless discarding of plastic materials, which profoundly impacts both the environment and human well-being (Aidonojie et al., 2022; Aidonojie et al., 2020). This multifaceted exploration delves into the extensive dimensions of this pressing concern, shedding light on the dangers it poses within the Nigerian context. At the heart of the problem lies the extensive proliferation of plastic waste across urban and rural landscapes in Nigeria (Aidonojie et al., 2022; Anani et al., 2023). Despite the undeniable convenience plastics offer in modern life, their improper disposal has manifested as a pervasive ecological menace. The consequences of this thoughtless discarding are far-reaching and detrimental to the environment and human health. As plastic waste accumulates in landfills, it instigates a chain of environmental hazards. The leaching of harmful chemicals from the decomposing plastics infiltrates the soil and water, leading to the contamination of vital natural resources and agricultural lands (Anani et al., 2022; Eguh, 1997). The repercussions of this contamination extend beyond immediate environmental degradation; they directly threaten the health and sustenance of urban and rural communities relying on these resources for their livelihoods. Compounding the severity of the issue is the non-biodegradable nature of plastics, which ensures their persistence in the environment for centuries (Aidonojie et al., 2022). This persistence exacerbates the long-term impact on Nigeria's ecosystems, creating a lasting burden that future generations must contend with. The accumulation of plastic waste not only disrupts the delicate balance of ecosystems but also jeopardizes biodiversity and the overall resilience of the natural environment.

The socio-economic ramifications of indiscriminate plastic waste disposal in Nigeria are profound and extend far beyond the immediate environmental consequences. This section delves into the multifaceted implications, shedding light on how plastic waste disrupts the very fabric of the nation. Nigeria faces a critical challenge with its waste management infrastructure, as highlighted by Ijaiyah and Wardah (2018) and Imoisi and Aidonojie (2023). Inadequate waste management infrastructure leads to clogged drainage systems, particularly problematic during the rainy season when plastic waste obstructs natural water flow. The result is widespread flooding, which not only damages property but also disrupts the livelihoods of communities. The destruction caused by flooding goes beyond the immediate financial burden on affected communities. Homes are damaged or destroyed, businesses are disrupted, and agricultural lands are rendered unproductive. The financial toll on individuals and communities is significant, as they grapple with the costs of rebuilding and the loss of income due to disrupted economic activities.

The unsightly presence of plastic waste blights the aesthetic beauty of both urban and rural areas in Nigeria, as emphasized by Willner and Vilkesland (2018) and Ukhurebor et al. (2021). This visual pollution not only impacts the daily lives of residents but also

deters tourism, a sector crucial for economic growth. Tourism is a major contributor to the national economy, providing jobs and fostering economic development. However, the unattractive landscape created by plastic waste diminishes the appeal of Nigeria as a tourist destination. This, in turn, tarnishes the country's image on the global stage. The economic implications of reduced tourism extend beyond the immediate financial burdens caused by a decline in tourist spending. Nigeria's attractiveness for foreign investments is also compromised, impacting the nation's potential for sustained economic growth.

The health consequences stemming from indiscriminate plastic waste disposal in Nigeria present a pressing concern that transcends mere environmental impact. This section explores the distressing health ramifications and the complex legal challenges that hinder the effective management of this critical issue. As plastics degrade over time, they fragment into smaller particles, releasing toxic chemicals into the environment. This process poses a significant threat to human health as these contaminants eventually find their way into the food chain. The consequences are severe, encompassing a range of potential health issues, from endocrine disruption to carcinogenic effects. The gravity of these risks is particularly heightened for vulnerable populations, with children being at a higher risk due to their potential unknowing ingestion or contact with these toxins (Jaap, 2019; Jitendra, 2019). Children, in particular, are more susceptible to the adverse effects of these toxins due to their still-developing physiological systems. Ingesting or coming into contact with these toxic substances can lead to long-term health issues, compromising both their immediate well-being and future health outcomes. The urgency to address this health crisis is further underscored by the potential for intergenerational impacts, as the health of the youth today will shape the health landscape of the nation tomorrow.

Despite the clear and imminent health dangers associated with indiscriminate plastic waste disposal, Nigeria finds itself entangled in a web of legal challenges that impede effective regulation. The lack of robust legislative measures to control plastic production, usage, and disposal is a glaring gap in the nation's legal framework. This regulatory void not only allows for the proliferation of plastic waste but also leaves the population exposed to health risks associated with toxic pollutants. Moreover, the inadequacies in the implementation and enforcement of existing laws exacerbate the problem. Without stringent measures in place, industries may continue to produce and distribute plastic materials without due consideration for their environmental and health impacts. The absence of penalties or consequences for improper disposal further contributes to the perpetuation of this hazardous practice. The legal challenges are compounded by a lack of public awareness regarding the health implications of indiscriminate plastic waste disposal. Many individuals may remain unaware of the direct link between their actions and the potential harm to their health. This lack of awareness not only hinders the adoption of responsible disposal practices but also contributes to the perpetuation of harmful behaviors. In addition, inadequate waste management infrastructure further exacerbates the problem. Limited resources and outdated systems make it challenging to

collect, process, and dispose of plastic waste in an environmentally sustainable manner. As a result, even those individuals who are conscientious about their waste disposal may face limited options for responsible disposal.

Concerning the above, it suffices to state that the perilous consequences of indiscriminate plastic waste disposal loom large over Nigeria's environment, economy, and public health. The need for comprehensive, multi-dimensional solutions is urgent. This requires a coordinated effort involving robust legislation, enhanced waste management infrastructure, public awareness campaigns, and sustainable alternatives to plastic usage. Addressing this issue is not just a legal or environmental imperative; it is a commitment to safeguarding Nigeria's future for generations to come. The challenge demands immediate and concerted action on multiple fronts to mitigate the environmental, economic, and health risks associated with indiscriminate plastic waste disposal. Only through a comprehensive and collaborative approach can Nigeria hope to navigate through this crisis and pave the way towards a more sustainable and ecologically resilient future.

III. Legal Framework Concerning Regulation of Plastic Waste

In addition to the Nigerian Plastic Pollution Bill, Nigeria has a foundation of environmental laws that serve as a backdrop for effective waste management. Laws such as the National Environmental Standards and Regulations Enforcement Agency (Establishment) Act (2007). Section 4 of the Act delineates the responsibilities and functions of the National Environmental Standards and Regulations Enforcement Agency (NESREA). It likely outlines the agency's role in setting and maintaining environmental standards, including those related to waste management. By empowering NESREA to establish and enforce standards, this Act plays a crucial role in ensuring a structured and regulated approach to environmental quality, which includes waste management. The specificity of NESREA's functions would further detail its involvement in waste-related standards. Furthermore, section 9 of the Act confers the authority on the Agency to create regulations, which could include guidelines for waste management, emissions control, and other environmental aspects. Granting NESREA the power to make regulations is instrumental in adapting to evolving environmental challenges. It allows for the flexibility needed to address emerging issues in waste management and ensures that regulatory measures can be updated in response to changing circumstances.

Additionally, the Harmful Waste (Special Criminal Provisions, etc.) Act (1988) provides legal measures against the improper disposal of hazardous waste, contributing to a comprehensive legal framework for waste management in the country.

Section 3 of the Act enumerates specific actions or conditions classified as offenses under the Harmful Waste Act. It could include illegal disposal practices, mishandling of hazardous waste, or other actions deemed harmful to the environment. By clearly defining offenses, this section ensures legal clarity and sets the boundaries for what is

considered harmful waste-related criminal activity. This clarity is essential for effective enforcement. Section 5 further outlines the penalties imposed for offenses under the Act. This could include fines, imprisonment, or a combination of both. The imposition of penalties is a deterrent mechanism, reinforcing the seriousness of offenses. It serves as a punitive measure and contributes to the effectiveness of the legal framework in deterring harmful waste-related activities. Furthermore, section 8 confers the power to law enforcement agencies to make arrests and seize materials related to offenses under the Act. Granting the power of arrest and seizure enhances the enforcement capability of regulatory authorities. It ensures swift action against violators and facilitates the removal of materials causing harm to the environment.

The combination of these laws creates a robust legal framework for waste management in Nigeria. The NESREA Act provides the structure and standards-setting authority, while the Harmful Waste Act establishes clear offenses, penalties, and enforcement measures. Together, these laws contribute to a comprehensive approach to environmental protection and sustainable waste management in the country.

The United Nations Framework Convention on Climate Change (UNFCCC) represents a pivotal global commitment to address the complex challenges posed by climate change. Enacted in 1992 and operational since March 21, 1994, this international treaty, with 154 state signatories, plays a crucial role in shaping the response to environmental threats. The UNFCCC aims to counteract hazardous human interference with the global climate system, emphasizing the stabilization of greenhouse gas concentrations. This commitment aligns with broader goals, including facilitating scientific research, fostering international cooperation through meetings and negotiations, and developing future policy agreements. The treaty's objective is not only to address climate change but also to enable the natural adaptation of ecosystems, safeguard food production, and promote sustainable economic development. Article 2 outlines the overarching objectives of the UNFCCC, emphasizing the stabilization of greenhouse gas concentrations in the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system. This sets the foundation for the treaty's commitment to preventing harmful impacts, including those associated with plastic waste, on the global climate.

Article 3 of the UNFCCC serves as a cornerstone, emphasizing the imperative of protecting the environment and ecosystems. Parties to the treaty are entrusted with the responsibility of maintaining a climate untainted by pollution, encompassing various environmental stressors, including the pervasive issue of plastic waste. This commitment is rooted in the vision of fostering an environment that is conducive, serene, and habitable for present and future generations. Notably, Article 3 is entirely dedicated to the prohibition of environmental pollution, showcasing the framers' clear intent to cultivate a world free from pollutants. Upon closer scrutiny, Article 3 directs parties to safeguard the climate system based on the principles of common but differentiated responsibilities and respective capabilities. This nuanced approach recognizes the diverse capacities of nations to address climate-related challenges, acknowledging

historical disparities. Developed countries, as signatories, are explicitly obligated to take a leading role in addressing climate change, reflecting their advanced economic status and historical contributions to environmental impacts. Also, article 4 broadens the scope by encompassing general commitments that parties undertake for comprehensive climate change action. This includes not only the mitigation of climate change but also strategies for adapting to its inevitable impacts. The multifaceted nature of the climate challenge is underscored, prompting parties to adopt a holistic approach in addressing its diverse implications.

However, article 6 highlights the importance of education, training, and public awareness in addressing climate change. This provision can be instrumental in raising awareness about the environmental consequences of plastic waste, fostering a sense of responsibility among the public, and encouraging sustainable practices. By article 7 emphasizes the need for a focused approach to adaptation, recognizing the vulnerability of certain regions and communities to the impacts of climate change. While not explicitly addressing plastic waste, the adaptation strategies outlined in this article could indirectly contribute to mitigating the environmental effects of improper waste disposal. Article 11 emphasizes the importance of conducting impact assessments and minimizing adverse effects of activities that may contribute to climate change. This provision could be invoked to address the environmental impact of plastic waste, particularly when assessing the consequences of indiscriminate disposal methods.

Furthermore, article 12 highlights the significance of research and systematic observation to understand the evolving nature of climate change. Incorporating research on the impact of plastic waste on ecosystems and climate would align with the broader objectives of the UNFCCC. Article 13 underscores the importance of promoting sustainable development in the context of addressing climate change. This provision encourages integrated strategies that consider environmental, social, and economic dimensions, providing a platform for initiatives that tackle plastic waste through sustainable waste management practices. the UNFCCC serves as a cornerstone in the global mission to combat climate change and its multifarious consequences. While the treaty does not exclusively focus on plastic waste regulation, its principles and provisions highlight the critical importance of curbing environmental pollution, including plastic waste. The framework encourages a sustainable, resilient, and pollution-free environment for current and future generations, underscoring the interconnectedness of climate change and broader environmental concerns. The commitment to differentiated responsibilities and the call for holistic strategies demonstrate a recognition of the global community's shared but varied responsibilities in addressing the challenges of climate change.

The evolution of environmental governance has seen the emergence of various legal instruments and protocols as derivatives of the United Nations Framework Convention on Climate Change (UNFCCC). These instruments play a pivotal role in addressing climate change directly and shaping global efforts toward environmental sustainability.

While I cannot provide specific sections or articles of the law as I don't have access to a database of legal texts, I can offer a general analysis of the information you provided regarding the Kyoto Protocol and the Paris Agreement. The Kyoto Protocol was a landmark international treaty adopted in 1997 under the United Nations Framework Convention on Climate Change (UNFCCC). It imposed legally binding emission reduction targets on developed countries, aiming to address the issue of climate change. The treaty established a set of flexible mechanisms, such as emissions trading and the Clean Development Mechanism (CDM), to help countries meet their targets more efficiently.

The Paris Agreement, operational since 2016, builds upon the foundation laid by the Kyoto Protocol. Unlike the Kyoto Protocol, the Paris Agreement includes commitments from both developed and developing nations, reflecting a more inclusive approach to address climate change. It sets the goal of limiting global temperature increase well below 2 degrees Celsius above pre-industrial levels, with efforts to limit the increase to 1.5 degrees Celsius. The Conference of the Parties (COP) is the main decision-making body of the UNFCCC, responsible for reviewing and advancing the implementation of these international agreements. COP meetings, including COP21 in Paris, are crucial for evaluating the progress made in combating climate change and negotiating additional measures.

The provided information indicates that critiques have been raised, particularly regarding the effectiveness of these agreements in reducing carbon dioxide emissions. The criticism centers on the perceived failure of some key signatory states to fulfill their commitments, which may impede the overall global effort to combat climate change. The references to Akambe and Kpae (2017) and Falkner (2016) suggest that scholars and researchers have delved into analyzing these limitations. In terms of legal analysis, one would need to refer to specific provisions within the Kyoto Protocol and the Paris Agreement to understand the legal obligations of the signatory states and the mechanisms in place to ensure compliance. Additionally, legal scholars might examine any dispute resolution mechanisms outlined in these agreements to address issues of non-compliance.

The Montreal Protocol, initiated in 1987, stands as a seminal protocol in environmental law. Universally ratified, it addresses the production and consumption of ozone-depleting substances (ODS). These substances pose a threat to the stratospheric ozone layer, crucial for shielding the environment and humanity from harmful ultraviolet radiation. The Montreal Protocol imposes obligations on parties to control the release of ODS, maintain national licensing systems, and submit yearly data reports. Noteworthy is its application of the principle of equal but differentiated responsibilities, binding both developed and developing nations to measurable commitments. Hailed as a model for combatting environmental degradation, the Montreal Protocol serves as a benchmark for crafting legislation, providing valuable insights for addressing challenges such as plastic waste (Andrady, 2015). Complementing these protocols is the Global Plastic

Treaty, an international legal framework specifically targeting the regulation of plastic waste. In conjunction with the UNFCCC and protocols like the Montreal Protocol, this treaty contributes significantly to the global mission of regulating plastic waste. It establishes guidelines, obligations, and commitments, offering a comprehensive model for countries seeking legislative means to urgently address the issue of plastic waste. By drawing on the successes and lessons of these international frameworks, nations like Nigeria can develop sustainable plastic waste management strategies (Akambe and Kpae, 2017; Falkner, 2016).

The synergy between international legal frameworks, including the UNFCCC, the Montreal Protocol, and the Global Plastic Treaty, underscores the collective commitment to addressing global environmental challenges. These frameworks provide a roadmap for countries, offering valuable guidelines, obligations, and commitments in the pursuit of sustainable environmental practices. As nations navigate the urgent issue of plastic waste, the lessons learned from these comprehensive models can inform legislative approaches, fostering a more sustainable and resilient global environment.

IV. Global Policies and Socio-economic Initiatives Concerning the Regulation of Plastic Waste

Without undermining the significance of the aforementioned laws pertaining to plastic waste regulation, it's pertinent to note that a pivotal global meeting convened on March 2, 2022. The objective of this meeting was to adopt a resolution that would initiate negotiations for the formulation of a legally binding agreement aimed at conclusively addressing the issue of plastic waste. This meeting brought together the global community, of which Nigeria is a participant, to collectively address the imperative of curbing indiscriminate plastic waste disposal through a concerted effort.

In addition to legal frameworks, the global community, has embraced sustainable policies and socio-economic strategies to effectively combat the challenge of indiscriminate plastic waste disposal. Some of these key policies and socio-economic measures are briefly explored below:

1. Global Tourism Plastics Initiative

Plastic waste have a large share in the tourism industry. The tourism industry is today rated as the major contributor to the high rate of plastic waste in the global environment. This is given the fact that the tourism industry associates with so many products that are meant to be used only one time or two and then get disposed of (Tedor and Nikola, 2014; Tu, 2018). Given the failure that has been recorded in this area, there has been a growing rate of Plastic Waste during tourism activities.

However, the Global Tourism Plastics Initiative is an effort to fight to reduce plastic waste that is incidental to touristic activities (Akambe and Kpae, 2017; Falkner, 2016). This initiative was an effort well calculated and founded on the firm commitment to fight, control, and stop plastic waste. It deployed several mechanisms

to involve businesses, governments, and other stakeholders to take appropriate actions and do their part in reducing plastic pollution (Auta et al., 2017; Barboza et al., 2019). According to their original plan which is still persistent, the objective of this initiative is to have strong agreements and terms by 2025.

Global Tourism initiative has so far United tourism sectors toward one goal which is to address the root cause of Plastic pollution. As of the time of this research, more than 100 organizations have signed the Global Tourism Plastics Initiative with the commitment to join in the mission of this initiative to eliminate unnecessary single-use plastics. They also undertake to join to perform the other and further objectives of the initiative such as the transition to reuse models and the use of reusable, recyclable, and finally compostable plastic packaging and items (Auta et al., 2017; Barboza et al., 2019).

Finally, the initiative is set to achieve the following objectives by 2025.

i. The holistic elimination of problematic or unnecessary plastic packaging and items;
ii. The movement away from single-use to reuse models or reusable alternatives.
iii. Increasing the amount of recycled content across all plastic packaging and items used.
iv. Collaboration and investment towards the increment of the recycling and composting rates for plastics.
v. Annual public report on the progress in the forgoing objectives.

2. **Extended Producer Responsibility (EPR):** Many countries, have adopted EPR policies that place the onus on producers to manage the entire lifecycle of their products, including proper disposal and recycling of plastic waste. This approach encourages manufacturers to design products with recyclability in mind, thereby reducing the burden of waste on the environment.

3. **Plastic Recycling Initiatives:** Governments and organizations have established programs to promote plastic recycling, incentivizing individuals and businesses to participate in recycling efforts. These initiatives create a circular economy that reduces the demand for new plastic production.

4. **Education and Awareness Campaigns:** Raising public awareness about the environmental hazards of plastic waste and the benefits of responsible disposal is crucial. Governments and non-governmental organizations (NGOs) often launch educational campaigns to inform citizens about proper waste management practices.

5. **Research and Innovation:** The global community has fostered research and innovation to develop alternative materials that are more sustainable than traditional plastics. Biodegradable plastics and innovative packaging solutions are among the advancements in this area.

6. **Waste Management Infrastructure Enhancement:** Improving waste collection, segregation, and disposal infrastructure is essential for preventing the indiscriminate dumping of plastic waste. Investments in efficient waste management systems help channel waste into proper channels, reducing environmental pollution.

7. **Circular Economy Promotion:** Embracing the principles of a circular economy entails minimizing waste, maximizing resource efficiency, and promoting recycling. Governments and industries are increasingly aligning with these principles to tackle the plastic waste crisis.

V. Legal issues and challenges concerning Plastic Waste Regulation in Nigeria and Singapore

The efforts to mitigate the escalating issue of plastic waste worldwide are evident and multifaceted. The United Nations has played a pivotal role in catalyzing this global movement. Nonetheless, many countries, including Nigeria, continue to grapple with legal and socio-economic challenges that hinder effective measures to combat the persistent problem of indiscriminate plastic waste disposal within their borders. While international initiatives have been set in motion, domestic implementation often faces hurdles. In countries like Nigeria, these setbacks are manifest in various legal and socio-economic aspects:

1. Legal Framework Limitations
2. Enforcement Challenges
3. Lack of Infrastructure
4. Socio-Economic Factors such as poverty and limited access to education, can contribute to the persistence of indiscriminate plastic waste disposal.
5. Cultural Practices
6. Lack of technological equipment in recycling plastic waste
7. Corruption
8. Conflict of Interest between those responsible for indiscriminate plastic waste dumping and those advocating against
9. Inadequate public awareness on the dangers of indiscriminate dumping of plastic waste.
10. Lack of facilities and agency to curtail the menace of indiscriminate dumping of plastic waste.

Concerning the above, it is apt to opine that the global efforts to address plastic waste are indeed commendable, with the United Nations playing a pivotal role in driving change. However, translating these efforts into effective solutions at the national level, as seen in Nigeria and other countries, can be challenging. Addressing these legal, socio-economic, and infrastructural setbacks is crucial to creating a comprehensive

and sustainable approach to tackling the indiscriminate dumping of plastic waste and safeguarding the environment for future generations.

Regulation of Plastic Waste in Singapore

The Environmental Public Health Act is a key legal framework in Singapore that addresses environmental health issues, including waste management. It empowers the National Environment Agency (NEA) to regulate and enforce environmental health standards. This act likely provides the legal basis for regulations related to the proper disposal of plastic waste, ensuring that waste management practices align with public health and environmental protection objectives.

It must be noted that one notable law that regulates plastic waste in Singapore is the Resource Sustainability Act (RSA) 2019, which is a comprehensive legislation that addresses the sustainable use of resources, waste reduction, and recycling. It includes provisions related to Extended Producer Responsibility (EPR) for certain products, encouraging producers to take responsibility for the end-of-life management of their products. The RSA is likely relevant to Singapore's initiatives to reduce plastic consumption and emphasize recycling. By implementing EPR for certain products, the legislation encourages a circular economy approach, promoting the responsible use and disposal of plastics. Furthermore, section 3 outlines the overarching purposes of the Act, which include implementing a framework where those profiting from product supply bear the cost of collecting and treating products when they become waste. While not specific to plastic, this purpose aligns with the extended producer responsibility concept, suggesting that producers should contribute to the management of waste generated by their products. Additionally, the Act aims to encourage producers of packaging to reduce, reuse, or recycle packaging, which indirectly addresses concerns related to plastic packaging waste. The third purpose focuses on enabling proper segregation and treatment of food waste, expanding the Act's scope to different waste streams.

Section 2 of the Resource Sustainability Act**,** it defines key terms relevant to the Act. Notably, "dispose" is defined as the act of disposing of something as waste, indicating a broad scope that could encompass various materials, including plastic waste. The definition of "import" excludes the bringing in of regulated goods or products intended for export without any landing or transhipment within Singapore, reflecting the international aspect of waste management. These definitions are crucial for understanding the roles and responsibilities of various entities within the waste management framework. While not explicitly focusing on plastic waste, the inclusion of terms like "specified waste" suggests a categorization that might encompass various types of waste, including plastic. Furthermore, section2(2) clarifies that, in the Act, a reference to the collection of any waste regulated under this Act includes the collection, receipt, removal, transportation, or storage of the waste for disposal. This emphasizes the comprehensive nature of waste management activities covered by the Act.

However, it suffices to state that section 6 of the Resource Sustainability Act outlines that Part 3 applies to a prescribed class or type of electrical or electronic product, emphasizing the regulatory focus on specific products. While not explicitly mentioning plastic waste, the definition of "regulated product" implies that it encompasses electrical or electronic products, which may include those with plastic components. Furthermore, section 6 of the Act, mandated that producers must collect regulated non-consumer products for disposal without demanding payment. Non-compliance can result in fines, and disposal must be through licensed waste collectors or e-waste recyclers. In this regard, it can be said that the provided law focuses on regulating the management of plastic waste in Singapore, particularly emphasizing the responsibilities of producers and occupiers in reducing, reusing, and recycling packaging materials. For an effective waste regulation, section 21 mandates that producers, as required by Section 20, submit a plan to the Agency detailing their strategies for reducing, reusing, or recycling packaging. The plan must encompass the implementation of these strategies. Failure to comply with this requirement constitutes an offense, with fines ranging from $5,000 on the first conviction to $10,000 or imprisonment for up to 3 months, and both fines, on subsequent convictions. Additionally, there's a provision for a daily fine for continuing offenses. The offense under Section 21(3) is a strict liability offense, meaning that intent is not a necessary element for prosecution.

Furthermore, section 25 imposes restrictions on the disposal of food waste in prescribed buildings, requiring occupiers to use designated facilities for food waste and prohibiting its disposal with other types of waste. Contravention of this provision results in a fine not exceeding $5,000. Also, section 26 places a duty on building managers to provide facilities within prescribed buildings for the separate disposal of food waste from other types of waste. Failure to comply leads to fines up to $10,000, imprisonment for up to 3 months, or both. Like Section 21, Section 26(2) is a strict liability offense, and daily fines may be imposed for continuing offenses.

Concerning the above, it suffices to state that, the law establishes strict regulations on the management of packaging and food waste, imposing significant penalties on producers and building managers for non-compliance, with an emphasis on promoting recycling and responsible waste disposal.

However, it must be noted that Singapore also has specific regulations governing the use of plastic bags. Retailers are required to charge customers for plastic bags, encouraging the reduction of single-use plastics. These regulations directly target plastic consumption by imposing a financial incentive for customers to minimize their use of plastic bags. This initiative aligns with the broader goal of reducing plastic waste and promoting sustainable practices. Also, Singapore has implemented mandatory packaging reporting requirements for businesses, requiring them to report on the types and amounts of packaging materials used. This initiative likely contributes to a more transparent understanding of the sources and types of packaging materials, including plastic, allowing for targeted efforts to reduce and manage plastic waste.

Concerning the above, the Singapore's regulations on the management and disposal of plastic waste are underpinned by various legislative measures, such as the Environmental Public Health Act and the Resource Sustainability Act. These regulations emphasize recycling, reduce plastic consumption through measures like plastic bag regulations, and promote extended producer responsibility. The multifaceted approach, including mandatory reporting and investments in waste management infrastructure, reflects Singapore's commitment to creating a sustainable and environmentally friendly approach to plastic waste. For the latest and most accurate information, it is recommended to consult the latest legal texts and publications from Singapore's relevant authorities.

However, it must be noted that considering the expectations of the Singaporean public for local leaders to address environmental concerns, it becomes crucial to examine Singapore's stance on relevant policies and regulations. The Sustainable Singapore Blueprint, released in 2015 by the National Environment Agency, outlines various initiatives such as the Singapore Packaging Agreement, a comprehensive waste management facility, and other strategies aimed at transitioning the nation toward zero waste.

Noteworthy advancements have also been made by organizations like PACT (Plastic Action), a voluntary initiative led by the World Wide Fund for Nature (WWF), operating at both sectoral and individual company levels. For instance, in June 2019, PACT, in collaboration with zero Waste SG, successfully enlisted 23,970 food and beverage establishments in Singapore to eliminate plastic straws by July 1, 2019. While government and non-profit-led efforts have predominantly focused on facilitating changes within businesses, initiatives targeting behavioral shifts among consumers are still in their early stages in Singapore. Local and community-driven endeavors, though valuable, often face challenges related to scale and long-term sustainability.

VI. Presentation and Analysis of Data

The data produced via an online questionnaire distributed to the participants is consequently presented and analyzed in the subsequent manner:

Sample Size and Techniques

In order to elicit a more comprehensive and representative range of responses from respondents in Nigeria through the utilization of a questionnaire, the study specifically targeted individuals residing in Nigeria. The study's sample size was further narrowed down to 310 respondents, spread across the country's various geo-political zones. The process of selecting respondents to participate in the questionnaire involved the application of a simple random sampling method. This method of sampling is considered advantageous and relevant for the following reasons (Aidonojie et al. 2023; Aidonojie and Edetalehn, 2023; Aidonojie et al. 2023; Aidonojie, 2023):

i. A random sampling method is particularly suitable for identifying respondents from diverse and heterogeneous populations (Aidonojie et al., 2022; Aidonojie, 2022)

ii. The outcomes obtained from a simple random sampling approach are impartial, unbiased, and objective.
iii. The utilization of a random sampling method for respondent selection is less complex and devoid of complications.
i. This method is deemed pertinent and advantageous in the context of a hybrid legal research approach (Aidonojie, 2022; Aidonojie and Francis, 2022, Aidonojie et al., 2022).

A. Data Analysis

The data obtained from the questionnaire is subsequently visualized through the use of charts and tables, ensuring accuracy and enhancing the clarity of presentation.

1. Research Question One

Figure 1: Respondents identifying their residential area in Nigeria

Table 1: Valid respondents' identification of their residential area in Nigeria

S/N	Geopolitical Zones in Nigeria	Responses of Respondents	Percent
1	North Central	23	7.4%
2	North East	49	15.8%
3	North West	36	11.6%
4	South East	58	18.7%
5	South South	83	26.8%
6	South West	61	19.7%
	TOTAL	**310**	**100%**

Figure 1 and Table 1 are valid respondents' identification of the various geo-political zones they reside or live in Nigeria.

2. Research Question Two

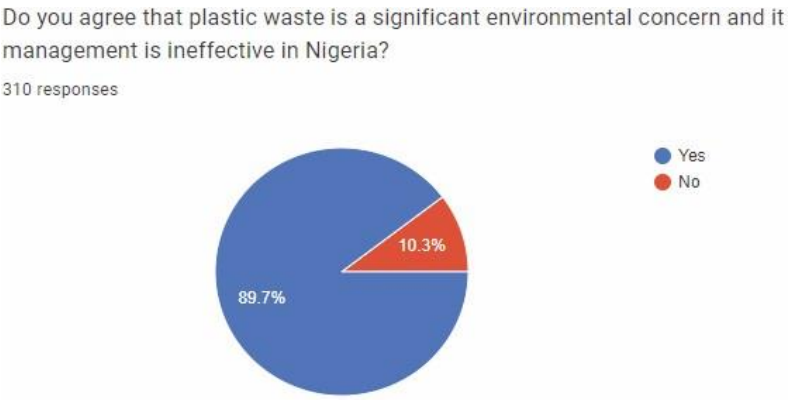

Figure 2: Respondents' confirmation of plastic waste as an environmental concern and its ineffective management in Nigeria

Table 2: Valid respondents' confirmation of plastic waste as an environmental concern and its ineffective management in Nigeria

	Response	Percent
Valid Yes	278	89.7%
Valid No	32	10.3%
Total	**310**	**100%**

Figure 2 and Table 2 above are respondents clarifications and valid confirmation by of plastic waste as a significant environmental concern and its ineffective legal and socio-economic management in Nigeria.

3. Research Question Three

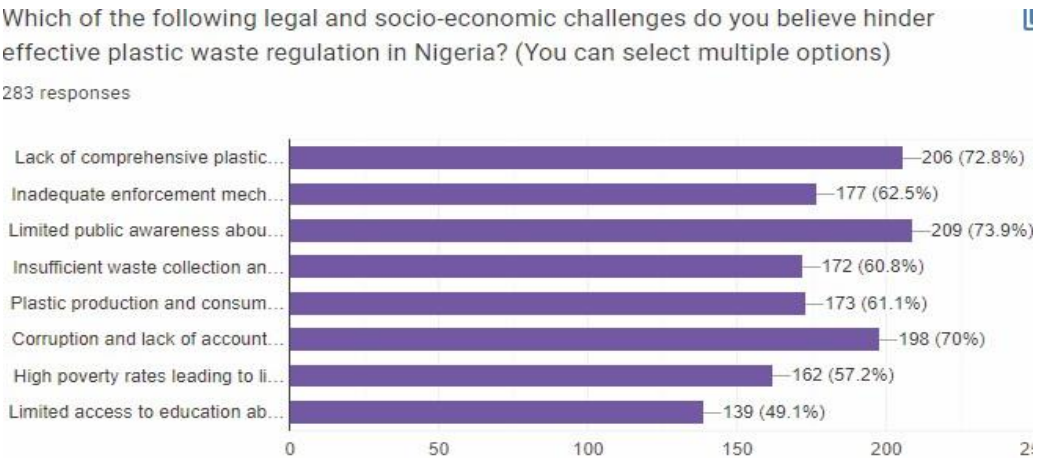

Figure 3: identification of the Legal and Socio-economic challenges of Plastic Waste Management in Nigeria

Table 3 : Valid Cluster of identification of the Legal and Socio-economic challenges of Plastic Waste Management in Nigeria

Waste Legal and Socio-economic challenges of Plastic Waste Management in Nigeria	Cluster of Response	Percentage
Lack of comprehensive plastic waste regulation laws	206	72.8%
Inadequate enforcement mechanisms	177	62.5%
Limited public awareness about proper plastic waste disposal	209	73.9%
Insufficient waste collection and recycling infrastructure	172	608%
Plastic production and consumption patterns	173	61.1%
Corruption and lack of accountability in waste management	198	70%
High poverty rates lead to limited waste management resources	162	57.2%
Limited access to education about the environmental impact of plastic waste	139	49.1

Figure 3 and Table 3 are clusters of identification of the the legal and socio-economic challenges that often limit the effective plastic waste management in Nigeria.

4. Research Question Four

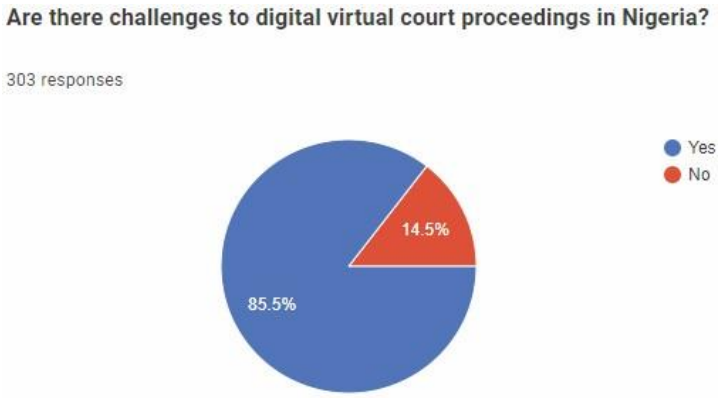

Figure 4: Respondents' confirmation of if effective socio-economic and policy framework could aid in plastic waste management

Table 4: Valid confirmation of if effective socio-economic and policy framework could aid in plastic waste management

	Response	Percent
Valid Yes	280	90.3%
Valid No	30	9.7%
Total	**310**	**100%**

Figure 4 and Table 4 are valid confirmations by respondents in identifying if there an effective legal and socio-economic framework could aid in curtailing the indiscriminate dumping of waste in Nigeria.

5. Research Question Five

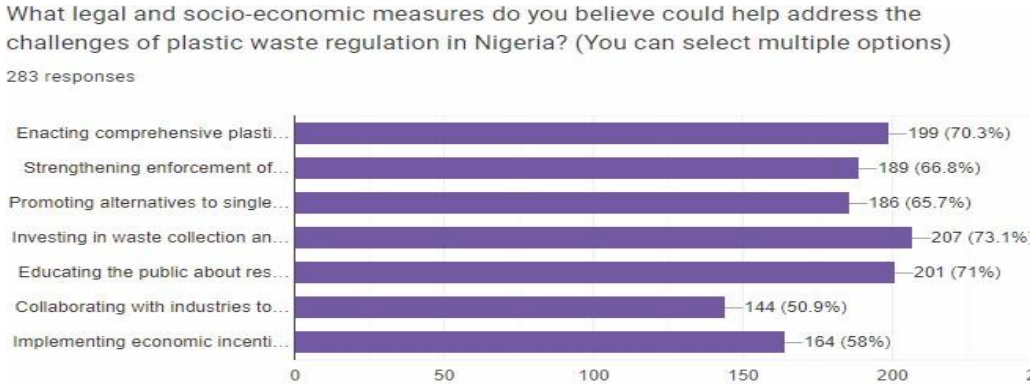

Figure 5: Legal and socio-economic measure in addressing issues of plastic waste in Nigeria

Table 5: Cluster identification of the Legal and socio-economic measure in addressing issues of plastic waste in Nigeria

Legal and Socio-economic Measures in curtailing the dumping of plastic waste	Cluster of Response	Percentage
Enacting comprehensive plastic waste regulation laws	199	70.3%
Strengthening enforcement of existing regulations	189	66.8%
Promoting alternatives to single-use plastics	186	65.7%
Investing in waste collection and recycling infrastructure	207	73.1%
Educating the public about responsible plastic waste disposal	201	71%
Collaborating with industries to reduce plastic production	144	50.9%
Implementing economic incentives for plastic recycling	164	58%

Figure 5 and Table 5 are clusters of identification of the legal and socio-economic measure the Nigeria government should adopt in addressing issues as it concern plastic waste in Nigeria.

VII. Discussion of Findings

The gathered results from the data provide valuable insights into various aspects of plastic waste management in Nigeria. Each research question sheds light on different facets of the issue: The data presented in Figure 1 and Table 1 offer insights into the geographical distribution of respondents' residential areas across the various geopolitical zones in Nigeria. The respondents' identification of their residential areas provides

contextual information for analyzing their perspectives on plastic waste management. The distribution indicates that respondents were well-represented across different parts of Nigeria, allowing for a diverse range of opinions and experiences to be captured. The South-South geopolitical zone had the highest number of respondents at 26.8%, followed closely by the South West at 19.7%. The South East and North East zones each accounted for 18.7% and 15.8% of the respondents, respectively. The North West and North Central zones had 11.6% and 7.4% of respondents, respectively. In this regard, the distribution of respondents across these regions highlights the nationwide significance of the issue of plastic waste management. It suggests that the concern over plastic waste is not limited to a specific geographic area but resonates across various regions of Nigeria. The data's geographical diversity strengthens the validity and generalizability of the findings, as perspectives from both urban and rural areas are represented.

Figure 2 and Table 2 illustrate respondents' confirmation of plastic waste as a significant environmental concern and the perceived ineffective management of plastic waste in Nigeria. The overwhelming response of 89.7% confirming the concern emphasizes the collective recognition of plastic waste's adverse impact on the environment. This high percentage reflects a broad awareness of the environmental challenges posed by plastic waste and its associated consequences. Figure 3 and Table 3 outline the clusters of responses regarding the legal and socio-economic challenges of plastic waste management in Nigeria. The data highlight specific obstacles hindering effective plastic waste management:

i. 72.8% of respondents identified the absence of comprehensive regulations as a significant challenge. This underscores the need for well-defined legal frameworks to guide plastic waste management practices and enforcement.
ii. 62.5% expressed concern over the inadequate enforcement of existing regulations, indicating the importance of strengthening enforcement mechanisms to ensure compliance.
iii. 73.9% acknowledged the challenge of limited public awareness about proper plastic waste disposal, emphasizing the need for educational campaigns to promote responsible waste disposal habits.
iv. 60.8% recognized the lack of proper infrastructure for waste collection and recycling, underscoring the need for investment in waste management infrastructure.
v. 6.1% identified the patterns of plastic production and consumption as a challenge, suggesting the importance of addressing the root causes of plastic waste generation.
vi. 70% expressed concern about corruption and lack of accountability in waste management, indicating the need for transparent and accountable practices.
vii. 57.2% highlighted the impact of high poverty rates on limited waste management resources, calling for socio-economic interventions to address this issue.
viii. 49.1% recognized limited access to education about the environmental impact of plastic waste, suggesting the need for educational initiatives to raise awareness.

However, Figure 4 and Table reveal respondents' confirmation of the role of an effective socio-economic and policy framework in aiding plastic waste management. A significant 90.3% of respondents confirmed that such a framework could contribute to curbing indiscriminate plastic waste disposal. This overwhelming response underscores the perceived importance of comprehensive legal and socio-economic measures in addressing plastic waste challenges. Figure 5 and Table 5 present clusters of responses regarding the legal and socio-economic measures that could address plastic waste issues in Nigeria. The identified measures include:

i. 70.3% endorsed the need for comprehensive regulations to guide plastic waste management, highlighting the role of legal frameworks in shaping effective practices.
ii. 66.8% emphasized the importance of robust enforcement mechanisms to ensure compliance with plastic waste regulations.
iii. 65.7% acknowledged the significance of promoting alternatives to single-use plastics as a strategy to reduce plastic waste generation.
iv. 73.1% recognized the importance of investing in infrastructure to enhance waste collection and recycling capabilities.
v. 71% endorsed public education campaigns to raise awareness about responsible plastic waste disposal practices.
vi. 50.9% recognized the need to collaborate with industries to reduce plastic production and consumption.
vii. 58% suggested the implementation of economic incentives to encourage plastic recycling efforts.

Concerning the above, it suffices to state that the data presented in response to Research Question One to Five provide a comprehensive understanding of respondents' perspectives on plastic waste management challenges and potential solutions in Nigeria. The findings reflect the urgency of addressing plastic waste concerns through legal, socio-economic, and environmental strategies to safeguard the environment and promote sustainable practices.

VIII. Conclusion

Concerning the above, it suffices to state that The regulation of plastic waste in Nigeria presents a multifaceted challenge that necessitates a comprehensive and integrated approach. The legal intricacies associated with plastic waste management call for the establishment of a robust framework capable of addressing gaps and ambiguities throughout the entire life cycle of plastic products, drawing inspiration from Singapore's successful model. It is imperative to meticulously regulate every stage, from production to disposal, to ensure environmental sustainability and minimize the detrimental impact of plastic pollution. The efficacy of any regulatory framework crucially relies on the implementation of strong enforcement mechanisms and penalties. Adequate

consequences for non-compliance are essential to create a deterrent effect and instill a culture of responsibility among stakeholders. Here, Singapore's stringent enforcement mechanisms can serve as a benchmark for Nigeria to aspire to, ensuring a more effective governance of plastic waste.

Socio-economic considerations introduce an additional layer of complexity to the regulatory landscape. Recognizing the impact of plastic waste management on livelihoods, especially within the informal waste sector, requires a nuanced strategy, drawing insights from Singapore's balanced approach. Striking a delicate balance between environmental imperatives and economic realities is paramount. A comprehensive strategy must include public awareness campaigns to educate the populace about responsible plastic use, disposal, and recycling. Simultaneously, efforts should be directed towards promoting sustainable alternatives, reducing dependency on single-use plastics, and encouraging a shift towards eco-friendly practices. In the pursuit of regulating plastic waste, a holistic approach that seamlessly aligns legal frameworks with socio-economic considerations is indispensable. Such an approach not only contributes to a cleaner environment but also plays a pivotal role in fostering sustainable development and social equity.

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