TRADE & INDUSTRIAL POLICY STRATEGIES

INDUSTRY STUDY

SUSTAINABILITY REPORT: PLASTICS INDUSTRY

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TIPS industry studies aim to provide a comprehensive overview of key trends in leading industries in South Africa. For each industry covered, working papers will be published on basic economic trends, including value added, employment, investment and market structure; trade by major product and country; impact on the environment as well as threats and opportunities arising from the climate crisis; and the implications of emerging technologies. The studies aim to provide background for policymakers and researchers, and to strengthen our understanding of current challenges and opportunities in each industry as a basis for a more strategic response.

This study delves into two critical aspects shaping the future of the plastics market: the carbon intensity of the value chain and the evolving policy landscape, along with the associated sustainability risks.

Authors:
Rapula Diale, TIPS Economist and Dr Michael Hector, TIPS Economist: Sustainable Development

CONTENTS

ABBREVIATIONS

CBAM	Carbon Border Adjustment Mechanism
CCS	Carbon Capture and Storage
CHP	Combined Heat and Power
CTL	Coal-to-liquids
EPR	Extended Producer Responsibility
GHG	Greenhouse Gas
HDPE	High-density Polyethylene
LNG	liquefied natural gas
NWMS	National Waste Management Strategy
PET	Polyethylene Terephthalate
PP	Polypropylene
PROs	Producer Responsibility Organisations
SUPD	Single-Use Plastics Directive

1. INTRODUCTION

The global plastics market is a dynamic and integral part of modern economies, underpinning various sectors from packaging and construction to automotive and consumer goods, with demand for various plastics anticipated to grow. However, the environmental sustainability of this market is increasingly coming under scrutiny. As concerns about climate change and environmental degradation intensify, stakeholders across the value chain — from producers to end-users — are evaluating the carbon intensity and overall environmental footprint of plastic products. This report delves into two critical aspects shaping the future of the plastics market: the carbon intensity of the value chain and the evolving policy landscape, along with associated sustainability risks.

The study provides a comprehensive overview of the current state of the plastics market and its trajectory towards a more sustainable and low-carbon future. It examines the carbon intensity of the plastics value chain, focusing on emissions generated during the production, conversion, and disposal phases of the plastics value chain. It highlights how different types of plastics contribute to greenhouse gas (GHG) emissions and explores opportunities for reducing carbon footprints through technological innovation and improved recycling practices. It analyses the policy landscape affecting the plastics market, including regulations, international agreements, and corporate sustainability commitments. It also assesses the sustainability risks associated with these policies, such as regulatory compliance, market access restrictions, and shifting consumer preferences towards more sustainable alternatives.

2. CARBON INTENSITY OF THE VALUE CHAIN

The plastics value chain is a complex system that spans the production, processing, use, and disposal of plastic materials, leading to a wide range of environmental impacts, such as GHG emissions, water pollution, and the release of toxic chemicals. While the production and conversion segments of the value chain are the most carbon intensive across the value chain, the consumption and disposal segment of the value chains are pollution intensive.

This section focuses on the environmental implications of the plastics value chain. The aim is to highlight the primary sources of emissions, the factors driving carbon leakage, and the overall environmental impact.

2.1. Plastics feedstock

Historically, South Africa's economic development has been driven by its energy-minerals complex, anchored in exploitation of vast coal reserves for energy and petrochemical production. The country's significant coal endowment, combined with trade isolation during the apartheid era, spurred substantial investments in coal infrastructure. A key outcome of these efforts was the establishment of Sasol, which pioneered coal-to-liquids (CTL) technology, playing a critical role in SA's energy security and industrialisation (PAGE, 2022).

2.1.1. Petrochemical feedstocks

Using the patented Fischer-Tropsch process, Sasol has pioneered CTL technology in South Africa, converting coal into liquid fuel and a range of petrochemicals, including wax products and key chemical intermediates such as propylene, polyethylene, and polyvinyl chloride (PVC) — essential polymers for the plastics industry (Sasol, n.d). Sasol faces limited competition in producing key polymers that serve as inputs into downstream plastics value chains. These polymers play a critical role in diverse plastic products, ranging from household goods such as buckets and chairs to industrial components like automotive parts and water tanks. The significance of these value chains stems from their contribution to downstream industries by supplying essential raw materials for manufacturing.

Most GHG emissions in the plastic value chain arise during the production process. The production and conversion of plastics accounts for an estimated 90% of GHG emissions across the plastics lifecycle (OECD, 2022). International GHG emissions from polymer production and conversion range from 2.7 to 6.3 tCO^2 eq per tonne of plastic. The emissions intensity centres on Sasol's production processes. In 2022, Sasol alone emitted 54.6 million metric tonnes of scope 1 carbon dioxide — emissions resulting from the organisation's activities — and 5.95 million metric tonnes of Scope 2 carbon dioxide — indirect emissions resulting from energy purchased i.e. coal-generated electricity. This makes Sasol one of the country's largest CO_2 emitters, surpassing the emissions of downstream segments in the value chain.

Given the energy-intensity of production, emissions from electricity supply compound the carbon intensity of the conversion process itself. Coal continues to dominate the energy mix in SA, and provides about 80% of electricity generated in the country (Pierce and Le Roux, 2023). This highlights the country's heavy reliance on coal combustion for energy. This dependence on coal amplifies the carbon footprint of energy-intensive industries like polymer production. The result is that South Africa's domestically produced plastic products are highly carbon intensive. This reliance complicates efforts to combat climate change and has impacted production practices across industries.

Taking a longer term view, economic and environmental risks from plastics production, use and export are emerging. Trade-related climate policies such as the EU Carbon Border Adjustment Mechanism (CBAM) are increasingly incentivising low-carbon products while imposing restrictions or penalties on imports from countries and industries with high carbon footprints, While plastics are not currently a sector subject to the CBAM, the potential sectoral expansion of the CBAM places plastic exports at risk of being uncompetitive when entering markets subject to border carbon adjustments. The risks are exacerbated by the uncertain future of Sasol — particularly the Secunda plant — which supplies key upstream inputs for the plastics industry. As a result, the entire petrochemicals and plastics value chain faces heightened vulnerability (Crompton, Young and Hahn, 2024).

In addition, Sasol has historically benefited from regulatory exemptions, such as lenient Minimum Emission Standards and a low carbon tax with various waivers. These exemptions lower the punitive costs on high emitters, which mean that the true costs of emissions are not accounted for. As a result, should high emitters be compelled to pay fully the costs of emissions, they would face increased costs, further constraining their profitability, investment and success. The exemptions also shift the true environmental and public health costs of emissions onto society (Green Building Africa, 2025).

2.1.2. Bio-based plastics

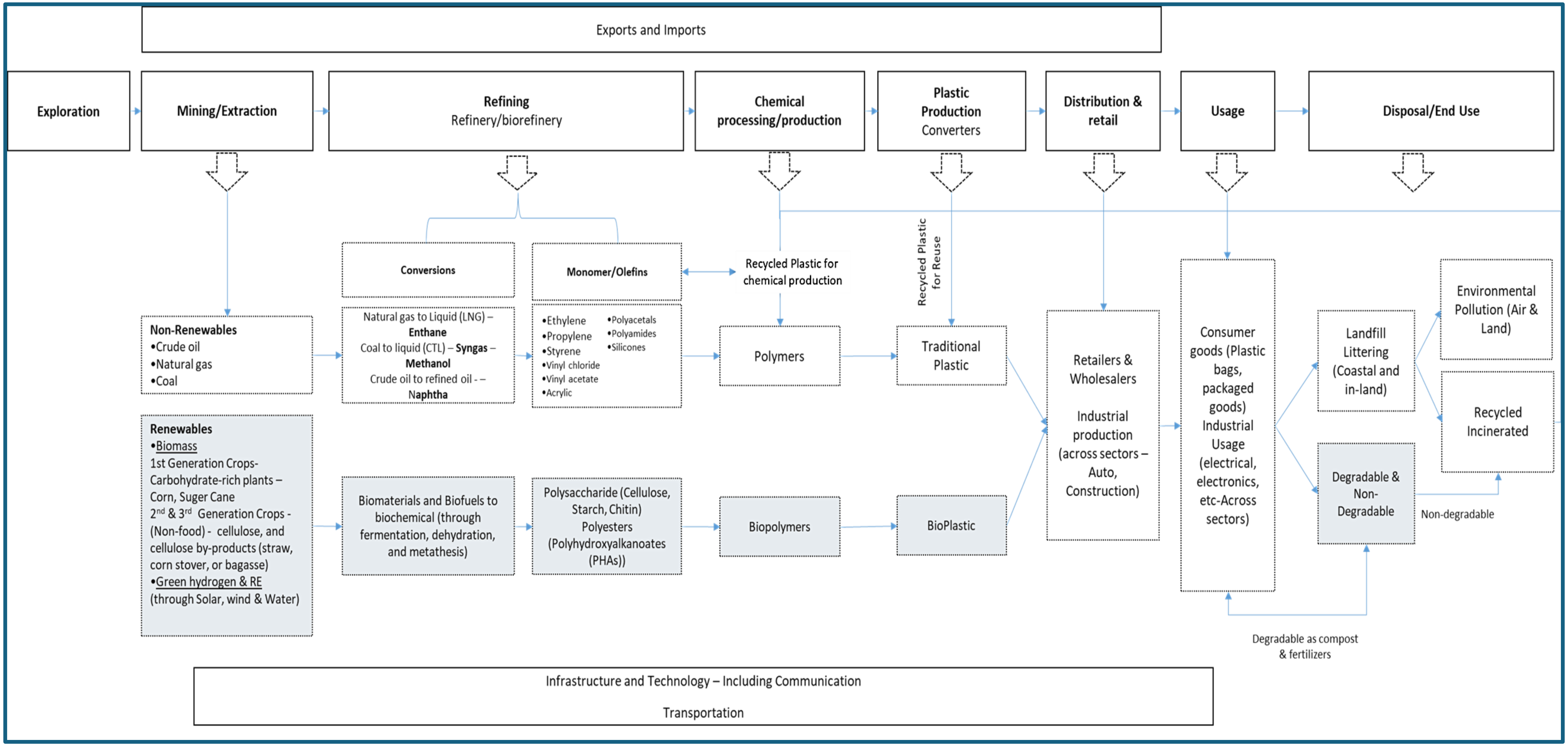
The introduction and increasing use of bio-based plastics provides an alternative to the heavy reliance on fossil fuels, while achieving similar characteristics to fossil-based plastics. Biobased plastics are produced from high-starch biomass sources such as the residues of corn, and wheat or fibres of sugarcane, and by-products from other processes. They produce lower GHG emissions than fossil-based plastics. Additionally, it is essential to differentiate between biodegradable, non-biodegradable, compostable, and non-compostable plastics, as their polymer composition and applications vary. These differences influence the material's performance, sustainability, and ability to integrate into circular systems such as recycling and reuse. Biodegradable plastics decompose through natural microbial activity, while compostable plastics require specific conditions to break down into non-toxic components.

Though a promising solution, biobased plastics account for only about 1% of the global plastics market. In 2023, global bioplastics production capacity stood at two million metric tons, with projections indicating an increase to 5.7 million metric tons by 2029 (Statista, 2025). However, scaling up production presents significant challenges, particularly on land and water use.

Producing biobased plastics requires substantial agricultural land to grow feedstocks such as corn, wheat, and sugarcane. This can compete with food production, potentially driving up food prices and exacerbating food security concerns. Expanding cropland for biomass can also contribute to deforestation, leading to habitat destruction, biodiversity loss, and carbon emissions from the release of stored carbon in trees and soil. Water use presents another critical issue. Large volumes of water are required to cultivate bioplastic feedstocks, straining local water supplies, particularly in regions already facing shortages. Irrigation runoff from these crops can also pollute water systems, harming ecosystems and reducing water quality (Bergsma et al., 2023; Keyes et al., 2024).

While biobased plastics typically produce fewer greenhouse gas emissions than fossil-based plastics, their overall environmental impact remains contentious. Land-use changes, such as deforestation, can generate significant emissions, potentially offsetting the climate benefits of replacing fossil-based plastics. The destruction of tropical forests and other natural ecosystems releases large amounts of carbon in a single event, diminishing the net gains of biobased alternatives.

Figure 1: The plastics value chain



Source: Maimele, 2024.

Table 1 shows the GHG emissions of fossil fuel-based and bio-based plastics during the cradle-to-gate phases of their respective value chains and represent global averages. While these figures are not South Africa-specific, they are useful in comparing the different level of emissions based on the different feedstock.

High-density polyethylene (HDPE), polyethylene terephthalate (PET), and polypropylene (PP) are widely used plastics in packaging, construction, and automotive industries, collectively accounting for over 60% of global plastic consumption (OECD, 2022). Demand for these materials continues to rise, driven by economic growth, digitalisation, and increased electrification (OECD, 2022). However, their production generates substantial greenhouse gas emissions, and recycling rates remain low. In 2019, plastics accounted for 3.4% of global emissions, primarily due to fossil fuel-based production.

Plastic consumption is projected to nearly triple from 460 million tonnes (Mt) in 2019 to 1231 Mt by 2060, with plastic waste increasing from 353 Mt to 1014 Mt over the same period. Greenhouse gas emissions from the plastics lifecycle are expected to more than double, rising from 1.8 gigatonnes of CO_2 equivalent (Gt CO_2 e) to 4.3 Gt CO_2 e (OECD, 2022).

Among the three common plastic materials, PET has the highest cradle-to-gate GHG emissions . Fossil fuel-based PET polymers emit more than bio-based polymers. PET polymer emissions range from 2.2 to 3kg CO_2 eq./kg, compared to bio-based polymers, which emit between 1 to 2.4kg CO_2 eq./kg (Table 1). PP, on the other hand, has the lowest GHG emissions among the materials studied, with fossil fuel-based PP producing emissions within the same range as HDPE. However, bio-based PP demonstrates a notable environmental benefit, with emissions ranging from -0.2 to -0.3 kg CO_2 eq./kg, indicating that it sequesters more carbon than is emitted during its cradle-to-gate phases (Table 1).

Similarly, bio-based HDPE also sequesters more carbon than it emits, with a GHG emission range of-0.55 to -0.88 kg CO_2 eq./kg. In contrast, fossil fuel-based HDPE emissions range from 1.9 to 2kg CO_2 eq./kg. This comparison highlights the environmental benefits of transitioning to bio-based polymers, which can act as a carbon sink and reduce the overall carbon footprint of plastic production (Table 1).

Table 1: Plastics GHG emission comparison

MATERIAL	FOSSIL FUEL-BASED POLYMER (KG CO2 EQ/KG)	BIO-BASED POLYMER (KG CO2 EQ/KG)
HDPE	1.9 to 2	-0,55 to -0,88
PET	2.2 to 3	1 to 2.4
PP	1.8 to 2	-0.2 to -0.3

Source: OECD, 2022. Global plastics Outlook.

2.2. Plastic use and waste

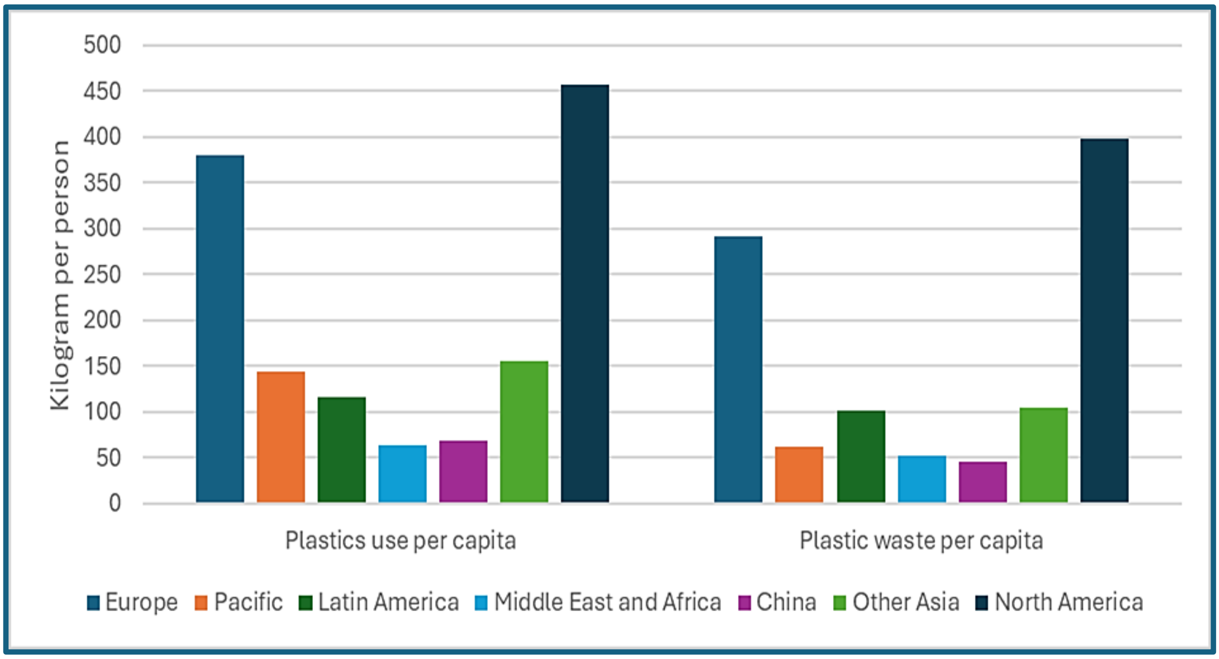
The production and consumption of plastic polymers, products, and waste are correlated with economic growth. Thus, in an economic downturn or in a period of low economic activity demand for plastics tends to decline (OECD, 2022). This trend can be seen, for instance in the regional differences in plastic use and waste per capita reflected in varying levels of economic development, consumption habits, and the effectiveness of recycling programs. In 2019, North America and Europe were high consumers of plastic and producers of waste. Meanwhile, relatively smaller economies in the Global South, such as South Africa, tend to produce and consume lower volumes compared to advanced economies, highlighting the interconnectedness of plastic production, use and waste with economic development (Diale, 2024).

Graph 1 compares plastic use and plastic waste per capita across various regions of the world. North America stands out with the highest per capita plastic use, exceeding 400kg, and the highest plastic waste per capita. Much of the plastic used in North America becomes waste, indicating high consumption levels with limited recycling or reuse efforts. Europe follows as the second highest in both plastic use and waste per capita, using around 300kg per person. Although Europe also generates substantial plastic waste, the gap between use and waste suggests some level of recycling or more efficient waste management.

In contrast, regions like the Pacific, Latin America, Other Asia, China, the Middle East, and Africa exhibit significantly lower plastic use and waste per capita, generally ranging from 100kg to 200kg per person, or even lower. China, the Middle East, and Africa show particularly low levels, which reflects lower consumption rates or more efficient waste management practices compared to other regions.

Advanced economies with high levels of plastic consumption and waste generation must urgently improve recycling systems and restrict single-use plastics. In contrast, developing regions — currently exhibiting lower consumption — can integrate sustainable practices, preventing future environmental burdens as their consumption expands

Graph 1: The regional use and waste per capita of all plastics, in 2019



Source: Adapted from OECD, 2022.

2.3. MICROPLASTICS AND PLASTIC LEAKAGE

The waste and disposal segments of the plastic value chain face significant sustainability challenges, particularly concerning microplastics and environmental leakages. According to OECD (2022) data, an estimated 22 million tonnes of plastics leak into the environment annually, with microplastics making up 12% of the leakage. While the literature on macroplastics is vast, little is covered on microplastics. Microplastics are small plastic particles generated during the use, degradation, or improper disposal of plastics. Unlike general plastics litter, which includes larger, visible plastic waste such as bottles and packaging, microplastics are often invisible to the naked eye but have a pervasive presence in ecosystems. Microplastics pose unique and potentially greater challenges compared to macroplastics due to their pervasive nature and the difficulty of detection and removal. Microplastics typically originate from the breakdown of larger plastics, tyre wear, synthetic textiles, and even personal care products. Microplastics often escape conventional waste management systems, allowing them to infiltrate waterways and accumulate in soil, oceans, and the atmosphere.

These tiny particles have been detected in drinking water, seafood, and even table salt, easily bypassing filtration systems and entering the food chain, where they can be ingested by humans. Once inside the body, microplastics can release toxic substances such as phthalates, bisphenol A, and persistent organic pollutants, which are linked to endocrine disruption, inflammation, and other chronic health conditions. Inhalation of airborne microplastics, originating from synthetic fibres and industrial emissions, poses additional risks, potentially contributing to respiratory illnesses like asthma. Beyond direct health impacts, microplastics amplify environmental contamination, diminishing the aesthetic and economic value of ecosystems. This pollution adversely affects industries such as tourism and fisheries, further underscoring the broad and long-term consequences of microplastics proliferation

3. THE POLICY LANDSCAPE AND SUSTAINABILITY RISKS

This section examines a range of complementary policy instruments used globally to mitigate the environmental impact of plastics and explores legislation and policies relevant to South Africa's plastics value chain. It covers international policy configuration for the plastics value chain, as well as South Africa's approach to reduce plastic waste and promote sustainability.

Decarbonising the plastics value chain demands a move away from fossil-based feedstocks. Biomass and bio-based feedstocks, such as agricultural residues and forestry waste, offer a substitute for fossil sources when manufacturing primary chemicals like ethylene and propylene. However, the supply of these feedstocks remains limited by land-use competition and sustainability issues.

Captured CO_2 may be converted into methanol (e-methanol) using renewable electricity. Although this method requires high energy input, it becomes scalable when paired with affordable renewable energy (Lopez et al., 2023). Chemical recycling techniques, such as pyrolysis and gasification, recover hydrocarbons from mixed plastics and could prevent up to 300 million tonnes of greenhouse gas emissions per year. This GHG saving, however, is an estimate based on specific assumptions — often a best-case scenario —and the real-world impact depends on whether these technologies can be scaled economically and sustainably. These technologies are still in development however, and many are at the R&D or pilot stage. Green hydrogen produced via electrolysis with renewables also becomes vital for ammonia production and methanol synthesis, a change that could make the chemical industry the largest consumer of green hydrogen by 2050 (Tan and Vegelan, 2022; Lopez et al., 2023; McKinsey & Company, 2023).

Improving energy efficiency in production remains equally crucial. Combined Heat and Power (CHP) systems use waste heat to reach efficiencies between 65% and 80% and reduce emissions by about 50% compared to conventional grid electricity and on-site boilers, particularly in high-temperature industries like petrochemicals. Supportive policies, including tax incentives and simplified permitting, further encourage their use (US EPA, 2022). Carbon Capture and Storage (CCS) presents another vital strategy for reducing emissions from energy-intensive processes such as steam cracking and ammonia production, although it demands significant infrastructure investments and geological conditions. Similarly, Carbon Capture and Utilisation, which converts CO_2 into methanol, illustrates the benefit of low-cost renewables and scalable electrolysis in establishing a circular chemical sector (McKinsey & Company, 2023; Zanon-Zotin *et al.*, 2024).

Improving waste management and recycling infrastructure also plays a key role in controlling end-of-pipe emissions. Mechanical recycling works effectively for single-polymer plastics like PET bottles but loses efficiency when faced with mixed or contaminated waste; this calls for upgraded sorting facilities and standardised packaging design. Chemical recycling methods, such as gasification and pyrolysis, convert non-recyclable plastics into syngas or oil, though they face regulatory uncertainties and cost issues. With incineration the integration of waste-to-energy processes with CCS may reduce emissions, while bioplastics that retain carbon over the long term could further contribute to net-negative emissions (Tan and Vegelan, 2022; McKinsey & Company, 2023; Zanon-Zotin et al., 2024).

On the demand side, reducing plastic consumption and changing consumer behaviour are essential. Public awareness campaigns that focus on reducing single-use plastics and improving recycling participation — illustrated by the EU's Single-Use Plastics Directive (SUPD)[1] — can alter consumption patterns. At the same time, corporate commitments to sustainability can drive the demand for low-carbon plastics. Policy instruments such as Extended Producer Responsibility (EPR) schemes and landfill taxes reinforce these efforts by promoting circular design and effective recycling practices.

To mitigate the negative impacts of plastics on the environment, the OECD argues for a broad and integrated approach through various policy instruments (Watkins et al., 2019 and Karasik, et al. 2022). These instruments vary in their scope and focus, with some specifically designed to target plastics, while others are directed at a wider array of waste and material types. For example, highly targeted measures such as bans and taxes on single-use plastics aim to reduce consumption of specific items like plastic bags. In contrast, broader measures, such as landfill taxes, apply to all solid waste and are designed to discourage disposal and promote recycling or energy recovery (Watkins et al., 2019).

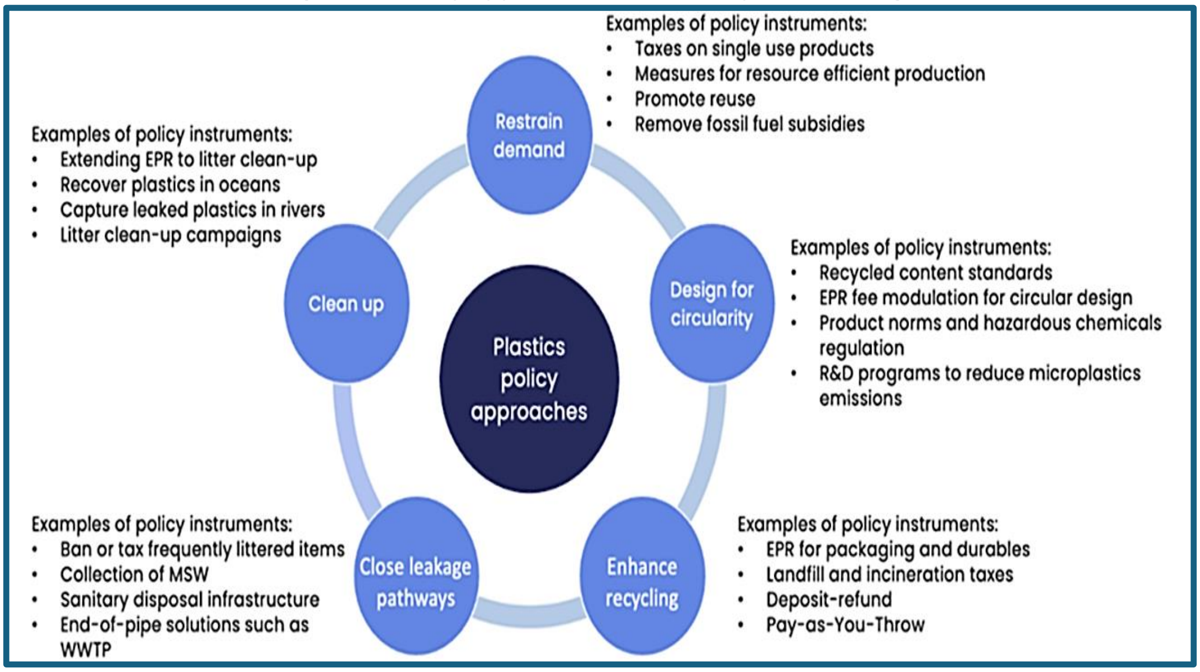
A comprehensive policy approach to reducing the environmental footprint of plastics involves a mix of complementary instruments. No single policy instrument has been effective in isolation. Instead, these policies must be part of a broader policy mix that includes mutually supportive and complementary measures.

In shaping a sustainable future for the plastics value chain, policymakers are employing a range of strategies to mitigate the environmental impact of plastics. The five key approaches to plastics policy outlined in the graphic — Restrain Demand, Design for Circularity, Enhance Recycling, Close Leakage Pathways, and Clean Up — provide a comprehensive framework for achieving sustainability in plastic production, consumption, and waste management (Watkins et al., 2019).

Together, these five approaches form a robust policy framework for the full lifecycle of plastics, from production and consumption to waste management and environmental remediation. Each approach complements the others, collectively driving the plastics value chain towards greater sustainability and reducing its overall carbon footprint. As such, they provide a comprehensive roadmap for governments, industries, and consumers to reduce the environmental impact of plastics while supporting economic and social development goals.

[1] The EU SUPD, enacted in 2021, aims to reduce the impact of single-use plastic products on the environment.

Figure 2: Policy approaches to reduce plastic leakage



Source: OECD, 2022. Global plastics outlook. Note: MSW = Municipal Solid Waste, WWTP = Waste Water Treatment Plant.

3.1. South Africa's plastics sustainability policies

South Africa's approach to managing plastic sustainability is multifaceted, emphasising circular economy principles while integrating policy measures to reduce carbon emissions across the plastic value chain. Recent policy frameworks reflect a growing commitment to lessen the environmental impact of plastics, incorporating strategies for recycling, consumer behaviour, and decarbonisation.

Circular economy and recycling initiatives

South Africa has prioritised circularity by promoting recycling, aiming to reduce landfill reliance, in alignment with the goals of the National Waste Management Act and increase recycling rates, which stood at 27% of plastic waste in 2020. The drive for a circular economy in the plastics value chain is further supported by EPR schemes. Mandatory EPR schemes require producers, importers, and retailers to manage the lifecycle of plastic packaging. This includes registration with the Department of Forestry, Fisheries, and the Environment, payment of EPR fees, and meeting annual recycling targets (Plastics SA, 2024).

In addition in 2014/2015, industry body, Plastics SA set an ambitious target to achieve zero plastics to landfill by 2030. This initiative aims to intensify recycling rates and reduce the environmental impact of plastic waste. Key strategies include improving access to solid waste streams, promoting separation at source, and enhancing recycling infrastructure (Mavuso, 2015).

Decarbonisation efforts

In addition to advancing circularity initiatives, South Africa aims to decarbonise the plastics sector by adopting renewable energy, alternative feedstocks, and innovative technologies. Deploying alternative feedstocks, solar and wind energy in production facilities, along with carbon capture technologies, is anticipated to reduce emissions and reliance on fossil fuels, positioning the plastics sector to remain globally competitive as markets increasingly demand low-carbon products.

South Africa's efforts to decarbonise its electricity generation have made headway in ramping up renewable energy, yet significant systemic challenges remain. Despite procuring 11 590MW of renewables and 800MW of battery storage since 2011, progress is continually impeded by deep-rooted financial constraints, regulatory uncertainty, and technical capacity limitations. Political resistance — exacerbated by entrenched coal-sector interests — and a 700% rise in electricity prices (in nominal terms) between 2000 and 2021 have further complicated efforts. Regulatory reforms enacted in 2021–2022, including removing licensing requirements for private power generation, have spurred self-generation projects registering 7.5GW between 2022 and 2024, yet the energy mix remains overly reliant on fossil fuels (Montmasson-Clair and Patel, 2024).

On the utility front, Eskom's Just Energy Transition strategy — which aims to achieve net-zero emissions by 2050 — embodies a pragmatic but gradual approach. The strategy focuses on diversifying the energy portfolio by incorporating nuclear, renewables, and a mix of storage solutions to reduce coal dependency while preserving grid stability. Critical to this transition is the strategic shift towards liquefied natural gas (LNG): Eskom is moving to repurpose existing coal-fired plants in partnership with Sasol, a measure that could nearly halve CO_2 emissions compared to coal-based generation (Majola, 2024; Sasol, 2024).

To reinforce decarbonisation efforts, South Africa introduced a pioneering carbon tax in June 2019. This tax covers about 90% of the country's GHG emissions , with exemptions for agriculture, forestry, land use, and waste. Designed to incentivise lower emissions across industries, including plastics, the carbon tax incorporates tax-free thresholds and carbon offsets, allowing industries to transition more smoothly toward a low-carbon economy by adjusting tax liabilities based on sector-specific emissions factors (RSA, 2019).

The carbon tax's impact is phased and moderated to balance economic and social pressures associated with transitioning to low-carbon operations. South Africa has introduced temporary tax-free allowances of 60%–75% on emissions for most sectors, with additional offsets available, thus mitigating immediate financial impacts while encouraging a gradual reduction in emissions. This structured approach aims to align economic resilience with sustainability goals, supporting industries as they adapt to a low-carbon future.

Consumer behaviour and packaging reduction

Efforts to reduce single-use plastic consumption often involve a combination of incentives and regulations designed to promote reusable alternatives and influence consumer behaviour positively. Beyond consumer-focused strategies, industry initiatives play a crucial role in driving sustainable practices.

For instance, in 2016, Woolworths introduced South Africa's first plant-based milk bottle, comprising 30% plant-based plastic. This innovation was achieved through collaboration with Braskem, a leading biopolymer producer based in Brazil (Braskem, 2016; Woolworths, 2016). More recently, Woodlands Dairy, one of South Africa's largest milk producers, launched packaging for its First Choice Fresh extended shelf-life milk featuring a bio-based closure. The closures are partly made from plastics derived from plant-based materials such as sugarcane, and the cartons consist of over 80% plant-based raw materials, making the entire package 100% recyclable (Mohan, 2020; The Herald, 2020).

These industry-led initiatives contribute to South Africa's climate objectives by supporting waste reduction and mitigating emissions associated with production. While influencing consumer behaviour is essential, fostering a policy environment that encourages industry engagement in circular practices and decarbonisation is imperative to align with both national and global sustainability goals.

3.1.1. National Environmental Management: Waste Act No. 59 of 2008 and the National Waste Management Strategy (NWMS)

South Africa's environmental stewardship is primarily guided by the National Environmental Management Waste Act of 2008 (Waste Act). This legislation, rooted in the National Environmental Management Act No. 107 of 1998, ensures adherence to the constitutional right to a healthy environment. The Waste Act establishes a comprehensive framework for waste management, including national norms and standards, and deals with various waste types, including plastic waste. While the Waste Act does not explicitly target plastic waste, it provides the foundation for resolving this pressing issue. The Waste Act is put into practice through the NWMS, first through the 2011 draft and more recently the 2020 draft, which outlines the government's approach to reducing plastic waste, particularly single-use plastics that contribute to marine pollution. Although specific recycling and waste reduction targets for packaging and plastics are yet to be established within the NWMS, it sets broader goals to be achieved over a five-year period, such as waste minimisation — which includes a 40% diversion of waste from landfills within five years and 75% over a 15-year period — and effective and sustainable waste service, as well as creating awareness, and enforcing compliance with regulations.

3.1.2. Extended Producer Responsibility (EPR) Regulations

EPR in South Africa, established under the National Environmental Management Waste Act, came into effect in May 2021. As an environmental policy, EPR assigns producers both financial and physical responsibility for the entire lifecycle of their products, including the post-consumer waste treatment and disposal (Brown, et al. 2023). However, the policy framework is limited to producers of paper and packaging material. Despite being a driver of plastic use, packaging is only one of the many activities that produce plastic waste and leakage (WWF, 2021; Watkins et al., 2019) Globally, EPR policies have been implemented to tackle waste management challenges, promote sustainability, and increase producer responsibility. In South Africa, the introduction of EPR has led the plastics industry to explore establishing a Producer Responsibility Organisation (PRO) (Dlothi et al., n.d).

Under EPR, producers must manage the collection, recycling, and safe disposal of their products including electronic waste, scrap metal, plastics, as well as glass and paper material once they reach the end of their useful life. The key objectives of EPR policies are multifaceted: they aim to reduce environmental impacts by ensuring proper end-of-life management, promoting recycling, minimising landfilling, and preventing pollution (Dlothi, et al. n.d). Additionally, EPR encourages resource conservation and supports a circular economy by motivating producers to design recyclable products, use recycled materials, and promote efficient resource use and waste reduction. The policy also focuses on internalising the costs associated with waste management, recycling, and disposal, integrating these costs into product pricing to foster sustainable practices and equitable cost distribution. Furthermore, EPR fosters collaboration among producers, recyclers, government agencies, and other stakeholders to improve waste management systems, promote information sharing, and enhance collection and recycling efficiencies.

Producers under the EPR framework in South Africa must comply with several key requirements. They are mandated to develop and implement EPR measures, which include establishing the necessary procedures, processes, and resources to manage the collection, reuse, recycling, recovery, and disposal of their products at the post-consumer stage (Brown, et al. 2023). The scope of EPR extends to waste generated from the use of paper and paper packaging, plastic packaging, biodegradable and compostable plastic packaging, single-use products, glass packaging, and metal packaging containers, except for plastic carrier bags and flat bags. Under the EPR, PROs are set up to enforce compliance, oversee collection, recycling, and proper disposal of waste products, and are responsible for monitoring and reporting activities across the relevant industries. Producers are also required to submit EPR schemes to the relevant Minister or establish a PRO to submit such schemes. New producers beginning operations after January 15, 2021, must submit an EPR scheme to the Department of Forestry, Fisheries, and the Environment within six months of starting operations, or alternatively, join an existing EPR scheme within three months (Diale, 2024).

South Africa's EPR policy, while ambitious, faces several hindrances to full implementation and effectiveness. Compliance with EPR requirements imposes significant administrative burdens on producers, particularly small and medium enterprises (SMEs), which may lack the resources to meet these demands. Weak enforcement, with limited monitoring and accountability, reduces compliance and undermines the policy's impact. Additionally, inadequate waste collection, recycling, and disposal infrastructure, especially in rural areas, hinders achieving the policy's objectives. Concerns about increased production costs, particularly in industries with tight margins, leads some producers to resist adopting sustainable practices. Public awareness and participation are also critical for EPR success, yet consumer engagement in recycling and waste management practices is weak. Furthermore, while EPR promotes resource efficiency and product recyclability, it provides limited direct incentives for producers to innovate in eco-design or adopt broader circular economy principles.

3.1.3. Plastic bag levy and potential extensions to single-use plastics

To reduce litter and promote plastic bag reuse, South Africa introduced a plastic bag levy in 2004, initially set at R0.03 per bag for certain types of plastic shopping bags. This levy has gradually increased, reaching R0.32 in April 2024 (OECD, 2022). The tax was introduced to reduce consumer dependence on plastic bags by incentivising reuse and the adoption of durable alternatives, with the broader objective of lowering plastic waste generation nationwide (Nahman, 2010). In addition to this measure, the National Treasury has explored the possibility of expanding the levy to encompass all single-use plastics used for retail purposes, such as plastic straws, utensils, and packaging. However, no such expansion has as yet been implemented. Contemplation of extending the levy highlights the government's ongoing efforts to reduce plastic waste and its environmental impact.

According to Dlothi et al. (n.d), the use of plastic bags initially decreased following introduction of the levy but subsequently rose again due to various complexities and obstacles in implementing the legal and policy framework. These include inadequate enforcement, resistance to legislation, and a lack of available substitutes for plastic bags. Such factors have undercut effective and sustainable plastic bag waste management and hindered the levy attaining it intended objectives.

4. CONCLUSION

The plastics value chain must balance its economic significance with its environmental impact. Fossil-based plastics dominate the industry, with their production and conversion accounting for approximately 90% of GHG emissions in the plastics lifecycle. In South Africa, this is further exacerbated by a reliance on coal-based feedstocks and energy-intensive, carbon-intensive processes. This substantial environmental footprint underscores the urgent need for a balanced and sustainable approach to development.

This report has examined the key sustainability factors, current and expected, focusing on the carbon footprint of the value chain and the evolving policy landscape. In doing so, it has highlighted significant findings and underscored the challenges and opportunities in transitioning to a more sustainable plastics industry.

Bio-based polymers like bio-HDPE and bio-PP show significantly lower or even negative GHG emissions compared to their fossil-based counterparts. Although bio-based plastics may reduce GHG emissions, they impact land use, water consumption, and biodiversity. Consumer behaviour and producer innovation in eco-design and material efficiency play a crucial role in achieving long-term sustainability.

The policy landscape reflects a growing emphasis on circular economy principles through international and national initiatives aimed at reducing single-use plastics, promoting recycling, and encouraging low-carbon innovation. In South Africa, measures such as the EPR regulations, carbon tax, and NWMS are vital steps toward reducing plastic waste and emissions. However, weak enforcement, limited infrastructure, and resistance from producers hinder the full realisation of these policies.

In conclusion, transitioning to a low-carbon plastics industry requires a collaborative, multifaceted approach. Stakeholders across the value chain must drive the adoption of bio-based alternatives, invest in robust recycling infrastructure, and ensure effective implementation of comprehensive policies. By aligning economic priorities with sustainability objectives, the plastics sector can cut back its environmental impact while supporting economic and social development.

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info@tips.org.za I +27 12 433 9340 I www.tips.org.za