BRIEFING NOTE

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REDUCING PLASTIC POLLUTION: A COMPREHENSIVE, EVIDENCE-BASED STRATEGY FOR SOUTH AFRICA

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KEY FINDINGS

Applying the 'Pathways tool' to South Africa demonstrates that no single strategy will effectively address the plastic pollution problem, but a **63% reduction in plastic pollution by 2040** as compared to business as usual could be achieved through a system change involving the following intervention strategies:

Intervention	What does it mean?	Target per annum
Reduce demand and substitute	Reuse, eliminate, alternative delivery models, substitution of plastics with paper, coated paper and compostable bioplastics	2.7% reduction
Collect and recycle	Waste separation at source, collection of segregated materials, sorting of collected materials and increased recycling rates	4.85% increase
Collect and safely dispose	Capturing waste in collection systems and safe disposal at sanitary landfills (engineered and well managed)	3.36% increase

INTRODUCTION

The 'Breaking the Plastic Wave' study provided the first, comprehensive global assessment of pathways towards stopping ocean plastic pollution. South Africa, like most countries, is faced with growing plastic consumption and disposal and, with it, leakage of plastic into the terrestrial and aquatic environment. The Pathways tool, which evolved from The Pew Charitable Trusts' 2020 report 'Breaking the Plastic Wave', is a modelling framework and software tool, developed by Professor Richard M Bailey (University of Oxford) in partnership with The Pew Charitable Trusts. This study applied the 'Pathways tool' to provide an evidence-based approach for South Africa towards improved plastics management and achieving near-zero plastic leakage into the environment. The 'Pathways tool' enables the analysis of current and projected plastic material flows (Figure 1) and the effects of strategies and policy interventions on reducing plastic pollution. In addition, it provides an opportunity for multi-objective optimisation, so that decisions can not only be guided by the need to protect the environment and reduce plastic pollution, but also to ensure socioeconomic development by providing jobs and infrastructure at a reasonable cost.

METHOD

The 'Pathways tool' was used to model three distinct scenarios, namely, a Business-as-Usual (BAU) scenario with no new policies and measures, which assumes that no intervention is made in relation to the current plastic-related policy, economics, infrastructure or materials, and that cultural norms and consumer behaviours do not change; an Extended Producer Responsibility (EPR) scenario, which assumes that the EPR collection and recycling five-year targets for paper and packaging as contained in gazetted EPR regulations are implemented and enforced; and an Optimal System Change (OSC) scenario, which seeks to identify an optimal solution for South Africa's sustainable development that balances environmental objectives of minimising plastic pollution and greenhouse gas (GHG) emissions, with socioeconomic objectives of minimising costs and maximising jobs. The OSC scenario combines strategies of increasing plastics waste collection, recycling, and disposal to sanitary landfill, and reducing the demand for plastics.

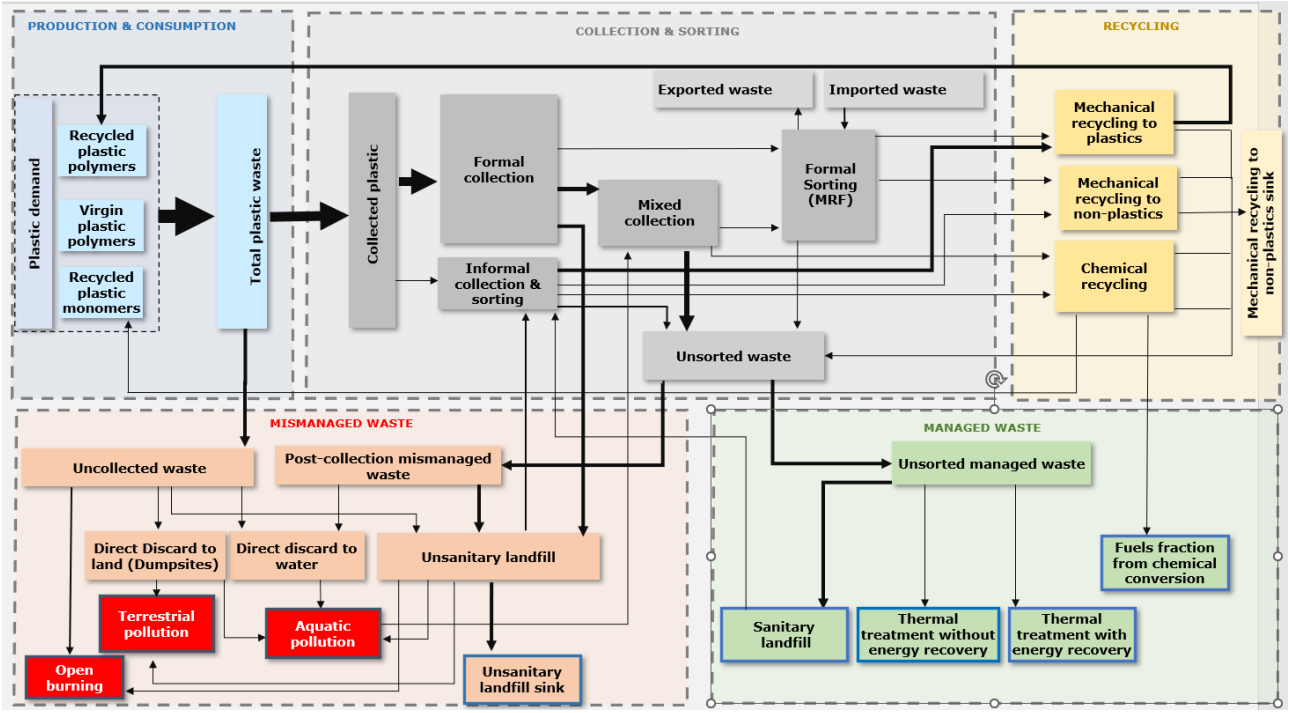

Figure 1: System map for South Africa showing plastic flows in 2020. The arrow width indicates the plastic mass flow (Sankey diagram)

Currently, approximately 37% of households in South Africa do not have weekly waste collection services, leaving 29% of all generated household waste uncollected, which is often disposed of improperly. Furthermore, the waste that is collected is sent to landfill, but many of the authorised municipal landfill sites do not function effectively in terms of waste treatment and containment. Consequently, plastic waste mismanagement causes plastic leakage (from both uncollected waste and the collected waste, which is subsequently improperly disposed at landfill) to the environment, where it impacts air quality, water and land resources. South Africa's waste management practices and the percentage of the population living in close proximity (< 1 km) to water bodies were used to model plastics leakage and the fate of the plastic pollution in the receiving environment.

RESULTS AND DISUSSION

The informal waste sector collects 76% of all plastic that enters recycling. Waste collected by formal waste collection systems is disposed of at municipal landfills. The current annual total plastic waste (2020 data)[1] is estimated to be 1 546 kt, of which 1 350 kt is collected and 196 kt uncollected. Most of the plastic collected is in the form of mixed municipal solid waste, with relatively little plastics separation at source. Only 301 kt of plastics is recycled – this represents a recycling rate of 19% of the total plastic waste disposed, or 22% of the total plastic waste collected. Due to the mismanagement of disposed waste, 488 kt of waste plastic leaks into the environment, where it causes air pollution through open burning (275 kt), land pollution (145 kt) and aquatic (freshwater and marine) pollution (68 kt).

Under the BAU scenario, with a projected growth in plastic consumption of 1.33% per annum (from rising population and increased consumption) and with no plastics-related policies and measures in place, plastic pollution is set to almost double from 491 kt in 2020 to 865 kt in 2040. The greenhouse gas emissions associated with plastics will increase by 63% over the same period, with virgin plastics production contributing 64%, plastic conversion 25% and open burning 8%.

Compared to the current BAU trajectory with no policies and measures (Figure 2A), achieving the recently legislated EPR five-year recycling targets for plastics (Figure 2B) in South Africa will avoid 33% total plastic pollution over the period 2023 to 2040 (aquatic pollution will be reduced by 25%, plastic pollution to land by 33% and plastic pollution to air from open

[1] The year 2020 is the most current date with primary data.
NOTE: 1kt=1kilo-tonne=1 000 metric tonnes=1 megagram (Mg)

burning by 35%). However, in absolute terms, the reduction of plastic pollution by increased collection and recycling is balanced by growth in plastics consumption, resulting in 2040 levels of plastic pollution (496 kt) being similar to current levels.

The Optimal System Change scenario (Figure 2C) will avoid 63% total plastic pollution over the period 2023 to 2040, compared to the BAU (aquatic pollution will be reduced by 56%, plastic pollution to land will decrease by 66%, and plastic pollution to air from open burning by 63%). In addition, the Optimal System Change scenario also avoids 37% of projected greenhouse gas emissions; reduces the required investment by 67% as a result avoided capital costs for plastic production, conversion, and disposal; while also increasing job opportunities by 3%; compared to the current BAU. The Optimal System Change requires a combination of strategies with a 2.67% annual reduction in plastic demand, a 4.9%, increase in plastics waste collection and recycling, as well as a 3.4% increase in the safe disposal of plastic waste to sanitary landfill so that the waste is contained *in situ.*

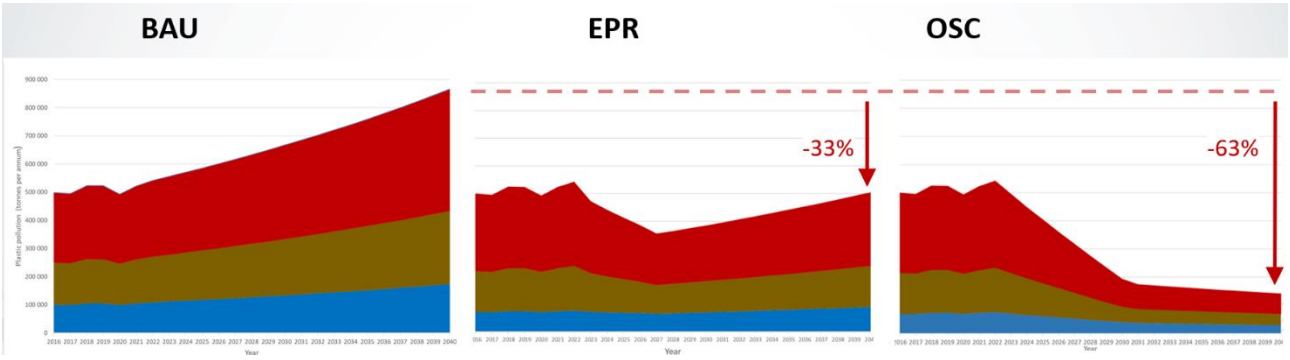

Figure 2: Scenario Comparison: BAU (A); meeting EPR targets for plastics (B); and OSC scenario (C), which combines the strategies of reducing demand, increasing collection and recycling, and increasing safe disposal to sanitary landfill.

CONCLUSIONS AND RECOMMENDATIONS

Plastic pollution is a growing concern and, without intervention, it is set almost double current levels by 2040. The main component of plastic pollution is the open burning of waste (56%) followed by land pollution (30%) and aquatic pollution (14%). To date, much of the global attention on plastic pollution has focused on marine plastic pollution. These findings reveal that plastic pollution is dominated by the open burning of waste and terrestrial pollution, with aquatic (fresh water and marine) pollution being a relatively small component of South Africa's pollution problem.

Plastic pollution is a symptom of waste mismanagement through both uncollected waste that is disposed to open dumps and collected waste that is disposed to non-compliant municipal landfill sites that fail to adequately contain the plastic waste. Interventions are required to improve waste collection services and management at landfills, including upgrades to achieve sanitary conditions that effectively contain all waste disposed. It is, therefore, very important to enforce licence conditions at landfills to protect the environment from plastic pollution. There is relatively little source separation of plastics, and plastics collection for recycling is predominantly carried out by the informal sector from mixed waste at curb side or landfill sites. The important role of informal waste pickers highlights the need to integrate the informal sector into recycling and waste management, as envisaged in the National Waste Management Strategy 2020 and EPR regulations.

A combination of strategies is needed to effect a system change that can effectively reduce plastic pollution in South Africa. This will require a collaborative approach between all stakeholders and a commitment to support the necessary changes across the value chain.

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